

## Case Study:

### Elegant glass bridge at Portuguese research centre benefits from the high performance of SentryGlas® ionoplast interlayer

A visual highlight of the Champalimaud Foundation's recently-completed biomedical research facility in Lisbon, Portugal is the lightweight steel and glass bridge that connects its two buildings. The glass envelope encasing the bridge consists of curved panels of laminated glass made with SentryGlas® ionoplast interlayer, specified by the structural engineers Schlaich Bergermann und Partner and the specialist contractor Bellapart on the basis of its decreased deflection and superior post breakage behaviour as compared to laminates made with PVB. Moreover, the proximity of the research facility to the sea meant that the excellent weathering and durability performance of laminates made with SentryGlas® were further criteria for their selection.

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## Elegant glass bridge at Portuguese research centre benefits from the high performance of SentryGlas® ionoplast interlayer



*The two buildings at the ‘Champalimaud Centre for the Unknown’ are connected by a lightweight steel and glass bridge encased by curved panels of laminated glass made with SentryGlas® ionoplast interlayer. The stiff and strong high-performance interlayer from DuPont was specified for the installation on the basis of its decreased deflection and superior post breakage behaviour as compared to laminates made with PVB. Photo: Bellpart*

The ‘Champalimaud Centre for the Unknown’ was designed by Charles Correa Associates of Mumbai, India, and comprises two buildings set in a large public area that accommodate treatment units, research laboratories, an auditorium and exhibition area as well as the offices of the Champalimaud Foundation itself. The buildings are connected by a 21-meter-(60-ft)-long steel and glass bridge, implemented by Schlaich Bergermann und Partner of Stuttgart, Germany, Prof. Schneider from TU Darmstadt, Germany and Bellpart of Olot, Spain. The curved glass envelope for the bridge consists of several laminated glass panels, each typically measuring 1950 x 1320 mm (78 x 52”) and produced by the Spanish laminator Cricursa using a comparatively lightweight construction of 8 mm (5/16”) tempered HST glass + 2.28 mm (90 mil) SentryGlas® interlayer + 8 mm (5/16”) tempered HST glass.

The panels are held in place by four custom-designed clamp plates from Bellpart, located at the glass vertices, whilst vertical steel rings positioned at every two meters along the envelope are used for its support.

### **Reduced glass thickness and weight**

Calculations by Schlaich Bergermann und Partner, carried out in partnership with Prof. Schneider of the TU Darmstadt,

confirmed that in order to achieve a comparable rate of deflection in similarly-sized laminated glass panels using a PVB interlayer, glass thickness would need to be increased from 8 + 8 mm (5/16”) to 12 + 12 mm (15/32”). Not only would this add significant weight to the installation, requiring a more substantial supporting structure, but it would also become difficult to achieve the required radius for the curved panels.

Familiar with SentryGlas® from previous projects, Bellpart repeated the glass load calculations for a laminated glass panel made with the ionoplast interlayer to ensure compliance with safety requirements, as Carles Teixidor, industrial engineer at Bellpart explains: “Our own calculations verified the low rate of deflection of the laminated glass panels with SentryGlas®, below L/100 in the 8 mm + 8 mm (5/16”) construction, which is achieved despite exposure to quite high wind loads resulting from its geometry as well as its proximity to the sea.

Moreover, the excellent post-breakage performance of laminated tempered glass with SentryGlas® in the event of failure of non-vertical installations was key: thanks to the high stiffness and limited creep of the interlayer, there is an extended period between the potential failure of the two glass components and the detachment of the panel from its



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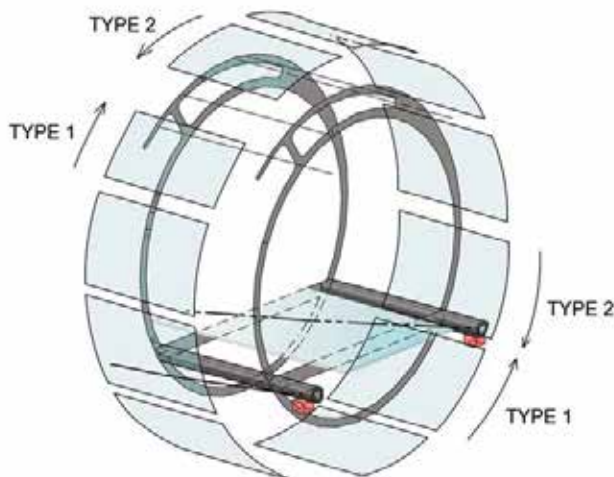
fixings, enabling more time for its repair or replacement and limiting the potential for danger to passers-by."

With the bridge being installed just a few metres from the sea, the superior edge stability of SentryGlas® also came to the fore on the glass panels with open edges at either end of the bridge. "There was no weather seal used to protect these panels from the external environment, yet the outstanding edges stability of SentryGlas® will ensure that no

appreciable edge delamination and no measurable moisture intrusion occurs," confirms Carles Teixidor.

The 'Champalimaud Centre for the Unknown' is located on a 60,000 m<sup>2</sup> (64.5834,63 sq ft) site in the Belém district of Lisbon, where the Tagus River flows into the Atlantic Ocean. Its location is of particular historical significance, being the place from where Portuguese pioneers set sail to discover the 'unknown' in the 15th and 16th centuries. The purpose of the multidisciplinary research centre is to leverage this historical heritage by creating a link between the discoveries of yesteryear and new scientific research in the fields of neurosciences and oncology. It was officially inaugurated on the 5th October 2010 by the President of the Republic of Portugal.

#### ARRANGEMENT OF GLASS SHEETS



Arrangement and types of glass sheets of glass envelope (exploded assembly)

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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.

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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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