



Industrial Adhesives and Tapes Division

Test Report

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TSR Case: 17945124

Date: October 23, 2020

I. Application Description:

Albuild Systems is considering the use of 3M™ VHB™ Architectural Panel Tape B16F and B90F for metal panel and profiles in a new exterior cladding system.

II. Test Objective(s):

Evaluate the bonding performance of 3M™ VHB™ Architectural Panel Tape B16F to the customer supplied substrates. A 90° peel adhesion test was performed with the VHB™ Tape applied to the customer supplied substrate. The 90° peel adhesion test is the most sensitive test for determining how well the adhesive tape will bond to the substrate finish. The VHB™ Tape B16F evaluated in this study is 0.062" (1.6 mm) thick. VHB™ Tape B90F is the same tape compositionally and only differ by thickness at 0.090" thick. The results for B16F will be representative of what is expected for B90F.

III. Test Procedures:

Adhesion was measured using a 90° peel adhesion test based on test method ASTM D3330. 1/2" wide strips of tape were used for this test. This tape width is only for testing purposes and has no relation to the actual tape width used on this application. The strips of tape were applied to the customer supplied substrates after the application surfaces were prepared utilizing the surface preparation methods listed in Section IV. Three strips of tape were used for each different surface preparation method. The tape was then backed with a 0.005" thick aluminum foil strip and allowed to dwell for 3 days at room temperature conditions to allow bond strength to develop. The 90° peel adhesion tests were completed in 70°F/50% RH environmental conditions. Laboratory retained production samples of the VHB™ Tape were used for this study and average peel test data is reported in pounds per inch width of adhesive tape (lbs/in).

IV. Surface Preparation:

The following different surface preparation methods were evaluated in this study. Proper surface preparation is critical for achieving high bond strength. Kimberly-Clark WypAll X60 towels were utilized for all surface preparation techniques involving a wiping/cleaning procedure.

- a. IPA/Water ONLY - Clean bonding surface area with a 70:30 mixture of isopropyl alcohol (IPA) and water.
- b. 3M™ Adhesion Promoter 111 - Clean bonding area with 70:30 IPA/Water solution first and then prime with 3M™ Adhesion Promoter 111 (AP111). This solution is applied in a thin coating with a wetted towel and then allowed to dry without further wiping.
- c. 3M™ Primer 94 - Clean bonding area with 70:30 IPA/Water solution first and then prime with 3M™ Primer 94. This solution is applied via a dauber applicator and then allowed to dry without further wiping.

V. Summary of Results:

An average peel value of >25 lbs and a consistent cohesive failure mode of foam splitting is generally desired for bonding applications with 3M™ VHB™ Tape B16F. A failure mode of foam splitting



demonstrates the adhesive bond line strength is greater than the internal strength of the acrylic foam core. This is the most desirable failure mode demonstrating maximum achievable adhesive bond strength. Samples with an average peel value >25 lbs and consistent failure modes of foam splitting (fs) on all three peel adhesion samples was observed on samples highlighted “green” in the data table below.

Substrate	VHB Tape	Tape Width Y	Surface Preparation	Peel Test #1		Peel Test #2		Peel Test #3		Average Peel (lbs/in)
				(lbs/Y in)	Failure mode	(lbs/Y in)	Failure mode	(lbs/Y in)	Failure mode	
Bracket Profile (Zincalume® Finish)	B16F	1/2"	IPA Clean Only	17.4	fs	17.1	cp	18.9	cp	35.6
			IPA + AP111	18.3	fs	16.4	fs	17.1	fs	34.5
			IPA + P94	18.9	fs	16.4	fs	16.1	fs	34.3
Aluminum Panel (Dark Gray Paint)	B16F	1/2"	IPA Clean Only	19.4	mfs	17.2	fs	17.3	fs	35.9
			IPA + AP111	17.8	fs	16.5	fs	16.8	fs	34.0
			IPA + P94	16.8	fs	16.7	fs	15.6	fs	32.8
Aluminum Panel (Textured Surface w/Paint Finish)	B16F	1/2"	IPA Clean Only	9.3	cp	10.2	cp	8.6	cp	18.7
			IPA + AP111	17.7	fs	18.7	fs	15.9	fs	34.8
			IPA + P94	20.0	fs	18.7	fs	18.7	fs	38.2
Aluminum Extrusion (Mill Finish)	B16F	1/2"	IPA Clean Only	18.4	fs	17.5	fs	16.1	fs	34.6
			IPA + AP111	18.4	fs	16.2	fs	18.7	fs	35.5

