

AIRFOAM INDUSTRIES LTD. (DBA QUAD- LOCK BUILDING SYSTEMS) TEST REPORT

SCOPE OF WORK

REPORT OF AIRBOARD INSULATION TESTED IN ACCORDANCE WITH SELECTED SECTIONS OF CAN/ULC-S701.1-2017, *STANDARD FOR THERMAL INSULATION, POLYSTYRENE BOARDS*

REPORT NUMBER

104882268COQ-002A

TEST DATE(S)

12/13/21 –12/21/21

ISSUE DATE

12/23/21

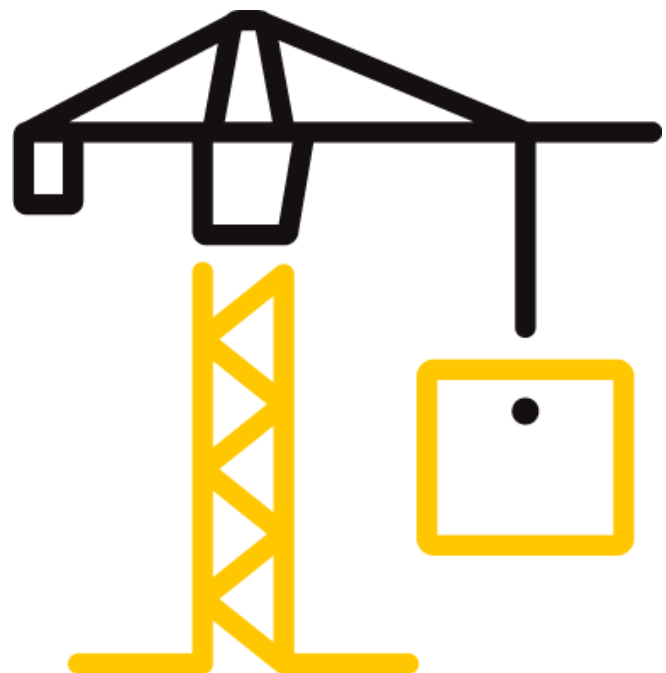
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DOCUMENT CONTROL NUMBER

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TEST REPORT FOR AIRFOAM INDUSTRIES LTD. (DBA QUAD-LOCK BUILDING SYSTEMS)

Report No.: 104882268COQ-002A

Date: 12/23/21

REPORT ISSUED TO

AIRFOAM INDUSTRIES LTD. (DBA QUAD-LOCK BUILDING SYSTEMS)

19402-56th Avenue
Surrey, BC, V3S 6K4
Canada


SECTION 1


SCOPE

Intertek Building & Construction (B&C) was contracted by Airfoam Industries LTD. (dba Quad-Lock Building Systems), 19402-56th Avenue, Surrey, BC, V3S 6K4, Canada, to perform testing in accordance with selected sections of CAN/ULC-S701.1-2017, *Standard for Thermal Insulation, Polystyrene Boards*, on their Airboard Insulation product. Results obtained are tested values and were secured by using the designated test method. Testing was conducted at the Intertek test facility in Coquitlam, BC, Canada.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Chris Chang, P.Eng. Sr. Tech.
TITLE:	– Building & Construction
SIGNATURE:	 EGBC Permit No.: 1000953
DATE:	12/23/21

REVIEWED BY:	Baldeep Sandhu Manager
TITLE:	– Building & Construction
SIGNATURE:	
DATE:	12/23/21

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SECTION 2**SUMMARY OF TEST RESULTS**

PROPERTY	RESULT	REQUIREMENT ⁽¹⁾	PASS/FAIL
Water Vapour Permeance, ng/Pa-s-m ²	1.5	≤ 130	Pass
Dimensional Stability, %	0.1	≤ 1.5	Pass
Water Absorption, %	0.7	≤ 2.0	Pass

Note 1 – Requirements taken from Type 3 EPS foam

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SECTION 3

TEST METHOD

The specimen was evaluated in accordance with the following:

CAN/ULC-S701.1-2017, Standard for Thermal Insulation, Polystyrene Boards

SECTION 4

MATERIAL SOURCE/INSTALLATION

Intertek representative, Kareem Abdelghany, randomly sampled the insulation product on November 22, 2021. The sample selection process was conducted at 19402-56th Avenue, Surrey, BC, V3S 6K4, Canada. The product was selected in accordance with recognized independent sampling procedures, and was received at the Evaluation Center on December 9, 2021 (Coquitlam ID# VAN2112101514-001) and December 10, 2021 (Coquitlam ID# VAN2112101515-001).

