ESD ANALYSIS REPORT

FABRIC SHOE COVERS

SHOE INN, LLC
Sparks, NV. USA

Report No. 18136

ESD ANALYSIS REPORT

All equipment and terms used on this analysis laboratory are approved, accepted and recognized by the ESD communities, according with the EOS/ESD S20.20 – 2014.

ANALYSIS DATE: November 02, 2018

COMPANY: SHOE INN

PRODUCT: Fabric shoe covers with traction and Esd Ribbon

MODEL: 7FWT-100-ESD

ESD ANALYST: Roberto Martinez Santana

REFERENCE STANDARD:

ANSI/ESD S20.20-2014 / ESD STM11.11-2015 / ESD STM11.12-2015
ANSI/ESD S541-2018

ENVIRONMENTAL CONDITIONS :

Specimens shall be preconditioned and tested at two environmental conditions :

12% ± 3% relative humidity, 23 ± 3°C. (73° ± 5° F) for a minimum of 48 for a minimum of 48 hours but not greater than 72 hours.

50% ± 2% relative humidity, 23 ± 3°C. (73° ± 5° F) for a minimum of 48 hours but not greater than 72 hours.

INSTRUMENTATION:

During the evaluation, the following equipment was used:

PRS-801 Resistance System-Prostat
PGA-710 Auto analysis System Set
PFM-711A Electrostatic Field Meter – Prostat
CPM-720A Charge Plate - Prostat
ets Control Environment Chamber Model 5532

Note: All instruments properly calibrated on May 29, 2018 by Prostat lab.

ANALYSIS PROCEDURE:

1. Place the 6 samples in the chamber for 48 h. to 12% and 50% HR.
2. Measure the Surface resistance of booties strip.
3. Measure the Resistance of Person with booties (system).
4. Measure the Resistance of Floor.
5. Measure the Resistance of System Floor/Person.
6. Measure the Voltage Generation – Walking test.
7. Record the results.

