



# World-Class Curtainwalls within Will Rogers World Airport

By Chuck Knickerbocker

**Figure 1.** Exterior curtainwall allows daylight to flood airport terminal.

Source: Simon Hurst Photography

**WILL ROGERS WORLD** Airport in Oklahoma City, Oklahoma, recently expanded with a new east concourse. According to HOK and Frankfurt-Short-Bruza (FSB), the two architectural firms heading the project, the expansion gave the airport the capacity to attract new airlines or allow existing carriers to increase their capacity. Further, the project helped the airport meet the Transportation Security Administration's (TSA's) evolving requirements by providing a larger, consolidated security checkpoint with more pre- and post-security space. Also, the expansion provided extra room for a customs area for international flights.

Another goal for the expansion was to improve the overall travel experience. This initiative involved adding new shops and restaurants, lounge areas with USB-charging ports, and other traveler amenities. It also entailed designing a space that promoted occupant comfort. Central to this concept was drawing natural light deep into the building (Fig. 1). HOK and FSB achieved this design objective with four interior and two exterior curtainwall systems of transparent glass held in place with narrow stainless steel frames.

The interior systems create a security checkpoint between the public side and secured side of the airport and provide an observation deck for travelers. The exterior systems are located on both the air side and the land side of the airport. These curtainwalls increase the amount of natural light within the terminal, bolster visual connection between spaces, enhance security, and update the overall design aesthetic of the airport—all of which translate to a better experience for passengers and staff.

Because the exterior curtainwall systems match the four interior systems, the design across the airport is cohesive. However, achieving this harmonious design presented some challenges. Both the exterior curtainwalls boast large spans of uninterrupted glass—almost 27 feet (8 meters) in some instances. Also, the air-side wall drops below the floor so that the wall appears to float, and the land-side system follows the subtle bow of the building profile to create an impressive facade.

Due to their above-average size, the curtainwalls could have required bulky support systems—despite the steel backup system provided by the airport's structural design. These additional supports would have complicated

the installation. While the Will Rogers World Airport's original structure helped the architects accomplish their designs, it is important to note that the steel framing systems used in the curtainwalls can span heights almost double that of aluminum curtainwall frames while offering positive wind loading of 25 lb/ft<sup>2</sup> (122.06 kg/m<sup>2</sup>) and negative wind loading between -27 and -34 lb/ft<sup>2</sup> (-131.83 and -166.00 kg/m<sup>2</sup>).

## GREETING DEPARTING PASSENGERS WITH A BOWED EXTERIOR

The Will Rogers World Airport is radiused to match the slight curve of the passenger drop-off road. This presented the first challenge to the design team. The designers recognized that preserving this profile would help the new terminal fit its location more seamlessly than

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**Figure 2.** Exterior curtainwall drops below the interior floor to heighten design.

Source: Courtesy of Avenue C Glass.

if the curtainwall were left unbowed; their aim was to make the new east concourse seem as if it had always been a part of the airport. To achieve this design goal, the designers chose to specify a system that could bow slightly concave. While the glazier had installed convex systems in the past, a concave bow was a first for the firm. The bowing demanded a level of exactitude that exceeds most curtainwall installations.

In addition to the subtle curve, the entire assembly also drops below the floor line, so the wall appears to float (**Fig. 2**). Dropping the curtainwall below the floor lends an ultra-modern aesthetic to the concourse, which is befitting of an international airport. Despite the possible difficulty of these features, the curtainwall systems used at the Will Rogers World Airport were easy to install due to their strength and streamlined design.

Combined, the curved exterior and dropped wall create two impressive exterior facades that evolve as a passenger moves from the outside to the inside of the airport. The monolithic glass appearance of both curtainwalls, which was achieved through the use of the narrow stainless steel mullions with T-shaped cross sections, elevates the terminal's look and allows daylight to flood the interior space (**Fig. 3**).

Additionally, the transparent glazing provides a visual connection to the terminal's interior. By increasing the overall internal visual connection between spaces, both the exterior and interior curtainwall systems contribute to a more easily

navigable floor plan as travelers are able to see what lies beyond the security checkpoint from the public side of the terminal and vice versa.

