



Certificate of Test

Client: Underwriters Laboratories Inc
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Date: 29 March 2018
SES Document No.: 1601904-TS-CT-11 (Rev 0)
Project Manager: Steven E Kinyon, Ph.D.
Date of Testing: 22 February 2018

Project/Test Description: Project: Lithium-Ion Thermal Runaway Containment Study
TEST 11: Cell Block Transport Container Test 1 of 2. Cells Not Connected (NC), 100% State of Charge (SOC), Center Cell Heated

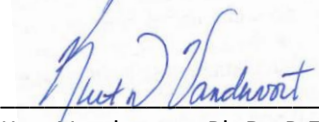
Test Sample Identification: PANASONIC 18650 3.4Ah, 25NC @ 100% SOC, installed in shipping box with lid, inside of Cell Block Transport Container with Loose Fill Material in Lid

Test Equipment: Strain DAQ, K-type thermocouples, 30VDC Power Supply, Kapton Heater (30V, 20W/in²)

Procedure: Heat center cell at a rate less than 10 °F/min to vent and thermal runaway or 400 °F. Record temperature and video.

Results: Heated cell vented and subsequently ejected its contents. Release of vapor from heated cell significantly charred box top and inside of container lid, activating the loose fill (CellBlockEX) material. No thermal runaway propagation or drop in adjacent cell voltage, but the cells adjacent to the heated cell showed some damage from expelled electrolyte.

Prepared by: 
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Associate

Reviewed by: 
Kurt Vandervort, Ph.D., P.E.
Principal

List of Attachments:

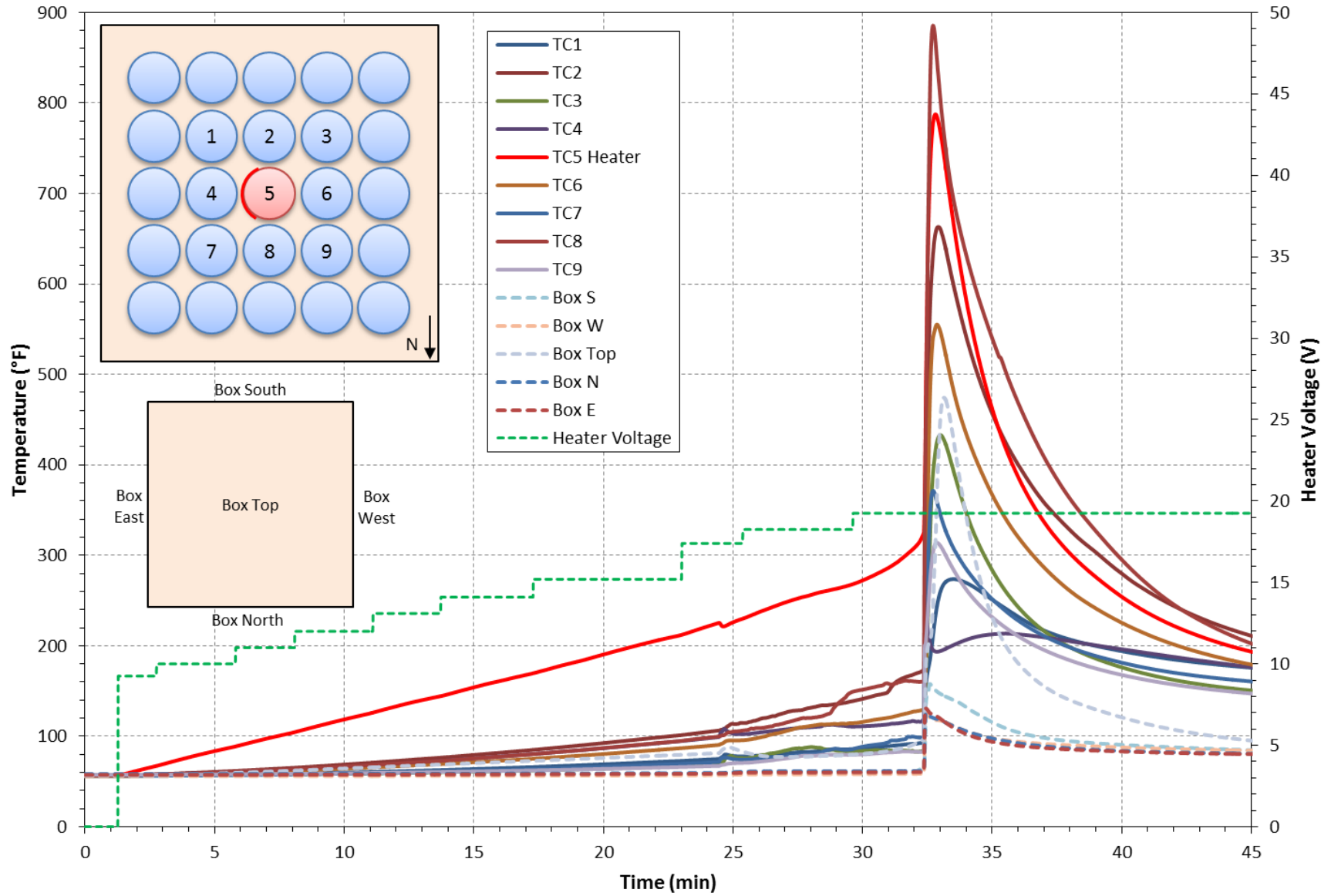
- Attachment 1: Test Data Recorded
- Attachment 2: Test Photographs