BOOTIE RESISTANCE TEST

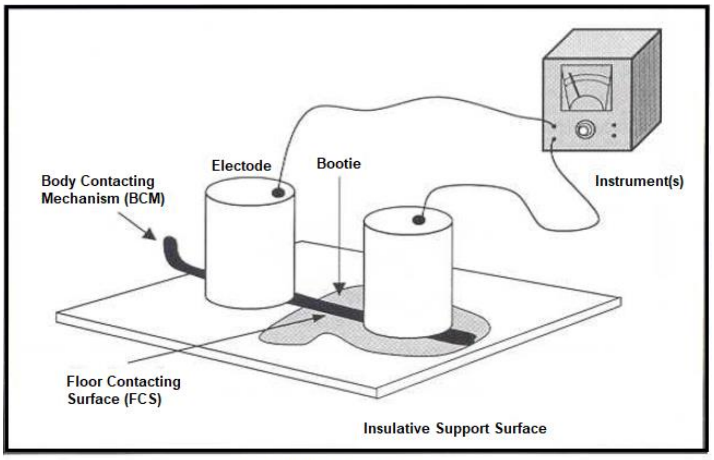

Figure 2: Bootie Resistance Test

RESISTANCE SYSTEM

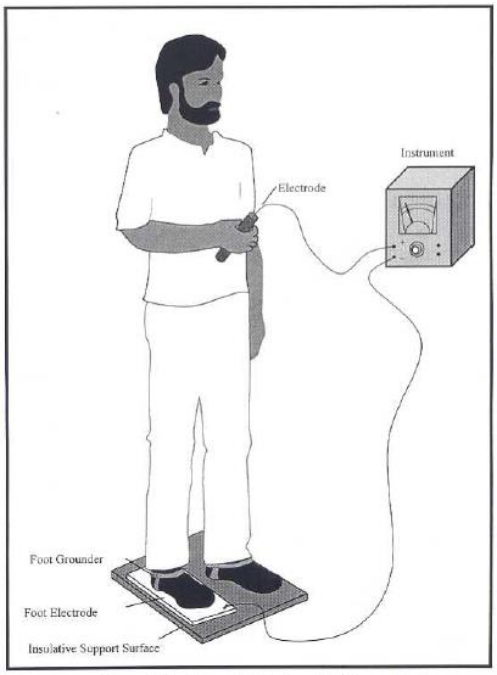

Figure 3: Foot Grounder System Resistance Test

RESISTANCE LIMITS BY *ANSI/ESD S20.20-2014*

Table 3. EPA ESD Control Items

Technical Requirement	ESD Control Item	Product Qualification[7]		Compliance Verification	
		Test Method	Required Limit(s) [8]	Test Method	Required Limit(s)
EPA	Foot Grounders	ESD SP9.2	Point to Groundable Point < 1 x 10^9 ohms	For compliance verification of Footwear / Flooring System, see Table 2.	

Table 2. Personnel Grounding Requirement

Technical Requirement	Product Qualification[4]		Compliance Verification	
	Test Method(s)	Required Limit(s)	Test Method(s)	Required Limit(s)
Wrist Strap System	ANSI/ESD S1.1 (Section 6.11)	< 3.5×10^7 ohms	ESD TR53 Wrist Strap Section	< 3.5×10^7 ohms
Footwear / Flooring System[5] – (Both limits must be met)	ANSI/ESD STM97.1	< 1.0×10^9 ohms	ESD TR53 Footwear Section	< 1.0×10^9 ohms[6]
	ANSI/ESD STM97.2	< 100 volts Peak	ESD TR53 Flooring Section	< 1.0×10^9 ohms[6]

ANSI/ESD SP9.2-2003

APPENDIX E - Foot Grounder Classification

Electrical	Resistance Value*
Foot Grounder Standard Use Type A	8.0×10^5 to 3.5×10^7
Foot Grounder Special Use High Type B	3.5×10^7 to 1.0×10^9
Foot Grounder Special Use Low Type C	$<8.0 \times 10^5$

* Resistance values are obtained from evaluation or compliance verification testing.

Foot Grounder Classification

Standard use:
Type A (standard) foot grounder has a lower resistance limit of 8.0×10^5 ohms to limit current flow to <0.5 milliamp at 240 VAC. The upper resistance limit of less than 3.5×10^7 ohms is defined by ANSI/ESD S20.20 as the recommended person to ground resistance value.

Special use:
Special electrical performance characteristics of materials used to make foot grounders may be required to achieve product attributes such as non-marking and high durability or very low resistance for handling some components.. These special characteristics may necessitate foot grounder resistance values outside of the recommend level defined in ANSI/ESD S20.20.

MEASUREMENTS RESULT:

	ELECTRICAL RESISTANCE (readings in ohms)					
	BOOTIE STRIP RESISTANCE		SYSTEM RESISTANCE		FLOOR RESISTANCE	
Sample	**RH 50%**	**RH 12%**	**RH 50%**	**RH 12%**	**RH 50%**	**RH 12%**
1	5.10E+07	9.44E+07	6.30E+06	1.17E+07	6.50E+04	9.82E+04
2	3.70E+07	6.85E+07	6.60E+06	1.22E+07	6.70E+04	1.01E+05
3	5.30E+07	9.81E+07	5.90E+06	1.09E+07	6.60E+04	9.97E+04
4	3.60E+07	6.66E+07	6.50E+06	1.20E+07	6.80E+04	1.03E+05
5	5.70E+07	1.05E+08	6.80E+06	1.26E+07	6.70E+04	1.01E+05
6	4.30E+07	7.96E+07	6.90E+06	1.28E+07	6.40E+04	9.66E+04
Min	3.60E+07	6.66E+07	5.90E+06	1.09E+07	6.40E+04	9.66E+04
Max	5.70E+07	1.05E+08	6.90E+06	1.28E+07	6.80E+04	1.03E+05
Avg	4.62E+07	8.54E+07	6.50E+06	1.20E+07	6.62E+04	9.99E+04
DevStd	8773064.839	16230169.95	363318.042	672138.379	1471.96014	2222.66

Measurement Result

According to the results obtained from the resistance of the bootie strip, the classification of this bootie is of Foot Grounder Special Use High Type B.

