

ICC NTA TEST REPORT

ASTM D3498 Adhesive Test

RENDERED TO: WOLF GROUP OÜ
Suur-Paala 10
Tallinn Estonia 13619

PRODUCT: VSAP – Subfloor Foam Adhesive



Report No.: 2022-6183
Test Date(s): 11/17/2022 - 12/05/2022
Report Date: 12/16/2022
Pages: 15

1. TITLE

ASTM D3498 Test on VSAP - Subfloor Foam Adhesive

2. OBJECTIVE

To determine if Wolf Group's VSAP - Subfloor Foam Adhesive meets the specification for field-gluing OSB to lumber framing for floor systems as defined in ASTM D3498.

This test report pertains only to the specimens tested. It remains the sole responsibility of the manufacturer to provide a product consistent to that which was tested. Simple Acceptance, as defined in ISO Guide 98-4, is used for any statements of conformity given in this report.

3. TESTED FOR

Wolf Group OÜ
Suur-Paala 10
Tallinn Estonia 13619


4. TESTING ORGANIZATION

ICC NTA, LLC
58640 State Road 15
Goshen, IN 46528

See A2LA Certificate Number 6395.01 for ISO 17025 Accreditation.

5. TESTING PERSONNEL

Building Products Testing Manager
Technician

- Brad Wear 
- Norm Amstutz

6. REFERENCE STANDARDS

ASTM D3498-19a - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing

ASTM D905-08(2013) - Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading

7. TESTING EQUIPMENT

Tension/Compression Test Machine (PEI No. 1177)
Load Cell (PEI No. 1181 and 1182)
Block Shear Tool (PEI No. 134)
6" Digital Caliper (PEI No. 1214)

8. TEST SPECIMEN

Adhesive

VSAP - Subfloor Foam Adhesive manufactured by Wolf Group in an expandable polyurethane foam adhesive and provided to ICC NTA in a pressurized canister with a gun system. Manufacture Date: Unknown.

Oriented Strand Board (OSB)

5/8" PS-2 grade marked stamped, sanded on one side.

Framing

2" nominal thickness (cut down to required size) Douglas Fir and Southern Pine, clear dry lumber. Selected with surfaces free of bark, knots, splits and pitch. The moisture was content between 8% and 15%.

9. TEST SPECIMEN CONSTRUCTION

Prior to construction, all materials and the adhesive were conditioned in accordance with Section 10.3 and Table 2 of ASTM D3498.

- A. Gluing: A bead of adhesive was placed in the center of the lumber to ensure 100% coverage.
- B. Open Time: The lumber was assembled ten (10) minutes after the adhesive was applied.
- C. Glue Preparation: The adhesive was ready to use.
- D. Cure Time: As specified in Table 4 of ASTM D3498.
- E. Assembly: Test samples were nailed together with the appropriate spacers, for the specified curing times and then nails were withdrawn.
- F. Oxidation Resistance Sample Construction: The adhesive was cast using a spreader as described in ASTM D3498. Samples were cut from the formed adhesive.

10. TEST SPECIMEN CONDITIONING

The test specimens were conditioned in accordance with Tables 3 and 4 of ASTM D3498.

11. TEST SET-UP

A. Tests A, B, C, Gap-Filling, and Moisture Resistance

The block shear tests were set-up in accordance with ASTM D905.

All block shear specimens were cut to the dimensions specified in Figure 5 of ASTM D3498.

B. Oxidation Resistance

The Durability (Oxidation Resistance) samples were vertically oriented in a 300 psi oxygen chamber at 158°F for 500 hours.

12. TEST PROCEDURE

A. Tests A, B, C, Gap-Filling, and Moisture Resistance

The block shear specimens were tested in accordance with ASTM D905 using a load rate of 0.20 inches per minute.

B. Oxidation Resistance

The samples were removed from the oxygen chamber and placed in 70°F and 50% R.H. for 24 hours. The samples were then bent 180° around a 0.25" mandrel. Visual observations were recorded.

