



Flammability Characteristics of 3M™ VHB™ Tapes

Technical Bulletin

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Background:

3M™ VHB™ Tapes have been used worldwide in a variety of industrial applications since 1980. As national, regional and local regulations and standards change, many manufacturers are looking to use materials that satisfy flammability standards. Several different flammability standards exist (UL 94, NFPA 130, EN45545, etc.) for a variety of industries, and each have their own sample preparation and test methods to demonstrate compliance.

Many of the flammability tests require standardized “open-face” test specimens (see Figure 1 for basic UL 94 schematic). A burner of specified configuration and thermal output is held in proximity to the material for a specific amount of time. Most commonly burn time and length, time for self-extinguishment, and flaming “drips” are evaluated. This configuration is not representative of double-sided tapes used to bond two noncombustible materials.

3M™ VHB™ Flame Retardant Tape 5958FR is oftentimes the first choice by end-users for applications that are intended to be flame-retardant or “FR” rated. A flame-retardant material is added to the acrylic adhesive to specifically pass the FAR 25.853(a) 12-second burn standard. It will only pass this specific certification and may not reliably pass others.

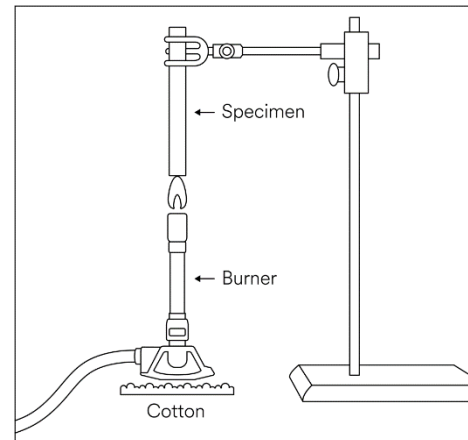


Figure 1: Open-Face Format Burn

Analysis:

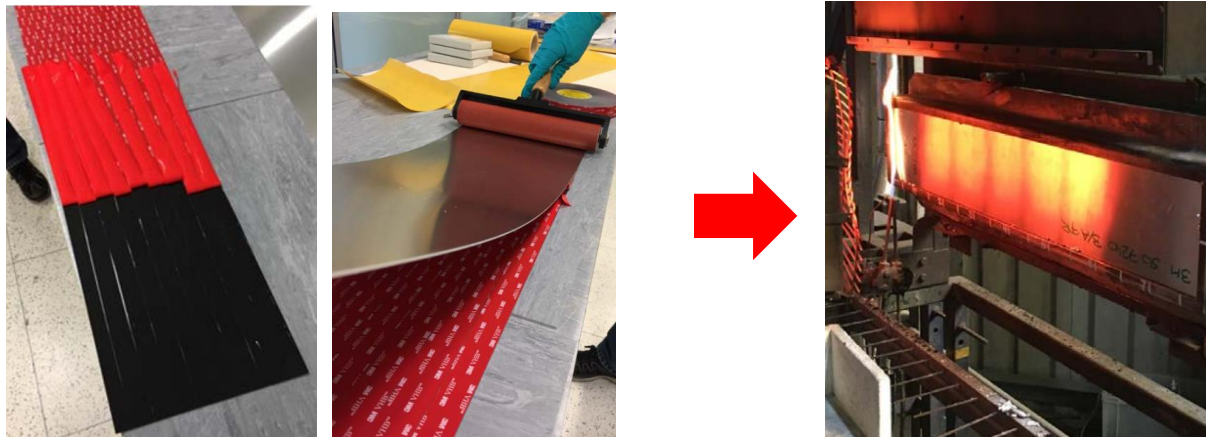
An open-face format burn makes sense for many polymeric materials, but not for double-sided tapes like 3M™ VHB™ Tapes that are intended for use between two substrates, which are often non-combustible substrates. When 3M™ VHB™ Tapes are subjected to open-face format burn testing, the acrylic adhesive will likely result in non-compliance. Instead, manufacturers should look at a test of their assembled system – where the adhesive is “sandwiched” between two materials in the intended end-use product configuration, more representative of actual use.

In speaking with UL’s engineering team members, they have consistently confirmed:

“Any evaluation of an adhesive or adhesive tape needs to be conducted as part of the specific end-use- product configuration when there’s a concern about the contribution of the adhesive or adhesive tape to the flammability of the polymeric system”

When bonded between two non-combustible substrates, it has been observed in 3rd party testing that 3M™ VHB™ Tapes do not contribute to flame propagation. While the bulk of the adhesive burns in open-face formats, a closed-face format only exposes the very thin edge of the acrylic adhesive to the flame. This edge may char or melt, but the entire bonded system generally passes most flammability tests.

EN45545 is a European standard for railway vehicles that takes the closed-face format into account. The adhesive is laminated between two metal panels and then burned, as shown in Figures 2-4.



Figures 2-4: Closed-Face Format Burn

EN45545 Standards test for similar outputs (flame spread, heat emission, etc.) and 3M™ VHB™ Tapes reliably pass many of these tests due to the closed-face attachment format. This is an indicative test that allows use of 3M™ VHB™ Tapes in applications where the substrates are non-combustible components.

Conclusion:

In practice, 3M™ VHB™ Tapes are commonly used to bond two non-combustible substrates. When standard 3M™ VHB™ Tapes are used to bond two non-combustible components to create a “system”, these tapes perform well and the flame does not propagate as the bond line is so thin and/or the 3M™ VHB™ Tape is recessed from the edge and not exposed to direct flame.

3M™ VHB™ Flame Retardant Tape 5958FR should only be used when FAR 25.853 (a) performance is required. In practice, the flame-retardant additive in 3M™ VHB™ Flame Retardant Tape 5958FR acts as a “filler” in the adhesive, dropping adhesive performance and creating more smoke in flame tests compared to standard 3M™ VHB™ Tape offerings without a flame-retardant additive. If practical performance is the metric, independent testing of the assembled part(s) or system with 3M™ VHB™ Tapes is suggested for consideration.

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