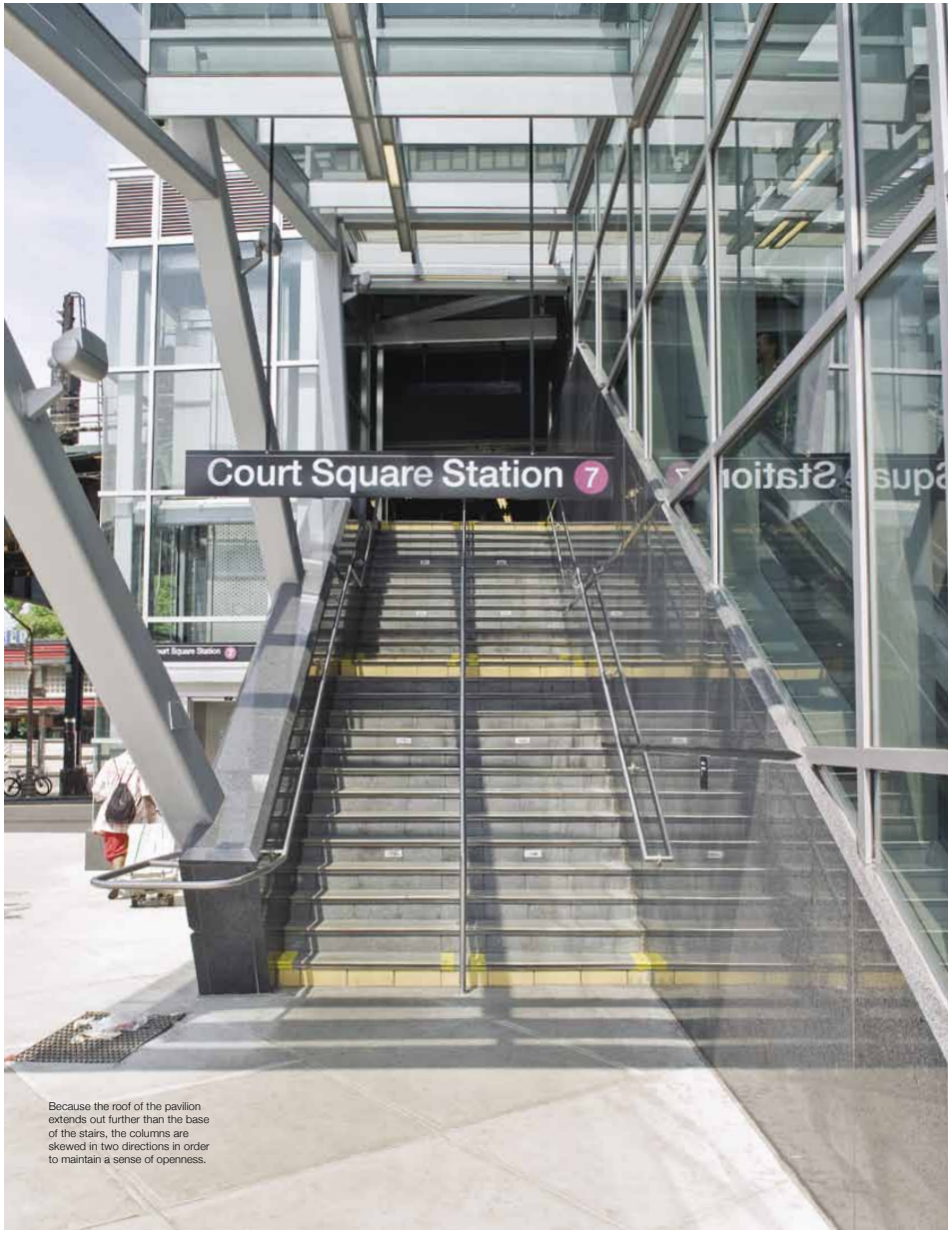


Because the roof of the pavilion extends out further than the base of the stairs, the columns are skewed in two directions in order to maintain a sense of openness.

