

# ARMORCORE-WACO COMPOSITES MIAMI-DADE TEST REPORT

**SCOPE OF WORK**

TAS 201, TAS 202, TAS 203, ASTM E330, ASTM E1886 AND ASTM E1996 TESTING ON UL752-LEVEL 1 PANEL

**REPORT NUMBER**

Q9471.01-801-18-r0

**TEST DATE(S)**

02/09-10/24

**ISSUE DATE**

04/30/24

**RECORD RETENTION END DATE**

02/10/34

**MIAMI-DADE COUNTY NOTIFICATION NO.**

ATI 1312401

**LABORATORY CERTIFICATION NO.**

22-0428.10

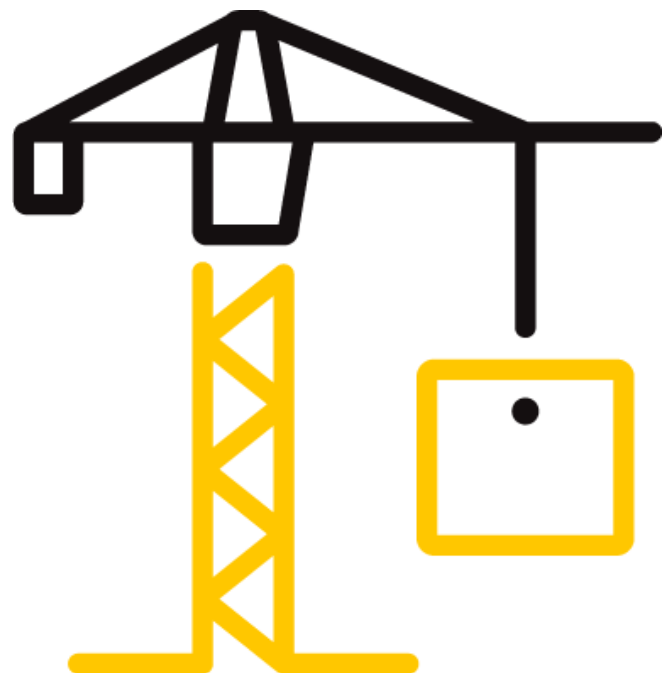
**PAGES**

17

**DOCUMENT CONTROL NUMBER**

RT-R-AMER-Test-2816 (10/12/23)

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## TEST REPORT FOR ARMORCORE-WACO COMPOSITES

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Date: 04/30/24

### REPORT ISSUED TO

#### ARMORCORE-WACO COMPOSITES

302 S. 27<sup>th</sup> St

Waco, TX 76710

### SECTION 1

#### SCOPE

Architectural Testing, Inc. (an Intertek company) dba Intertek Building & Construction (B&C) was contracted by Armorcore-Waco Composites to perform TAS 201, TAS 202, TAS 203, ASTM E330, ASTM E1886 and ASTM E1996 testing in accordance with Miami-Dade County requirements on their UL 752 Level 1 Panel. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at the Intertek B&C test facility in Plano, TX. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

### SECTION 2

#### SUMMARY OF TEST RESULTS

The specimen(s) tested met the performance requirements set forth in the protocols.

**Product Type:** Fiberglass Panel

**Series/Model:** UL 752 Level 1 Panel

SPEC.	TEST PROTOCOL	DESIGN PRESSURE
1	TAS 202/ASTM E330	+100 / -100 psf
1	TAS 201/203 (Large Missile)	+100 / -100 psf
1	ASTM E1186/1996 (Large Missile)	+100 / -100 psf
2	TAS 201/203 (Large Missile)	+100 / -100 psf
1	ASTM E1186/1996 (Large Missile)	+100 / -100 psf
3	TAS 201/203 (Large Missile)	+100 / -100 psf
1	ASTM E1186/1996 (Large Missile)	+100 / -100 psf

For INTERTEK B&C:

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<b>COMPLETED BY:</b>	Jeffrey Crump, FMPC	<b>REVIEWED BY:</b>	Tyler Westerling, P.E.
<b>TITLE:</b>	Laboratory Manager – Building & Construction	<b>TITLE:</b>	Operations Manager
<b>SIGNATURE:</b>		<b>SIGNATURE:</b>	
<b>DATE:</b>	04/18/24	<b>DATE:</b>	04/18/24