### A WINDOW TO THE WORLD

Providing access to daylight is a well-researched concept in modern architecture. In particular, this access is considered essential in biophilic design, as natural lighting may contribute to improving moods, regulating circadian rhythms, enhancing morale, and supporting other aspects of psychological wellness. Studies suggest that the benefits of natural lighting range from faster recoveries in healthcare settings<sup>1</sup> to better test scores in school.<sup>2</sup> For this project, the design team hoped that incorporating natural lighting into the airport design would be beneficial for both temporary visitors such as passengers and flight crews as well as long-stay occupants such as airport employees and travelers with extensive layovers. Ideally, the natural lighting will help



**Figure 3.** Cross section of framing mullions.

Source: Courtesy of Technical Glass Products (TGP)

## Although the scope of the expansion was ambitious, the curtainwall systems handled all the challenges without overcomplicating the project.

soothe flight anxiety and boost airport employee satisfaction and wellness.

At the Will Rogers World Airport, a color-neutral, low-emissivity (low-e) solar coating was used on the transparent glass of the exterior curtainwalls to allow 50% of visible light transmission to pass through the glass and illuminate the airport terminal. Because the mullions boast an astonishing amount of strength despite their narrowness, the curtainwall systems incorporate as much glass as is possible without using a butt-glazed wall panel assembly (which has only a perimeter frame and lacks vertical mullions). With little obstruction from framing components, the exterior curtainwall of the east concourse allows the utmost access to daylight. Also, the narrow frames cast only thin shadows on the mosaics in the terminal's floor, so the mosaics have a particularly bright appearance.

The daylight that streams into the terminal extends beyond the concourse waiting areas. It can flow out beyond the security checkpoint, where massive walls of glass are also used to create a modern and transparent design aesthetic. The combination of these systems ensures that all occupants have access to natural light no matter where they are in the boarding process.

However, despite the amount of visible light that is allowed into the airport, the glass also provides winter U-factors between 0.28 and 0.30, summer U-factors between 0.21 and 0.26, a shading coefficient of 0.26, and a solar heat-gain coefficient of 0.23. These ratings help the glass contribute to an energy-efficient design in addition to supporting the psychological wellness of occupants.


### A STREAMLINED SYSTEM EASES INSTALLATION

Although the scope of the expansion was ambitious, the curtainwall systems handled all the challenges without overcomplicating the project. The streamlined design of the systems allowed the glaziers to focus on the built environment instead of a difficult assembly; as a result, excess time and money were not expended on logistics and reworks. "The curtainwalls were satisfying to install," said Mike Marlin, the project manager at Avenue C Glass, the project's glazier. "And they are simpler than comparable assemblies."

The glaziers had to shop-glaze the curtainwall systems into cassette frames with structural silicone glazing. Despite this additional step, the systems were installed without a hitch, thanks in part to the efficiency with which the cassette frames anchored into the backing components. Thus, these curtainwalls offered a substantial payoff to the intense design and engineering process while also contributing to the airport's world-class look.

### A LEAP FORWARD

"The bow, stainless steel frames, and large spans—all of it was a leap forward for us," Marlin said. From some of the biggest panels of glass the glazier has handled to the heavy-duty mullions, the curtainwall systems used on this project pushed the boundaries of what is possible with floor-to-ceiling glazing. Further, by allowing a substantial amount of visible light to pour into the terminal while also resisting greenhouse effects, the glazing assemblies help ensure travelers and employees remain comfortable during their time within the

terminal. The transparent glass curtainwalls are part of a sleek and modern design that will help the airport become a global hub for years to come. 

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### ABOUT THE AUTHOR



**Chuck Knickerbocker**

**Chuck Knickerbocker** is the curtainwall manager for Technical Glass Products (TGP), a supplier of fire-rated glass and framing systems, along with specialty architectural glazing products.

With over 40 years of curtainwall experience, he has successfully worked with numerous architects, building owners, and subcontractors from development of schematic design through installation.

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