PRI Construction Materials Technologies LLC

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Laboratory Test Report

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Report for:	Jeff Hock Sheffield Metals International 5467 Evergreen Parkway Sheffield Village, OH 44054
Product Name:	.032 Al SMI 1.5" Mechanical Seam
Project No.:	1802T0003
Date(s) Tested:	Oct. 23, 2020
Test Methods:	FBC (HVHZ) TAS 100-95
Results Summary:	Compliant with FBC (HVHZ) TAS 100-95

Purpose: Determine the wind and wind-driven rain resistance for the specified roof covering in accordance with **Florida Building Code Test Protocols for the High Velocity Hurricane Zone (HVHZ) Testing Application Standard (TAS) No. 100: *Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems***.

Test Methods: Testing was conducted as described in Florida Building Code Test Protocols for the High Velocity Hurricane Zone (HVHZ) Testing Application Standard (TAS) No. 100-95: *Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems*.

Sampling: The following materials were received by PRI.

Product	Source	Date	Sampling
.032 Al SMI 1.5" Mechanical Seam	Clearwater, FL	Sep. 21, 2020	Modern Metals
1-1/2" Butterfly Clip	Bowdon, GA	Sep. 14, 2020	Sheffield
#10-13 x 1" PH screws	Acworth, GA	Sep. 22, 2020	Sheffield
Eave Trim	Clearwater, FL	Sep. 21, 2020	Modern Metals
Valley Pan	Clearwater, FL	Sep. 21, 2020	Modern Metals
Offset Cleat	Clearwater, FL	Sep. 21, 2020	Modern Metals
Z closure	Clearwater, FL	Sep. 21, 2020	Modern Metals
Gable cleat	Clearwater, FL	Sep. 21, 2020	Modern Metals
Gable Flashing	Clearwater, FL	Sep. 21, 2020	Modern Metals
Cleat	Clearwater, FL	Sep. 21, 2020	Modern Metals

All other roofing components were procured by PRI Construction Materials Technologies LLC through local distribution.

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Conditioning: The prepared test deck was conditioned for 16h at 135-140°F. After conditioning, test deck was allowed to equilibrate to ambient conditions.

Product Descriptions:

SMI 1.5" Mechanical Seam:	0.032" Fluropon® coated 3105 H24M aluminum; 1.5" mechanical lock standing seam; 180° seam; 12" wide coverage;
1-1/2" Expansion Clip:	18ga. G90 galvanized steel base and 24ga. G90 galvanized steel expansion clip
#10 x 1" PH screws:	#10 X 1" coated, pan head screw

Result: Testing was performed at ambient conditions at a 2:12 roof slope. Requisite manufacturer's drawings are contained in Appendix A. Requisite photograph(s) are contained in Appendix B. Requisite calibration documentation is provided in Appendix C.

Component:	Description	Attachment	Additional Detail	TAS 100 Result [Pass/Fail]
Deck:	15/32" APA span rated CDX plywood sheathing over nominal No. 2 wood trusses at 24" o.c.	8d x 2-1/2" ring shank nails	6" o.c. at ends 12" o.c. along intermediates	Pass
Underlayment:	ASTM D226 Type II roofing felt with 4" wide side laps	32 ga. x 1-5/8" Ø tin caps with 12 ga. x 1-1/4" ring shank nails	Fasteners installed 6" o.c. in laps and 12" o.c. in two, staggered rows in the field of the roll. At the valley, the underlayment was woven by extending 12" past valley centerline.	
Roof Covering:	0.032" Al, SMI 1.5" Mechanical Seam 1-1/2" Butterfly Clip	#10x 1" PH screws	#10 x 1" PH screws installed two (2) per clip, clips placed 6" o.c.	
Eave Detail:	Eave Trim	#10-13 x 1" PH screws	#10-13 x 1" PH screws placed 6" o.c. 0.032" Al, SMI 1.5" Mechanical Seam panels were hemmed around eave metal	
Rake Detail:	Gable Flashing Z Closure Facia cleat	#10-13 x 1" PH screws	Facia cleat was installed using #10-13x1" PH screws placed 6" o.c. Z Closure was installed using #10-13x1" PH screws placed 6" o.c. sealed to panel using 3/16" x 7/8" Butyl tape. Gable flashing installed using Pop rivets installed 18" o.c.	
Valley Detail:	0.040" Al, painted steel, preformed "W" Valley	0.040" Al Offset Cleat with #10-13 x 1" PH screws	Cleat/Fasteners installed 6" o.c. along the edge of the valley, 6" from valley center with butyl sealant installed under attached leg of offset cleat. 0.032" Al, SMI 1.5" Mechanical Seampanels hemmed around Offset Cleat ASTM C920 sealant installed at valley ends of panels to fill openings. Valley metal hemmed around Eave and Gable Trim.	