13800 Westfair East Drive; Houston, Texas 77041-1101; 281-955-2900
Texas Registered Engineering Firm F-195

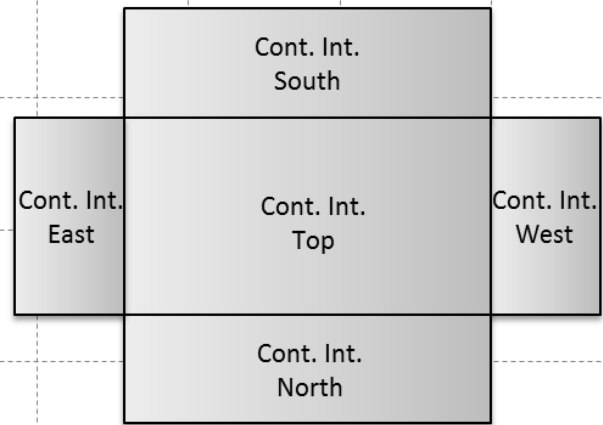
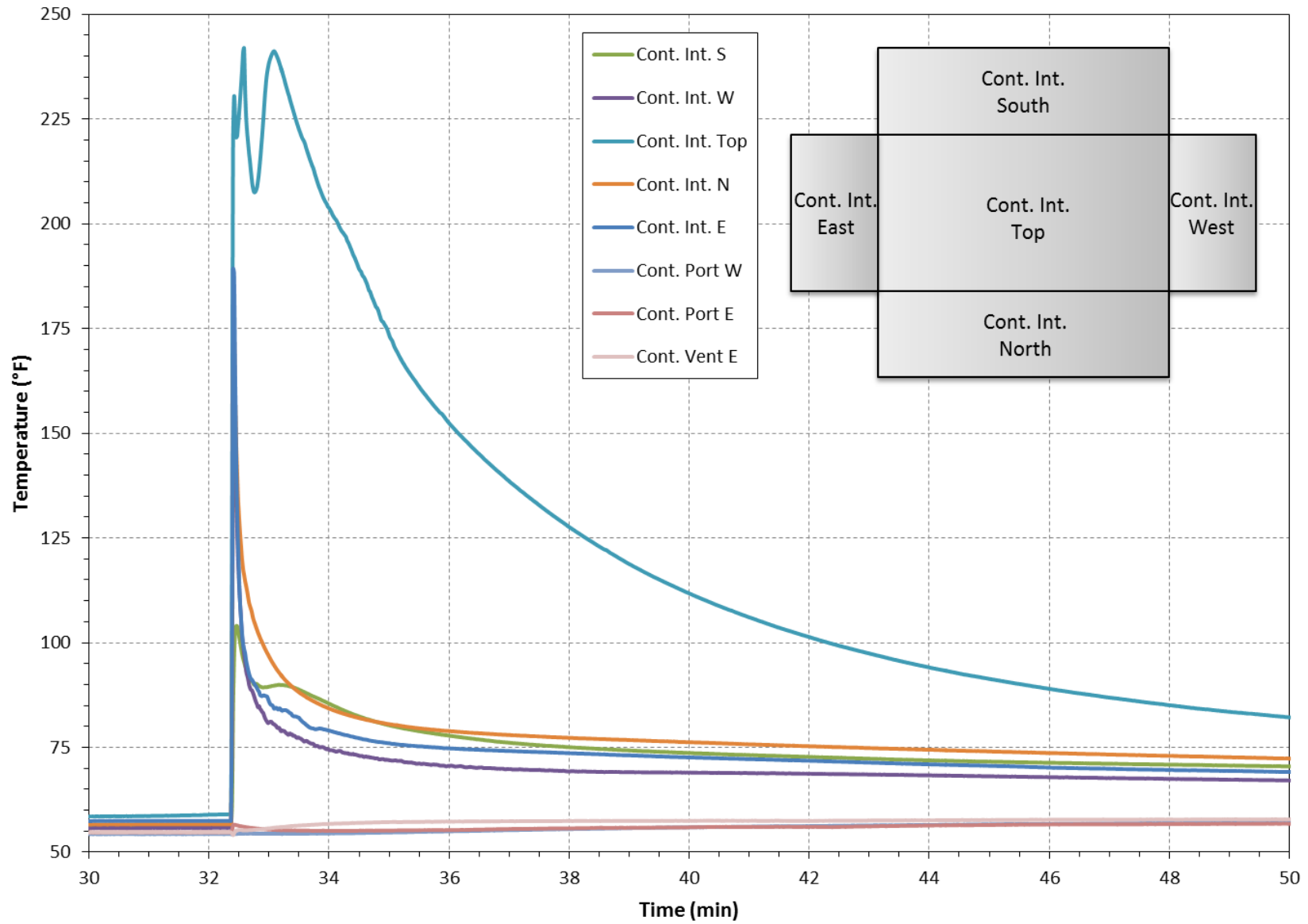
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Attachment 1: Test Data Recorded