Definitions of failure modes:

cp = clean peel; over 95% clean peel of tape from substrate

mcp = mostly clean peel; 75-95% clean peel of tape from substrate – remainder is foam split

pfs = partial foam split; 25-75% foam split of the tape

mfs = mostly foam split; 75-95% foam split of the tape

fs = foam split; over 95% foam split of the tape

Bracket Profile: 3M™ VHB™ Tape B16F formed high bond strength to the steel bracket profiles with the Zincalume® finish. The use of 3M™ Adhesion Promoter 111 or 3M™ Primer 94 led to high bond strength (green highlight) of 3M™ VHB™ Tape B16F to this substrate surface.

Flat Aluminum Panel (Dark Gray Paint): 3M™ VHB™ Tape B16F formed high bond strength to the dark gray painted aluminum panel. The use of 3M™ Adhesion Promoter 111 or 3M™ Primer 94 led to high bond strength (green highlight) of 3M™ VHB™ Tape B16F to this substrate surface.

Textured Aluminum Panel (Painted Finish): 3M™ VHB™ Tape B16F formed high bond strength to the textured surface of this painted aluminum panel. The use of 3M™ Adhesion Promoter 111 or 3M™ Primer 94 led to high bond strength (green highlight) of 3M™ VHB™ Tape B16F to this substrate surface.

Aluminum Extrusion: 3M™ VHB™ Tape B16F formed high bond strength to the mill finish aluminum extrusion profile. The use of 3M™ Adhesion Promoter 111 or cleaning only with IPA/water led to high bond strength (green highlight) of 3M™ VHB™ Tape B16F to this substrate surface.

VI. Additional Considerations – Design & Fabrication:



1. Work Area & Substrate Temperatures: While surface preparation is critical to achieving good bonding performance of 3M™ VHB™ Tapes, it is equally important to apply the adhesive tape in a workshop with a temperature >60°F (15°C). In addition, the bonding substrates must be at the same temperature. Once fabricated and full bond strength is achieved, the bonded parts are capable of withstanding cold exterior temperatures.
2. Application Pressures: It is also critical to provide adequate pressure to the tape after it has been applied to the first prepared substrate surface and then after the two parts are joined together. The application of pressure facilitates good contact and adhesion of the adhesive tape to both substrate surfaces. Hand pressure alone should not be considered adequate pressure in most applications for the final application of pressure to the assembled parts. The use of pressure application equipment (clamping pressure roller, clamps, presser, etc...) is suggested for the final pressure application step.
3. Static Loads: 3M™ VHB™ Tapes have a static load design guideline strength of 0.25 psi to minimize creep after months/years of service. This means that there should be 4 in² of 3M™ VHB™ Tape for every 1 lb of weight it will support on a constant basis. If an application will involve a constant static load acting on the 3M™ VHB™ Tape for months/years, the customer should verify that an appropriate amount of tape is utilized to satisfy this design guideline.
4. Dynamic Loads: 3M™ VHB™ Tapes have a dynamic load design guideline strength of 12 psi. Dynamic loads are short term forces applied to the 3M™ VHB™ Tape such as a high wind gust. The customer should verify that their design will satisfy 3M's design guideline.
5. Force/Stress Types: In general, when designing with 3M™ VHB™ Tapes, forces acting on the tape should consist of either shear or tensile type stress loads. This allows the stress or force to be applied over the whole tape area. Applications placing cleavage or peel type stress on the tape (e.g., bonding of warped or bowed substrates or substrates that will bow or warp after bonding) should be thoroughly evaluated as this will place the stress on the leading of edge of the peel or cleaving and may lead to a failure in some situations.

The data reported in this document is to be used as a representation of how well the tested 3M™ VHB™ Tape will bond to the specific customer-supplied substrates with the same surface preparation methods and environmental conditions. A thorough evaluation should be done by the customer to determine if a 3M™ VHB™ Tape can meet the total needs of the application, including those that were not anticipated with this testing.

Sincerely,

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