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Intuitive wayfinding and a welcoming atmosphere are key objectives in the design of the new terminal front bridge at Pittsburgh International Airport, write **Kevin O'Connor** and **Michael Fitzpatrick**



The close proximity of the two-level bridge to the new terminal means it has very tight movement tolerances (Gensler/HDR/Luis Vidal & Architects)

Pittsburgh International Airport is in the midst of a US\$1.39-billion modernisation project, the largest component of which is the construction of a new terminal designed to host 12-18 million travellers each year. In front of the terminal will be a new two-level, 396m-long bridge, which will serve as the entry and exitway to the departure and the arrival levels, respectively.

Allegheny County Airport Authority, which runs the airport, envisions the terminal as the front door to the Pittsburgh region, as well as the airport. HDR is the lead designer and engineer for the bridge, as part of the design team that is tackling the overall project: Gensler and HDR, in association with Luis Vidal & Architects.

Functionally, the bridge connects the roadway loop bringing passengers from the airport entrance to the new terminal, and from there to the exit or back again. A transitional space for travellers, it includes lanes for drivers going across the bridge, stopping cars and pedestrians. With a deck width of 25m, each of its two levels has four 3.6m-wide lanes for vehicles and a 9.7m-wide sidewalk beside the building.

The bridge's structure and aesthetic also complement the design of the new terminal, which will be three stories high, with the ground level entrance used for commercial services, the middle for arrivals and the top for departures. The bridge's height matches the terminal, with the height of each level set by the terminal floors. Each level is 6.4m high, with a clear height requirement on the bridge roadways of 4.4m. The position of the bridge's columns was also restricted by underground tunnels and a desire for a layout that complemented the building column layout, while not matching it exactly. Throughout the process, the team worked with the interior design and terminal architectural team to match the shape, colour and even texture of the columns used inside the building.

The height restrictions over the roadway led to the creation of a relatively shallow structure that maximises the view of the building while still carrying large vehicles. The transverse floor beams at the piers were kept in the same plane as the longitudinal girders to maintain the required 4.4m clearance. The trapezoidal box-girder design is not supported by typical hammerhead columns or wall piers, as the airport authority didn't want a heavy highway viaduct in front of the terminal. Instead, an iterative design process which included the owner and terminal architect led the bridge team to a unique two-column concept that creates an open visual feel while echoing the terminal design.

Allowing drivers to see the terminal during their approach was an important intuitive wayfinding consideration for designers and the airport. The girders are supported on short struts between pairs of round columns. The struts and columns were challenging to design because the struts were height-limited to maintain an unobstructed visual gap between the columns, lightening the overall appearance of the structure.

Another constraint is the presence of three active tunnels in the work area. The airport currently has separate landside and airside terminals connected by a 0.8km underground automated people mover (APM) line. When open in 2025, the new terminal will eliminate the need for the APM, but it will remain active during works. The bridge and its foundations are designed to span the APM tunnel and a utility tunnel in the area.

Bridge foundation construction adjacent to the APM is challenging due to limits on vibrations, as well as restrictions on thermal and other movement adjacent to the APM. To avoid these potential impacts, drilled caissons were chosen for the bridge foundations. The bridge also has very tight movement tolerances due to its proximity to the terminal building, requiring the designers to consider the different movements between bridge and terminal building. As a result, a very robust multi-directional seismic expansion joint was specified between the bridge and building to ensure safe passage for pedestrians, baggage carts and wheelchairs.

Aesthetic details were also key to creating a structure that complements the terminal interior and maintains a comfortable experience for users. For example, because the bridge will be visible as passengers drive into the airport, light poles are arranged from the centre outwards, rather than simply spaced at regular intervals. The roadway lighting is spaced to line up with lights on the interior of the terminal's third level, reinforcing the connection between the two spaces.

Knowing that many pedestrians will be using the bridge, wayfinding was a particular focus. While the actual bridge height is constant across its length, ceiling panels were added above crosswalks on the first two levels. These provide a visual cue to drivers to slow down by compressing the spacing while maintaining minimum clearances and help guide pedestrians looking for the airport entrance. Variations in lighting intensity also help travellers understand where to go. Rather than flooding the area with light, designers took their inspiration from subway stations, which use

lighting to aid in wayfinding. Roadways are lit with the smallest amount of light at one-tenth of the intensity inside the building at most. Sidewalks receive about half as much light as the interior, vestibules a bit more, while the interior is strongly lit. Together, the changes guide travellers without a jarring transition from bright to dark or vice versa.

The overall goal of the design was not to impress travellers with features, but to create a bridge that functions as the front door to Pittsburgh and complement the architecture of the terminal, delivering a cohesive space from the beginning to end of airport trips. As airport authority chief development officer Paul Hoback says, "The Terminal Modernisation Programme will deliver a more efficient and enjoyable passenger experience. Through innovation, collaboration, and dedication, we are moving this project forward and remain committed to creating a safe, clean, healthy airport, while also advancing our region's recovery. We are building the future of travel right here, for Pittsburgh and by Pittsburgh."

At the time of writing no contractor had yet been selected for the project, with bids expected to be opened in November. The new terminal is scheduled to open in early 2025 ■

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The colour and texture of the terminal columns are reflected in the supports of the bridge (Gensler/HDR/Luis Vidal & Architects)