



Seattle's iconic landmark gets a fenestration performance overhaul

Built in 1962 for the World's Fair, the Space Needle stands 605 feet above Seattle and welcomes more than 1.3 million guests from around the world each year. In June 2018, the historic landmark unveiled a massive renovation and celebrated a milestone in its "Century Project," a multi-year, privately funded, \$100 million effort to preserve and enhance the visitor experience for the next 50 years.

Challenge:

The challenge of the renovation was maintaining the historic building's overall appearance while improving the views and energy performance and controlling condensation risk. LEED® Gold certification through the U.S. Green Building Council was the target, as well as meeting the Seattle energy code—one of the strictest in the country.

The existing structure had poor thermal performance in the opaque areas, where supporting elements passed from exterior to interior at many points without thermal separation. This put extra demand on the glazing systems to meet the performance requirements, especially since the project utilized a 196% increase in glazed area for enhanced views. 176 tons and 10 types of glass replaced entire walls, barriers and floors.

The cooling load after renovation also could not exceed the capacity of the existing chiller system because removing it and replacing with a bigger one was not an option. "We had to coordinate quite tightly with the HVAC designers at Arup," explains Richard Green, P.E. of the glazing consultant and designer Front, Inc. "We needed to get as good a performance as possible out of the glazing system. Getting the right insulating glass spacers in there made the difference. Spacers tend to be a fabricator's choice. Many use stainless steel as standard; we needed better."

As part of the building envelope's high-performance insulating glazing units (IGUs), Front, Inc. selected Technoform's plastic hybrid stainless steel (PHSS) spacer because it solved their energy performance challenges without compromising durability or structural performance.

Loupe level at 500 feet (restaurant):

The restaurant level of the Space Needle features floor to ceiling glass walls; 7-foot-wide and 10-foot-tall, laminated, IGU's supported only on the top and bottom to maximize the view. With no frame on the vertical edges, the weakest link in energy performance was the edge of glass.

Solution:

Technoform's spacer was considered the only option to provide both the thermal performance and the necessary edge seal rigidity. The rigidity provided by Technoform's spacer was needed to manage the localized edge seal stresses resulting from the special support conditions at the top and bottom, which were required to reduce the displacement of the frameless glass.

Atmos level at 520 feet (observation deck):

On the Atmos level, the glazing needed to retain the original deep, exterior facing steel mullions. This unique aspect of the building envelope posed one of the project's most

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significant challenges in terms of thermal performance.

This “reverse curtain wall” creates a smooth surface on the inside, so viewers have fewer physical obstructions to get close to the glass. As a result, the deep mullions on the outside act as a heat sink with very little in the way of a thermal break between it and the glass edge.

With people sitting next to the glass in all seasons, the radiant temperature on the interior would affect the visitors’ comfort. “The only thermal separation we have is in the small thermal spacer [between the mullion and the glass] and in the IGU seals, making Technoform’s spacer super-important in both thermal performance and condensation resistance,” Green explained.

Solution:

Pulp Studio manufactured 8 by 7 foot, double-laminated IGUs with a neutral, triple silver, low-e coating for solar control and anti-reflective coatings to maximize the view. Technoform’s 5/8-inch-wide spacer provided the required large thermal break.

“The reduction in solar heat gain is a key driver for the use of warm-edge spacers in this case,” said Technoform’s Helen Sanders. “The exterior mullion absorbs the solar radiation and this heat would conduct across the glass edge to the room-side if not for the spacer. This thermal break performance helped reduce the cooling load on the chiller.”

Black spacers were specified. “Olson Kundig wanted them to disappear as much as possible and not distract from the view. We didn’t want to see something bright and shiny,” stated Green.

The right partner and product:

Technoform’s team provided extensive technical support to the design team and on the production floor with Pulp Studio, the glass fabricator.

Since Pulp Studio had only used stainless steel box spacer for their insulating glass previously, the Technoform team spent a significant amount of time on Pulp Studio’s factory floor, making sure that their equipment was optimized, and their staff trained in the best practices of high-quality fabrication with Technoform spacers.

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Technoform’s spacer provides a drop-in solution for fabricators from both a processing and certification standpoint. It processes the same way as other rigid bar spacers for insulating glass but provides a higher performing warm edge solution without sacrificing any durability.

Also, the Insulating Glass Certification Council (IGCC) allows standard, stainless steel box spacers to be directly substituted with Technoform’s PHSS, rigid bar, warm-edge spacers—without the need for a new certification—because the sealants are bonding to the same durable, solid stainless steel surfaces.

The ability to use Technoform’s spacer as a direct substitute for stainless steel without a long IG certification process was critical in meeting the nine-month timeline for the project.

According to Bernard Lax, Pulp Studio’s CEO, “Technoform’s team was extremely helpful in visiting our location and supporting us through the whole process. Quality counts for everything on this iconic project, where glass is everything. Their spacers have now become our go-to material because of this experience.”

Project: Space Needle

Location: Seattle, WA

Architect: Olson Kundig

Glazing consultant & designer: Front, Inc.

Glass fabricator: Pulp Studio

Product: Technoform’s PHSS warm edge spacer, 5/8" airspace, black

