



DuPont™ SentryGlas® Case Study

## TKTS booth in Times Square advances use of structural laminated glass

Popular New York destination sparkles in the imaginative redesign by architect Perkins Eastman and structural glass innovator Dewhurst Macfarlane.



**SentryGlas®**

TKTS project highlights

- Glass amphitheatre seating creates a popular new Times Square gathering spot
- Structural loads carried on innovative glass bearing walls made with DuPont™ SentryGlas®
- Cantilevered, open-edged glass canopy draws strength from interlayer rigidity
- Clear, 7-layer structural glass laminate reveals interior building elements

With its 27 million visitors each year, Times Square in New York City is a lively location for people-pleasing design and state-of-the-art technical innovation. The new, award-winning all-glass TKTS structure is a perfect example.

Renowned architecture firm Perkins Eastman was inspired by a competition-winning idea from the Australian architecture firm Choi Ropiha in designing this show-stopping structure. Principal Bradford Perkins, FAIA, describes the TKTS booth as “the most sophisticated all-glass structure in a truly unique public space at the crossroads of the world.”

Located on a narrow triangular median between 7th Avenue and Broadway, the new TKTS structure provides a jewel-like public amphitheater from which people view the flashing billboards, large-screen media displays and constant activity at this busiest intersection in the city.

Designing such an innovative structure called for more than just skinning a traditional frame with façade glass. Novel design and engineering details for



## TKTS BOOTH ADVANCES STRUCTURAL USE OF LAMINATED GLASS

TKTS include its use of laminated glass in load-bearing walls and unique glass beams that hold up the 500-person outdoor seating area.

The seating area is supported by internal glass beams, which transfer weight to all-glass bearing walls located at the front (ticket-selling) face and mid-point of the structure.

These bearing walls, made with DuPont™ SentryGlas®, create a clear, see-through structure exposing the building's inner workings including an energy-efficient geothermal system to warm the seating area and prevent icing. The forward-leaning front wall, also made with SentryGlas®, includes openings for ticket-selling and supports a cantilevered glass canopy to help keep patrons sheltered from the rain.

The building's exterior side panels extend from the ground upward, as tall as 15 feet at the highest end of the structure, helping further accent a sparkling all-glass design. At the top, the sidewall glass (made with PVB) is capped with a metal rail, serving as a balustrade for seated or standing spectators.

Inside the TKTS structure, about midway along its sloped seating area, is a 7-layer glass wall laminated using four layers of ½-inch-thick, tempered, low-iron glass. The glass is laminated using three SentryGlas® interlayers, each 0.06 inches thick, for the extra load-bearing strength.

"Approximately half of the mass is carried on this laminated glass bearing wall," explains structural engineer Michael Ludvik of Dewhurst Macfarlane, who worked with Perkins Eastman on the project.

According to Ludvik, structural loading calculations were based on occupancy of 1,000 people, or twice the number of people actually expected on the structure at any time. This conservative approach allowed for dancing or other crowd behavior that could impact dynamic loading.

The glass beams carrying loads to the bearing wall are each 30 feet long, which was a particular manufacturing challenge. Dewhurst Macfarlane drew from the ingenuity of glass structural designer guru Tim Macfarlane to come up with a solution that enabled manufacture in multiple sections, which are spliced together in overlapping, staggered lengths through-connected by metal bolts.

Use of SentryGlas® interlayers in the laminated glass bearing walls increases their composite strength, because of the stronger shear coupling of the interlayer compared with PVB. Their reduced deflection and lower buckling potential also contributed to other key structural elements.

"Without the strength of SentryGlas®, features such as the frameless cantilevered overhead glass above the purchase windows would have been impossible," says Ludvik.

The canopy above the purchase windows keeps weather off the theater patrons waiting to buy tickets. Its red color is imparted by a colored interlayer, combined with the DuPont™ SentryGlas® structural interlayer for deflection resistance and load carrying performance. The canopy extends 6 feet beyond its structural supporting wall. Open edges add to its design elegance, and a special drip edge in the glass helps prevent condensation or rain from trickling down onto guests.



Structural glass made with DuPont™ SentryGlas® ionoplast interlayers is used for an internal load-bearing wall and front-facing ticket seller locations at TKTS in Times Square.



## TKTS BOOTH ADVANCES STRUCTURAL USE OF LAMINATED GLASS

The new all-glass TKTS structure adds special sparkle to an already dazzling Times Square environment. It has become a favorite destination and meeting place not only for the daily line of discounted theater ticket buyers, but also for native New Yorkers and visitors from all over the world, pausing to climb up into the glass seating area and take in a relaxed view of the hustle and bustle of Duffy Square and Broadway, stretching out below.

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