APPENDIX E - Foot Grounder Classification

Electrical	Resistance Value*
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Foot Grounder Special Use Low Type C	$<8.0 \times 10^5$

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	ELECTRICAL RESISTANCE MEASUREMENTS- Readings in ohms					
	Test Feet on Floor at 12 % RH			Test Feet on Floor at 50 % RH		
Sample	**2 FEET**	**LEFT**	**RIGHT**	**2 FEET**	**LEFT**	**RIGHT**
1	3.58E+07	4.47E+07	4.77E+07	1.20E+07	1.50E+07	1.60E+07
2	3.58E+07	5.07E+07	4.77E+07	1.20E+07	1.70E+07	1.60E+07
3	3.87E+07	5.07E+07	4.47E+07	1.30E+07	1.70E+07	1.50E+07
4	3.58E+07	4.47E+07	4.47E+07	1.20E+07	1.50E+07	1.50E+07
5	3.58E+07	4.77E+07	5.07E+07	1.20E+07	1.60E+07	1.70E+07
6	3.87E+07	4.47E+07	5.07E+07	1.30E+07	1.50E+07	1.70E+07
Min	3.58E+07	4.47E+07	4.47E+07	1.20E+07	1.50E+07	1.50E+07
Max	3.87E+07	5.07E+07	5.07E+07	1.30E+07	1.70E+07	1.70E+07
Avg.	3.68E+07	4.72E+07	4.77E+07	1.23E+07	1.58E+07	1.60E+07
Std. Desv.	1538865.383	2929912.399	2665393.03	516397.779	983192.08	894427.2

BODY VOLTAGE GENERATION:

This measurement of Voltage Generation is realized in agreement to the conditions that proves the standard **ANSI/ESD STM97.2-2016.**