13. TEST RESULTS

ASTM D3498 Test Method	Lumber Type	ASTM D3498 Requirement	Average Results OSB (psi)	Pass/ Fail
Test A (Wet Lumber)	Douglas-fir	150 psi (1.035 MPa), min. avg.	111.5	Fail
	Southern Pine		96.7	Fail
Test B (Frozen Lumber)	Douglas-fir	100 psi (689 MPa), min. avg.	372.4	Pass
	Southern Pine		332.4	Pass
Test C (Dry Lumber)	Douglas-fir	150 psi (1.035 MPa), min. avg.	527.6	Pass
GAP-Filling (.062")	Douglas-fir	100 psi (689 MPa), min. avg.	150.8	Pass
GAP-Filling (.125")	Douglas-fir	100 psi (689 MPa), min. avg.	140.0	Pass
Durability (Moisture Resistance)	Douglas-fir	min of 22 of 24 specimens shall show no adhesive bond failure.	No adhesive bond failure.	Pass
	Douglas-fir	150 psi (1.035 MPa), min. avg.	97.3	Fail
Durability (Oxidation Resistance)	None	No visible signs of melting after exposure, nor fracture of free film on mandrel bend.	No melting detected. All three (3) samples fractured when wrapping the samples around the steel mandrel.	Fail

See the attached data pages for results.

14. CONCLUSION

Wolf Group's VSAP - Subfloor Foam Adhesive met all of the adhesive strength requirements as defined in Table 1 of ASTM D3498, except the Test A (Wet Lumber), Durability (Moisture Resistance), and Durability (Oxidation Resistance) Testing.

ASTM D3498
Test A (Wet Lumber)

Date: 12/2/2022

Test Condition: 70°F and 21% R.H.

Client: Wolf Group

Load Rate: .200" per minute

Adhesive: VSAP - Subfloor Foam Adhesive

Required Number: **150 psi**

Prior Block Conditioning: 28 days @ 100°F / 90% R.H.

Wood Type: Douglas Fir to OSB

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %		
						Adhesion	Cohesion	Wood Pull
W-DF-1-1	1.082"	1.560"	1.688 sq.in.	361.0	213.9		90	10
W-DF-1-2	1.038"	1.590"	1.650 sq.in.	269.0	163.0	20	80	
W-DF-1-3	1.034"	1.548"	1.601 sq.in.	171.0	106.8	80	20	
W-DF-1-4	1.018"	1.528"	1.556 sq.in.	149.0	95.8	90	10	
W-DF-1-5	1.073"	1.535"	1.647 sq.in.	155.0	94.1	90	10	
W-DF-1-6	1.031"	1.556"	1.604 sq.in.	172.0	107.2	80	20	
W-DF-1-7	1.065"	1.526"	1.625 sq.in.	125.0	76.9			100
W-DF-1-8	1.044"	1.533"	1.600 sq.in.	310.0	193.7		80	20
W-DF-2-1	1.009"	1.545"	1.559 sq.in.	253.0	162.3		90	10
W-DF-2-2	1.025"	1.523"	1.561 sq.in.	169.0	108.3	20	80	
W-DF-2-3	1.053"	1.510"	1.590 sq.in.	139.0	87.4	20	80	
W-DF-2-4	1.020"	1.508"	1.538 sq.in.	106.0	68.9	20	80	
W-DF-2-5	1.010"	1.556"	1.572 sq.in.	127.0	80.8	30	70	
W-DF-2-6	1.044"	1.503"	1.569 sq.in.	120.0	76.5	70	30	
W-DF-2-7	1.026"	1.506"	1.545 sq.in.	128.0	82.8	70	30	
W-DF-2-8	1.040"	1.509"	1.569 sq.in.	259.0	165.0	20	70	10
W-DF-3-1	1.036"	1.520"	1.575 sq.in.	223.0	141.6		50	50
W-DF-3-2	1.024"	1.515"	1.551 sq.in.	152.0	98.0	10	30	60
W-DF-3-3	1.021"	1.512"	1.544 sq.in.	132.0	85.5		100	
W-DF-3-4	1.021"	1.518"	1.550 sq.in.	104.0	67.1		100	
W-DF-3-5	1.031"	1.550"	1.598 sq.in.	103.0	64.5	10	90	
W-DF-3-6	1.053"	1.544"	1.626 sq.in.	142.0	87.3	50	50	
W-DF-3-7	1.032"	1.534"	1.583 sq.in.	155.0	97.9	10	90	
W-DF-3-8	1.031"	1.556"	1.604 sq.in.	241.0	150.2	10	90	

Average	177.7	111.5
<i>Standard Deviation</i>	68.5	41.2

**ASTM D3498
Test A (Wet Lumber)**

Date: 12/2/2022

Test Condition: 70°F and 21% R.H.

