Silicone structural sealant vs. tapes

Following are the tests suggested by the ASTM C 1184 (Tests of sealant which should pass the minimum specifications before put in structural bonding of glass and aluminum in structural application.) The minimum adhesion should be 50 PSI.

	Acrylic Tapes		**Silicone Sealant**	
	Peak Stress (PSI)	Fail	Peak Stress (PSI)	Fail
Room Temp. Cure	80.5	Adhesive	157	Cohesive
7 days H_2O	52.2	Adhesive	164	Cohesive
1 Hr. 88^o C	32.7	Adhesive	145	Cohesive
1 Hr. (-) 29^{o}C	120.6	Adhesive	216	Cohesive

ASTM C 1184 Requirements for Physical, Mechanical and Performance Qualities of the Sealant

Property	Requirement	Test Method
Rheologic, *max*		C 639
Vertical	4.8 mm (3⁄16in.)	
Horizontal	no deformation	
Extrudability,	max 10 s C 603	
Hardness,	Shore A 20-60	C 661
Heat aging		
Weight loss,	max 10 %	
Cracking	none	
Chalking	none	
Tack-free time, max	no transfer in 3 h	C 679
Tensile value, min		C 1135
Standard conditions:	345 kPa (50 psi)	
88°C (190°F)	345 kPa (50 psi)	
−29°C (−20°F)	345 kPa (50 psi)	
Water immersion	345 kPa (50 psi)	
5000 h weathering	345 kPa (50 psi)	8.6.2.5
Shelf life, min	6 months	9.1

3M™ VHB™ Tapes for Construction Applications

Adhesion to a Variety of Surfaces

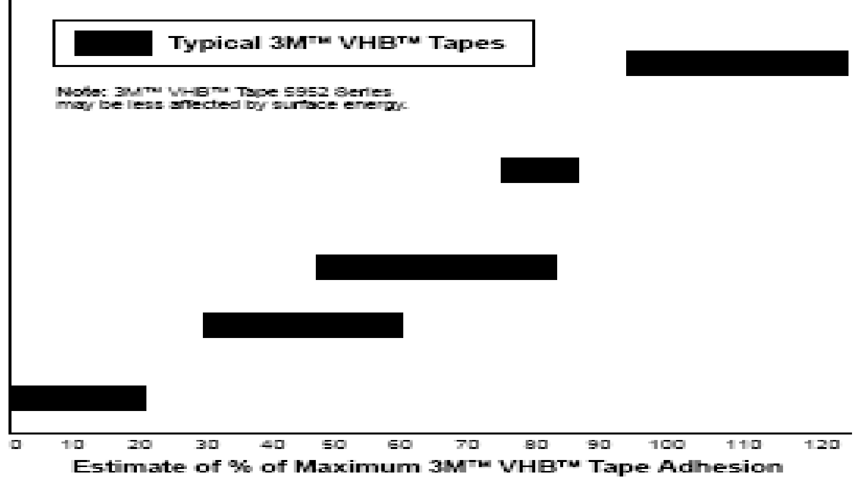
The Effect of Surface Energy on Adhesion

Adhesion is the molecular force of attraction between unlike materials, similar to a magnetic force. The strength of attraction is determined by the surface energy of the material. The higher the surface energy, the greater the molecular attraction – the lower the surface energy, the weaker the attractive forces. Greater molecular attraction results in increased interfacial contact between an adhesive and a substrate. In other words, on a high surface energy material the adhesive can more easily flow or "wet" the surface to obtain a stronger bond.

Surface Energy Range (dynes/cm)

Material	Surface Energy Range (dynes/cm)
Aluminum Stainless Steel Copper Zinc Tin Lead Anodized Aluminum Glass	400-1100
Kapton™ Phenolic Nylon™ Alkyd Enamel Polyester Epoxy Paint Polyurethane	42-50
ABS Polycarbonate (Lexan™) PVC Noryl™ Acrylic Polane™ Paint	38-39
PVA Polystyrene Acetal	36-37
EVA Polyethylene Polypropylene Tedlar™ Silicone Teflon™	18-33

Relationship of Peel Adhesion and Surface Energy



NOTES: There are a wide variety of formulations, surfaces finishes and surface treatments available on substrate materials which can affect adhesion. This chart is intended to provide only a rough estimate of the adhesion levels which can be expected on some common materials relative to a reference surface such as aluminum.

Light surface abrasion can significantly increase adhesion levels on many materials.