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Observations:

Interval	Test Condition	Result
1	Wind Speed: 35 mph Water Spray: 8.8in/h Duration: 15 min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**
2	Wind Speed: 0 mph Water Spray: Off Duration: 10 min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**
3	Wind Speed: 70 mph Water Spray: 8.8in/h Duration: 15 min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**
4	Wind Speed: 0 mph Water Spray: Off Duration: 10 min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**
5	Wind Speed: 90 mph Water Spray: 8.8in/h Duration: 15 min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**
6	Wind Speed: 0 mph Water Spray: Off Duration: 10 min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**
7	Wind Speed: 110 mph Water Spray: 8.8in/h Duration: 5min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**
8	Wind Speed: 0 mph Water Spray: Off Duration: 10 min	Wind Speed: **No panel displacement** Water Spray: **No Water infiltration**

Statement of Compliance: The test deck constructed complies with all the requirements of **Florida Building Code Test Protocols for the High Velocity Hurricane Zone (HVHZ) Testing Application Standard (TAS) No. 100:** ***Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems***. The laboratory test results presented in this report are reprehensive of the materials supplied.

Signed: _____

Zachary R. Priest
Florida Registered Professional Engineer
P.E. Number: 74021

Date: 11/13/2020

ZACHARY R. PRIEST LICENSE No 74021 STATE OF FLORIDA PROFESSIONAL ENGINEER

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Report Issue History:

Issue #	Date	Pages	Revision Description (if applicable)
Original	11/13/2020	12	NA

APPENDIX FOLLOWS

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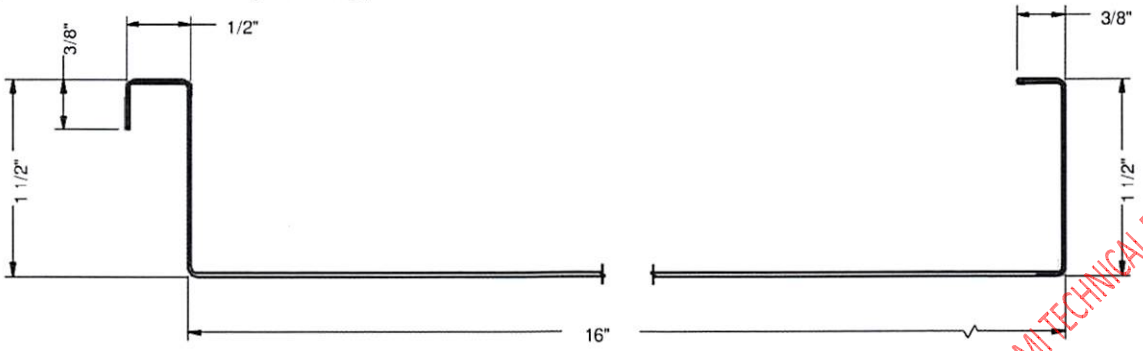
Appendix A: Panel and Clip Drawings



18ga., 1-1/8" tall x 2-1/8" wide x 6" base with 24ga., 1.5" tall x 7/16" wide x 1.75" long expansion tab

