

Element Materials Technology Denver-Longmont A.K.A. NTS Labs, LLC Test Report for Environmental/Dynamics Testing of the KST7250 and KST3601

Prepared For

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Revision History

Rev.	Description	Issue Date
0	Initial Release	06/20/2024
1	Corrected Test Result	06/26/2024



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1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Environmental/Dynamics test program at Element Materials Technology Denver-Longmont (hereafter referred to as "Element"). The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements defined in the test specification.

2.0 References

The following references listed below form a part of this document to the extent specified herein.

- Test Specification: See Table 5.0-1
- KS Technologies, LLC Purchase Order EMT-2415-01, dated 04/08/2024
- Element Quotation OP0651495, dated 12/11/2023
- ISO/IEC 17025:2017(E) General Requirements for the Competence of Testing and Calibration Laboratories, dated 11/2017

3.0 Product Selection and Description

KS Technologies, LLC selected and provided the following test sample(s) to be used as the Equipment Under Test.

Item Name/Description Part Number **Serial Number** Qty. KST7250 KST7250 000003 1 2 1 KST3601 KST3601 000583 KST7250 KST7250 000004 3 1 4 KST3601 000259 1 KST3601 KST7250 KST7250 000001 5 1 6 1 KST3601 KST3601 000495 7 1 KST7250 KST7250 000005 8 KST3601 KST3601 000589 1

Table 3.0-1: Product Identification – Equipment Under Test (EUT)

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

The instrumentation used in the performance of these tests is periodically calibrated and standardized within manufacturer's rated accuracies and are traceable to the National Institute of Standards and Technology. The calibration procedures and practices are in accordance with ISO 17025:2017. Certification of calibration is on file subject to inspection by authorized personnel.



5.0 Test Description and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result
5.1	Dust (IP-6x)	IEC 60529	Longmont	05/31/2024 -	KST7250	000001, 000495	No visual
5.1	Dust (II -0x)	IEC 00327	Longmont	06/03/2024	KST3601	000001, 000473	damage noted
5.2	Water Corner (ID v.5)	IEC 60529	Lanamant	05/31/2024	KST7250	000004, 000259	No visual
3.2	Water Spray (IP-x5)	IEC 60329	Longmont	03/31/2024	KST3601	000004, 000239	damage noted
5.3	Immersion (IP-x7)	IEC 60529	Lanamant	05/31/2024	KST7250	000003, 000583	No visual
3.3	Immersion (IP-x/)	IEC 60329	Longmont	03/31/2024	KST3601	000003,000383	damage noted
		MIL-STD-810G &		06/06/2024 -	KST7250		Visual damage
5.4	Drop	IEC 60068-2-31	Longmont	06/17/2024	KST3601	000005, 000589	noted. Customer
	•	1EC 00008-2-31		00/1//2024			Determination



5.1 **Dust (IP-6x)**

5.1.1 Test Procedure

IEC 60529

5.1.2 Test Result

The EUT showed no visual damage noted after the test was completed.