Client: Wolf Group

Load Rate: .200" per minute

Adhesive: VSAP - Subfloor Foam Adhesive

Required Number: **150 psi**

Prior Block Conditioning: 28 days @ 100°F / 90% R.H.

Wood Type: Southern Yellow Pine to OSB

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %		
						Adhesion	Cohesion	Wood Pull
W-SP-1-1	1.041"	1.552"	1.616 sq.in.	254.0	157.2	70	30	
W-SP-1-2	1.029"	1.564"	1.609 sq.in.	144.0	89.5	50	50	
W-SP-1-3	1.017"	1.538"	1.564 sq.in.	95.0	60.7	80	20	
W-SP-1-4	1.038"	1.541"	1.600 sq.in.	70.0	43.8	80	20	
W-SP-1-5	1.029"	1.550"	1.595 sq.in.	110.0	69.0	20	80	
W-SP-1-6	1.010"	1.576"	1.592 sq.in.	73.0	45.9	80	20	
W-SP-1-7	1.008"	1.564"	1.577 sq.in.	145.0	92.0	10	90	
W-SP-1-8	1.037"	1.574"	1.632 sq.in.	300.0	183.8	50	50	
W-SP-2-1	1.048"	1.575"	1.651 sq.in.	262.0	158.7	10	90	
W-SP-2-2	1.027"	1.552"	1.594 sq.in.	144.0	90.3	50	50	
W-SP-2-3	1.047"	1.531"	1.603 sq.in.	117.0	73.0	10	90	
W-SP-2-4	1.017"	1.547"	1.573 sq.in.	76.0	48.3	60	40	
W-SP-2-5	1.016"	1.502"	1.526 sq.in.	96.0	62.9	60	40	
W-SP-2-6	1.036"	1.540"	1.595 sq.in.	125.0	78.3		100	
W-SP-2-7	1.065"	1.534"	1.634 sq.in.	164.0	100.4	80	20	
W-SP-2-8	1.006"	1.538"	1.547 sq.in.	64.0	41.4		10	90
W-SP-3-1	1.015"	1.515"	1.538 sq.in.	311.0	202.2		30	70
W-SP-3-2	1.025"	1.493"	1.530 sq.in.	175.0	114.4	10	90	
W-SP-3-3	1.016"	1.533"	1.558 sq.in.	161.0	103.4	50	50	
W-SP-3-4	1.017"	1.534"	1.560 sq.in.	146.0	93.6	10	90	
W-SP-3-5	1.049"	1.495"	1.568 sq.in.	119.0	75.9	20	80	
W-SP-3-6	1.001"	1.530"	1.532 sq.in.	133.0	86.8	10	90	
W-SP-3-7	1.031"	1.519"	1.566 sq.in.	170.0	108.6	20	80	
W-SP-3-8	1.029"	1.518"	1.562 sq.in.	221.0	141.5	10	80	10

Average	153.1	96.7
<i>Standard Deviation</i>	68.8	43.0

ASTM D3498
Test B (Frozen Lumber)

Date: 12/5/2022

Client: Wolf Group

Adhesive: VSAP - Subfloor Foam Adhesive

Wood Type: Douglas Fir to OSB

Test Condition: 68°F and 32% R.H.

Load Rate: .200" per minute

Required Number: **100 psi**

Prior Block Conditioning: 7 days @ 0°F

21 days @ 40°F

7 days @ 70°F / 50% R.H.

