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Environmental Test Report

For

Facebook

OpenCellular - Connect-1

Testing Per: OpenCellular - Connect-1 Environmental Test Specification Document v1.0

COMPANY: Facebook
1601 Willow Road
Menlo Park, CA 94025

TEST SITE(S): National Technical Systems – Silicon Valley
38995 Cherry Street
Newark, CA 94560

JOB NUMBER: PR063169

REPORT DATE: July 21, 2017

TOTAL PAGES: 13

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REVISIONS

Revision	Reason for Revision	Date
0	Original	7/21/2017

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1.0 SUMMARY

The Facebook OpenCellular - Connect-1 was subjected to Wind Driven Rain testing per OpenCellular - Connect-1 Environmental Test Specification Document v1.0 to define unit tightness against Rain & Blowing Rain and to possible leaks of the unit. Facebook removed the test item to take back to their lab for final inspection and determine pass/fail. NTS was contracted to perform Rain & Blowing Rain test only.

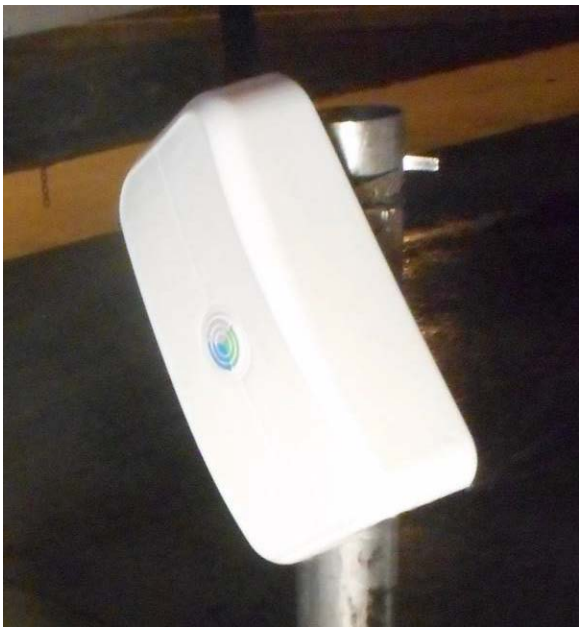

Figure 1: OpenCellular - Connect-1

2.0 GENERAL TESTING INFORMATION

2.1 References

a. OpenCellular - Connect-1 Environmental Test Specification Document v1.0
b. Customer PO#: 1073842

2.2 Test Equipment

The instruments used during testing covered by this report are presented in the equipment list in APPENDIX C.

2.3. Instrumentation Calibration Policy

NTS Silicon Valley adheres to a standard calibration cycle. Each category "A" instrument undergoes recalibration every 12 months, while other instruments are recalibrated on a periodic basis. All calibration is traceable to the National Institute of Standards and Technology (NIST).

2.4 Test Conditions/Profiles

The tests were conducted at conditions specified in OpenCellular - Connect-1 Environmental Test Specification Document v1.0 – Section 3.4 Rain & Blowing Rain:

3.4.1.4 Control & Measurements

1. Rain fall rate & Wind velocity are set as below
    a. Rain fall rate: 2.8 mm/min
    b. Wind velocity: 18 m/s
2. Water Flow rate & Wind velocity to be kept constant throughout the test & it should be monitored using flow rate measuring device attached to water outlet valve.
3. Position the wind source with respect to the test item so that it will cause the rain to beat directly, with variations up to 45° from the horizontal.
4. Measure the wind velocity at the position of the test item before placement of the test item in the facility
5. Rotate the unit so that each surface will be exposed for 30 minutes.
6. Total testing time will be for 2 hours.
7. Using stop watch for accurate time measurement.