5.1.3 Test Datasheets

		Te	st Log		
MJO N	o: PR18290	6 Customer: KS Technologies	Test Specification: IEC 60529	Test Performed	l: IP-6x
Date	Time		Log Entry		Tech
5/31/2024	1445	No visible evidence of damage bef			CS
		IP Designation: IP-6x End	closure Category: 1 – Air pressure r	educed within	CS
			ubic meter of the test chamber volu	me	CS
			hose fitting to allow for pulling a vacuu		
5/31/24	1450	cavity of the sample.	,		CS
5/31/24	1455	Sample was set up within the dust ch	namber.		CS
5/31/24	1500		low for the test shall be 0.97 to 1.45 li	ters per minute.	CS
			of 2kPA within the sample was achieve		
1 1			, no measurable flow was achieved, th	erefore the test	
5/31/24	1510	duration was set at 8 hours.			CS
5/31/24	1511	Began the 8-hour exposure			CS
			. Opened the chamber, cleared away	all the dust from	
6/3/24	0715	the sample, and removed it from the			CS
6/3/24	0720	Opened the sample and performed a			CS
6/3/24	0735	No evidence of dust ingress was obs	served. Results meet the passing crite	ria for IP-6x	CS
					CS
6/3/24	0810	Sample KST3601 was affixed with a cavity of the sample.	hose fitting to allow for pulling a vacuu	um on the internal	CS
6/3/24	0813	Sample was set up within the dust ch	namber.		CS
6/3/24	0813	Per the IEC specification, the target f	low for the test shall be 0.97 to 1.45 li	ters per minute.	CS
1000 Page - 1000 Page 1		9	ted flow was achieved so the test dura	tion was set to 2	
6/3/24	0815	hours.			CS
6/3/24	0822	Began the 2-hour exposure			CS
			. Opened the chamber, cleared away	all the dust from	
6/3/24	1025	the sample, and removed it from the			CS
6/3/24	1030	Opened the sample and performed a			CS
6/3/24	1045		served. Results meet the passing crite	ria for IP-6x	CS
6/3/24	1100	Test complete, no visual damage			CS
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\vdash		<u> </u>			
\vdash					
\longmapsto					
\vdash		<u> </u>			
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\vdash		<u> </u>			
 					
 		1			
 		1			
 					



5.1.4 Test Photographs



Pre- Exposure



SN-000001_Pre- Exposure



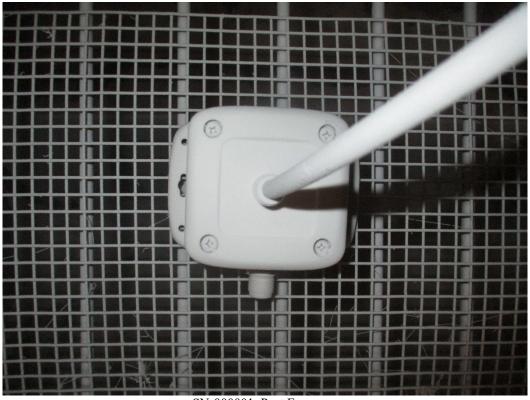


SN-000001_Post Exposure



SN-000001_Post Exposure





SN-000001_Post Exposure



SN-000001_Post Exposure





SN-000001_Post Exposure



SN-000001_Post Exposure





SN-000001_Post Exposure



SN-000495_Pre- Exposure



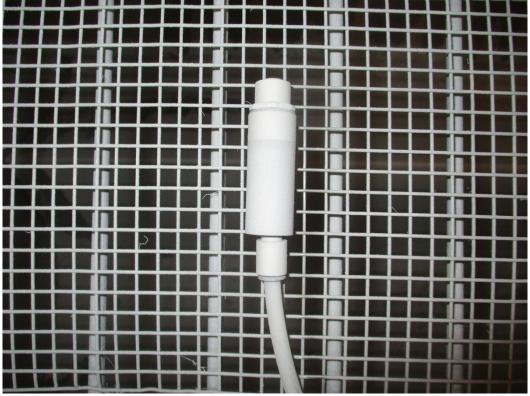


SN-000495_Pre- Exposure



SN-000495_Post Exposure





SN-000495_Post Exposure



SN-000495_Post Exposure





SN-000495_Post Exposure



SN-000495_Post Exposure



5.1.5 Test Equipment List

Table 5.1-1: First Characteristic Numeral 6 Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC080871	Chamber (Dust, Settling)	Thermotron	D27	08/15/2023	NCR
WC061711	Scale (Digital)	Accutek	W-8250-50B	09/05/2023	09/05/2024
WC084362	Gauge (Vacuum)	Dwyer Instruments	2000-10KPA	06/22/2023	06/22/2024
WC084363	Meter (Flow)	Dwyer Instruments	RMA-11	06/12/2023	06/12/2024

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.2 Water Spray (IP-x5)

5.2.1 Test Procedure

IEC 60529

5.2.2 Test Result

The EUT showed no visual damage noted after the test was completed.

