

Ceramic Frit with Saflex® and Vanceva® PVB Interlayers

Saflex® and Vanceva® brands of polyvinyl butyral (PVB) interlayer by Eastman are plasticized interlayer films that are laminated between two or more plies of glass. The PVB interlayer can react with non-compatible materials with which it may come in contact. As such, direct contact between Saflex and/or Vanceva PVB interlayers with inks, paints, or coatings for ceramic fritting and spandrel applications should be carefully examined and deemed acceptable prior to use. Type, formulation, application and processing can affect long term results. Consult your glass fabricator for specific recommendations.

The adhesive response of Saflex PVB to ceramic fritted glass has been well established over the course of the last 25+ years as first established in the automotive industry. Black ceramic frit bands became extensively used in contact with PVB interlayers at the advent of press bent windshields although some applications of this technique existed before this time. The interlayer has not shown degradation or delamination due to incompatibility in the fritted area when a fully processed compatible frit and proper lamination procedures are used.

The glass surface temperatures of the black band of the windshield can easily reach greater than 60°C (140°F) below -18°C (0°F) as cars with the same glazing configuration are positioned throughout the world in various climates.

A study of the adhesion response of Saflex interlayers to ceramic frit paint by two suppliers was conducted. The method used was to assess the adhesion of a metal button adhered to the ceramic frit or plain glass surface with Saflex PVB interlayer. The buttons were adhered using standard autoclave conditions. After autoclave and cooling, the button was pulled off the glass via a calibrated torque wrench. Pull strength was calculated as well as the release mode. Two frit scenarios were tested – solid coverage, where 100% of the glass was covered with frit, and dot matrix coverage which is between 40 – 50% coverage of the area under the button.

It can be seen by Figure 1 the adhesion of the interlayer is decreased from that of pristine glass for both materials offered by the ceramic frit suppliers. The mode of breakage however, is predominately the glass breaking cohesively and not the adhesion between the interlayer and the ceramic frit (Figure 2). This indicates that the adhesion, although reduced, is not the weak linkage in the system.

The two modes of release seen in this test are glass breakage – the button, interlayer and glass are pulled apart from the laminate, or adhesive release – the button is pulled off the interlayer or the interlayer from the glass. The ability of Saflex PVB interlayers to adhere to ceramic frit is demonstrated based on these results. Not all manufacturers and types of paints or frits have been tested and these results are not a guarantee of long terms performance. Eastman will continue to analyze products as made commercially available and report the results. Due to the inability of Eastman to control the formulation, application and processing of these products we cannot recommend any non-interlayer materials for applications.

Additional adhesion testing was completed on materials from another supplier as well. Using 100% coverage and a red frit, laminates were prepared with moisture controlled Saflex interlayer. Pummel adhesion, 90-degree peel, and bake tests were used in the evaluation of the samples. The bake test results of the samples passed 16 hours at 100C and were subjected to the standard progressive bake test, successfully passing 120C with no bubbles. Peel adhesion was slightly lower for the fritted glass versus the control but still within acceptable ranges and the pummel test correlated with the direction of the peel test yielding slightly lower pummel values (0.5 PU lower) for the fritted samples, but still within the acceptable range.

It is recommended that the frit and the interlayer be analyzed for compatibility and that processes are monitored to ensure proper and complete firing of the frit to the glass prior to lamination. Although no specific

studies have been done to date by Eastman on architectural frit products for long term durability, the variables and expectations are deemed similar between the architectural and automotive applications.