JC:cm

### SECTION 3

#### TEST METHOD(S)

The specimens were evaluated in accordance with the following:

**TAS 201-94**, *Impact Test Procedures*

**TAS 202-94**, *Criteria for Testing Impact & Non Impact Resistant Building Envelope Components Using Uniform Static Air Pressure*

**TAS 203-94**, *Criteria for Testing Products Subject to Cyclic Wind Pressure Loading*

**ASTM E330-14**, *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.*

**ASTM E1886-19**, *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials*

**ASTM E1996-20**, *Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes*

### SECTION 4

#### MATERIAL SOURCE/INSTALLATION

Test specimens were provided by the client. Representative samples of the test specimen(s) will be retained by Intertek B&C for a minimum of ten years from the test completion date.

Then specimen was installed into a pine test buck.

LOCATION	ANCHOR DESCRIPTION	ANCHOR LOCATION
Interior and Exterior of Panel	Panel is secured inbetween one 2 x 4 on each side. 2 x 4 attached to surrounding test buck	2 x 4 attached to test buck with #8 x 2" coarse thread screws.

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### SECTION 5 EQUIPMENT

**Cannon:** Constructed from steel piping utilizing compressed air to propel the missile

**Missile:** 2x4 Southern Pine

**Timing Device:** Electronic beam type

**Cycling Mechanism:** Computer controlled centrifugal blower with electronic pressure measuring device

**Deflection Measuring Device:** Linear transducers

### SECTION 6 LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Jeffrey Crump	Intertek B&C
Jovica Cijuk	Intertek B&C

### SECTION 7 TEST SPECIMEN DESCRIPTION

**Product Type:** Fiberglass Panel

**Series/Model:** Bullet Resistant Fiberglass Panels

**Product Size(s):**

OVERALL AREA:	WIDTH		HEIGHT	
	millimeters	inches	millimeters	inches
2.2 m <sup>2</sup> (24.0 ft <sup>2</sup> )				
Overall Size	914	36	2438	96
Thickness	6.35	1/4		

**Panel Construction:**

MATERIAL	DESCRIPTION
Fiberglass	Multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets

**SECTION 8**  
**TEST RESULTS**

**Protocol TAS 202-94 and ASTM E330, Static Air Pressure**

**Test Date(s):** 02/09/24 through 02/10/24

The temperature during testing was 22°C (71°F). The results are tabulated as follows:

**Test Specimen #1: Preload and Design Load per TAS 202**

LOAD (psf)	INDICATOR LOCATION	DEFLECTION (in.)		PERMANENT SET (in.)	
		MEASURED	ALLOWED	MEASURED	ALLOWED
+75.00 50% of Test Pressure	1	.05	N/A	.00	N/A
	2	.90	N/A	.00	N/A
	3	.20	N/A	.00	N/A
+100.00 Design Pressure	1	.06		.00	
	2	1.12		.01	
	3	.12		.00	
-75.00 50% of Test Pressure	1	.04	N/A	.00	N/A
	2	1.13	N/A	.01	N/A
	3	.15	N/A	.00	N/A
-100.00 Design Pressure	1	.04		.00	
	2	1.26		.01	
	3	.07		.01	

LOAD (psf)	INDICATOR LOCATION	PERMANENT SET (in.)	
		MEASURED	ALLOWED
+150.00 Test Pressure	1	.01	
	2	.03	.19
	3	.01	
-150.00 Test Pressure	1	.00	
	2	.02	.19
	3	.01	

**Note 1:** Positive and negative uniform static load test loads were held for 30 seconds.

**Note 2:** Tape and film were not used to seal against air leakage during structural testing.

**Note 3:** See Sketch #1 for indicator locations. Deflection/permanent set reported is the overall deflection between three points (longest unsupported span) which accounts for support movement.