5.2.3 Test Datasheets

		Τε	est Log		
MJO No	o: PR182906	Customer: KS Technologies	Test Specification: IEC 60529	Test Performed	l: IP-x5
Date	Time		Log Entry		Tech
5/31/2024	1215	No visible evidence of damage be	fore testing.		CS
		IP Design: IP-x5			CS
		Test Means: Water jet hose nozzle	e - 6.3 mm diameter		CS
		Water flow rate: 12.5 l/min			CS
		Duration: 1 min/m at least 3 min			CS
		Distance from nozzle to enclosure			CS
		Water Temperature: The water ter by more than 5 K.	nperature does not differ from that o	of the specimen	CS
5/31/24	1220	Sample temperatures were within 5	K of the water temperature		CS
5/31/24	1225	Setup sample KST7250	it of the water temperature		CS
5/31/24	1230	The second of th	mple KST7250 for a total duration of 3	minutes	CS
2290, 554 92 1 (552)	1010	Sample was inspected for signs of w	vater intrusion. No water intrusion was		00
5/31/24	1240	sample			CS
5/31/24	1315	Setup sample KST3601	2016		CS
5/31/24	1319	rotated during exposure	601 for a total duration of 3 minutes. S	ample was	CS
5/31/24	1325	Sample was inspected for signs of w sample	vater intrusion. No water intrusion was	found within the	CS
5/31/24	1340	Test complete, no visual damage			CS
0/01/21	1010	rest complete, no viocal carrage			
 					
 					



