

3M Surface Preparation for 3M™ VHB™ Tape Applications

Technical Bulletin

October, 2017

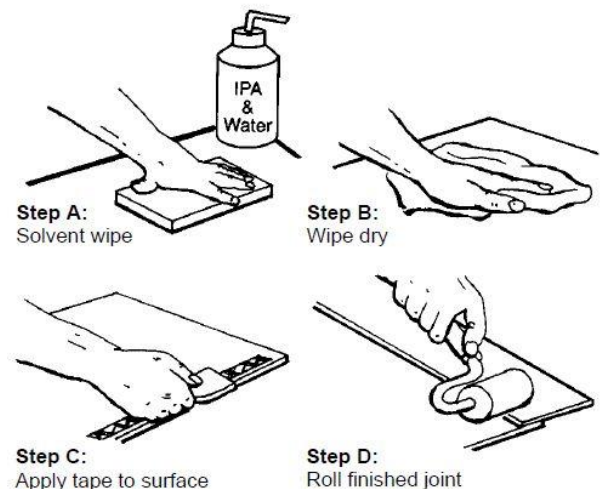
Summary Most substrates are best prepared by cleaning with a mixture of isopropyl alcohol (IPA) and water* (approximately 50% to 70% IPA) prior to applying 3M™ VHB™ Tapes.

Exceptions to this general procedure that may require additional surface preparation include:

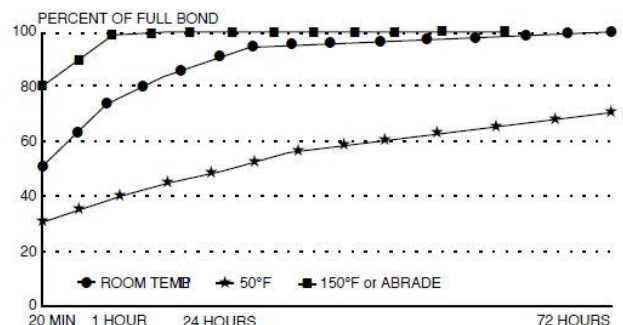
- **Heavy Oils:** A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
- **Abrasion:** Abrading a surface, followed by cleaning with IPA/water, can remove heavy dirt or oxidation and can increase surface area to improve adhesion.
- **Adhesion Promoters:** Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
- **Porous Surfaces:** Most porous and fibred materials such as wood, particleboard, concrete, etc. need to be sealed to provide a unified surface.
- **Unique Materials:** Special surface preparation may be needed for glass and glass-like materials, copper and copper containing metals and plastics or rubber that contain components that migrate (e.g. plasticizers).

General 3M VHB Tape Bonding Procedure

- To obtain optimum adhesion, the bonding surfaces must be stable or unified, clean and dry. A common surface cleaning solvent is IPA/water mixture.* (Steps A and B)
- As a pressure-sensitive adhesive, bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. Generally, this means that the tape should experience >15 psi (>100 kPa) in roll down or platen pressure. (Steps C and D)
- After application, the bond strength will increase as the adhesive flows onto the surface. At room temperature, approximately 50% of the ultimate strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. Handling Strength is typically achieved immediately after application of pressure to the bonded components. In some cases, bond strength can be increased and ultimate bond strength can be achieved more quickly by exposure of the bond to elevated temperatures (e.g. 150 °F (66 °C) for 1 hour).



Typical Bond Build Over Time



* **Note:** These cleaner solutions contain greater than 250 g/l of volatile organic compounds (VOC). Please consult your local Air Quality Regulations to be sure the cleaner is compliant. When using solvents, be sure to follow the manufacturer's precautions and directions for use when handling such materials.

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Heavy Oils On surfaces with a light oily film, or other light contamination, the IPA/water solution is usually adequate. Where heavy oils or grease are present, a “degreasing” solvent such as 3M™ Prep Solvent 70, 3M™ Adhesive Remover, 3M™ Citrus Base cleaner, acetone, mineral spirits, naphtha or similar solvents can be used to cut the oil. When cleaning with solvents, always follow with an IPA/water clean to remove any residue or film that may be present.

Abrasion Abrading a surface can serve several functions:

- Remove heavy levels of dirt or oxide from metals or paints.
- Create additional surface area that can increase adhesion.
- Smooth a textured surface to obtain more flatness, allowing improved contact area and adhesion.