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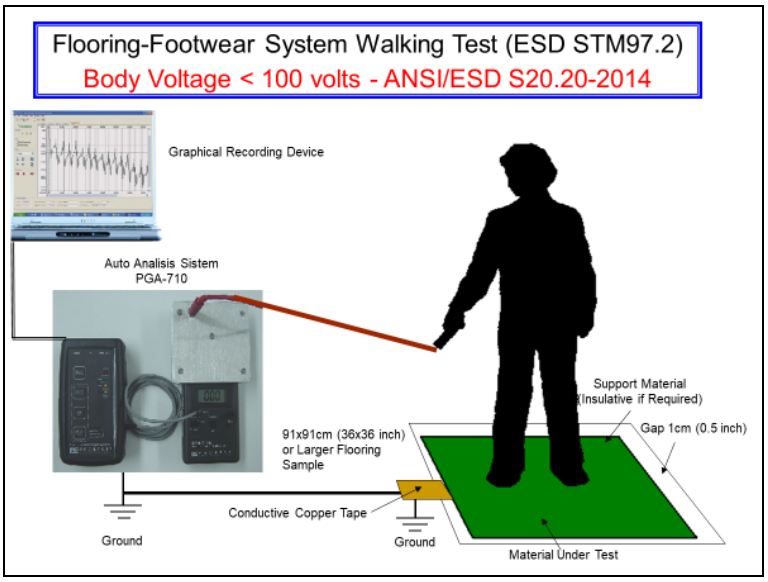
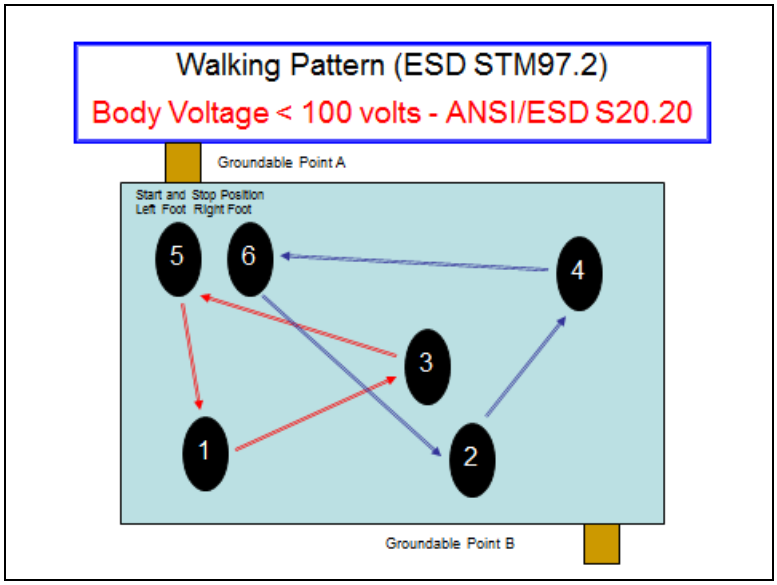
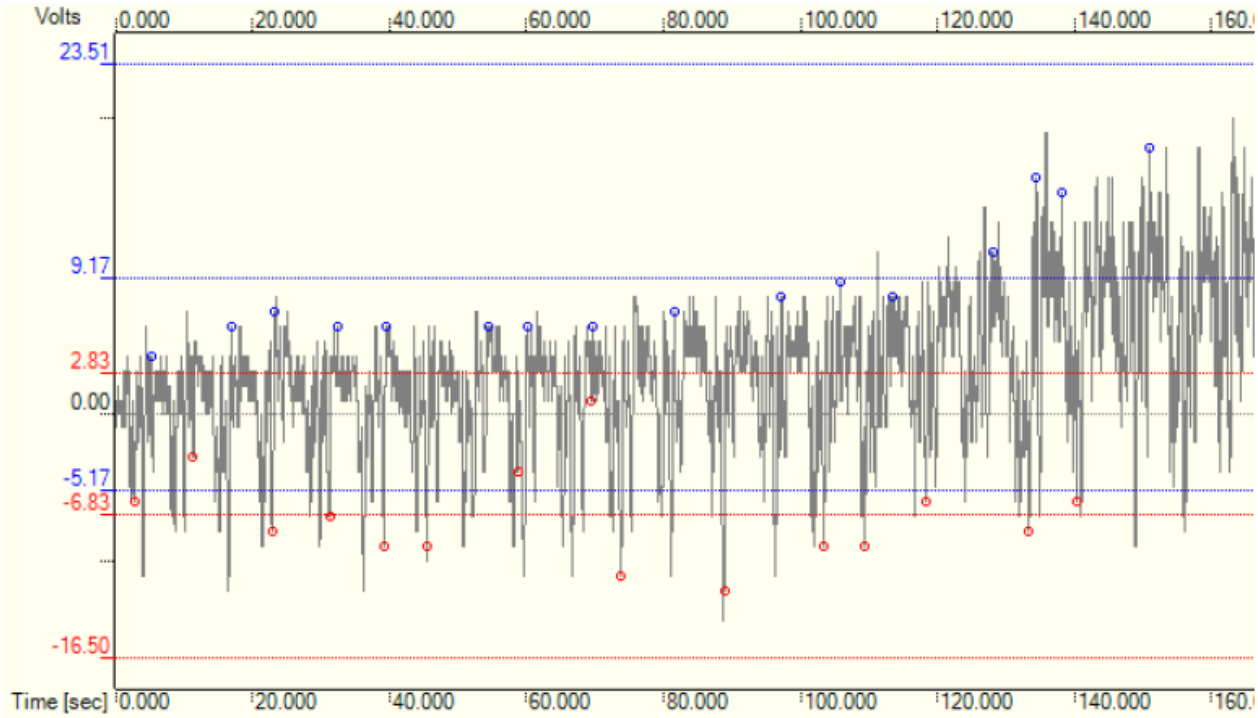




