



Case Study:

SentryGlas® ionoplast interlayer in commuter rail systems
All aboard for SentryGlas®

Durable, lightweight transportation glazing solutions take advantage of SentryGlas® ionoplast interlayer strength and design freedom.

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kuraray

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Laminated safety glass balustrades on Stadler Rail's new double-decker trains are lighter, stronger and more durable with SentryGlas® ionoplast interlayers.

Stiff SentryGlas® ionoplast interlayers make train carriage balustrades lightweight and secure

Balustrades made from SIGLAPLUS® laminated safety glass from FLACHGLAS Wernberg help protect passengers on the newly-developed RABe 511 double-decker train carriages from the Swiss company Stadler Rail AG.

Laminated safety glass is used instead of tempered glass because the balustrade needs to maintain a safety barrier even after the glass breaks. Thin, elegantly curved laminated glass made with strong, stiff SentryGlas® interlayer helps meet that requirement while contributing to carriage weight reduction.

Martin Rädels, sales manager for transport at FLACHGLAS Wernberg adds: "Stadler Rail sought a safe solution for every eventuality, which would neither require a guardrail, nor be heavier than toughened safety glass. By using SIGLAPLUS® with SentryGlas® interlayers, we have been able to provide them with a solution."

Ingo Stelzer, design specialist at Kuraray Glass Laminating Solutions explains the role of the safety interlayer: "By using high stiffness ionoplast interlayers instead of standard PVB (polyvinyl butyral), the point-fixed glass laminate is able to withstand greater loads at a given thickness. If the glass breaks, the interlayer maintains much higher strength, helping prevent passengers and luggage from falling to the lower floor of the carriage."

Weight-Saving Advanced Interlayer Technology

Finite element analysis of glass structures subjected to a centralised load of 5 kN (500 kg) showed that glass with a PVB interlayer would need to be produced at a thickness of 17.52 mm = 8 mm glass/1.52 mm PVB/8 mm glass (11/16" = 5/16" glass / 60 mil PVB / 5/16" glass) in order to obtain the same level of resistance to deformation as a 10 mm (25/64 inch) thick panel of toughened safety glass.

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Lighter façade panels enable more subtle supporting structures

For decades, interlayers made of polyvinyl butyral (PVB) have been the industry standard when producing laminated safety glass. Architects are well aware of the possibilities and limitations of such glass when used extensively in façade engineering, for roofing and window panels. In contrast, SentryGlas® enables an entirely new approach because the interlayer is over 100 times stiffer and five times stronger than PVB. As a consequence, there is an almost perfect

transmission of load between two laminated sheets of glass, even at high temperatures, leading to the excellent flexural behavior of the glass when under load - also under direct sunlight in high summer. Accordingly, laminates with SentryGlas® show less than half the rate of deflection when compared to laminates with PVB, when under the same load, and thus almost the same behavior as monolithic glass of the same thickness.

Stelzer continues: "With a 1.52 mm (60 mil) SentryGlas® interlayer, two 5-mm-thick (13/65") glass panels replicate the resistance of 10-mm toughened safety glass. The weight saving versus using laminates of PVB is close to 40%."

Comprehensive laboratory testing conducted by FLACHGLAS Wernberg, which included pendulum impact tests, confirmed Kuraray's calculations.

Using a screen printing process, FLACHGLAS Wernberg creates clear and opaque versions of the new balustrade panels, which began service in 2011 on Swiss rail's Zurich district passenger line.



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As well as improved strength and stiffness, other benefits of SentryGlas® include:

- **Safety:** In the event of breakage, glass fragments remain firmly bonded to the interlayer, reducing the chance for injury
- **Security:** SentryGlas® can be used in glazing that withstands bullets, hurricane-force winds and even bomb blasts
- **Durability:** SentryGlas® is extremely durable and resistant to clouding, even after years of exposure
- **Design Versatility:** SentryGlas® can be used in glass manufactured flat or curved, including annealed, toughened, heat-strengthened, spandrel, wired, patterned and color tinted glass
- **UV control:** SentryGlas® is available with or without UV transmittance

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