A finely abraded surface (approximately 180 to 320 grit scratch) can help adhesion to many paints and plastics. Very small scratches on the surface, generated with circular motion rather than straight-line motion, are most desirable. Micro-scratches on a surface increases the available surface area to bond to resulting in greater initial adhesion and achieving higher ultimate strength. 3M™ Scotch-Brite® Hand Pads (7447 Maroon or Heavy Duty Green) are optimal for achieving the right level of abrasion. Powered sanders (e.g., palm or dual-action sanders) will assist on large surface areas. Avoid grinding a surface with coarse abrasive materials, as they can create too much texture for the adhesive to adequately flow into the surface. Always clean the surface with the IPA/water solution or methods previously described, and be certain that loose particles are removed from the abraded surface prior to bonding.

Exceptions to these abrading guidelines are 3M™ VHB™ Tapes 4932 and 4952, as they typically perform best on smooth, glossy surfaces and abrasion may reduce the bond strength.

Adhesion Promoters Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints because of their low surface energy or process additives they may contain. A primer creates a new surface for 3M VHB Tape to adhere to and can also create a layer that may impede the migration of additives that may be present in a material. It is important for the user to determine the suitability of the 3M VHB Tape, the adhesion promoter and the application process.

Porous Surfaces Rough, porous or fibered materials such as wood, particleboard, cement, etc., have an open surface and require sealing to provide a unified surface for tape bonding. Common sealing materials would include paint, varnish or other hard surface coatings. Fast drying 3M™ Rubber and Vinyl Spray 80 can also be used to unify the surface and improve the tape bond.

Unique Surfaces Glass, stone, ceramic or other siliceous materials are hydrophilic (water-loving) by nature. Normally, the hydrophilic nature makes pressure sensitive adhesive bond durability susceptible to change under high humidity or exposure to moisture. In basic terms, water vapor can undercut the tape bond and interfere with the normal adhesion forces. Silane coupling agents, added to the IPA/water cleaning solution, can help reduce the “water-loving” tendency of these surfaces and enhance the tape bond in high moisture environments.

Copper, brass, and bronze are prone to oxidation even after the 3M VHB Tape is applied. To prevent a weakening of the bond, a lacquer or varnish should be applied to these surfaces. Be sure to test the tape bond to the sealer on a metal surface to verify good adhesion.

Flexible PVC (vinyl) contains plasticizers that can migrate into the tape and affect adhesion. There are several 3M VHB Tapes that are formulated to be resistant to plasticizer migration, or 3M™ Scotch-Grip™ Plastic Adhesive 2262, thinned, can serve as a barrier to migration. Rubber materials (e.g. EPDM, neoprene) can have low surface energy and may also contain plasticizers and oils. These require the use of an adhesion promoter for stable bond strength. Test for compatibility with flexible PVC and rubber materials by aging bonded samples for 7-days at 150°F (66°C) and check for softening of the adhesive, discoloration or reduction in bond strength.

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Suggested Primers The table below offers suggested primers and alternative methods for surfaces that commonly require primers, adhesion promoters or other surface treatments for successful use with 3M VHB Tapes. This list is not intended to be fully comprehensive but may be useful for many applications. It is very important for the user to determine the suitability of the 3M VHB Tape, primer and application process and compliance with local Air Quality Regulations*.

| Surface | Concern | Suggested Primer | Alternatives |
|--|--|--|---|
| Steel or Aluminum | Surface must be clean | None suggested | Abrasion may clean surface, or use 3M Adhesion Promoter 111 or 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV |
| Copper, Brass, Bronze | Oxidation after bonding | Lacquer or varnish ^(a) | Architectural grade coatings |
| Concrete, Brick | Non-unified or rough surface, moisture | 3M™ Rubber and Vinyl Spray 80 | Concrete sealer, paint |
| Glass, Stone, Ceramic Tile | High humidity, moisture | 3M™ Silane Glass Treatment AP 115 or similar silane coupling agent in IPA/water mixture ^(a) | 3M Tape Primer 94 |
| Wood (soft, hard particle board, etc.) | Weak fiber layer on surface (e.g., low surface strength) | 3M Rubber and Vinyl Spray 80, 3M™ Fastbond™ 30 Contact Adhesive | Urethane paint, varnish |
| Plastics: Polyolefin Non-olefin | Low adhesion Additives, low adhesion | 3M™ Tape Primer 94 or 3M™ VHB™ Tape Universal Primer UV (additional surface preparation may be required) 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV | Flame treatment, Corona treatment Abrade or 3M™ VHB™ Tape Family 5952 |
| Polyurethane (Molded or Rubber) | Mold release, low adhesion | 3M Tape Primer 94, 3M VHB Tape Universal Primer UV (additional surface preparation may be required), or 3M™ Adhesion Promoter 111 | Abrade followed by priming |
| Rubber: Neoprene, Santoprene EPDM | Migrating oils Low adhesion | 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV (additional surface preparation may be required) 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV | 3M™ Heat-Activated Tapes 3M Heat-Activated Tapes |
| Paints | Low adhesion | 3M Adhesion Promoter 111 | Abrade or 3M VHB Tape Family 5952 or 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV |
| Coil Coated Aluminum | Low adhesion | 3M Adhesion Promoter 111 | Abrade or 3M VHB Tape Family 5952 or 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV |
| Flexible PVC (Vinyl) | Plasticizer migration | 3M™ Scotch-Grip™ Plastic Adhesive 2262 ^(b) , 3M Rubber and Vinyl Spray 80 | 3M™ VHB™ Tapes 4945 and 4941 (test for migration) |

