HIGH-PERFORMANCE LAMINATED GLASS FOR ENERGY EFFICIENT LIGHTWEIGHT RAILWAY-GLAZING

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ABSTRACT

Laminated Safety Glass is widely used in the design and construction of railed vehicles.
In this contribution we examine the mechanical behavior of laminated glass and show that improvements in performance may be achieved through the use of a stiff, structural, non-PVB, interlayer in combination with modern glass processing methods. Enhancements in mechanical properties, such as strength, post-glass breakage coupled with enhancements in durability and materials compatibility, are provided with an Ionoplast structural interlayer (DuPont™ SentryGlas®) that extends the performance of laminated glass well beyond the established PVB limits. Examples are given of project where such a structural interlayer provides key enabling technology and the most energy-effective, lightweight, value-engineered design solution for railway glazing.

KEYWORDS

Laminated Glass, Strength, Design, Safety, Ionoplast, PVB, SentryGlas®, Lightweight, Railway Glazing

INTRODUCTION

Vehicle laminated safety glass is dominated by the use of PVB interlayers, such as DuPont™ Butacite®. This ascendancy can be attributed to the long (> 70 years), successful history of PVB use in the automotive industry for laminated safety glass windshields. Although many requirements for automotive laminates and railway laminates are the same, there are notable differences. Here we examine the use of one such structural interlayer: DuPont™ SentryGlas®. This interlayer is based on a different chemistry to PVB. Associated with the growth in applications of a structural interlayer has been the development of property information and design methodologies that have enabled the most mechanically and energy-efficient safety glass designs.

STRUCTURAL PERFORMANCE OF IONOPLAST LAMINATES

In this section we present comparisons of laminate structural behavior using either Butacite® (PVB) or SentryGlas® (Ionoplast) interlayers. A key benefit of a SentryGlas® interlayer is the full structural coupling achieved between glass plies in the laminate. These structural properties are maintained to elevated temperatures and long-term load durations. This provides much enhanced strength behavior and reduced laminate deflection versus a conventional PVB laminate (presented as Figure 1).

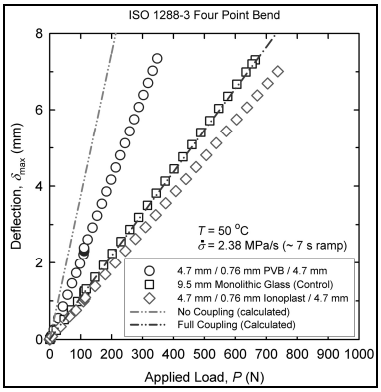

Figure 1: Maximum beam deflection as a function of applied load

DESIGN SOLUTIONS WITH IONOPLAST INTERLAYERS

Here we present an example of a real railway side window in which the use of SentryGlas® has provided a design solution that has extended the laminate performance beyond a PVB limit and shows a significant reduction of the glass thickness. **This allows a weight saving of over 30 % for the units!**

CONCLUSIONS

We have presented performance data and commercial examples that highlight the structural advantage of laminated glass made with an Ionoplast interlayer. The combination of the unique structural properties of this interlayer with modern engineering and production methods, enables the design of high-performance, energy-effective laminated safety glass for the railway market. It allows the designers to find environmentally friendly solutions which combine high passenger comfort and safety.