Design Considerations

- **How much tape to use:**
  As a general rule, 4 sq. in./lb. (55 sq. cm/kg) of 3M™ VHB™ Tape should be used to support static loads. More or less tape may be required depending upon the particular application.
- **Bonding to rigid surfaces:**
  The necessary thickness of VHB tape depends on the rigidity of the substrates, their irregularity, and the amount of application pressure which can be applied to mate the surfaces. The mismatch between surfaces must be less than half of the tape thickness, in conjunction with firm lamination pressure, to establish good surface contact.
- **How much pressure to apply:**
  Typically, good surface contact can be obtained by applying enough pressure to ensure that the VHB tape experiences approximately 15 psi (100 kPa). Rigid surfaces may require 2 or 3 times that much surface pressure to make certain the tape experiences 15 psi pressure.
- **Allowing for thermal expansion/contraction and flexibility:**
  VHB tapes can perform well in applications where two bonded surfaces expand and contract differentially. The tapes can typically tolerate differential movement up to 3 times their thickness in shear. Tape bonds are more flexible, so suitable design modifications or periodic use of rigid fasteners may be needed to achieve required stiffness.

Guide for Load Bearing

(for NORMOUNT 1300/2800/4600)

Static Load Bearing capacity of 35 g/cm^2

Load (Kgs) \ mm	6	8	10	12	14	16	18	24	30	36	42	48
	Width of Tape in cm											
1	60	45	36	29	26	23	20	15	12	10	9	8
2	121	91	73	59	53	47	41	31	25	21	19	17
3	182	138	110	89	80	71	62	47	38	32	29	26
4	243	183	147	119	107	95	83	63	52	43	39	35
5	304	230	184	149	134	119	104	79	64	54	49	44
6	365	275	221	179	161	143	125	95	78	65	59	53
7	426	321	258	209	188	167	146	111	90	76	69	62
8	487	367	295	239	215	191	167	127	104	87	79	71
9	548	413	332	269	242	215	188	143	116	98	89	80
10	610	460	370	300	270	240	210	160	130	110	100	90
11	670	505	406	329	296	263	230	175	142	120	109	98
12	731	551	443	359	323	287	251	191	155	131	119	107
13	792	597	480	389	350	311	272	207	168	142	129	116
14	853	643	517	419	377	335	293	223	181	153	139	125
15	914	689	544	449	404	359	314	239	194	164	149	134

***Table base assumes Aluminium to Aluminium cladding.**

VARIABLES

Substrate

- The adhesion between the two surfaces depends on the 'smoothness or roughness', coated or uncoated, flexibility and partsize.
- The physical charactaristic of a material which affects its bonding capacity is ***"Surface Energy"***
- Length of the tapes required thus, would vary according to the substrate. Refer the surface enerty spectrum

Mounting Method

- The method of mounting viz : vertical, horizontal or inclined will influence the resultant static load.
- Whichever the way of mounting the resultant componant of static load shoud not exceed 35 g/cm^2

Surface Prepration

- For maximum adhesive performance ,prepare the contact surface by removing dirt, wax,soap and oily films with a cleaning solvent . A typical cleaning solvent is a 50/50 isopropyl alcohol/water mixture.
- If added adhesion is desired (specially for low surface energy materials), SAINT GOBAIN recommends the use of Tite -R-Bond Adhesion promoter.Refer brochure for the application guide

Surface energy Spectrum

Sr.	Surfaces	dynes/cm
COMMON SUBSTRATES		
1	Copper	1103
2	Aluminium	840
3	Zinc	753
4	Tin	526
5	Lead	458
6	Stainless steel	700-1100
7	Glass	250-500
HIGH SURFACE ENERGY PLASTICS		
1	Kapton	50
2	Phenolic	47
3	Nylon	46
4	Alkyd Enamel	45
5	Epoxy paint	43
6	**Polyurethane paint**	**43**
7	PVC Rigid	39
8	Noryl Resin	38
9	**Acrylic**	**38**
LOW SURFACE ENERGY PLASTICS		
1	Polystyrene	36
2	Acetal	36
3	EVA	33
4	Polypropylene	29
5	Polyvinyl Flouride Film	28

* Surface energy:

The surface energy determines the the strength of molecular attraction amongst two different materials.Higher the surface energy ,greater would be the molecular attraction."

In other words ,on a high surface energy material, the adhesive can flow out (or wet out) to assure a stronger bond.

Please Note:

SAINT GOBAIN cannot anticipate or control every potential application ,we strongly recommend testing this product under individual application conditions proir to commercial use.

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