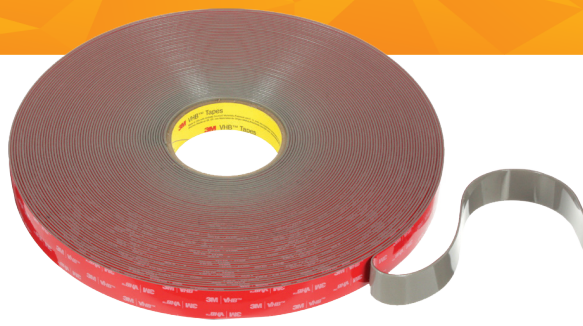
3M™ VHB™ Tapes for Architectural Panel Applications



Expand your architectural design options and increase production efficiency with 3M VHB Tapes for architectural panel applications.

3M™ VHB™ Architectural Panel Tapes and 3M™ VHB™ Tape GPH-160 are high performance double- sided pressure sensitive acrylic foam tapes used in the fabrication of architectural panel systems. Stiffeners can be attached prior to liquid paint or powder coat processes involving a paint-bake cycle or post-paint. These tapes are a fast and easy-to-use permanent bonding method providing high strength and long-term durability since 1980.

- **Simplified process**
  Easy to apply bonding solution
- **Increased productivity**
  Immediate handling strength reduces assembly and delivery time
- **Improved appearance**
  Eliminates drilling, grinding, refinishing, screwing, welding and associated re-work
- **Less waste**
  Typically, less than 2% waste factor

3M™ VHB™ Architectural Panel Tapes

Improved design flexibility and fabrication productivity.

3M™ VHB™ Tapes are used for many applications in the construction industry, including the manufacture of architectural panels for curtain walls, exterior building cladding and interior panel and trim attachment. In many situations, 3M VHB Tapes can replace liquid adhesives, sealants, welds and mechanical fasteners.

3M™ VHB™ Architectural Panel Tapes provide immediate handling strength during the fabrication process and do not shrink after curing, like with some liquid applied sealants. This shrinkage can result in isolated panel stress that may be visible on the exterior face of the architectural panel.

3M VHB Tapes are easy to apply to simplify the bonding/attachment process.

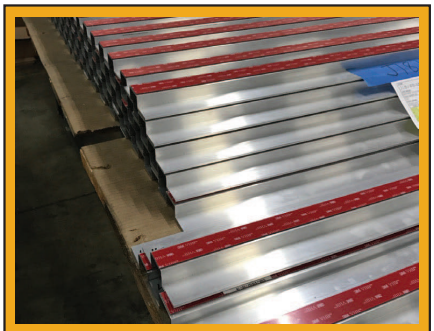
3M™ VHB™ Tapes for Architectural Panel Applications

3M™ VHB™ Tape GPH-160GF

Solving the challenges of panel assembly prior to a paint-bake cycle.

3M VHB Tape GPH-160GF is a 1.6mm thick gray double-sided acrylic foam tape with a red polyethylene film liner. With superior high temperature performance, it can be suitable for assembly prior to liquid paint or powder coat processes involving a paint bake cycle. It's an ideal solution for stiffeners applied to architectural metal panels.

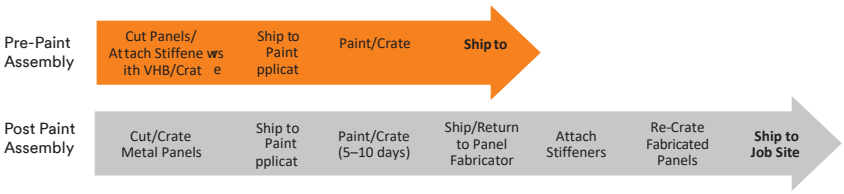
3M VHB Tape GPH-160GF allows increased manufacturing efficiency through reduced touch points and streamlined processes. The elimination of unnecessary handling and transportation, frees-up time to take on additional projects and most importantly, allows panels to be delivered to the job site quicker.



3M VHB Tapes are fully cured allowing stiffeners to be pre-taped prior to assembly.

3M VHB Tapes are fully cured allowing stiffeners to be pre-taped prior to assembly.

Process Improvement from Pre-Paint Assembly



3M VHB Tape GPH-160GF is compatible with chemicals typically used in paint pre-treatment processes (spray and dip). Tests completed by a leading supplier of pre-treatment chemicals suggest that the tape does not cause premature degradation of chemical solutions. It is understood that paint pre-treatment processes may differ between systems and it may be advisable to conduct compatibility and/or degradation tests to confirm compatibility with your specific system.