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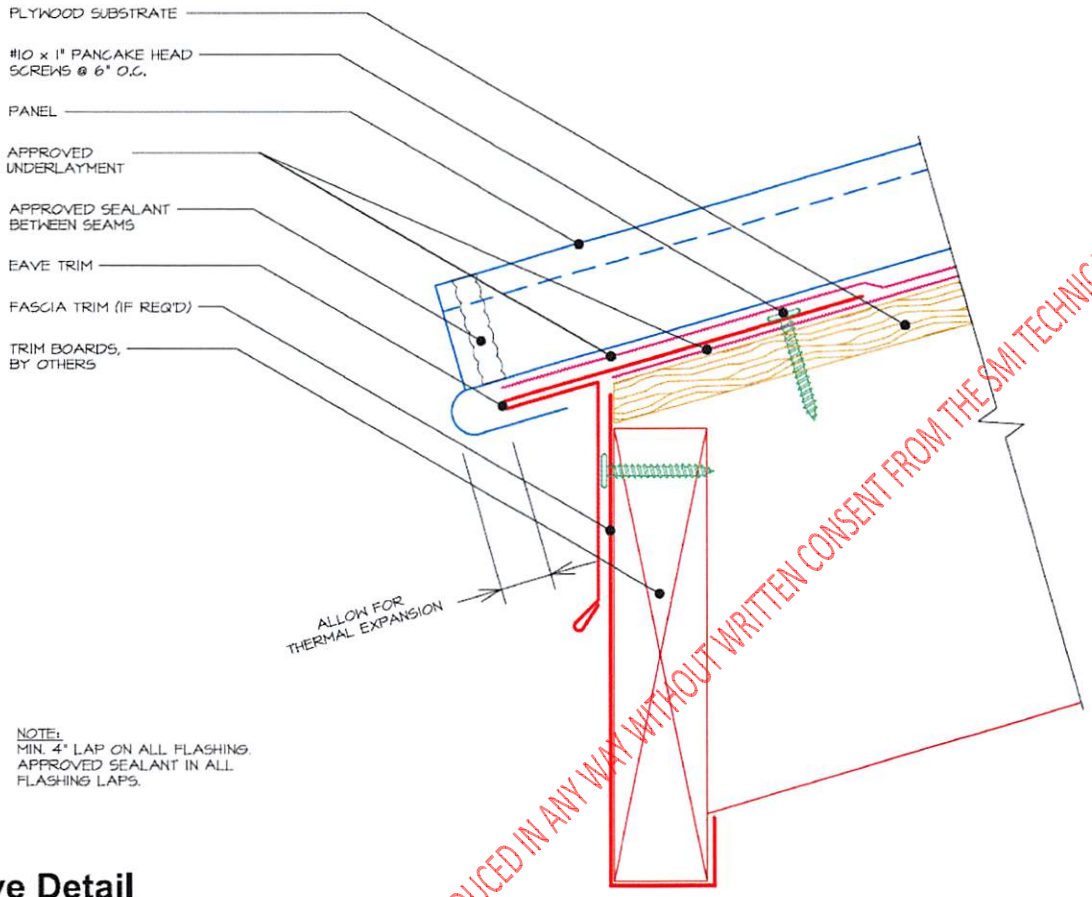

Eave Detail

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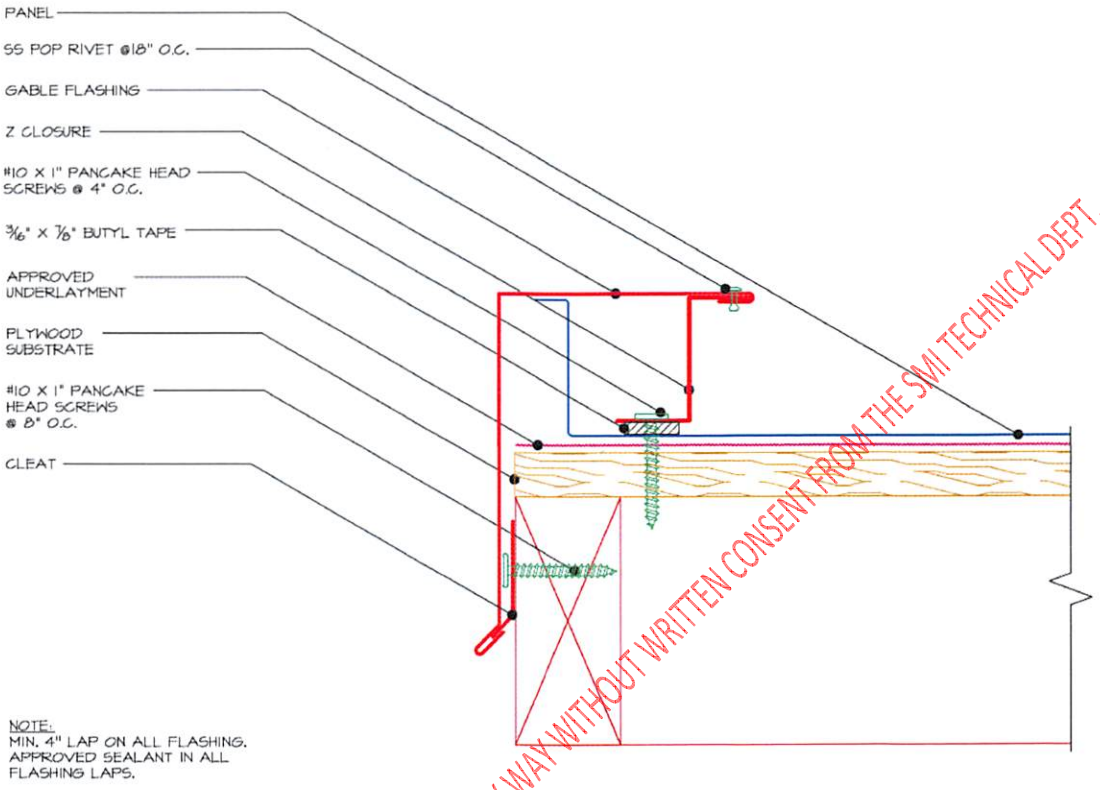