Saflex® Adhesion to Ceramic Frit Pull Test - Pull Strength (Nm)

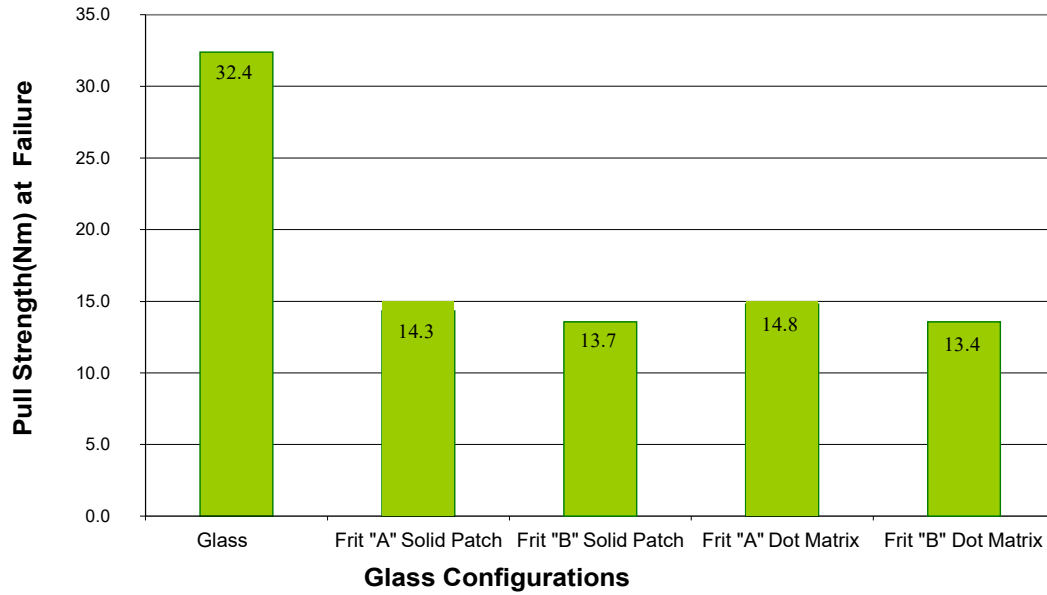


Figure 1: Pull Test - Ceramic Frit and PVB

Saflex® Adhesion to Ceramic Frit
Pull Test - Glass Breakage as Release Mode

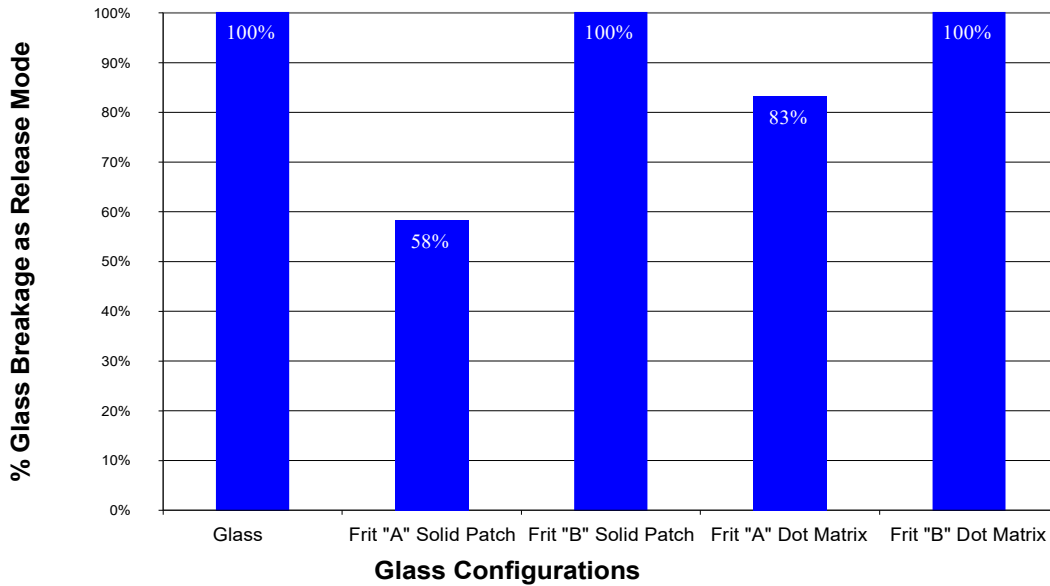


Figure 2: Glass Breakage - Release Mode

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