Body Voltage Generation Analysis Test Summary



Body Voltage Generation Test Information

Test Date:	02/11/2018 04:42:09p. m.	Conditions:	Temperature [C]	23.30
			Temperature [F]	73.94
			Humidity [%Rh]	51.35
Technician:	ROBERT SANTANA	Affiliation:	STROMLAB	

Location

Address:	STROMLAB GUADALAJARA, JALISCO MEXICO	Area Info:	LAB TEST AREA

Material

Description: CONDUCTIVE FLOOR WITH FABRIC SHOE COVER MODEL 7FWT-100-ESD

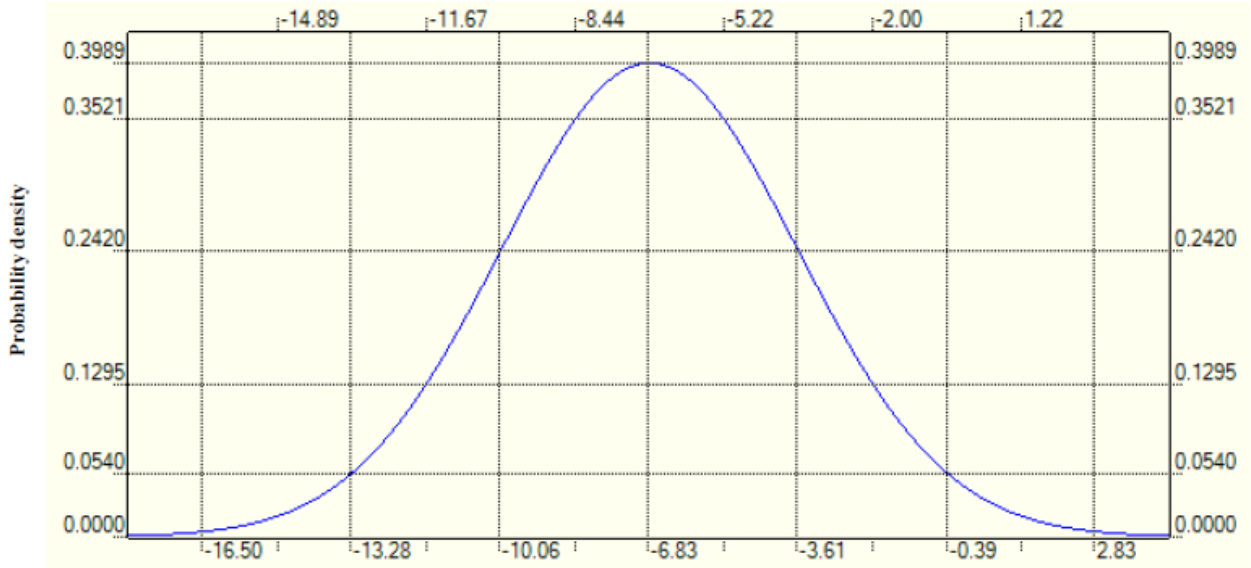
Data Summary:

			Standing	Walking	Global
Number of Full Test Cycles:	18				
		Average Voltage [V]:	-6.83	9.17	2.64
Peak Recorded Values [V]:	20.00	Standard Deviation:	3.22	4.78	
ANSI/ESD STM 97.2	18.00	Minimum Voltage [V]:	-12.00	4.00	-14.00
	16.00	Maximum Voltage [V]:	1.00	20.00	20.00