Rake / Gable Detail

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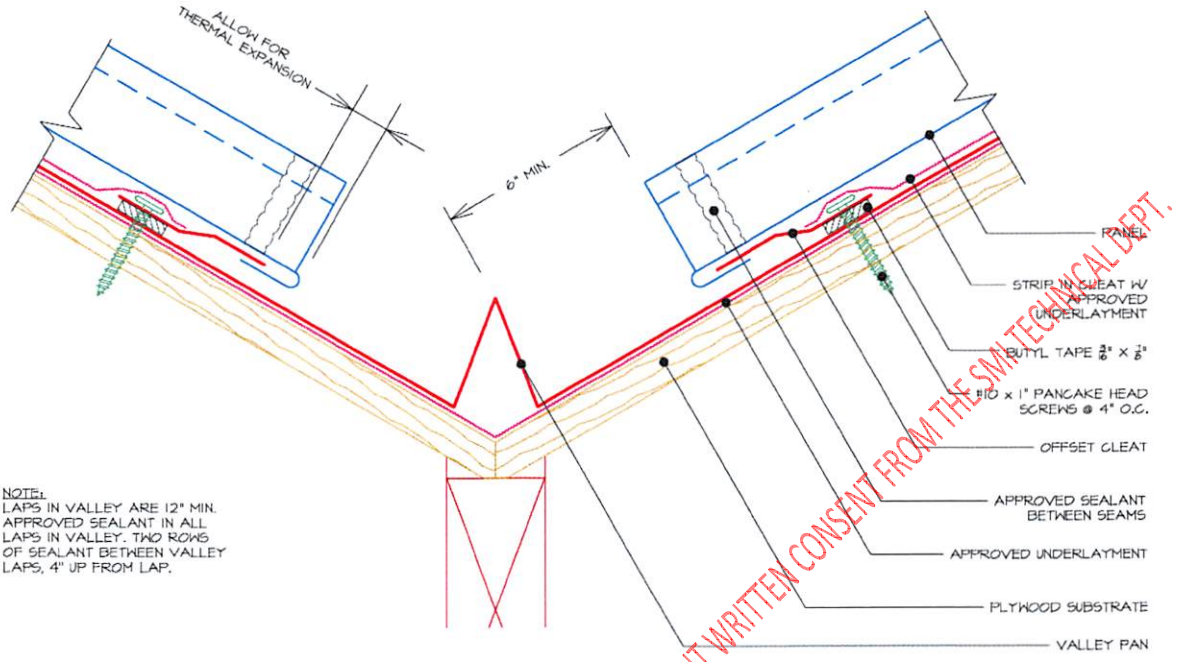

Valley Detail

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Appendix B: Photographs

Prior To Testing

Subsequent To Testing

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Prior To Completion of Interval 1: 35mph

Prior To Completion of Interval 2: 0mph

Prior To Completion of Interval 3: 70mph

Prior To Completion of Interval 4: 0mph

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Prior To Completion of Interval 5: 90mph

Prior To Completion of Interval 6: 0mph

Prior To Completion of Interval 7: 110mph

Prior To Completion of Interval 8: 0mph

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Appendix C: Calibration

Windstream Calibration

Procedure: The windstream velocity calibration is conducted on a vertical plane grid measuring 8' wide by 4' high and grid dimensions of 2' by 2'. The plane is located in front of the wind tunnel exit. For each axial velocity setting, windstream pressures are measured using either a Dwyer Model 605-3 or 605-10 Magnehelic Differential Pressure Indicating Transmitter to a Dwyer Model 160-48 Pitot Tube. Velocity pressures for each grid square are observed as inches of water and converted to miles per hour according to the below relationship.

$$MPH = 12.4625\sqrt{P_V/_d}$$

where, P_V represents the velocity pressure in inH_2O and d represents the density of air in lbs/ft^3 adjusted for temperature, barometric pressure, and relative humidity.