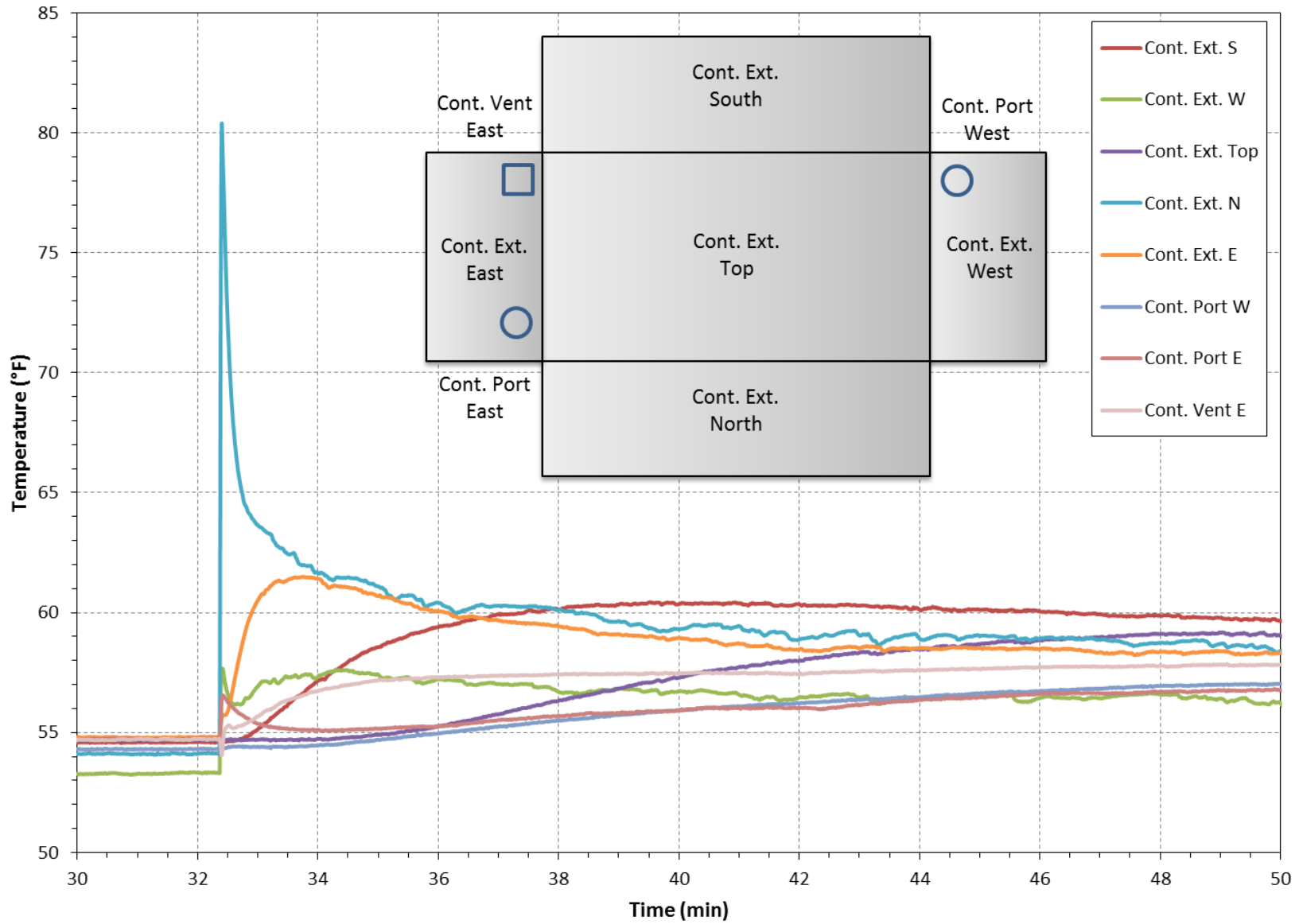
1601904 02-22-18 PAN18650 25NC 100% SOC Container Test 11