3.4.1.5 Test Specification

1. The Test need to carry out as per the test standard MIL STD-810G Method 506.5 procedure
2. Unit should be configured as per actual field condition (Exception case: Electronic PWB assemblies could be removed as per the test conditions)
3. Unit mounting: Pole mounting condition
4. Pass / Fail criteria
    Pass: At the end of the test there shall not be any water detected in the IPX5 area.
    Fail: Water marks seen inside the IPX5 area

3.4.1.6 Test Procedure

1. Install the unit as per field installation (Pole mounting condition)
2. The simulated wind to be directed horizontally to blow through the water spray and drive it against the surfaces of the unit.
3. Ensure the rain is dispersed completely over the test item when accompanied by the prescribed wind.
4. Rotate the unit to expose each surface for 30mins, with total testing time of 2hrs.
5. After completion of test, without disturbing the unit, place the unit inside thermal chamber and dry the unit for minimum of 2 hours at 50 degree before opening up the unit for observation.
6. Finally open the unit & visually inspect the unit for any water leak inside IPx5 area as give below
    - Connector joints
    - Gaskets
    - Screws
    - Adhesive / Label
    - Electronic circuit board
    - Cables

2.5 Pass Fail Criteria

Not applicable – NTS not contracted to determine pass/fail criteria.

3.0 DISPOSITION OF TEST SAMPLE

Upon conclusion of testing, the test item was returned to Facebook.

APPENDIX A

TEST DATA

WIND DRIVEN RAIN TEST

DATA LOG SHEET

CUSTOMER:	Facebook	**MJO/JO:**	PR063169
TEST ITEM:	OpenCellular - Connect-1	**DATE:**	5/11/2017
MODEL:	OpenCellular - Connect-1	**UNIT NO**	1
SPECIFICATION:	OC Connect-1 ETS v1.0 **Method:** Para 3.4	**CHAMBER NO:**	N/A

DESCRIPTION OF TEST

DATE:	TIME:	LOG ENTRY:	OP:	TECH:
5/11/2017	20:30	Set up for wind driven rain test		SPG
	21:15	Mount unit on pole	No	SPG
	21:20	Position pole such that front face of EUT is facing rain		SPG
		Mounting Height: 114 cm, Distance from Sprayers: 100 cm		SPG
	21:45	Start wind driven rain test. VFD set to 22 Hz to achieve 18 m/s at EUT	No	SPG
		Flow meter set to 13 SLPM to achieve 2.8 mm/min pre-calibrated rainfall rate		SPG
		Test duration is 30 minutes/side.		SPG
	22:15	Halt wind driven rain test. Rotate pole such that right face of EUT is exposed		SPG
	22:19	Start wind driven rain test on right face of EUT	No	SPG
	22:49	Halt wind driven rain test. Rotate pole such that left face of EUT is exposed		SPG
	22:59	Start wind driven rain test on left face of EUT	No	SPG
	23:29	Halt wind driven rain test. Rotate pole such that rear face of EUT is exposed		SPG
	23:31	Start wind driven rain test on rear face of EUT		SPG
5/12/2017	0:01	Halt wind driven rain test.		SPG
		Test Complete. Facebook removed EUT to take back to their lab for final		SPG
		inspection. Facebook will share inspection data and photographs with NTS		
		for inclusion in final report.		