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %		
						Adhesion	Cohesion	Wood Pull
F-DF-1-1	1.023"	1.489"	1.523 sq.in.	543.0	356.5		50	50
F-DF-1-2	1.038"	1.478"	1.534 sq.in.	503.0	327.9		50	50
F-DF-1-3	1.042"	1.518"	1.582 sq.in.	465.0	294.0		50	50
F-DF-1-4	1.042"	1.483"	1.545 sq.in.	491.0	317.7		50	50
F-DF-1-5	1.067"	1.500"	1.601 sq.in.	595.0	371.8		100	
F-DF-1-6	1.033"	1.475"	1.524 sq.in.	598.0	392.5		100	
F-DF-1-7	1.043"	1.476"	1.539 sq.in.	547.0	355.3		50	50
F-DF-1-8	1.031"	1.491"	1.537 sq.in.	578.0	376.0		20	80
F-DF-2-1	1.010"	1.517"	1.532 sq.in.	579.0	377.9		70	30
F-DF-2-2	1.009"	1.506"	1.520 sq.in.	553.0	363.9		20	80
F-DF-2-3	1.010"	1.507"	1.522 sq.in.	479.0	314.7		20	80
F-DF-2-4	1.012"	1.507"	1.525 sq.in.	536.0	351.5		100	
F-DF-2-5	1.019"	1.495"	1.523 sq.in.	443.0	290.8	40	40	20
F-DF-2-6	1.021"	1.495"	1.526 sq.in.	522.0	342.0		70	30
F-DF-2-7	1.043"	1.496"	1.560 sq.in.	581.0	372.4		50	50
F-DF-2-8	1.012"	1.502"	1.520 sq.in.	684.0	450.0		90	10
F-DF-3-1	1.018"	1.566"	1.594 sq.in.	753.0	472.3			100
F-DF-3-2	1.001"	1.544"	1.546 sq.in.	662.0	428.3		30	70
F-DF-3-3	1.032"	1.563"	1.613 sq.in.	731.0	453.2		80	20
F-DF-3-4	1.032"	1.571"	1.621 sq.in.	618.0	381.2		70	30
F-DF-3-5	1.011"	1.541"	1.558 sq.in.	625.0	401.2		50	50
F-DF-3-6	1.017"	1.526"	1.552 sq.in.	631.0	406.6			100
F-DF-3-7	1.015"	1.522"	1.545 sq.in.	532.0	344.4	30		70
F-DF-3-8	1.030"	1.512"	1.557 sq.in.	617.0	396.2		50	50

Average	577.8	372.4
<i>Standard Deviation</i>	77.7	46.8

ASTM D3498
Test B (Frozen Lumber)

Date: 12/5/2022

Client: Wolf Group

Adhesive: VSAP - Subfloor Foam Adhesive

Wood Type: Southern Yellow Pine to OSB

Test Condition: 70°F and 34% R.H.

Load Rate: .200" per minute

Required Number: **100 psi**

Prior Block Conditioning: 7 days @ 0°F

21 days @ 40°F

7 days @ 70°F / 50% R.H.

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %		
						Adhesion	Cohesion	Wood Pull
F-SP-1-1	1.033"	1.520"	1.570 sq.in.	764.0	486.6		30	70
F-SP-1-2	1.022"	1.517"	1.550 sq.in.	610.0	393.5		20	80
F-SP-1-3	1.022"	1.512"	1.545 sq.in.	442.0	286.0		60	40
F-SP-1-4	1.011"	1.517"	1.534 sq.in.	521.0	339.7		100	
F-SP-1-5	1.019"	1.515"	1.544 sq.in.	519.0	336.2		20	80
F-SP-1-6	1.038"	1.519"	1.577 sq.in.	488.0	309.5		50	50
F-SP-1-7	1.026"	1.512"	1.551 sq.in.	517.0	333.3		50	50
*F-SP-1-8	.767"	1.517"	1.164 sq.in.	226.0	194.2			
F-SP-2-1	1.005"	1.501"	1.509 sq.in.	444.0	294.3		10	90
F-SP-2-2	1.009"	1.487"	1.500 sq.in.	526.0	350.6		70	30
F-SP-2-3	1.019"	1.508"	1.537 sq.in.	552.0	359.2		80	20
F-SP-2-4	1.024"	1.512"	1.548 sq.in.	554.0	357.8		70	30
F-SP-2-5	1.021"	1.482"	1.513 sq.in.	479.0	316.6		50	50
F-SP-2-6	1.048"	1.510"	1.582 sq.in.	441.0	278.7			100
F-SP-2-7	1.019"	1.488"	1.516 sq.in.	562.0	370.6		50	50
F-SP-2-8	1.029"	1.515"	1.559 sq.in.	530.0	340.0			100
F-SP-3-1	1.019"	1.512"	1.541 sq.in.	757.0	491.3		30	70
F-SP-3-2	1.022"	1.519"	1.552 sq.in.	636.0	409.7		50	50
F-SP-3-3	1.027"	1.487"	1.527 sq.in.	537.0	351.6		70	30
F-SP-3-4	1.033"	1.490"	1.539 sq.in.	251.0	163.1	90		10
F-SP-3-5	1.040"	1.502"	1.562 sq.in.	517.0	331.0		70	30
F-SP-3-6	1.038"	1.545"	1.604 sq.in.	432.0	269.4		20	80
F-SP-3-7	1.044"	1.498"	1.564 sq.in.	475.0	303.7		50	50
F-SP-3-8	1.041"	1.512"	1.574 sq.in.	489.0	310.7		70	30