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**Protocol TAS 201-94 and ASTM E1886/1996, Large Missile Impact Procedures**

Test Date(s): 02/09/24 through 02/09/24

The temperature during testing was 22°C (71°F). The results are tabulated as follows:

**Test Specimen #1**

IMPACT #	MISSILE WEIGHT (lbs.)	MISSILE LENGTH (in.)	MISSILE VELOCITY (ft./sec.)	DEFLECTION	
				INSTANTANEOUS (in.)	PERMANENT (in.)
1	9	96	50	1.0	0
2	9	96	50	.50	0

**Test Specimen #2**

IMPACT #	MISSILE WEIGHT (lbs.)	MISSILE LENGTH (in.)	MISSILE VELOCITY (ft./sec.)	DEFLECTION	
				INSTANTANEOUS (in.)	PERMANENT (in.)
1	9	96	50	.50	0
2	9	96	50	1.25	0

**Test Specimen #3**

IMPACT #	MISSILE WEIGHT (lbs.)	MISSILE LENGTH (in.)	MISSILE VELOCITY (ft./sec.)	DEFLECTION	
				INSTANTANEOUS (in.)	PERMANENT (in.)
1	9	96	50	1.0	0
2	9	96	50	.50	0

**Note 4:** See Sketch #2 – 4 for impact locations.

**Protocol TAS 203-94 and ASTM E1886/1996, Cyclic Wind Pressure Loading**

Test Date(s): 02/13/24 through 02/14/24

The temperature during testing was 22°C (71°F). The results are tabulated as follows:

**Test Specimen #1: Cyclic Test Spectrum and Average Cycle Time per TAS 203**

DESIGN PRESSURE	STAGE		
+100.0 /-100.0 psf	1	2	3
POSITIVE PRESSURE RANGE (psf)	0 – 50	0 – 60	0 – 130
AVERAGE CYCLE TIME (sec.)	1.9	2.2	1
NUMBER OF CYCLES	600	70	1
	4	5	6
NEGATIVE PRESSURE RANGE (psf)	0 – 50	0 – 60	0 – 130
AVERAGE CYCLE TIME (sec.)	2.3	2.6	1
NUMBER OF CYCLES	600	70	1

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**Test Specimen #1: Positive Cyclic Load per TAS 203**

INDICATOR LOCATION	MAXIMUM DEFLECTION (in.)	PERMANENT SET (in.)	PERCENT RECOVERY	
			MEASURED %	ALLOWED %
2	1.41	.02	98%	> 90

**Test Specimen #1: Negative Cyclic Load per TAS 203**

INDICATOR LOCATION	MAXIMUM DEFLECTION (in.)	PERMANENT SET (in.)	PERCENT RECOVERY	
			MEASURED %	ALLOWED %
2	1.48	.02	99%	> 90

**Test Specimen #2: Cyclic Test Spectrum and Average Cycle Time per TAS 203**

DESIGN PRESSURE	STAGE		
+100.0 /-100.0 psf	1	2	3
POSITIVE PRESSURE RANGE (psf)	0 – 50	0 – 60	0 – 130
AVERAGE CYCLE TIME (sec.)	2.1	2.5	1
NUMBER OF CYCLES	600	70	1
	4	5	6
NEGATIVE PRESSURE RANGE (psf)	0 – 50	0 – 60	0 – 130
AVERAGE CYCLE TIME (sec.)	2.6	2.8	1
NUMBER OF CYCLES	600	70	1

**Test Specimen #2: Positive Cyclic Load per TAS 203**

INDICATOR LOCATION	MAXIMUM DEFLECTION (in.)	PERMANENT SET (in.)	PERCENT RECOVERY	
			MEASURED %	ALLOWED %
2	1.42	.02	98%	> 90

**Test Specimen #2: Negative Cyclic Load per TAS 203**

INDICATOR LOCATION	MAXIMUM DEFLECTION (in.)	PERMANENT SET (in.)	PERCENT RECOVERY	
			MEASURED %	ALLOWED %
2	1.48	.02	99%	> 90

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### Test Specimen #3: Cyclic Test Spectrum and Average Cycle Time per TAS 203

DESIGN PRESSURE	STAGE		
	1	2	3
+100.0 / -100.0 psf			
POSITIVE PRESSURE RANGE (psf)	0 – 50	0 – 60	0 – 130
AVERAGE CYCLE TIME (sec.)	1.9	2.2	1
NUMBER OF CYCLES	600	70	1
	4	5	6
NEGATIVE PRESSURE RANGE (psf)	0 – 50	0 – 60	0 – 130
AVERAGE CYCLE TIME (sec.)	2.3	2.6	1
NUMBER OF CYCLES	600	70	1