5.2.4 Test Photographs



Pre- Exposure



Pre- Exposure





SN-000004_Pre- Exposure



SN-000004 Exposure





SN-000004_Exposure



SN-000004_Exposure





SN-000004_Exposure



SN-000004_Exposure





SN-000004_Post Exposure



SN-000004_Post Exposure

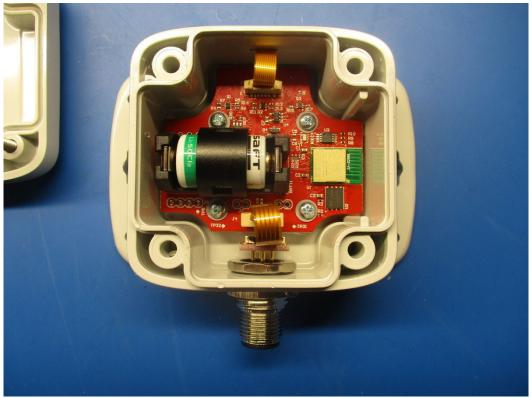






SN-000004_Post Exposure





SN-000004_Post Exposure



SN-000259_Pre Exposure



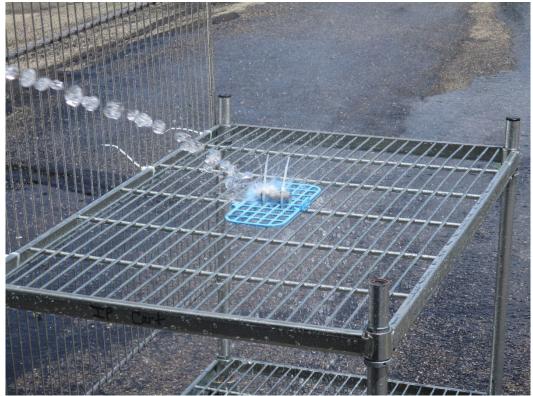


SN-000259_Exposure



SN-000259_Exposure





SN-000259_Exposure



SN-000259_Exposure



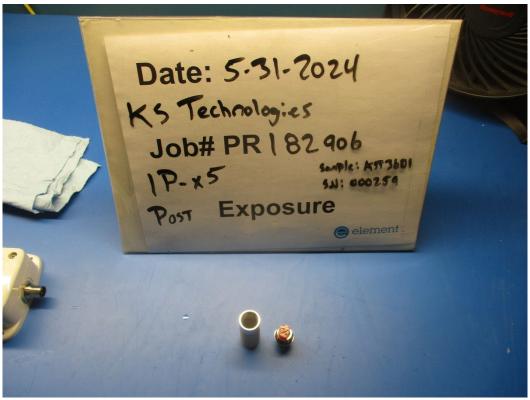


SN-000259_Post Exposure



SN-000259_Post Exposure



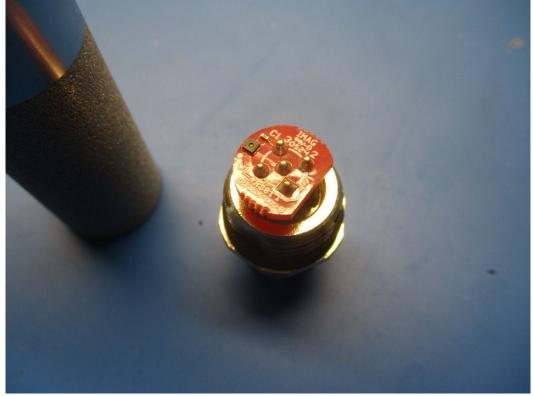


SN-000259_Post Exposure



SN-000259_Post Exposure





SN-000259_Post Exposure



5.2.5 Test Equipment List

Table 5.2-1: Second Characteristic Numeral 5 Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC084243	Nozzle (Spray)	Element	Nozzle	NCR	NCR
WC084353	Tank (Water)	Element	Water Tank	NCR	NCR
WC061417	Calibrator (Thermocouple)	Omega Engineering	CL27	11/02/2023	11/02/2024
WC080932	Stopwatch (Digital)	Digi	94460-28	03/21/2024	03/21/2025
WC084240	Measurement Tools (Tape Measure)	Stanley	33-726	06/20/2022	06/19/2024

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.3 Immersion (IP-x7)