Average	511.2	332.4
<i>Standard Deviation</i>	117.3	71.5

* Aluminum spacer strip was accidentally included during the cutting process. The width of the strip was calculated out of the Height measurement.

**ASTM D3498
Test C (Dry Lumber)**

Date: 12/1/2022

Test Condition: 69°F and 15% R.H.

Client: Wolf Group

Load Rate: .200" per minute

Adhesive: VSAP - Subfloor Foam Adhesive

Required Number: **150 psi**

Prior Block Conditioning: 28 days @ 70°F / 50% R.H.

Wood Type: Douglas Fir to OSB

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %	
						Adhesion	Wood Pull
D-1-1	1.063"	1.484"	1.577 sq.in.	664.0	420.9	90	10
D-1-2	1.065"	1.462"	1.557 sq.in.	547.0	351.3	100	
D-1-3	1.066"	1.497"	1.596 sq.in.	671.0	420.5	100	
D-1-4	1.035"	1.478"	1.530 sq.in.	672.0	439.3	50	50
D-1-5	1.037"	1.476"	1.531 sq.in.	623.0	407.0	100	
D-1-6	1.050"	1.485"	1.559 sq.in.	682.0	437.4	100	
D-1-7	1.075"	1.493"	1.605 sq.in.	1,081.0	673.5	70	30
D-1-8	1.070"	1.498"	1.603 sq.in.	1,109.0	691.9	80	20
D-2-1	1.038"	1.490"	1.547 sq.in.	812.0	525.0	90	10
D-2-2	1.046"	1.489"	1.557 sq.in.	807.0	518.1	100	
D-2-3	1.063"	1.488"	1.582 sq.in.	517.0	326.9	100	
D-2-4	1.054"	1.493"	1.574 sq.in.	551.0	350.1	20	80
D-2-5	1.060"	1.488"	1.577 sq.in.	650.0	412.1	100	
D-2-6	1.048"	1.491"	1.563 sq.in.	822.0	526.1	100	
D-2-7	1.045"	1.490"	1.557 sq.in.	958.0	615.3	100	
D-2-8	1.075"	1.490"	1.602 sq.in.	814.0	508.2	30	70
D-3-1	1.082"	1.515"	1.639 sq.in.	1,038.0	633.2	90	10
D-3-2	1.073"	1.523"	1.634 sq.in.	933.0	570.9	70	30
D-3-3	1.069"	1.525"	1.630 sq.in.	865.0	530.6	90	10
D-3-4	1.033"	1.483"	1.532 sq.in.	824.0	537.9	80	20
D-3-5	1.048"	1.493"	1.565 sq.in.	850.0	543.2	90	10
D-3-6	1.084"	1.480"	1.604 sq.in.	978.0	609.6	100	
D-3-7	1.054"	1.473"	1.553 sq.in.	1,198.0	771.6	70	30
D-3-8	1.064"	1.463"	1.557 sq.in.	1,311.0	842.2	30	70

Average	832.4	527.6
<i>Standard Deviation</i>	207.5	129.8

ASTM D3498 Gap-Filling Test

Date: 11/22/2022

Test Condition: 69°F and 22% R.H.

Client: Wolf Group

Load Rate: .200" per minute

Adhesive: VSAP - Subfloor Foam Adhesive

Required Number: **100 psi**

Gap Size: 0.062"

Prior Block Conditioning: 28 days @ 70°F / 50% R.H.