### Test Specimen #3: Positive Cyclic Load per TAS 203

INDICATOR LOCATION	MAXIMUM DEFLECTION (in.)	PERMANENT SET (in.)	PERCENT RECOVERY	
			MEASURED %	ALLOWED %
2	1.40	.02	98%	> 90

### Test Specimen #3: Negative Cyclic Load per TAS 203

INDICATOR LOCATION	MAXIMUM DEFLECTION (in.)	PERMANENT SET (in.)	PERCENT RECOVERY	
			MEASURED %	ALLOWED %
2	1.39	.02	99%	> 90

**Note 5:** See Sketch #1 for indicator locations. Deflection/permanent set reported is the overall deflection between three points (longest unsupported span) which accounts for support movement.



**SECTION 9****CONCLUSIONS**

The large missiles impacted each intended target. Each impact location was carefully inspected. No signs of penetration, rupture, or opening after the large missile impact test were observed; as such, each test specimen satisfies the large missile requirements of TAS 201 and ASTM E1996. Upon completion of testing, specimens tested for TAS 201-94 and ASTM E1996-20 met the requirements of Section 1626 of the Florida Building Code, Building.

No signs of failure were observed in any area of the test specimen during the TAS 202 testing; as such, the test specimen satisfies the requirements of TAS 202. Upon completion of testing, specimens tested for TAS 202-94 met the requirements of Section 1620 of the Florida Building Code, Building.

AND

No signs of failure were observed in any area of the test specimens during the cyclic load test; as such, the test specimens satisfy the cyclic load requirements of TAS 203 and ASTM E1886-19. Upon completion of testing, specimens tested for TAS 203-94 and ASTM E1886-19 met the requirements of Section 1625 of the Florida Building Code, Building.

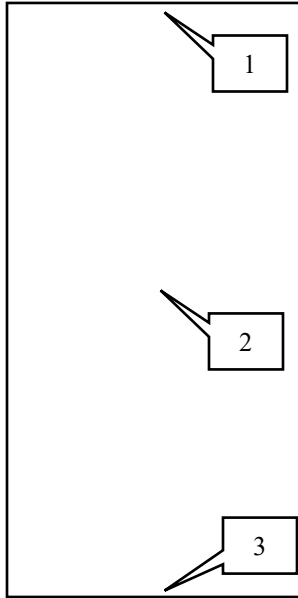
Unless differently required, Intertek reports apply the "Simple Acceptance" rule, also called "Shared Risk approach," of ILAC-G8:09/2019, Guidelines on Decision Rules and Statements of Conformity.

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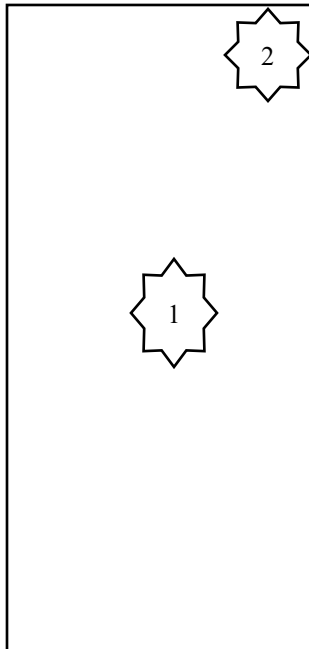
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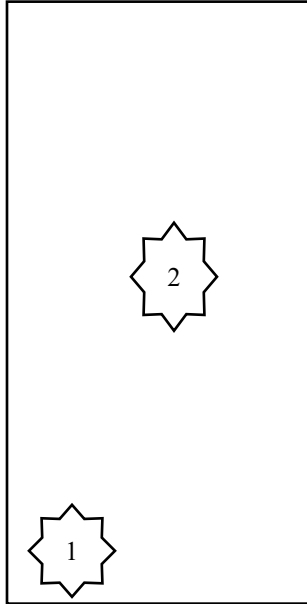
### SECTION 10 SKETCH(ES)