Product Selection Guide

Application	Product	Thickness mm	Colour	Minimum Application Temp.	Temperature Resistance		Application
					Short Term (minutes/ hours)	**Long Term (days/ weeks)**	
• Aluminum, Aluminum Composite, Steel and Stainless-Steel Panel bonding • Stiffener attachment	3M VHB Architectural Panel Tape B11F	1.1 mm	Gray	15 ° C	149 ° C	93 ° C	Short stiffeners or small panels (< 1000 mm)
	3M VHB Architectural Panel Tape B16F	1.1 mm	Gray	15 ° C	149 ° C	93 ° C	Medium sized panels and stiffeners (< 1500 mm)
	3M VHB Architectural Panel Tape B90F	2.3 mm	Black	15 ° C	149 ° C	93 ° C	Large panels and stiffeners (up to 4 m) , need for greater clearances
• Pre- Powder coating Stiffener attachment	3M VHB Architectural Panel Tape GPH-160	1.6 mm	Gray	10 ° C	232 ° C	149 ° C	Medium sized panels and stiffeners (< 1500mm), highest temperature resistance - Pre-powdercoating

3M™ VHB™ Tapes for Architectural Panel Applications

3M VHB Architectural Panel Tape Technical Information

Structural Performance – Testing & Design.

Architectural metal panels were assembled using 3M™ VHB™ Architectural Panel Tapes tested at Construction Research Laboratory (Miami, FL). http://multimedia.3m.com/mws/media/1042523O/english-structural-performance-test-in-architectural-panels-tds.pdf . Each panel measured 1525 mm x 2440 mm and was built with a perimeter frame and three floating stiffeners attached to the aluminum or ACM sheet using only VHB tape. The tests were performed according to ASTM E330 “Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference”. The panels survived pressures up to 5.7 kPa in both directions. The VHB tapes demonstrated excellent performance, even after the panels and stiffeners themselves had shown permanent deformation in these simulated high winds.

A duplicate set of panels constructed using VHB tapes was subjected to non-ambient temperature structural performance tests. The panels were subjected to positive and negative pressures up to 2.9 kPa at cold -29°C, ambient 32°C, and hot 66°C outside air test temperatures, which were the most extreme temperatures obtainable in this specific test configuration. Subsequent inspection showed VHB tapes withstood these wind pressures at the temperature extremes, and provided excellent performance despite the panels and stiffeners exerting high stresses on the tapes at all three test temperatures.

Assemblies were additionally assessed for impact and pressure cycling tests to determine their ability to survive a hurricane, cyclone or other high wind event in accordance with ASTM E1996 “Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes”, using the most severe wind zone classification for non-essential buildings. The impacts resulted in heavy damage to the panels, frame, and stiffeners, but the VHB tapes held fast and even expanded to maintain contact with both dented surfaces.

The same panels were then given the pressure cycling sequence specified by Dade County Specification PA-203 using the test method provided in ASTM E1886 “Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials”. This resulted in a total of 1,342 pressure cycles (in the positive and negative wind directions) on the panels using a building design pressure of 1.9 kPa. Visual inspection after the test indicated the VHB tapes had maintained full contact to all stiffeners with no loss of adhesion. The pressure cycling sequence was then repeated using a building design pressure of 2.9 kPa for an additional 1,342 cycles. The 3M VHB Architectural Panel Tapes tested maintained complete adhesive contact with the stiffeners after this additional pressure cycling, indicating excellent performance throughout the cyclone-related tests.

Dynamic Loads for design –The Trapezoid Rule is commonly used to calculate the minimum width of VHB tape required for frame and stiffener attachment, where the stiffeners are restrained back to a perimeter frame to withstand the dynamic forces which may be experienced by an architectural metal panel. The structural bite width of 3M VHB Architectural Panel Tape can be determine by knowing the windload (kPa), panel load area and VHB material design strength . Dynamic tensile and shear strength tests have shown the minimum material design stress for VHB tapes to be approximately 85 kPa over the temperature range from -20°C to 80°C, providing > 5 x safety factor.

3M™ VHB™ Tapes for Architectural Panel Applications

Thermal Expansion/Contraction –VHB tapes perform well in applications where the two bonded surfaces experience contraction and expansion relative to each other. VHB tapes can typically tolerate differential shear* movement up to 3 times their original thickness. The optimal thickness of VHB tape for a particular application depends on the size, rigidity, and flatness of the substrates. In general, thicker tapes will handle greater differential thermal expansion between surfaces than thin tapes.