5.3.1 Test Procedure

IEC 60529

5.3.2 Test Result

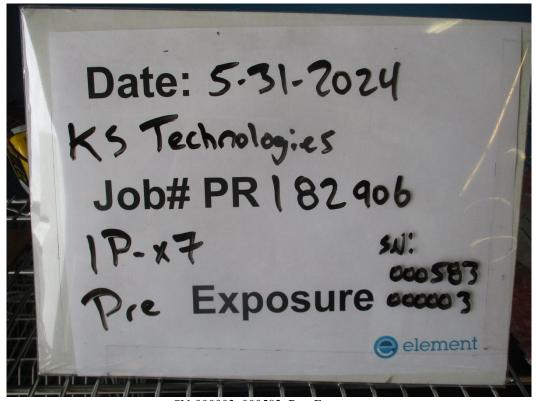
The EUT showed no visual damage noted after the test was completed.

5.3.3 Test Datasheets

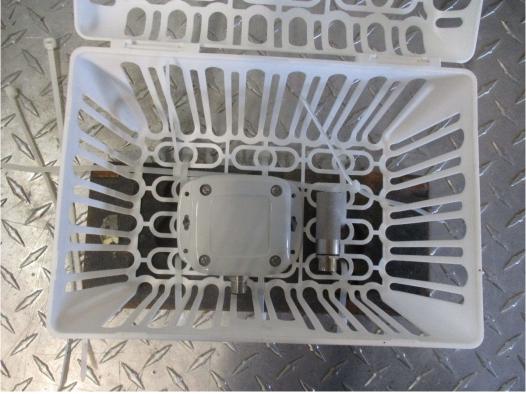
Test Log					
MJO No: PR182906 Customer: KS Technologies Test Specification: IEC 60529 Test Performed:					
Date	Time	Log Entry	Tecl		
5/31/2021	1020	No visible evidence of damage before testing.	CS		
		IP Designation: IP-x7	CS		
		Test Means: Immersion tank water-level on enclosure 0.15 m above top, 1 m bottom	above CS		
		Water Temperature: The water temperature does not differ from that of the sp by more than 5 K	Decimen CS		
		Test Duration: 30 minutes	CS		
5/31/24	1025	Sample temperatures were within 5 K of the water temperature	CS		
5/31/24	1027	Samples were placed inside of a cage with a rope that measures out to 1 meter	CS		
5/31/24	1032	Samples were then exposed to water immersion at 1 meter for a duration of 30 mir			
5/31/24	1102	Samples have completed water immersion exposure	CS		
		Samples were inspected for signs of water intrusion. No water intrusion was found			
5/31/24	1105	samples	cs		
5/31/24	1120	Test complete, no visual damage	CS		