TECHNICIAN / ENGINEER: Samuel P. Gregory **DATE:** 5/11/2017

APPENDIX B

PHOTOGRAPHS

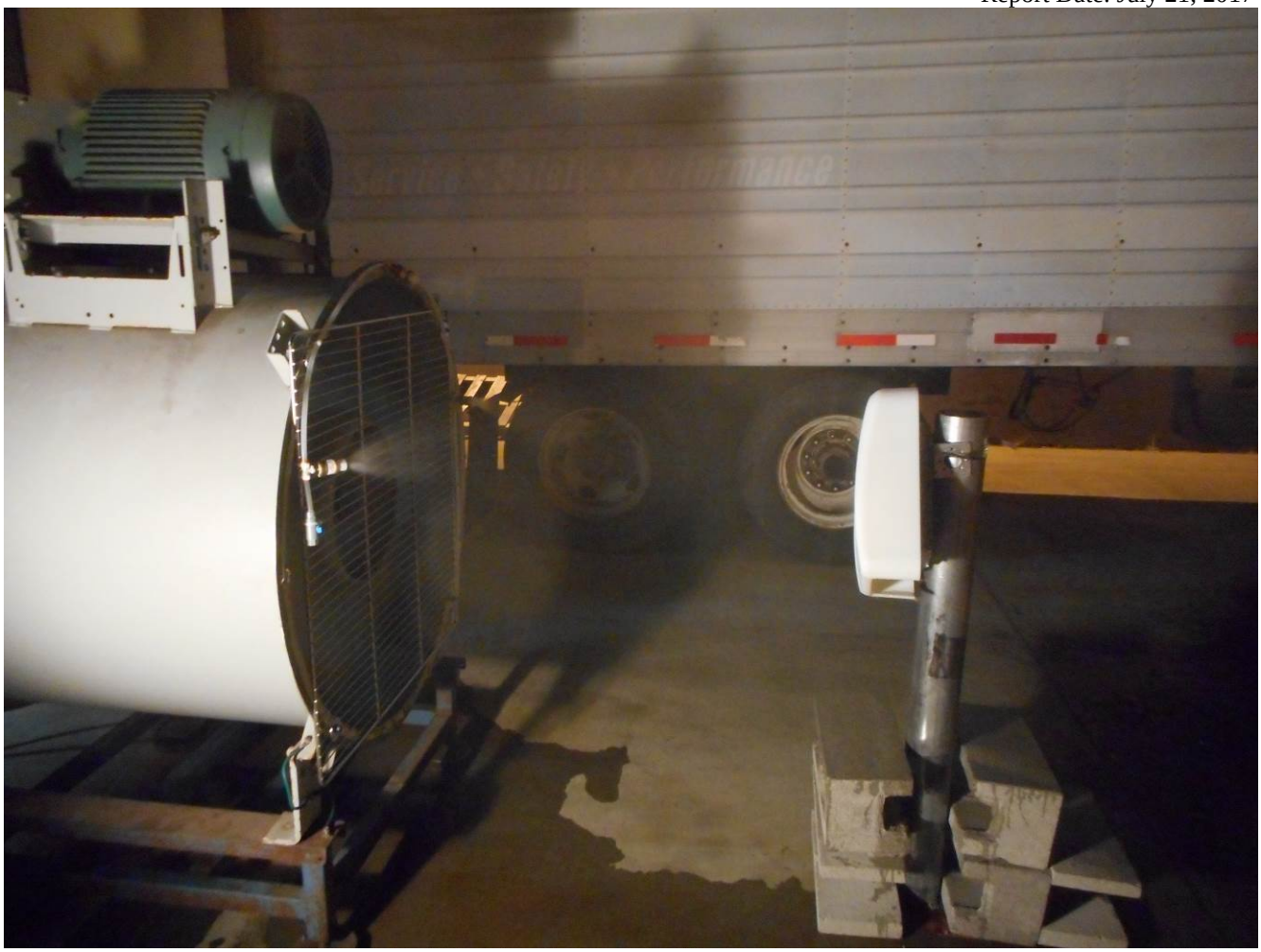

Figure 2: Rain& Blowing Rain Test, Front Face

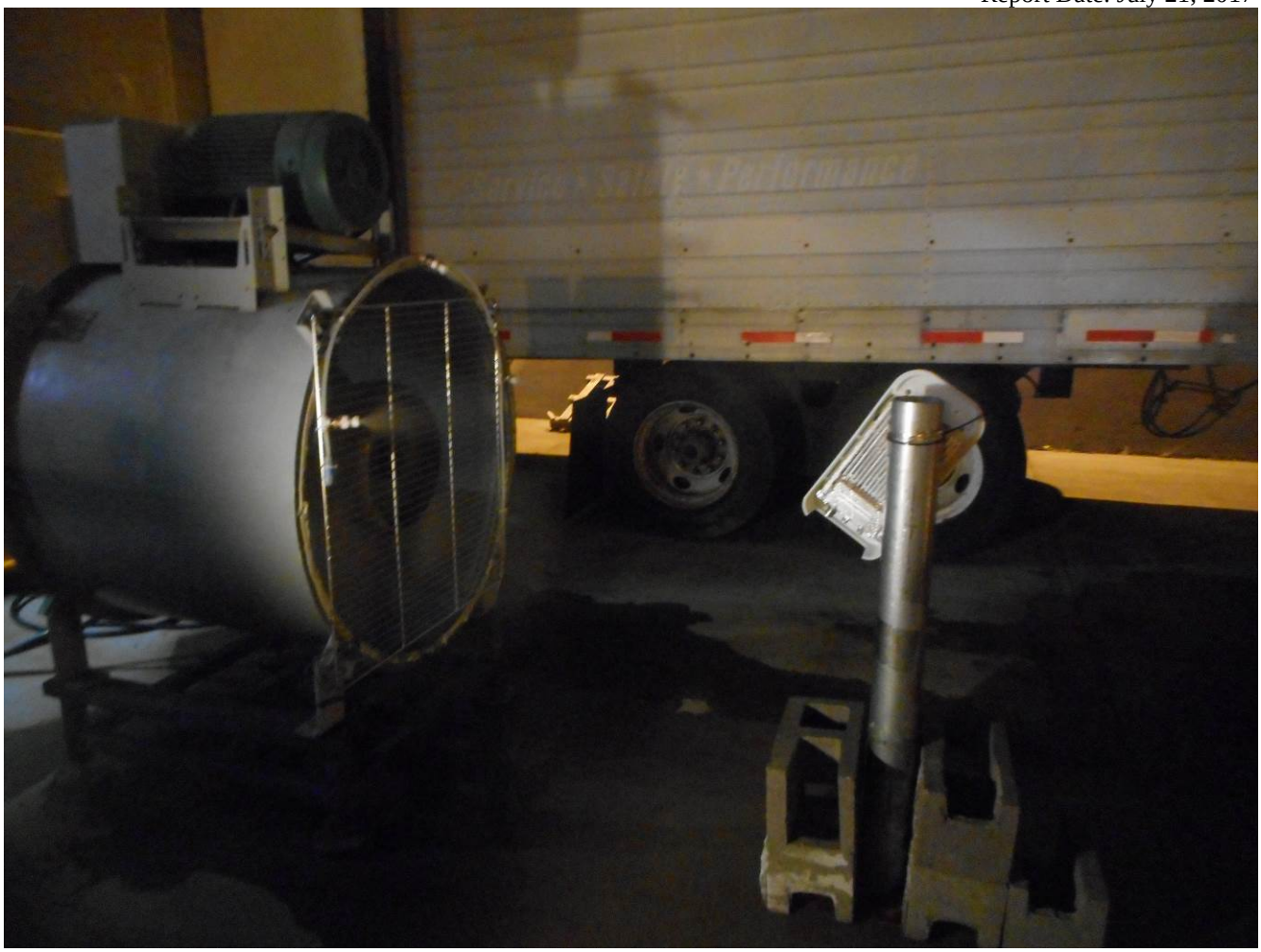

Figure 3: Test Rain& Blowing Rain Test, Right Face

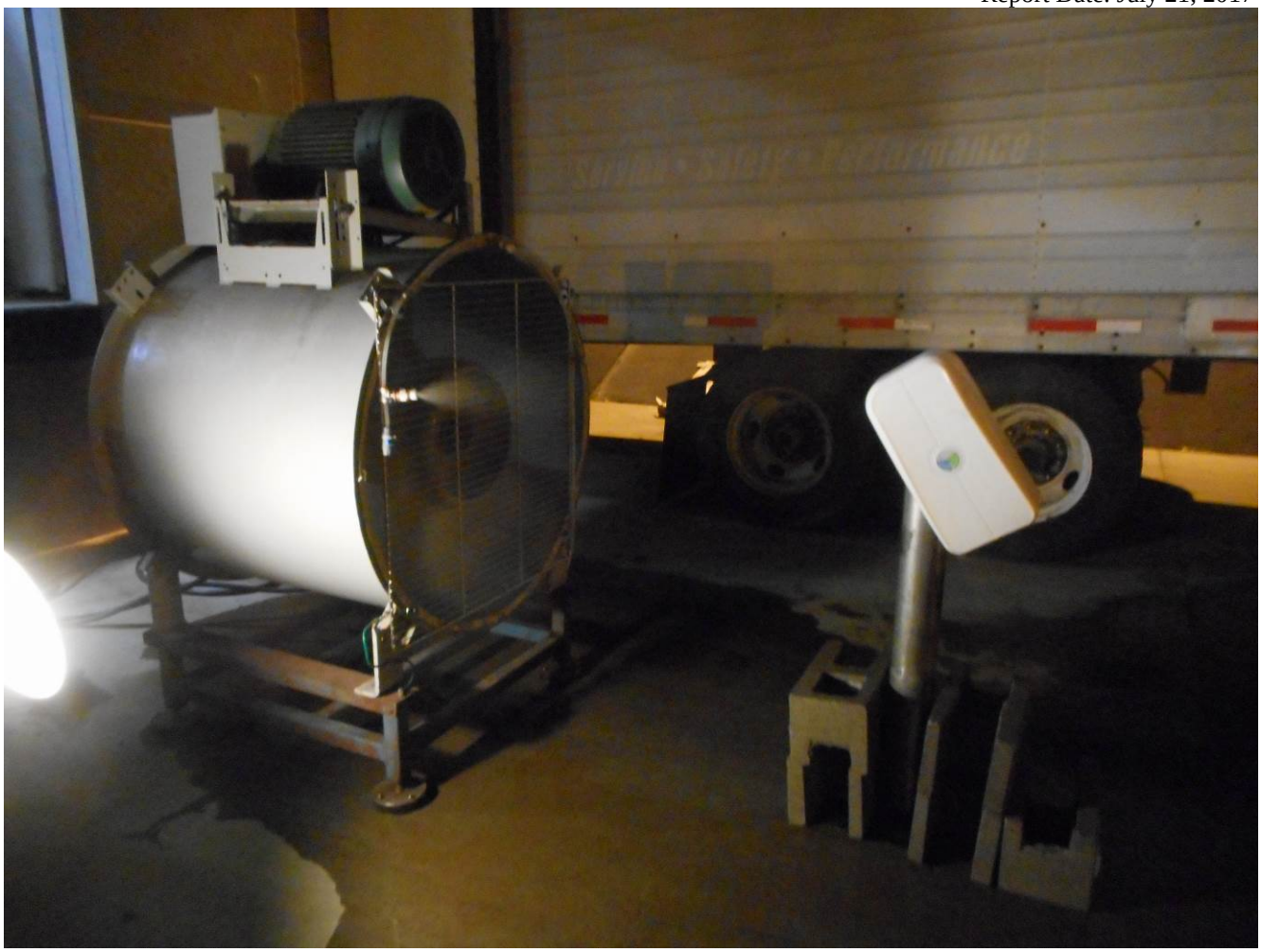

Figure 4: Rain& Blowing Rain Test, Left Face