SECTION 5

EQUIPMENT

Calibration of test equipment was performed by Intertek B&C in accordance with ISO 17025 requirements.

ASSET #	DESCRIPTION	MODEL	CAL DUE DATE
9-0473	ASTM E96 Environmental Chamber	N/A	N/A
P60610	T&D Temperature and Humidity Logger	TR-72Ui	05/09/22
P52606	Setra Scale 2000g	2000/Quartz	02/04/22
52606	Setra Scale 12500g	12000C	02/04/22
D6932	Alnor Wind Vane Anemometer	RVA501	03/02/22
P60005	Mitutoyo Digital Calipers	CD 8 CSX	06/08/22
22079	Lunaire Environmental Chamber	CE0958-4	N/A
P60557	Graphtec Temperature Logger	GL220	12/14/22
D2679	Fluke Digital Thermometer	52II	10/05/22

SECTION 6

LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Chris Chang	Intertek B&C

Note: The above observer(s) witnessed part of the test program.

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SECTION 7**TESTING PROCEDURE****CONDITIONING**

Before testing, the test specimen materials were held in standard laboratory conditions for at least 88 hours at a temperature of $23 \pm 2^{\circ}\text{C}$ and relative humidity of $50 \pm 5\%$.

WATER VAPOUR PERMEANCE

Water vapor permeance was determined in accordance with ASTM E96/E96M-21, *Standard Test Methods for Water Vapor Transmission of Materials*, desiccant method. Four (4) circular specimens of the material were prepared for testing. Three (3) test dishes measuring 229 mm (9 in.) in diameter were filled with calcium chloride to within 6.4 mm (¼-in.) of the top. The circular specimens were then attached to the top of each dish by sealing the perimeter of the material to the dish with a molten wax blend. The specimens were prepared with the product exterior surface placed face up. An additional control specimen was prepared in an identical manner to the other three (3) test specimens with the exception that no calcium chloride was placed in the dish. The four (4) assemblies were placed in a controlled chamber operating at a temperature and relative humidity of 23°C and 50% respectively. The assemblies were then weighed periodically until eight (8) data points were obtained. The water-vapor permeance was calculated as follows:

$$\text{WVT} = G/tA$$

$$\text{WVP} = \text{WVT}/\Delta P = \text{WVT}/S (R1-R2) O$$

Where: WVT= rate of water vapor transmission, $\text{g}/\text{m}^2\text{s}$

G= weight change, g

t= time during which G occurred

A= test area, m^2

WVP= permeance, $\text{g}/\text{Pa}\cdot\text{s}\cdot\text{m}^2$

ΔP = vapor pressure difference, Pa

S= saturation vapor pressure at test temperature, Pa

R1= relative humidity at the source expressed as a fraction

R2= relative humidity at the vapor sink expressed as a fraction

O= overlap factor

DIMENSIONAL STABILITY

Dimensional stability was tested in accordance with ASTM D2126-20, *Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging*. Three (3) specimens, each

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measuring 100 mm x 100 mm x 25 mm (4 in. x 4 in. x 1 in.), were measured for length, width and thickness before and after exposing the material to the following condition:

- 7 days at $70 \pm 2^{\circ}\text{C}$ and ambient humidity

The change in dimensions was calculated as a percentage of the original measurement as follows:

$$P = [(m_f - m_o) / m_o] \times 100$$

Where: P = Change in dimensions, %
m_f = Final measurement, mm (in.)
m_o = Original measurement, mm (in.)