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(a) Refer to supplier of lacquer, varnish, or silane coupling agent for information on VOC content.

(b) 3M Scotch-Grip Plastic Adhesive 2262 contains 183 g/l VOC.

Primer Source and Description

- **3M Tape Primer 94, 3M Adhesion Promoter 111, 3M VHB Tape Universal Primer UV, and 3M Silane Glass Treatment AP 115** are available through distributors who carry 3M VHB Tapes.
- **3M Scotch-Grip Plastic Adhesive 2262** must be thinned in acetone or MEK* in a 1:5 or 1:10 ratio (e.g., 1 part Scotch-Grip plastic adhesive 2262 to 5 parts acetone or MEK). The product is also available premixed as 3M Scotch-Grip Plastic Adhesive 2262AT (3.5 g/l VOC).*
- **Silane Coupling Agent** is also available premixed in a 91:9 IPA/water solution or as a concentrate. A 0.5 wt. % level of silane[©] adhesion promoter diluted in a 91:9 IPA/water cleaning solution has been found to be sufficient. Suggested sources for silane coupling agents:

Custom-Pak Products, Inc.
Lancaster Synthesis, Inc.

www.custompakproducts.com
www.lancastersynthesis.com

available premixed in IPA/water
available 100% concentrated

(c) **Note:** Be sure to read and follow silane and solvent manufacturer's precautions and directions for use for proper handling and storage information.

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Verification

Because 3M cannot anticipate all of the different possible surfaces and contaminants that may exist, it is imperative that the user conduct an evaluation to determine the suitability of 3M™ VHB™ Tapes, surface preparations procedures, and any other processes that may have an influence on the performance of the tape or the bonded parts. Likewise, where there are any changes in plastic or paint formulation, or suppliers of these materials, it is advisable to run evaluations to ensure that the change has not influenced the compatibility of the surface with 3M VHB Tapes.

Pressure Applicators (Hand-held J-Rollers)

Beno J. Gundlach Company
Gundlach V300-SB Pressure Roller
www.benojgundlach.com

Marshalltown Company
2" Flat Solid Rubber Seam Roller Item
19560, PN E54D
www.marshalltown.com

Rockler Woodworking and Hardware
High Pressure J Roller #50014
www.rockler.com

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

Limited Warranty

3M warrants for 24 months from the date of manufacture that 3M™ VHB™ Tape will be free of defects in material and manufacture. 3M MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. This limited warranty does not cover damage resulting from the use or inability to use 3M™ VHB™ Tape due to misuse, workmanship in application, or application or storage not in accordance with 3M recommended procedures. AN APPLICATION WARRANTY EXPRESSLY APPROVED AND ISSUED BY 3M IS AN EXCEPTION. THE CUSTOMER MUST APPLY FOR A SPECIFIC APPLICATION WARRANTY AND MEET ALL WARRANTY AND PROCESS REQUIREMENTS TO OBTAIN AN APPLICATION WARRANTY. CONTACT 3M FOR MORE INFORMATION ON APPLICATION WARRANTY TERMS AND CONDITIONS.

Limitation of Remedies and Liability

If the 3M™ VHB™ Tape is proved to be defective within the warranty period stated above. THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M™ VHB™ TAPE. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including negligence, warranty, or strict liability.



This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001 standards.



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