5.3.4 Test Photographs

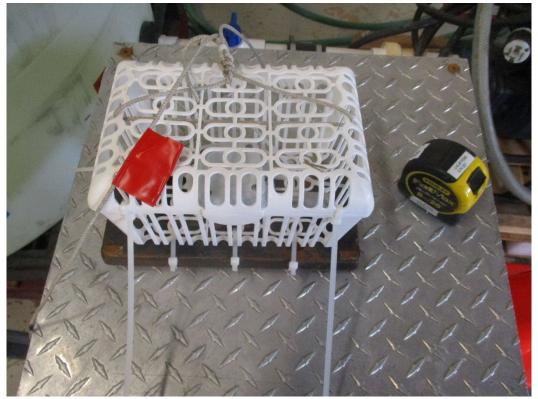


SN-000003, 000583_Pre- Exposure



SN-000003, 000583 Pre- Exposure





SN-000003, 000583_Pre- Exposure

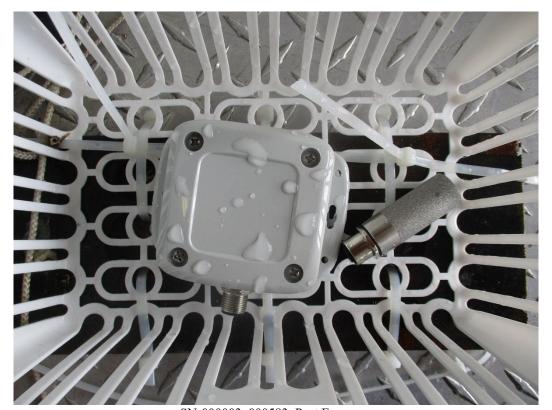


SN-000003, 000583_Exposure





SN-000003, 000583_Exposure



SN-000003, 000583_Post Exposure





SN-000003_Post Exposure



SN-000003_Post Exposure



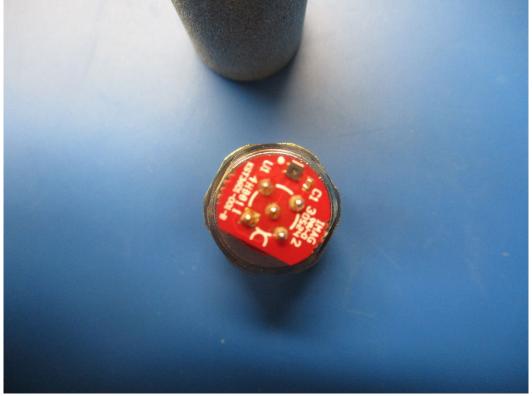


SN-000003_Post Exposure



SN-000583_Post Exposure





SN-000583_Post Exposure



SN-000003, 000583_Post Exposure



5.3.5 Test Equipment List

Table 5.3-1: Second Characteristic Numeral 7 Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC084353	Tank (Water)	Element	Water Tank	NCR	NCR
WC061417	Calibrator (Thermocouple)	Omega Engineering	CL27	11/02/2023	11/02/2024
WC080932	Stopwatch (Digital)	Digi	94460-28	03/21/2024	03/21/2025
WC084240	Measurement Tools (Tape Measure)	Stanley	33-726	06/20/2022	06/19/2024

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.4 Drop

5.4.1 Test Procedure

MIL-STD-810G & IEC 60068-2-31

5.4.2 Test Result

The EUT showed visual damage noted after the test was completed. The EUT's results will be determined by KS Technologies, LLC.