Walking Test Fabric Shoe Covers-2018.tst 02/11/2018 04:46:50p. m. Página 1 de 3

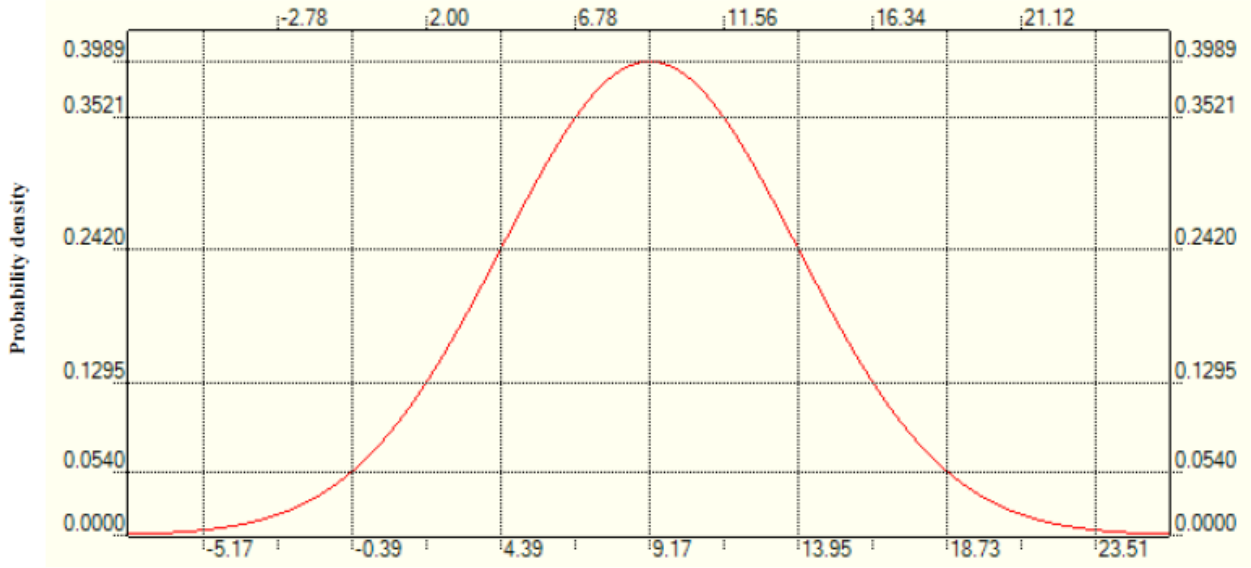
Body Voltage Generation Analysis Test Summary

Standing Voltage - 3 Sigma Analysis



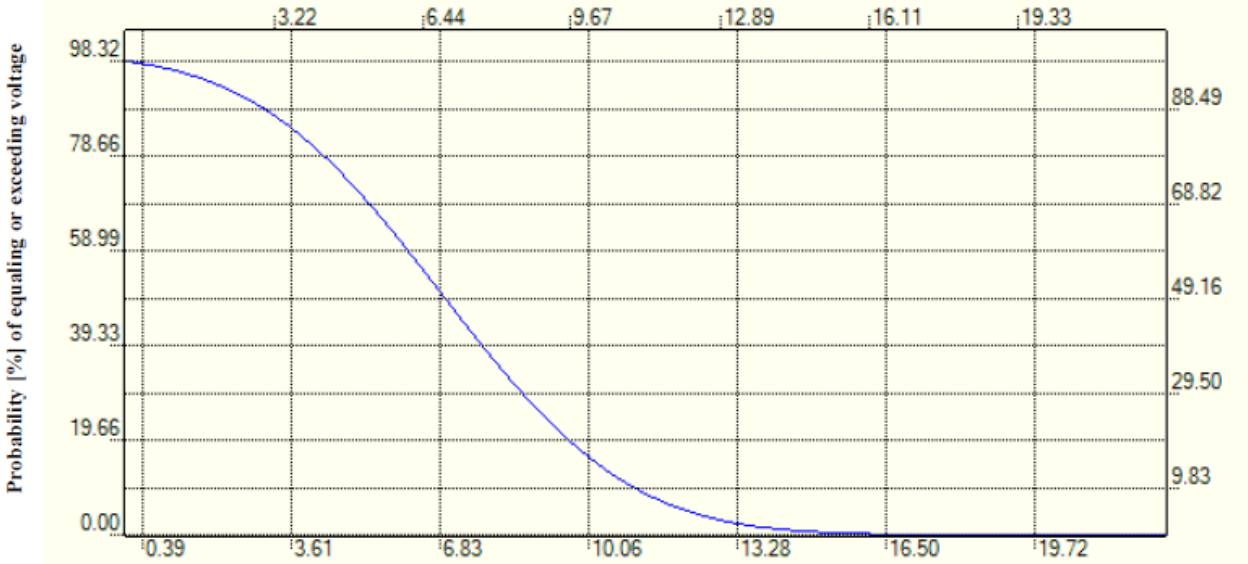
Standing Average:	-6.83	Min Range:	-16.50
Standing StdDev:	3.22	Max Range:	2.83
Standing StdDev (x3):	9.67		