Wood Type: Douglas Fir to OSB

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %		
						Adhesion	Cohesion	Wood Pull
GF-1/16-1-1	1.048"	1.460"	1.530 sq.in.	215.0	140.5	70	20	10
GF-1/16-1-2	1.052"	1.460"	1.536 sq.in.	208.0	135.4	20	80	
GF-1/16-1-3	1.044"	1.485"	1.550 sq.in.	205.0	132.2	30		70
GF-1/16-1-4	1.034"	1.489"	1.540 sq.in.	226.0	146.8	80	20	
GF-1/16-1-5	1.053"	1.493"	1.572 sq.in.	237.0	150.8	70	30	
GF-1/16-1-6	1.061"	1.468"	1.558 sq.in.	256.0	164.4	50	50	
GF-1/16-1-7	1.041"	1.487"	1.548 sq.in.	220.0	142.1	90		10
GF-1/16-1-8	1.072"	1.437"	1.540 sq.in.	214.0	138.9	80		20
GF-1/16-2-1	1.063"	1.476"	1.569 sq.in.	283.0	180.4	40	60	
GF-1/16-2-2	1.062"	1.473"	1.564 sq.in.	251.0	160.5	80	20	
GF-1/16-2-3	1.035"	1.465"	1.516 sq.in.	254.0	167.5	70	30	
GF-1/16-2-4	1.046"	1.468"	1.536 sq.in.	266.0	173.2	50	50	
GF-1/16-2-5	1.069"	1.474"	1.576 sq.in.	241.0	152.9	90	10	
GF-1/16-2-6	1.056"	1.470"	1.552 sq.in.	210.0	135.3	60	40	
GF-1/16-2-7	1.073"	1.488"	1.597 sq.in.	251.0	157.2	50	50	
GF-1/16-2-8	1.047"	1.462"	1.531 sq.in.	256.0	167.2	90	10	
GF-1/16-3-1	1.024"	1.389"	1.422 sq.in.	184.0	129.4	50		50
GF-1/16-3-2	1.023"	1.367"	1.398 sq.in.	195.0	139.4	50		50
GF-1/16-3-3	1.048"	1.377"	1.443 sq.in.	205.0	142.1	40		60
GF-1/16-3-4	1.054"	1.401"	1.477 sq.in.	197.0	133.4	70		30
GF-1/16-3-5	1.056"	1.403"	1.482 sq.in.	281.0	189.7	40	60	
GF-1/16-3-6	1.047"	1.407"	1.473 sq.in.	229.0	155.5	90	10	
GF-1/16-3-7	1.060"	1.407"	1.491 sq.in.	220.0	147.5			100
GF-1/16-3-8	1.064"	1.408"	1.498 sq.in.	205.0	136.8	80		20

Average	229.5	150.8
<i>Standard Deviation</i>	27.1	16.0

ASTM D3498 Gap-Filling Test

Date: 11/22/2022

Test Condition: 70°F and 24% R.H.

Client: Wolf Group

Load Rate: .200" per minute

Adhesive: VSAP - Subfloor Foam Adhesive

Required Number: **100 psi**

Gap Size: 0.125"

Prior Block Conditioning: 28 days @ 70°F / 50% R.H.

Wood Type: Douglas Fir to OSB

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %		
						Adhesion	Cohesion	Wood Pull
GF-1/8-1-1	1.043"	1.502"	1.567 sq.in.	221.0	141.1	80	20	
GF-1/8-1-2	1.046"	1.460"	1.527 sq.in.	253.0	165.7	80	20	
GF-1/8-1-3	1.042"	1.457"	1.518 sq.in.	204.0	134.4	60		40
GF-1/8-1-4	1.040"	1.457"	1.515 sq.in.	230.0	151.8	80		20
GF-1/8-1-5	1.042"	1.477"	1.539 sq.in.	180.0	117.0	90		10
GF-1/8-1-6	1.038"	1.472"	1.528 sq.in.	220.0	144.0	30		70
GF-1/8-1-7	1.057"	1.477"	1.561 sq.in.	194.0	124.3	90		10
GF-1/8-1-8	1.035"	1.472"	1.524 sq.in.	142.0	93.2			100
GF-1/8-2-1	1.049"	1.469"	1.541 sq.in.	253.0	164.2	70		30
GF-1/8-2-2	1.037"	1.476"	1.531 sq.in.	210.0	137.2	100		
GF-1/8-2-3	OSB was cracked before testing.							
GF-1/8-2-4	1.040"	1.493"	1.553 sq.in.	226.0	145.6	80		20
GF-1/8-2-5	1.073"	1.503"	1.613 sq.in.	239.0	148.2	70	30	
GF-1/8-2-6	1.045"	1.495"	1.562 sq.in.	275.0	176.0	90	10	
GF-1/8-2-7	1.042"	1.483"	1.545 sq.in.	236.0	152.7	50	50	
GF-1/8-2-8	1.042"	1.479"	1.541 sq.in.	251.0	162.9	90	10	
GF-1/8-3-1	1.033"	1.455"	1.503 sq.in.	259.0	172.3	90	10	
GF-1/8-3-2	1.046"	1.459"	1.526 sq.in.	205.0	134.3	100		
GF-1/8-3-3	1.047"	1.482"	1.552 sq.in.	192.0	123.7	80		20
GF-1/8-3-4	1.034"	1.466"	1.516 sq.in.	237.0	156.3	80	10	10
GF-1/8-3-5	1.060"	1.440"	1.526 sq.in.	218.0	142.8	90	10	
GF-1/8-3-6	1.033"	1.444"	1.492 sq.in.	158.0	105.9	100		
GF-1/8-3-7	1.035"	1.447"	1.498 sq.in.	128.0	85.5	100		
GF-1/8-3-8	Sample was damaged during the cutting process.							