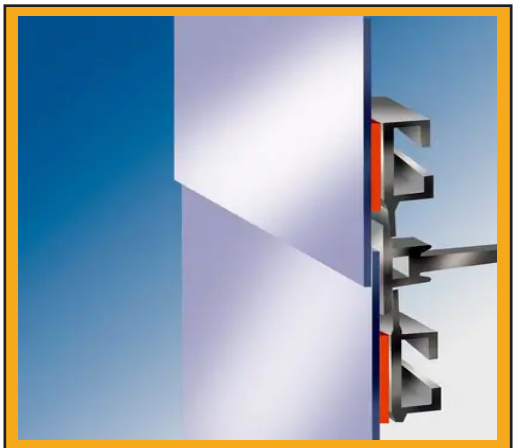
Static Load – VHB Architectural Panel Tapes in general will hold at least 150 g.cm-2 @ 93 ° C (15 kPa) for 7 days on appropriately prepared metal & painted surfaces . For permanent static load, a design value of 1.7 kPa is used to ensure there is no creep or de-bonding on appropriately prepared surfaces for in excess of 20 years for architectural panel applications.

Product	Dynamic Tensile Strength (kPa)	Dynamic Design Strength	Static Load (holds for 7 days at listed temperature)	Design Static Load Strength - Permanent Loads	Maximum Serviceability Shear strain *
3M VHB Architectural Panel Tape B11F	585	85 kPa	150 g.cm-2 @ 93 ° C	1.7 kPa (60 sq cm.kg-1)	300 % (3.3 mm)
3M VHB Architectural Panel Tape B11F					300% (4.8 mm)
3M VHB Architectural Panel Tape B90F	480				300% (6.9 mm)
3M VHB GPH-160	720		150 g.cm-2 @ 177 ° C		300% (4.8 mm)

Table 2 - Summary of 3M VHB Architectural Panel Tape design values.

*** Important Note :** Panels or bonded parts should not have the corners or edges constrained by mechanical fixing or high modulus sealants, that would result in buckling or deformation of the panel away from the plane of the underlying panel/frame. When the ends of panels are constrained in this way, the resultant bowing out /distortion of the panels from solar heating can cause excessive tensile strain on the VHB tape. If mechanical fastening is to be included , the fastening system must allow for movement greater than the calculated expansion/contraction through over sized holes for example .

The details about each architectural metal panel application (such as panel design, materials, surface preparation, selected VHB tape, and building-specific requirements) can affect the use and performance of a VHB tape. Therefore, VHB tapes should be thoroughly evaluated by the user under actual use conditions with intended substrates to determine whether a specific VHB tape is fit for a particular purpose and suitable for user's method of application, especially if expected use involves extreme environmental conditions.



Use lighter weight and thinner substrates with 3M VHB Tape.

3M VHB Tapes helped construct the Walt Disney Concert Hall in California.

3M™ VHB™ Tapes for Architectural Panel Applications

3M VHB Architectural Panel Tape and the National Construction Code Volume 1 (2019 A1)

B1.1 – Resistance to Actions, Limit State Design

An investigation conducted by Consulting Structural Engineer, David Beneke Consulting Ltd into the limit states design data provided in Table 2, verifies the data is derived from acceptable test methods, and that it conforms with the requirements of limit state design contained within AS/NZS1170.0-2002.
Additionally, for complex designs, 3M is uniquely positioned to provide material models in a format compatible with a variety of finite element modeling software. These material models can be used to predict mechanical behavior in a finite element analysis. Conventional mechanical properties, such as Young's modulus and Poisson's ratio, even when obtained at relevant rates and temperatures, do not accurately capture VHB tape behavior. Consequently, 3M has developed Material Data Cards (MDCs) which are available for VHB Architectural Panel Tapes in a ready to use format for numerous commercially available FEA software applications (Abaqus, ANSYS MAPDL, ANSYS Workbench, and LS Dyna) .Finite Element Analysis (FEA) data is available for this product at: 3m.com/FEA

C1.9 – Type A & B External walls & components required to be non-combustible to AS1530.1

In the Deemed to Satisfy (DtS) provisions of the National Construction Code, facades and external walls for buildings required to be of type A or B construction must have all components comprised on non-combustible construction when tested to AS1530.1. Table 3 is an extract from the NCC, describing the buildings that require Type A or B construction.