The measured windstream velocity within each grid square shall be within ±10% of the required axial velocity for each wind speed.

Data and Calculations: Data from the most recent calibration indicate that the wind generator provides a suitably constant wind profile for the TAS 100-95 test procedure. Windstream velocity calibration data is provided in the table that follows on the next page.

Windstream Velocity Calibration

Date of Calibration Procedure: 09/ 14/ 20 Next Due: March-21

Ambient Temperature:	85.0	°F
Barometric Pressure:	30.06	in Hg
Relative Humidity:	66	%

RPM	Grid Position	Velocity Pressure (in H_2O)	Windstream Velocity (mph)	Grid Position	Velocity Pressure (in H_2O)	Windstream Velocity (mph)	Grid Position	Velocity Pressure (in H_2O)	Windstream Velocity (mph)	Grid Position	Velocity Pressure (in H_2O)	Windstream Velocity (mph)
1100	1	0.50	32.8	2	0.50	32.8	3	0.50	32.8	4	0.60	35.9
	5	0.50	32.8	6	0.50	32.8	7	0.50	32.8	8	0.60	35.9
Target:	35 mph		Calibration: Each Grid Square shall be within ± 10% of 35 mph (31.5 - 38.5 mph)							Pass/Fail:		Pass
2200	1	2.2	68.7	2	2.3	70.2	3	2.4	71.8	4	2.4	71.8
	5	2.3	70.2	6	2.3	70.2	7	2.4	71.8	8	2.5	73.2
Target:	70 mph		Calibration: Each Grid Square shall be within ± 10% of 70 mph (63 - 77 mph)							Pass/Fail:		Pass
3000	1	3.7	89.1	2	3.8	90.3	3	3.9	91.5	4	4.0	92.6
	5	3.8	90.3	6	3.8	90.3	7	3.9	91.5	8	4.1	93.8
Target:	90 mph		Calibration: Each Grid Square shall be within ± 10% of 90 mph (81 - 99 mph)							Pass/Fail:		Pass
3600	1	5.6	110	2	5.6	110	3	5.7	111	4	5.8	112
	5	5.6	110	6	5.7	111	7	5.8	112	8	5.8	112
Target:	110 mph		Calibration: Each Grid Square shall be within ± 10% of 110 mph (99 - 121 mph)							Pass/Fail:		Pass

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Simulated Rainfall and Flow Meter Calibration

Procedure: Water is supplied to the windstream via mounted sprinkle-pipes. Calibration is conducted in essentially two steps. First, the flow meter readings, in gal/min, are recorded, summed, and input into the following equation:

$$\left[\frac{\left(\frac{gallons}{minute}\right)\times\left(\frac{60\ minutes}{1\ hour}\right)\times\left(\frac{231\ inches^3}{1\ gallon}\right)}{11{,}520\ inches^2}\right]=\left(x\frac{inches}{hour}\right)$$

The quantity x determined above shall be within ± 5% of the desired rainfall simulation of 8.8 inches/hour.

Second, the quantity of water captured in one (1) minute is weighed, converted to volume, and input into the below equation:

$$\left[\frac{\left(\frac{inches^3}{11{,}520\ inches^2}\right)}{1\ minute}\times\left(\frac{60\ minutes}{1\ hour}\right)\right]=\left(y\frac{inches}{hour}\right)$$

The flow meter determination x shall be within ± 5% of the quantity y determined above.

Data and Calculations: Data from the most recent calibration indicate that an appropriate volume of water is applied during the TAS 100-95 test procedure. Simulated rainfall and flow meter calibration data is provided in the below table.