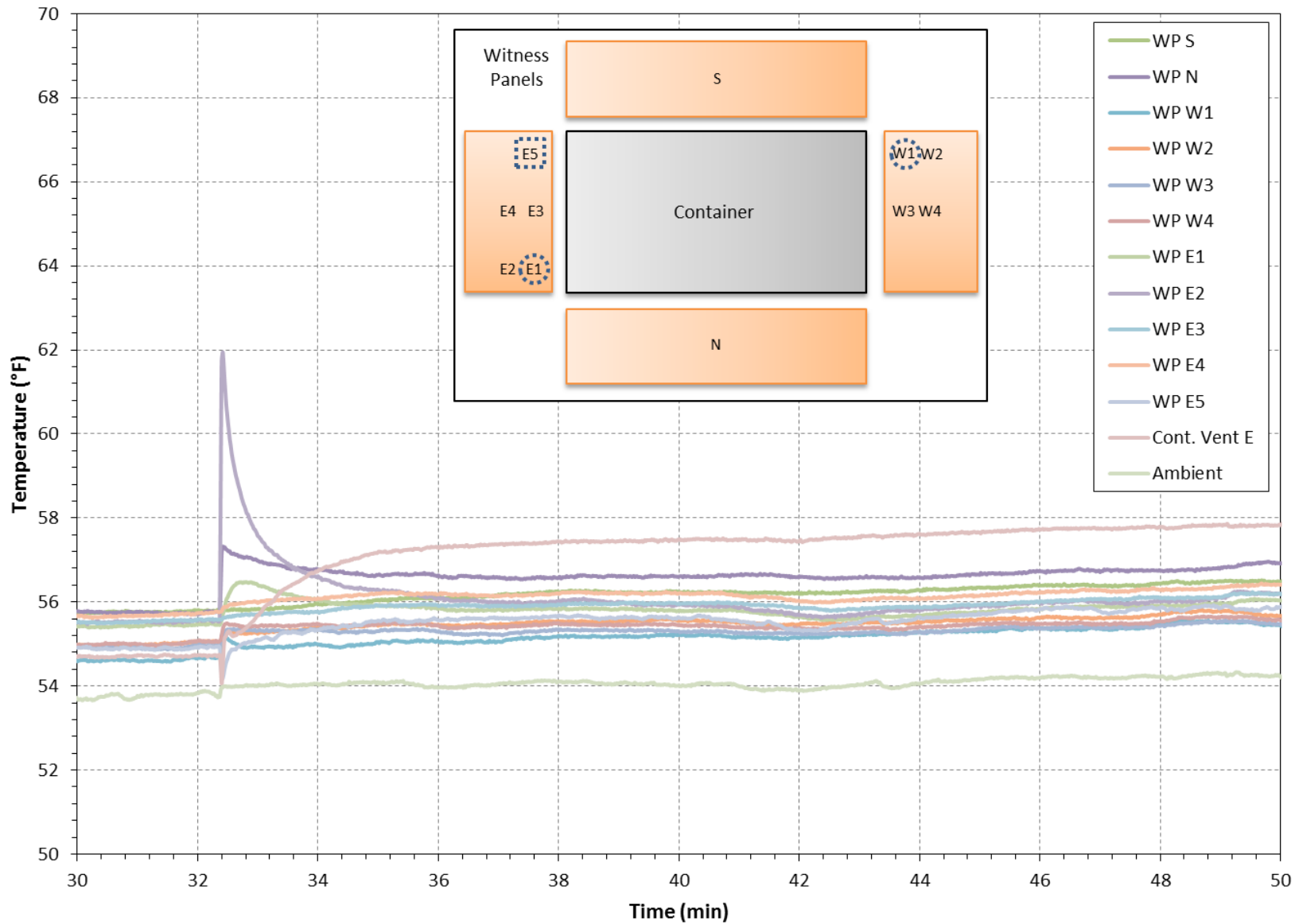
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Post- Test Cell Voltages

		South					
		A	B	C	D	E	
East	1	4.153	4.152	4.157	4.158	4.153	West
	2	4.153	4.147	4.126	4.151	4.153	
	3	4.152	4.132	Eject.	4.146	4.153	
	4	4.153	4.151	4.142	4.152	4.153	
	5	4.152	4.153	4.153	4.152	4.158	
		North					

Attachment 2: Photographs