5.4.3 Test Datasheets

Cam Stor	Axis	Plot No.	Serial No.	Customer Witness; N/A Temp: 72F Humidity: 54% Remarks	Initials		
620	Axis	Plot No.	Serial No.		Initials		
				l			
			1	UUT will be dropped from a height of 5 feet on to a piece of steel backed by concrete.			
			1	Swing Arm Drop tester will be used for height reference and UUT will be allowed to	1		
				freefall			
622				Setup KST3601 on Swing Arm Drop Tester #7			
	Face 3	Drop 1	000589	Perform a Drop on Face 3 (Opposite from connector end) from a height of 5 feet			
623	Face 2	Drop 2	000589	Perform a Drop on Face 2 from a height of 5 feet			
				After the drop on Face 2 the UUT showed signs of denting on the connector end			
1624 Face 4 Drop 3	000589	Perform a Drop on Face 4 from a height of 5 feet					
				After the drop on Face 4 the UUT showed signs of denting on the connector end			
626	Edge 6-3	Drop 4	000589	Perform a Drop on Edge 6-3 from a height of 5 feet			
1627 Edge 4-3 Drop 5 00		000589	Perform a Drop on Edge 4-3 from a height of 5 feet	CS			
				After the drop on Edge 4-3 the UUT showed signs of denting on the connector end	CS		
				UUT will be dropped from a height of 1000 mm on to a piece of steel backed by concrete. Swing Arm Drop tester will be used for height reference and UUT will be allowed to			
428	Face 3	Drop 1	000005				
429							
430	Face 1	_	000005	· · ·			
431	Face 6	Drop 4	000005				
432	Face 5	Drop 5	000005	, ,			
434	Face 4	Drop 6	000005	1 5			
435	Face 3	Drop 7	000005	Perform a drop from a height of 1000 mm on Face 3			
436	Face 2	Drop 8	000005	Perform a drop from a height of 1000 mm on Face 2			
436	Face 1	Drop 9	000005	Perform a drop from a height of 1000 mm on Face 1			
437	Face 6	Drop 10	000005	Perform a drop from a height of 1000 mm on Face 6			
437	Face 5	Drop 11	000005	Perform a drop from a height of 1000 mm on Face 5			
1438 F		Drop 12	000005	Perform a drop from a height of 1000 mm on Face 4	CS		
				Test complete, connector end showed signs of damage after the drop testing. Customer to make final determination of test results			
	526 527 428 429 430 431 432 434 435 436 436 437 437	Face 3 Face 3 Face 1 Face 4 Face 3 Face 1 Face 5 Face 3 Face 1 Face 6 Face 3 Face 1 Face 6 Face 1 Face 6 Face 3 Face 5 Face 3 Face 6 Face 1 Face 6 Face 1 Face 5 Face 1 Face 5 Face 1 Face 6 Face 1 Face 6 Face 1 Face 6	526 Edge 6-3 Drop 4 527 Edge 4-3 Drop 5 428 Face 3 Drop 1 429 Face 2 Drop 2 430 Face 1 Drop 3 431 Face 6 Drop 4 432 Face 5 Drop 5 434 Face 4 Drop 6 435 Face 3 Drop 7 436 Face 2 Drop 8 436 Face 1 Drop 9 437 Face 6 Drop 10 437 Face 6 Drop 11	Face 3 Drop 4 000055 431 Face 4 Drop 5 000055 432 Face 2 Drop 5 000055 433 Face 4 Drop 5 000055 434 Face 4 Drop 6 000005 435 Face 2 Drop 7 000005 436 Face 2 Drop 8 000005 437 Face 6 Drop 10 000005	Face 4 Drop 3 000589 Perform a Drop on Face 4 from a height of 5 feet After the drop on Face 4 from a height of 5 feet After the drop on Face 4 from a height of 5 feet Bdge 6-3 Drop 4 000589 Perform a Drop on Edge 6-3 from a height of 5 feet After the drop on Edge 4-3 from a height of 5 feet After the drop on Edge 4-3 from a height of 5 feet After the drop on Edge 4-3 the UUT showed signs of denting on the connector end UUT will be dropped from a height of 1000 mm on to a piece of steel backed by concrete. Swing Arm Drop tester will be used for height reference and UUT will be allowed to freefall Perform a drop from a height of 1000 mm on Face 3 Perform a drop from a height of 1000 mm on Face 2 Top 2 000005 Perform a drop from a height of 1000 mm on Face 1 The face 1 Drop 3 00005 Perform a drop from a height of 1000 mm on Face 1 The face 5 Drop 5 000005 Perform a drop from a height of 1000 mm on Face 5 The face 4 Drop 6 000005 Perform a drop from a height of 1000 mm on Face 4 The face 2 Drop 8 000005 Perform a drop from a height of 1000 mm on Face 4 Face 2 Drop 8 000005 Perform a drop from a height of 1000 mm on Face 4 Face 2 Drop 8 000005 Perform a drop from a height of 1000 mm on Face 4 Face 1 Drop 9 000005 Perform a drop from a height of 1000 mm on Face 4 Face 1 Drop 9 000005 Perform a drop from a height of 1000 mm on Face 1 Face 6 Drop 10 000005 Perform a drop from a height of 1000 mm on Face 1 Face 6 Drop 10 000005 Perform a drop from a height of 1000 mm on Face 1 Face 6 Drop 10 000005 Perform a drop from a height of 1000 mm on Face 6 Face 1 Drop 9 000005 Perform a drop from a height of 1000 mm on Face 6 Face 5 Drop 11 000005 Perform a drop from a height of 1000 mm on Face 6 Face 6 Drop 10 000005 Perform a drop from a height of 1000 mm on Face 6 Face 6 Drop 10 000005 Perform a drop from a height of 1000 mm on Face 6 Face 6 Drop 10 000005 Perform a drop from a height of 1000 mm on Face 6 Face 6 Drop 10 000005 Perform a drop from a height of 1000 mm on Face 6 Face 1 Drop 10 000005		