Simulated Rainfall and Flow Meter Calibration

These settings are for 35mph
Date of Calibration Procedure: **09/14/20** Next Due: **December-20**

X	Water Supply (gal/min)	Simulated Rainfall (in/hr)
Flow Meter #1	2.4	2.9
Flow Meter #2	4.8	5.8
Total	7.2	8.7
Simulated Rainfall		**8.7**
Target		8.8
Within ± 5% Tolerance		Pass

Y	Weight (lbs)	Volume (in^3)	Simulated Rainfall (in/hr)
Flow Meter #1	19.8	548.1	2.9
Flow Meter #2	40.2	1112.7	5.8
Total	60.0	1660.8	8.6
Simulated Rainfall			**8.6**
Target			8.7
Within ± 5% Tolerance			Pass

Simulated Rainfall and Flow Meter Calibration

These settings are for 70+ mph
Date of Calibration Procedure: **09/14/20** Next Due: **December-20**

X	Water Supply (gal/min)	Simulated Rainfall (in/hr)
Flow Meter #1	3.6	4.3
Flow Meter #2	3.6	4.3
Total	7.2	8.7
Simulated Rainfall		**8.7**
Target		8.8
Within ± 5% Tolerance		Pass

Y	Weight (lbs)	Volume (in^3)	Simulated Rainfall (in/hr)
Flow Meter #1	30.1	833.2	4.3
Flow Meter #2	30.1	833.2	4.3
Total	60.2	1666.3	8.7
Simulated Rainfall			**8.7**
Target			8.7
Within ± 5% Tolerance			Pass

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Water Distribution Check

Procedure: The water distribution of simulated rain fall over the test frame was determined by placing a thick absorptive material on the deck sheathing, determining the amount of water absorbed during a set time interval, and verifying the water distribution profile within given tolerances. The procedure outlined in TAS 100-95 and was followed. The deck was set to a 2in:12in slope. The thick absorptive material used was 46 gauge organic felt. Wind driven rain was applied for approximately six (6) minutes. Each individual 2' x 2' wetted square was weighed using an Ohaus Model I-10 Scale.

The simulated rainfall calculated for each 2' x 2' wetted square shall be within either ±15% (at 35mph) or ±10% (at 70mph) of every other wetted square.

Data and Calculations: Data from the most recent calibration indicate that the wind generator and water supply system provides a suitably constant water distribution profile for the TAS 100-95 test procedure. Water distribution check data is provided in the table below.

Water Distribution Check

Date of Calibration Procedure: **09/14/20** Next Due: **March-21**

Ambient Temperature:	84.0	°F
Barometric Pressure:	30.06	in Hg
Relative Humidity:	66	%

Windstream Velocity: 35 mph
Water Supply: 8.8 gal/min
Elasped Time: 6 min

Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)	Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)	Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)	Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)
1	180.0	671.0	8.52	2	185.0	670.0	8.42	3	190.0	703.0	8.91	4	185.0	663.0	8.30
5	180.0	684.0	8.75	6	180.0	682.0	8.72	7	180.0	691.0	8.87	8	185.0	672.0	8.45
9	185.0	695.0	8.85	10	180.0	691.0	8.87	11	185.0	683.0	8.65	12	190.0	692.0	8.72
13	190.0	663.0	8.21	14	180.0	703.0	9.08	15	190.0	664.0	8.23	16	185.0	700.0	8.94
17	185.0	702.0	8.98	18	185.0	710.0	9.11	19	180.0	712.0	9.24	20	185.0	680.0	8.59

Target: No one particular square sample shall exhibit a rainfall simulation greater than or less than 15% of any other square sample.

High Value:	9.24	⇒	Low Tolerance:	7.85	
Low Value:	8.21	⇒	High Tolerance:	9.44	Pass/Fail: **Pass**

Windstream Velocity: 70 mph
Water Supply: 8.8 gal/min
Elasped Time: 6 min

Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)	Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)	Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)	Grid Position	Dry Felt (g)	Wetted Felt (g)	Simulated Rainfall (in/hr)
1	180.0	662.0	8.4	2	180.0	683.0	8.73	3	180.0	682.0	8.72	4	180.0	694.0	8.92
5	180.0	691.0	8.9	6	180.0	689.0	8.84	7	180.0	690.0	8.85	8	180.0	681.0	8.70
9	185.0	700.0	8.9	10	185.0	701.0	8.96	11	185.0	687.0	8.72	12	185.0	683.0	8.65
13	185.0	694.0	8.8	14	185.0	694.0	8.84	15	185.0	691.0	8.78	16	185.0	698.0	8.91
17	190.0	699.0	8.8	18	190.0	700.0	8.85	19	190.0	707.0	8.98	20	190.0	712.0	9.06

Target: No one particular square sample shall exhibit a rainfall simulation greater than or less than 10% of any other square sample.

High Value:	9.06	⇒	Low Tolerance:	8.16	
Low Value:	8.37	⇒	High Tolerance:	9.20	Pass/Fail: **Pass**

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END OF REPORT

1802T0003

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