WATER ABSORPTION

Water absorption was conducted in accordance to ASTM D2842-19, *Standard Test Method for Water Absorption of Rigid Cellular Plastics*. Three (3) specimens, each measuring 152 mm x 152 mm x 25 mm (6 in. x 6 in. x 1 in.), were conditioned in an oven at 50°C to ensure that the weight change was not less than 0.2 g between two successive dry weighing. A 50 mm (2 in.) head of water was maintained over the specimens in a water tank filled with 23°C distilled water. Weight of jig and submerged specimens were measured with the balance before and after an immersion period of 96 hours. The water absorption as volume percent were calculated as follows:

$$\text{Water Absorption by volume} = [(W_{2i} - W_{3i}) - (W_{2f} - W_{3f})] / V_2 \times 100\%$$

$$V_2 = W_{2i} - W_{3i} + W_1$$

Where: V₂ = True specimen volume, cm³

W₁ = dry weight of specimen, g

W_{2i} = initial weight of empty submerged jig, g

W_{3i} = initial submerged weight of jig and specimen,

W_{2f} = final weight of empty submerged jig, g

W_{3f} = final submerged weight of jig and specimen after immersion period, g

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SECTION 8

TEST SPECIMEN DESCRIPTION

The sample was identified as the Airboard Insulation, an EPS insulation product that is covered with a layer of reflective laminating film on each side of the board. The insulation product measures 1 in. (25 mm) thick with a measured density of 2.2 lb/ft³.

SECTION 9

TEST RESULTS

See Appendix A for a full set of test data.

SECTION 10

CONCLUSION

The Airfoam Industries Ltd. (dba Quad-Lock Building Systems) Airboard Insulation panel product identified and evaluated in this report has met the selected requirements of CAN/ULC-S701.1-2017, *Standard for Thermal Insulation, Polystyrene Boards*.



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SECTION 11

APPENDIX A – TEST DATA (5 PAGES)



Total Quality. Assured.

Company	Airfoam Industries Ltd. (DBA Quad-Lock Building Systems)	Technician(s)	Chris Chang
Project No.	G104882268	Reviewer	Baldeep Sandhu
Models	AirBoard Insulation	Start/End Date	December 13 - 21, 2021
Product Name	Same as above	Sample ID	VAN2112101514-001, VAN2112101515-001
Standard	CAN/ULC-S701.1-2017, <i>Standard for Thermal Insulation, Polystyrene, Boards</i>		

Test Data Package

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Water Vapour Transmission #1	2
Water Vapour Transmission #2	3
Dimensional Stability	4
Water Absorption	5

Test: **Water Vapor Transmission** Project: G104882268
 Date: 13-Dec-21 Eng/Tech: Chris Chang
 Client: Airfoam Industries Ltd. (DBA Quad-Lock Building Systems) Reviewer: Baldeep Sandhu
 Product: **AirBoard Insulation**
 Method: CAN/ULC-S701.1-2017, *Standard for Thermal Insulation, Polystyrene, Boards*
 ASTM E96/E96M-21, *Standard Test Methods for Water Vapor Transmission of Materials*
 Equipment: Setra 2000g Digital Balance (Intertek ID# 52606, cal due February 4, 2022)
 Test Chamber (Intertek ID# 9-0473)
 Mitutoyo Digital Calipers (Intertek ID# P60005, cal due June 8, 2022)
 Alnor Wind Vane Anemometer (Intertek ID# D6932, cal due March 2, 2022)
 T&D Thermorecorder TR72Ui (Intertek ID# P60610, cal due May 9, 2022)