Average	215.0	140.0
<i>Standard Deviation</i>	37.1	23.6

ASTM D3498 Durability (Moisture Resistance) Test

Date: 11/30/2022

Client: Wolf Group

Adhesive: VSAP - Subfloor Foam Adhesive

Wood Type: Douglas Fir to OSB

Test Condition: 69°F and 23% R.H.

Load Rate: .200" per minute

Required Number: **150 psi**

Prior Block Conditioning: 28 days @ 70°F / 50% R.H.

Vacuum Pressure@ 110°F

7 days @ 70°F / 50% R.H.

Sample No.	Height	Width	Sq. In.	Ultimate Load	PSI Reached	Percent %		
						Adhesion	Cohesion	Wood Pull
MR-1-1	1.072"	1.403"	1.504 sq.in.	205.0	136.3	30		70
MR-1-2	1.053"	1.415"	1.490 sq.in.	145.0	97.3			100
MR-1-3	1.063"	1.419"	1.508 sq.in.	74.0	49.1		70	30
MR-1-4	1.085"	1.414"	1.534 sq.in.	210.0	136.9	20		80
MR-1-5	1.041"	1.420"	1.478 sq.in.	15.0	10.1		70	30
MR-1-6	1.068"	1.417"	1.513 sq.in.	27.0	17.8			100
MR-1-7	1.078"	1.424"	1.535 sq.in.	28.0	18.2			100
MR-1-8	1.086"	1.427"	1.550 sq.in.	97.0	62.6	100		
MR-2-1	1.068"	1.495"	1.597 sq.in.	96.0	60.1			100
MR-2-2	1.055"	1.502"	1.585 sq.in.	294.0	185.5		100	
MR-2-3	1.062"	1.502"	1.595 sq.in.	0.0	0.0		50	50
MR-2-4	1.077"	1.505"	1.621 sq.in.	0.0	0.0		50	50
MR-2-5	1.086"	1.477"	1.604 sq.in.	373.0	232.5		20	80
MR-2-6	1.082"	1.479"	1.600 sq.in.	355.0	221.8			100
MR-2-7	1.053"	1.487"	1.566 sq.in.	256.0	163.5			100
MR-2-8	1.096"	1.489"	1.632 sq.in.	50.0	30.6		100	
MR-3-1	1.074"	1.429"	1.535 sq.in.	100.0	65.2	80		20
MR-3-2	1.073"	1.457"	1.563 sq.in.	281.0	179.7		50	50
MR-3-3	1.065"	1.475"	1.571 sq.in.	167.0	106.3			100
MR-3-4	1.103"	1.496"	1.650 sq.in.	23.0	13.9			100
MR-3-5	1.074"	1.475"	1.584 sq.in.	47.0	29.7			100
MR-3-6	1.067"	1.498"	1.598 sq.in.	415.0	259.6		70	30
MR-3-7	1.068"	1.503"	1.605 sq.in.	394.0	245.5		20	80
MR-3-8	1.091"	1.502"	1.639 sq.in.	20.0	12.2			100

Average	153.0	97.3
<i>Standard Deviation</i>	135.1	84.8

Average excluding the highlighted samples	227.4	144.5
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Indicates that the lumber caught the edge of the shear fixture causing a spike in the load. The value shown was chosen from the chart at the point just before where the curve significantly increased (i.e. the lumber caught the fixture).