Court Square Subway Station

A new glass pavilion shelters stairs and escalators to an underground passage and an elevated station, creating a day-lit connection between the transit hub and the surrounding neighborhood.

FIRST-TIME USERS OF THE underground passage linking the E, G, and M subway lines in the Court Square complex are apt to find themselves rubbing their eyes in disbelief as they use the new link between the tunnel and the elevated station that serves the New York City's 7 train. Here, the dark walkway opens up into something subway riders don't often see: a dramatic, two-story, daylight-filled steel, aluminum, and glass pavilion. It's there to shelter the station's up and down escalators, interior and exterior stairways, and elevators, and was a long time in the planning.

Accomplishing wonderful design is never easy, and civic architecture in New York City has special challenges because so many parties are always involved. In the case of the Court Square, engineering and architecture firm Stantec ably balanced the input from three public agencies: MTA NYC Transit Authority, the New York City Planning Department, and the New York State Historic Preservation Office. Tishman Speyer Properties acted as the development manager for Citigroup, which funded the project to as part of a deal to develop a site nearby.

According to Stantec's principal James Ariola, who was a structural engineer on the project, each group had its own design priorities. "We had to accommodate pedestrian circulation, of course. And, there's a small plaza outside, so we needed to pay attention to the urban design issues. We were asked to make the structure as transparent as possible, to have a visual connection between people and the street."

"And, while we needed to pay homage to the historic forms and historic proportions," adds Stantec senior partner and architect Joseph Donovan. "Attaching anything to the elevated station that had any kind of a nostalgic intention was out."

The resulting structure encloses a pair of escalators, an interior stair and elevators, used by transferring subway passengers, within a glass and extruded aluminum curtain wall. The roof is composed of a series of shallow glass dormers supported by extruded aluminum rafters and purlins, each of which stair-steps above the previous one. Slotted steel angle clips and bolts secure the 6063-alloy aluminum curtain wall and roof framing system to the substructure of framed-in square and rectangular HSS 46 ksi steel.

The use of the dormers, as opposed to a much simpler sloped glass roof, has the effect of increasing the volume of the interior space covering the stairs and escalators, and gives it a more spacious feel. And, as it turned out, the dormers were quite useful in providing openings to allow the pavilion to be passively ventilated.

Even though coating on the vertical glass that encloses the pavilion limits its visible light transmittance to 70 percent,

Left The designers devised a roof made up of a series of glass dormers to allow greater headroom over the escalators. The space just beneath the purlins is open to allow this volume to be naturally ventilated; the fritted glass is cantilevered over this space to protect it from the weather.
Below The pavilion that covers the link between the underground passageway and the elevated station that serves the 7 train is supported by HSS columns and beams, along with an assemblage of extruded aluminum purlins and rafters.

and the glass roof panels have an additional 60 percent frit pattern added to that, computational fluid dynamics studies showed that without some openings the interior would be unacceptably hot in the summer. Each of the dormers has a 1-foot high opening along three sides to allow heat to escape. The panes of roof-glass cantilever over the openings, and offer some protection from the weather.

According to John Pachuta, an architect and partner with the project's curtain wall consultant, R.A. Heintges and Associates, "The studies show that the interior temperature will never be any higher than 5 degrees Fahrenheit above the exterior temperature."

Given the stringency of current seismic codes, and the rigid support required by the aluminum curtain wall and roof assembly, Stantec's choice of an HSS with welded steel frame for the pavilion's substructure was a natural one. "You can see how much the elevated station sways when a train enters the station. It moves a lot," says Ariola, as he points out the rubber-gasketed expansion joints that isolate the rock-solid pavilion from the oscillations of the elevated train structure.