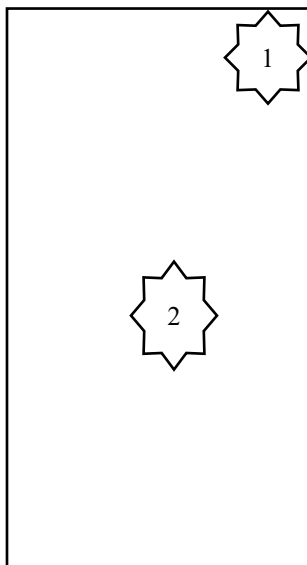
**Sketch No. 1**  
**TAS 202 Indicator Locations**



**Sketch No. 2**  
**Test Specimen #1 TAS 201 Impact Locations**



**Sketch No. 3**  
**Test Specimen #2 TAS 201 Impact Locations**



**Sketch No. 4**  
**Test Specimen #3 TAS 201 Impact Locations**

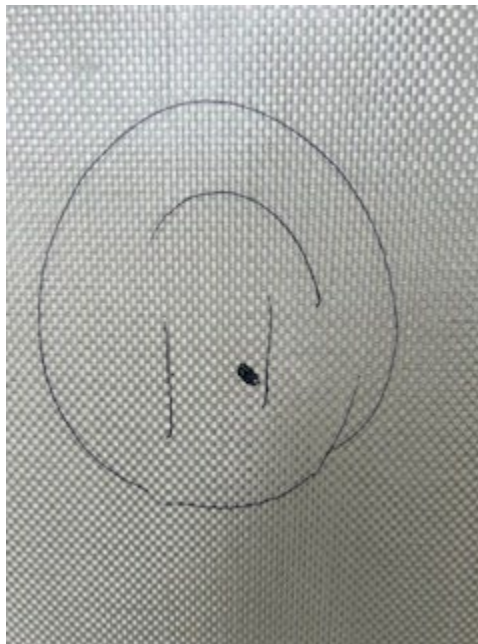
**SECTION 11**  
**PHOTOGRAPHS**



**Photo No. 1**  
**Armorcore UI 752 Level 1 Panel**



**Photo No. 2**  
**Armorcore UI 752 Level 1 Panel Post Impact**



**Photo No. 3**  
**Armorcore UI 752 Level 1 Panel Impact 1**

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**Photo No. 3**  
**Armorcore UI 752 Level 1 Panel Impact 2**



Total Quality. Assured.

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**SECTION 12**

**DRAWINGS**

The test specimen drawings have been reviewed by Intertek B&C and are representative of the test specimen(s) reported herein. Test specimen construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.

# Mechanical Properties

<i>Test</i>	<i>Method</i>	<i>Results</i>
<b>Tensile Tests:</b>		
0° Tensile Strength	ASTM D5083	54,800 psi
0° Tensile Elongation	ASTM D5083	1.95%
0° Tensile Modulus	ASTM D5083	3.73 Msi
90° Tensile Strength	ASTM D5083	46,120 psi
90° Tensile Elongation	ASTM D5083	2.70%
90° Tensile Modulus	ASTM D5083	3.21 Msi
<b>Flexural Tests:</b>		
0° Flexural Strength	ASTM D790	22,030 psi
0° Flexural Modulus	ASTM D790	3.24 Msi
90° Flexural Strength	ASTM D790	20,580 psi
90° Flexural Modulus	ASTM D790	3.21 Msi
<b>Short Beam Shear Tests:</b>		
0° Short-Beam Shear	ASTM D2344	1750 psi
90° Short-Beam Shear	ASTM D2344	1880 psi
<b>Compression Tests:</b>		
0° Compression	ASTM D695	13,440 psi
90° Compression	ASTM D695	11,690 psi
Specific Gravity	ASTM D792	2.08

**intertek**  
Total Quality Assured.

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Verified by: J. Crump

\*0° = Longitudinal Direction  
\*90° = Transverse Direction





Total Quality. Assured.

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**SECTION 13**

**REVISION LOG**

REVISION #	DATE	PAGES	REVISION
0	04/30/24	N/A	Original Report Issue