ASTM D3498

Durability (Oxidation Resistance) Test

Date: 11/17/2022

Client: Wolf Group

Adhesive: VSAP - Subfloor Foam Adhesive

Prior Conditioning: 3 days @ 70°F / 50% R.H.
 2 days @ 120°F / <40% R.H.
 500 hours @ 158°F / 300 psi
 24 hours @ 70°F / 50% R.H.

Procedure: The adhesive was cast into the shape and thickness as indicated in the ASTM D3498 standard. Samples were cut from the formed adhesive. After conditioning, samples were bent 180° around a 0.249" dia. steel mandrel to test for brittleness.

Specimen	Pass / Fail
1	Fail
2	Fail
3	Fail

Comments:

All three (3) samples had browned during the elevated heat exposure and no visible signs of melting were detected. When wrapping the samples around the steel mandrel, each sample cracked and broke.

ASTM D3498 Adhesive Testing VSAP - Subfloor Foam Adhesive

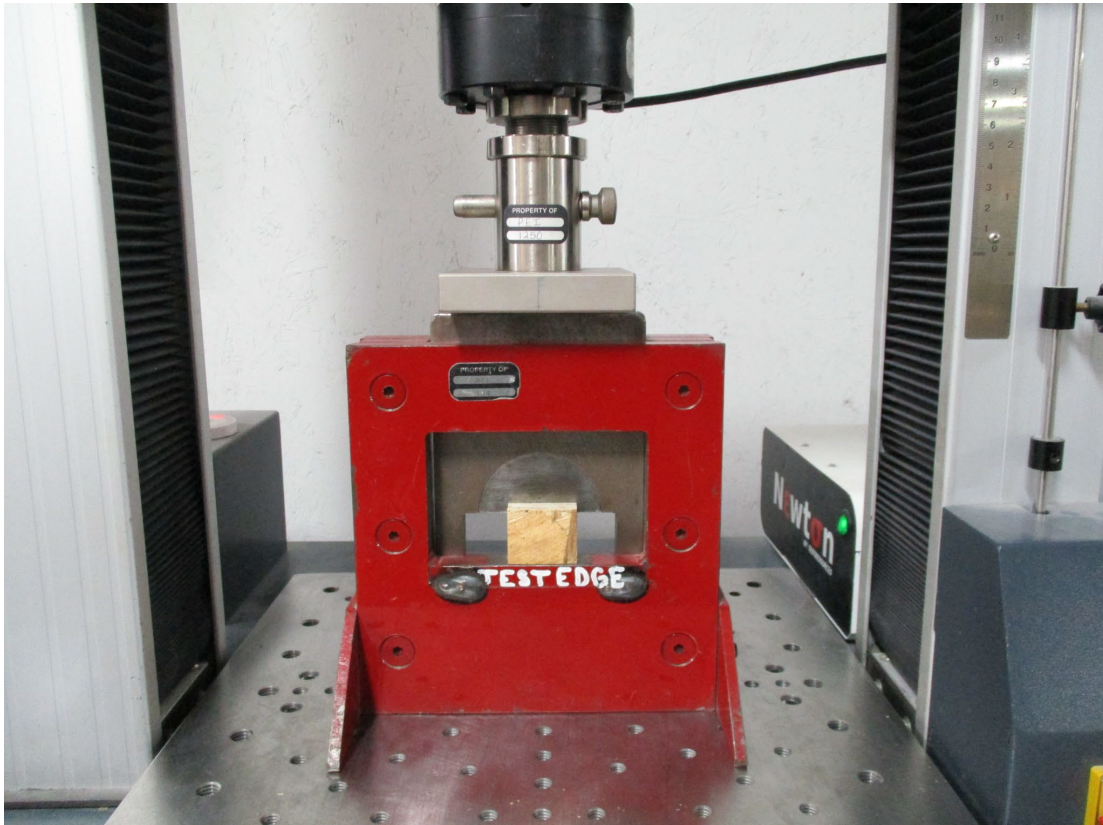


Wolf Group's Test Adhesive - As Received



Wolf Group's Test Adhesive - As Received

ASTM D3498 Adhesive Testing VSAP - Subfloor Foam Adhesive



Typical Test Setup



Typical Test Setup