Walking Voltage - 3 Sigma Analysis



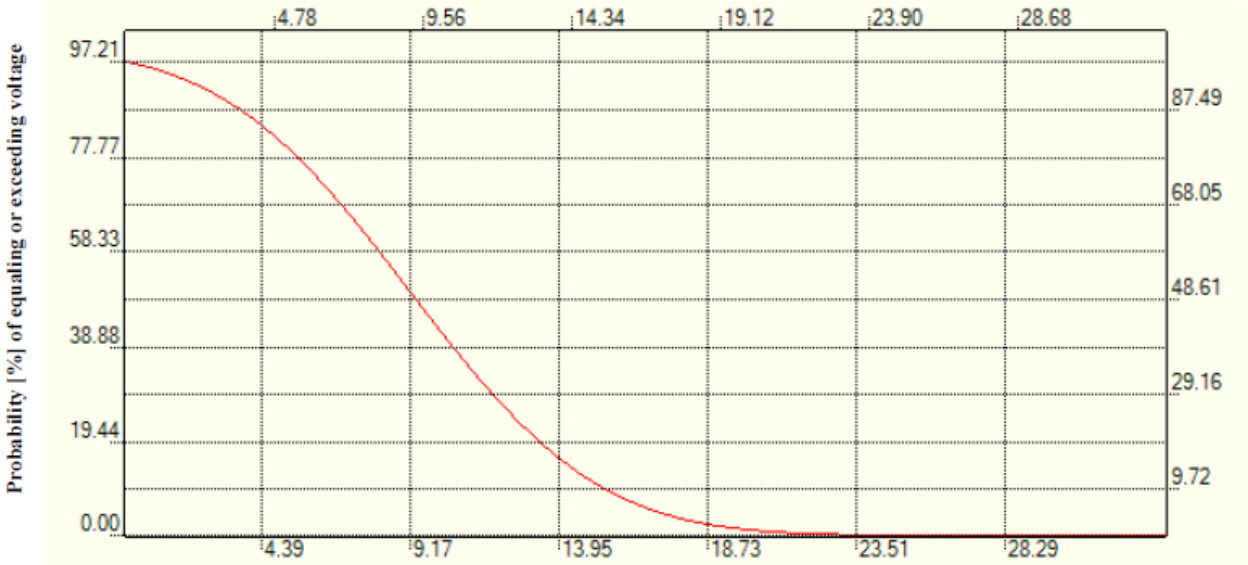
Walking Average:	9.17	Min Range:	-5.17
Walking StdDev:	4.78	Max Range:	23.51
Walking StdDev (x3):	14.34		

Standing Voltage Probability



Voltage [V]	0.39	3.61	6.83	10.06	13.28	16.50	19.72
Probability [%]	97.72	84.13	50.00	15.87	2.28	0.13	0.00

Walking Voltage Probability



Voltage [V]	4.39	9.17	13.95	18.73	23.51	28.29	33.07
Probability [%]	84.13	50.00	15.87	2.28	0.13	0.00	0.00

FINAL SUMMARY OF THE ANALYSIS:

According with the results obtained we conclude:

1. The footwear covers have a resistance that allow a good connection to ground through contact with the floor.
2. The voltage generate in combination with a person and conductive floor is less than 100 volts.
3. The booties under test are recommended to be used in an EPA.

IMPORTANT: The results shown in this report are in adherence to standard and results may not be consistent with the needs of the end user.

END

Any questions about this report, don´t hesitate to contact me.

Cordially

Eng. Roberto Martínez Santana
Esd Technical Director