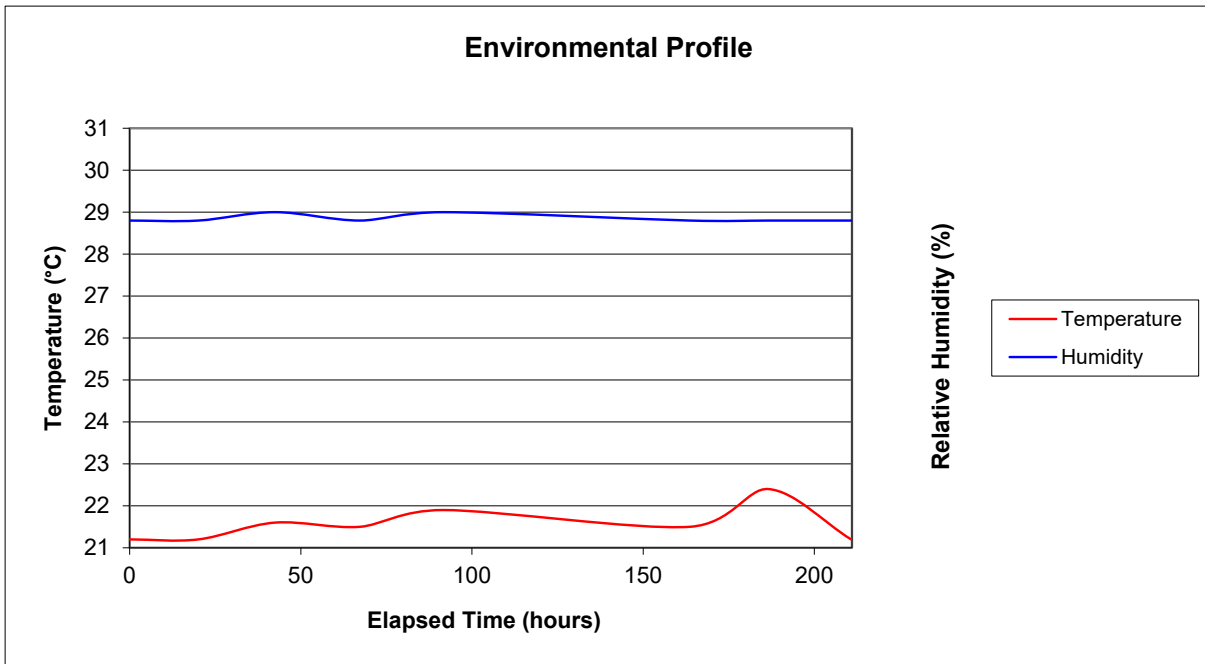
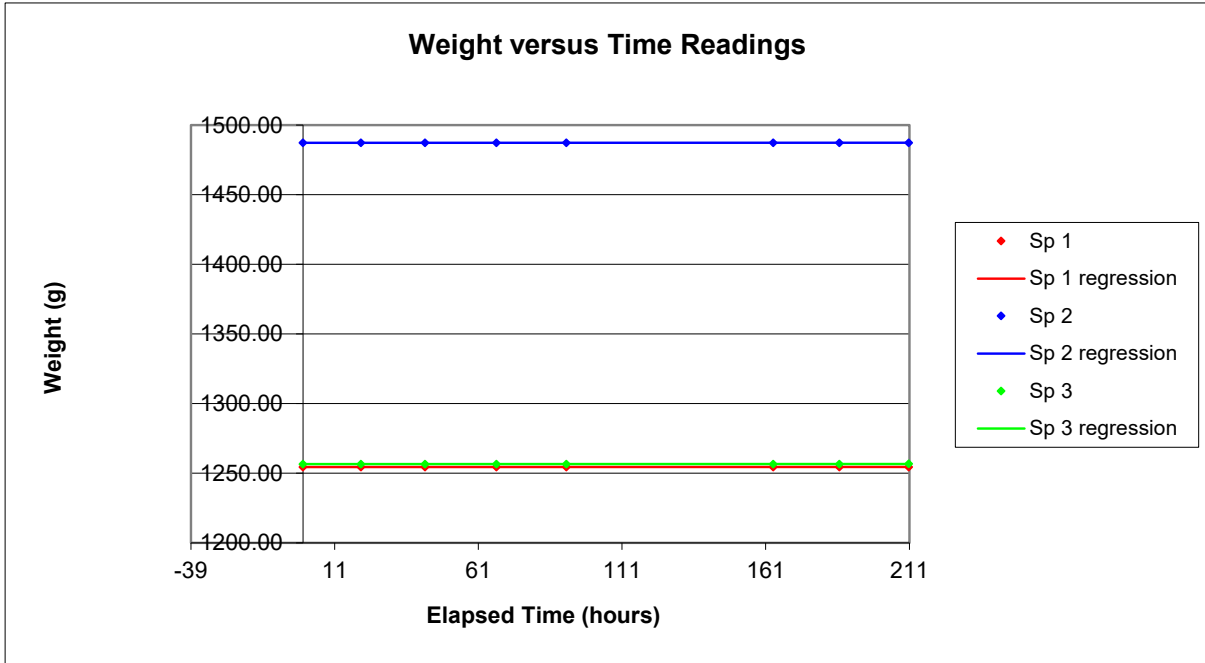
Measurement	Specimen		
	1	2	3
Mean Barometric Pressure (kPa)	101.36	101.36	101.36
Mean Air Temperature (°C)	21.56	21.56	21.56
Mean Saturation Vapour Pressure ¹ (Pa)	2611	2611	2611
Mean Relative Humidity in chamber (%)	49.3	49.3	49.3
Relative Humidity in test dish (%)	0	0	0
Specimen Weight Change (g)	0.057	0.092	0.075
Moisture Gain of Dessicant (%)	0	0	0
Moisture Gain Control Limit (%)	10	10	10
Effective Test Dish Diameter (mm)	230.0	230.0	230.0
Effective Test Area (m ²)	4.15E-02	4.15E-02	4.15E-02
Gradient of weight/time graph (g/hour)	2.83E-04	3.19E-04	2.84E-04
Specimen Mean Thickness (mm)	23.38	23.77	23.44
Uncorrected Water Transmission (g/hour.m ²)	6.81E-03	7.67E-03	6.84E-03
Uncorrected Water Permeance (ng/Pa.s.m ²)	1.47E+00	1.66E+00	1.48E+00