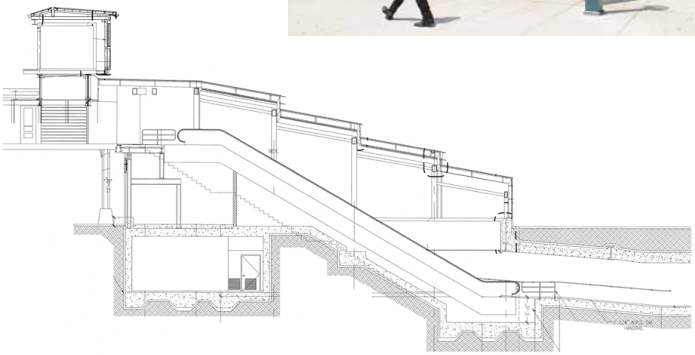
The most difficult connections to design and fabricate occurred where the sloping rectangular aluminum rafters and horizontal purlins intersect with short pieces of vertical aluminum extrusion to form the dormers, and where these in turn are fastened to the steel structural system.

"The purlins and rafters are extruded aluminum sections, not aluminum-wrapped steel tubes," says Pachuta. "Notice that rather than having a straight aluminum rafter that spans between the steel tube supports, the rafter is made up of three mitered pieces that when attached together form a step. The purlins are also detailed this way. And, because we wanted to celebrate the joints," he says, "the aluminum sections were fastened together on-site using either exposed 300-series stainless steel countersunk screws or button-head socket cap screws. Even something simple like had to be worked out on its own."

The glass roof also extends over an exterior stairway that leads from the plaza to the

Previous page: Timothy Schenck; top: MTA; left: Timothy Schenck; facing from top: liqcity.com, Timothy Schenck, Stantec

Right top and center Skewed HSS12x12x½ columns intersect the polished dimensional granite sheathing on the outside of the stair railing.
Bottom A series of glass dormers framed with extruded aluminum purlins and joists, which are supported by HSS square and rectangular tube, gives the escalators extra headroom, and shelters openings which allow the enclosed space to be naturally ventilated.



The glass pavilion protects stairs and escalators that lead from an underground link between the E, G, and M subway lines and an elevated station that serves the New York City's 7 train.

Timothy Schenck

turnstile lobby on the elevated platform. To maintain a sense of playful openness, three of the HSS12x12x⅝ columns on the outside of the stair are skewed in two directions, one is as much as 42 degrees from vertical. Referring to himself, Ariola joked, "It blew the structural engineer's mind. Columns should be straight!'"

Although building information modeling was not used on this project, Donovan says that three-dimensional AutoCAD renderings were freely exchanged and, "extremely useful for both explaining the design to the stakeholders who needed to sign off, and the fabricators. The 3D drawings shortened meetings that would have dragged on for hours."

The steel was given two coats of polyamide epoxy primer with a metallic acrylic polyurethane finish coat, and the aluminum extrusion received two coats of mica-pigmented polyvinylidene fluoride paint. These finishes rendered the dissimilar metals a matching light gray that is almost pearlescent in appearance. "The idea was to have the steel and aluminum look anodized, or galvanized, and to share the same relatively neutral color palette," said Donovan. "Given the heft of the structural frame we still wanted it to feel as transparent as possible."

The elevated 7 train line that serves Court Square Station is almost 100 years old, and as busy as ever. But, as the businesses it serves are gradually changing from industrial lofts to commercial offices, the new structure, supported by traditional steel but framed in high-tech glass and alloy aluminum extrusions, is perhaps an appropriate expression of what is taking place in Queens: a transition from the past to the future.

COURT SQUARE SUBWAY STATION

Location: **Court Square, Long Island City, Queens, NY**
Owner: **MTA New York City Transit Authority**, *New York, NY*
Client: **NYC Transit Authority/Citigroup**, *New York, NY*
Architect and Structural Engineer: **Stantec**, *New York, NY*
Mechanical Engineer: **Geri Goldman Engineering**, *New York, NY*
General Contractor: **Turner Construction**, *New York, NY*
Development Manager: **Tishman Speyer**, *New York, NY*
Curtain Wall Consultant: **R.A. Heintges and Associates**, *New York, NY*
Structural Steel Erector: **Capco Steel Corporation**, *Providence, RI*
Miscellaneous Iron Erector: **Capco Steel Corporation**, *Providence, RI*
Curtain Wall Erector: **Tower Installation, LLC**, *Windsor, CT*