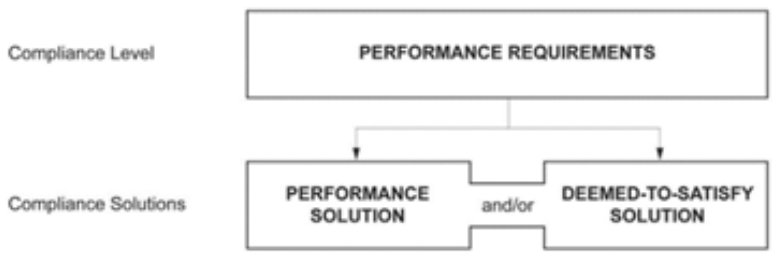
Rise in storeys	**Class of building** 2, 3, 9	**Class of building** 5, 6, 7, 8
4 or more	A	A
3	A	B
2	B	C
1	C	C

Table 3 - Construction type vs building classification and height.

No polymeric material can meet the requirements of AS1530.1 (including structural silicone sealant or adhesive), and only materials such as concrete, metals, glass stone & mineral can pass AS1530.1. It is often assumed that Flame Retardant or "FR" adhesives may be suitable alternatives, however these too cannot pass AS1530.1 to be classified as non-combustible , nor is there a pathway via the DtS provisions for "FR" adhesive materials .

The NCC acknowledges that it is virtually impossible to build a façade with only non-combustible materials, and provides a limited set of exemptions to the requirement for non-combustibility for Gaskets, Caulking & Sealants , per NCC Vol 1 2019 A1 , Clause C1.9 (d)(I – iii)] . However, no specific exemptions are available for "Adhesives", including Structural Silicone Adhesive and Pressure Sensitive Acrylic foam tapes.

Therefore, use of adhesive results in a departure from the DtS provisions and an alternate "Performance Solution" pathway may be required in accordance with NCC A2.1:



3M™ VHB™ Tapes for Architectural Panel Applications

The performance Solution is to be prepared by the projects' Façade Engineer and/or Fire Engineer. This process involves reviewing the components and configuration of the External Wall, and examining if the inclusion of non-exempt adhesive materials negatively impacts on Performance Requirements (CP2 - Spread of Fire & CP4 -Safe conditions for evacuation) within the National Construction Code.

Test data for 3M Architectural Panel Tapes is available to facilitate preparation of project specific performance solutions. This data includes:

- Heat of Combustion
- Heat Release Rate
- Smoke Developed
- Surface burning characteristics.

The test data above is not suitable for fabricators / installers to demonstrate compliance with the DtS provisions in NCC C1.9, and in general will only be provided on request to Façade & Fire Engineers for the purposes of writing a performance solution . It is also strongly recommended that the building certifier is made aware of the Performance Solution before any installation occurs.

Note: Some commentators have attempted to apply clause C1.9 (e) (vii) , by classifying the bond between an architectural panel and a stiffener , or the bond between an architectural façade panel and frame as a "Bonded Laminate" . Bonded laminates are exempt from the requirement of non-combustibility provided all layers (laminae) are non-combustible, and that any adhesives employed to bond the laminae together don't exceed 1 mm for any single layer , and total adhesive thickness is not to exceed 2 mm. Additionally, the entire construction is tested to AS1530.3, with the Spread-of-Flame Index and the Smoke-Developed Index of the bonded laminated material as a whole not exceeding 0 and 3 respectively. In the case of stiffeners bonded to an architectural panel, or an architectural panel bonded to a frame, C1.9 (e) (vii) DOES NOT APPLY, since neither of these configurations can be classified as "Bonded Laminate" . The definition of "Lamina" and by extension bonded lamina(tes) refers to continuous sheet materials bonded together.

Project Specific Warranties

Warranty Request

Project Warranties can be available for approved 3M VHB Architectural Panel Tape projects, and are subject to the provision of specific information to 3M and approval by 3M before fabrication can occur. The information required includes, but not limited to: exact design & shop drawings , wind load , bond surfaces submission of substrates for adhesion and fabrication environment details. 3M will conduct a design review, and if satisfactory will then conduct training in order to commence the Warranty process.
For more details, contact 3M.

For more details, contact 3M.

For more information about 3M VHB Tapes, visit www.3m.com.au/VHB

3M VHB Tape Since 1980

3M™ VHB™ Tapes 40 Years of Enabling Design Innovation.

Gaska Tape Australia
Converters - Foams, Tapes, Adhesives

1960 Hume Highway, Campbellfield VIC 3061 Ph: 03 9357 9941 sales@gaska.com.au

www.gaska.com.au