Permeability of Still Air (ng/Pa.s.m)	1.94E+02	1.94E+02	1.94E+02
Permeance of Still Air (ng/Pa.s.m ²)	3.04E+04	3.04E+04	3.04E+04
Vapor Resistance of Still Air (m ² .s.Pa/kg)	3.29E+07	3.29E+07	3.29E+07
Surface Resistances (m ² .s.Pa./kg)	4.00E+07	4.00E+07	4.00E+07
Total Still Air and Specimen Surface (m ² .s.Pa/kg)	7.29E+07	7.29E+07	7.29E+07
Four Times Test Area Divided By Perimeter (m)	2.30E-01	2.30E-01	2.30E-01
Excess Water Transmission Due to Mask (%)	4.19	4.21	4.20
Excess Water Permeance Due to Mask (ng/Pa.s.m ²)	6.16E-02	6.97E-02	6.20E-02
Mask-corrected Water Permeance (ng/Pa.s.m ²)	1.41E+00	1.59E+00	1.42E+00
Water Vapour Transmission (g/hour.m ²)	6.52E-03	7.35E-03	6.55E-03
Water Vapour Permeance (ng/Pa.s.m ²)	1.41E+00	1.59E+00	1.42E+00
Water Vapour Permeability (ng/Pa.s.m)	3.29E-02	3.77E-02	3.32E-02