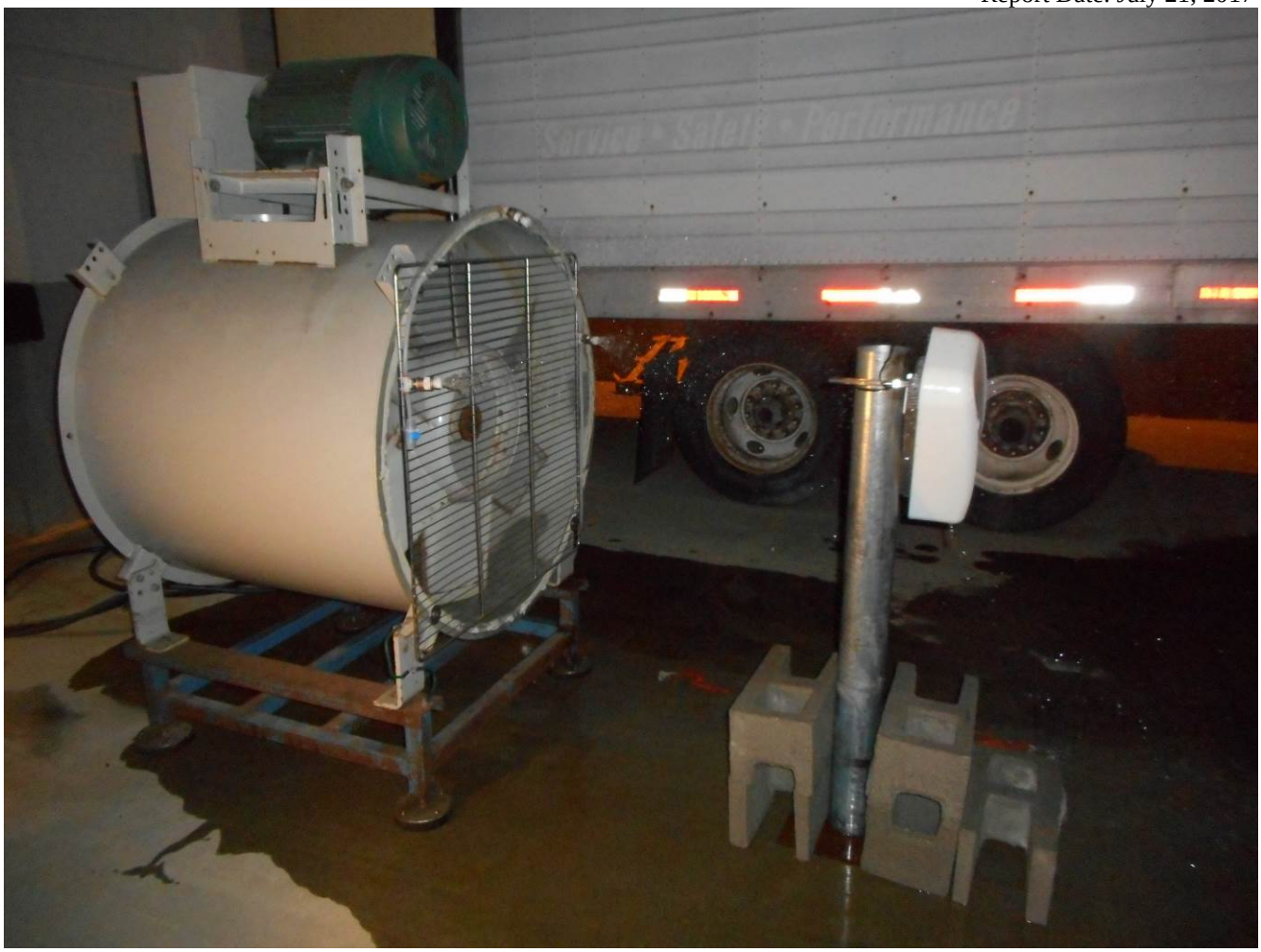

Figure 5: Rain& Blowing Rain Test, Rear Face

APPENDIX C

EQUIPMENT LIST*

NTS ID#	Manufacturer	Description	Model No.	Cal Date	Cal Due
3371	Stanley	Tape Measure	8m/26'	Verified by Asset # 3216	
2978	Thomas Scientific	Stop Watch	1235C26	06/04/16	06/04/17
3106	Digi-Sense	Vane Anemometer	20250-16	04/18/17	04/18/18
3447	ED&D	Sprayer Head	RTS-01	MFG[1]	
3448	ED&D	Sprayer Head	RTS-01	MFG[1]	
3449	ED&D	Sprayer Head	RTS-01	MFG[1]	
3450	Greenheck	Giant Blower Fan	TBI-FS-4L42-200-X	No Cal Required	
2901	Cole Parmer	Rain Gauge	03319-10	MFG	
3093	Cole Parmer	Rotameter	FR4L71BVBN-CP	05/05/17	05/05/18

* The instrumentation used in the performance of these tests is periodically calibrated and standardized within the manufacturer's rated accuracies. The calibration procedures and practices are in accordance with ANSI/NCSL Z540.3-2006 and ISO 17025. Certification of calibration is on file subject to inspection by request.

1 MFG – Manufacturer Guaranteed

End of Report