5.4.4 Test Photographs



Height



_Height





SN-000589_Drops_Face 3



SN-000589_Drops_Face 2





SN-000589_Drops_Face 3_Post Exposure

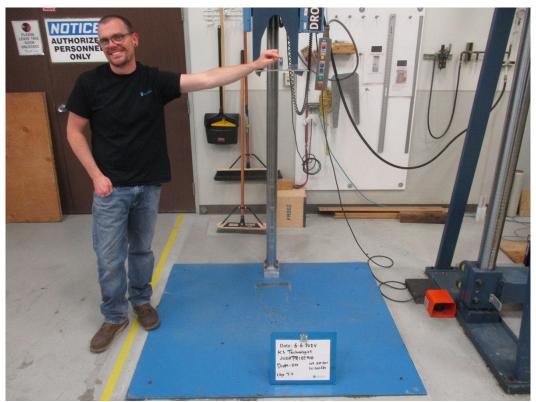


SN-000589_Drops_Face 4



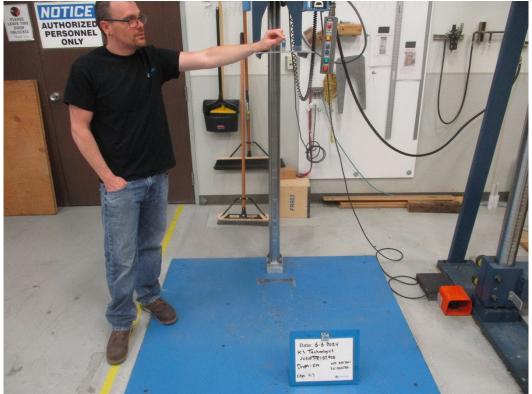


SN-000589_Drops_Face 4_Post Exposure



SN-000589_Drops_Edge 3-6



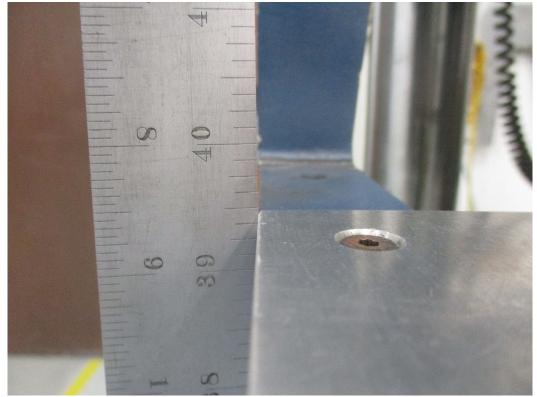


SN-000589_Drops_Edge 4-3



SN-000589_Drops_Edge 4-3_Post Exposure





1000 mm Height

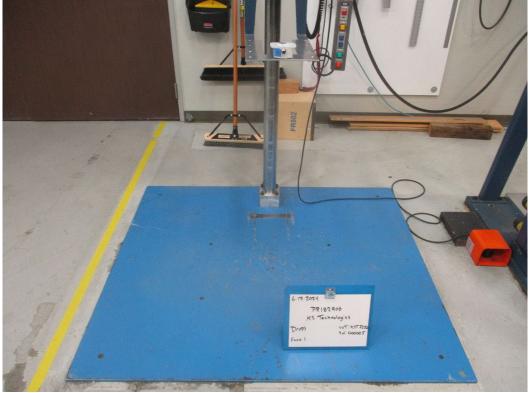


SN-000005_Drops_Face 3



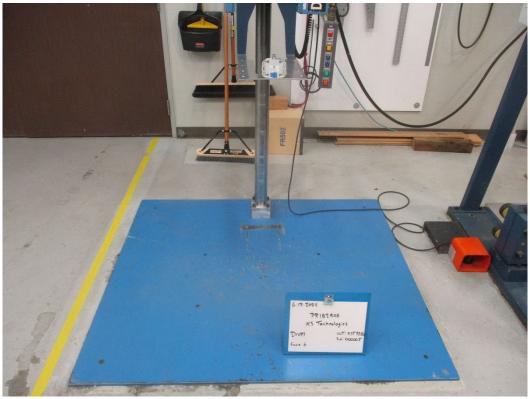


SN-000005_Drops_Face 2



SN-000005_Drops_Face 1



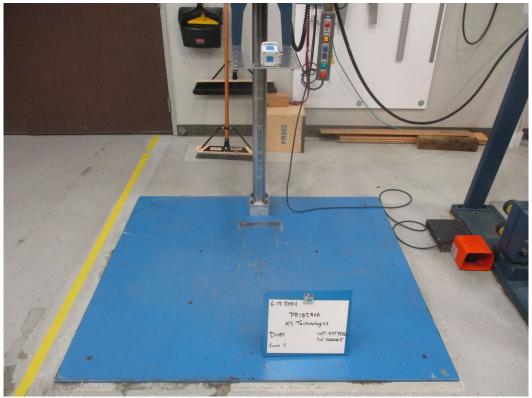


SN-000005_Drops_Face 6



SN-000005_Drops_Face 5





SN-000005_Drops_Face 4



SN-000005_Drops_Post Exposure





SN-000005_Drops_Post Exposure

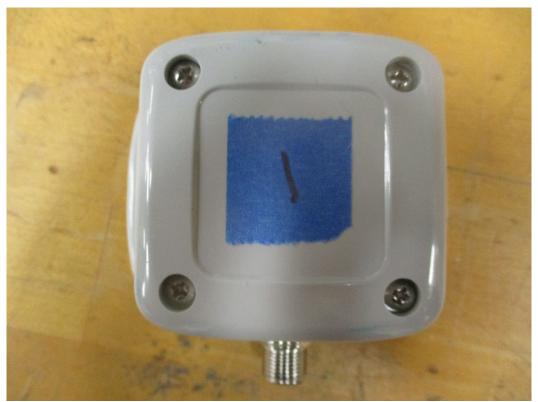


SN-000005_Drops_Post Exposure





SN-000005_Drops_Post Exposure



SN-000005_Drops_Post Exposure





SN-000005_Drops_Post Exposure



5.4.5 Test Equipment List

Table 5.4-1: Drop Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061449	Tower (Drop)	Lansmont	PDT56	NCR	NCR
WC061709	Probe (Temperature/Humidity)	Extech Instruments	EA20	11/03/2023	11/03/2024
WC078485	Measurement Tools (Ruler)	Starrett	C604R	NCR	NCR

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



End of Test Report