¹Estimated by the Clausius-Clapeyron equation

Test Result Summary	Metric units	Imperial Units
Water Vapor Transmission	6.81E-03 g/hr.m ²	9.74E-03 grns/hr.ft ²
	1.63E-01 g/day.m ²	2.34E-01 grns/day.ft ²
Water Vapor Permeance	1.47E+00 ng/Pa.s.m ²	2.57E-02 perms
Water Vapor Permeability	3.46E-02 ng/Pa.s.m	2.38E-02 Perm inch

Test: **Water Vapor Transmission**
Date: 13-Dec-21
Client: Airfoam Industries Ltd. (DBA Quad-Lock Building Systems

Project: G104882268
Eng/Tech: Chris Chang
Reviewer: Baldeep Sandhu



Test: Dimensional Stability
Date: 20-Dec-21
Client: Airfoam Industries Ltd. (DBA Quad-Lock Building Systems)
Product: **AirBoard Insulation**
Method: CAN/ULC-S701.1-2017, *Standard for Thermal Insulation, Polystyrene, Boards*
 ASTM D2126-20, *Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging*
Specimen Size: 100 mm x 100 mm x 25 mm (4 in. x 4 in. x 1 in.)
Conditioning: Minimum 88 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%
Exposure: **70°C for 7 days**
Equipment: Mitutoyo Digital Calipers (Intertek ID# P60005, cal due June 8, 2022)
 Lunaire Environmental Chamber (Intertek ID# 22079)
 Graphtec GL220 Temperature Data Logger (Intertek ID# P60557, cal due December 14, 2022)
Time/Temp/RH: 9:30AM / 23.0°C / 49.0%

Project: G104882268
 Eng/Tech: Chris Chang
 Reviewer: Baldeep Sandhu
 Location: Coquitlam, BC, Canada

Initial Measurement			
Specimen	Length (mm)	Width (mm)	Thickness (mm)
1	101.90	101.16	23.83
2	101.55	102.29	23.90
3	102.06	102.43	23.42

Time/Temp/RH: 8:45AM / 23.0°C / 49.0%

After Exposure - 168 hrs			
Specimen	Length (mm)	Width (mm)	Thickness (mm)
1	101.82	100.85	23.97
2	101.33	102.08	24.00
3	101.68	102.17	23.63

Specimen	Length (%)	Width (%)	Thickness (%)	Average
	168 hrs	168 hrs	168 hrs	
1	-0.1	-0.3	0.6	0.1
2	-0.2	-0.2	0.4	
3	-0.4	-0.3	0.9	
Mean:	-0.2	-0.3	0.6	
StdDev:	0.1	0.1	0.2	

Test:	Water Absorption of Rigid Cellular Plastics	Project:	G104882268
Date:	21-Dec-21	Eng/Tech:	Chris Chang
Client:	Airfoam Industries Ltd. (DBA Quad-Lock Building Systems)	Reviewer:	Baldeep Sandhu
Product:	AirBoard Insulation		
Method:	CAN/ULC-S701.1-2017, <i>Standard for Thermal Insulation, Polystyrene, Boards</i> ASTM D2842-12 <i>Standard Test Method for Water Absorption of Rigid Cellular Plastics-Procedure B</i>		
Specimen Size:	152 mm x 152 mm x 50 mm (6 in. x 6 in. x 2 in.)		
Conditioning:	Oven dry @ 50±3°C for 24 hr. Water Immersion @ 23±2°C for a 96hr period		
Equipment:	Setra Digital Balance 12000g (Intertek ID# 9-0418, cal due February 4, 2022) Setra Digital Balance 2000g (Intertek ID# 52606, cal due February 4, 2022) T&D TR-72Ui Temperature and Humidity Logger (Intertek ID# P60610, cal due May 9, 2022)		
Time/Temp/RH:	8:30AM / 21.9°C / 50.0%		

Sample	W ₁ (g)		W _{2i} (g)	W _{3i} (g)	W _{2f} (g)	W _{3f} (g)	V ₂ (cm ³)	Water Absorption by volume (%)
1	18.8	Avg.	1421.0	898.3	1422.8	904.8	541.5	0.9
	18.8	18.8						
2	18.2	Avg.	1421.0	896.9	1422.8	904.2	542.3	1.0
	18.2	18.2						
3	21.4	Avg.	1421.0	894.6	1422.8	897.5	547.8	0.2
	21.4	21.4						
Average:								0.7
StdDev:								0.4
COV:								62.5%

Note: Definitions of Symbols:

- W₁ = Dry weight of specimen
- W_{2i} = initial weight of empty submerged jig
- W_{3i} = initial submerged weight of jig and specimen
- W_{2f} = final weight of empty submerged jig,
- W_{3f} = submerged weight of jig and specimen after immersion period
- V₂ = True specimen volume



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SECTION 12
REVISION LOG

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