



7 Line Station at 34th Street/Hudson Yards

The structures and surfaces of the MTA's new Hudson Yards subway terminal make the most of steel's strength, elegance, and durability. Designed around deep, challenging site conditions and built to accommodate the area's dramatic expansion, the 7 line's westernmost station is the system's futuristic flagship.

DESCENDING 125 FEET FROM STREET LEVEL to reach the platform at the new 34th Street/Hudson Yards station on the Metropolitan Transportation Authority (MTA)'s 7 line, a rider has a choice. To the right, the major segment of the trip (from the upper to lower of two mezzanine levels) takes some 50 seconds on an escalator, the New York transit system's longest; to the left, it's about two minutes in an inclined elevator, the system's first. All other factors being equal, hurried commuters familiar with the different speeds would logically head for the escalator.

Still, some pick the elevator anyway. It may be the closest thing the MTA has to a carnival ride. Its shiny glass cars in large, well-lit tunnels, a refreshing contrast to claustrophobic counterparts at other deep-seated stations, offer a novel angle of descent. Riders on ascending and descending cars sometimes wave to each other as they pass. Close observers may notice the border between cut-and-cover construction and the long cavern mined through pegmatite and schist. If only briefly, a moment of childlike discovery brightens the everyday activity of getting around New York.

The MTA rarely adds stations. The system's budgetary and operational challenges are well-known causes of complaint among New Yorkers (especially those who forget what a rare privilege it is to have 24-hour transit available at all); just keeping the system running in its current state is a stretch, and the addition of the Second Avenue line, planned since the 1920s, has taxed the authority's resources further for years. Yet 34th/Hudson Yards, the first new station built since 1989 and "the largest single-line station in the system" according to Dattner Architects' principal-in-charge Beth Greenberg is an ambitious work of infrastructure, a potent catalyst for the Hudson Yards mixed-use development. Its reliance on structural and stainless steel helps it overcome substantial site challenges and makes it the subway system's most forward-looking component. At \$2.4 billion, the project is not cheap, yet its design/construction team brought it in on budget and ahead of schedule. It reflects a long-term investment by multiple civic agencies in a better-quality transit experience, implying a new system-wide sense of what MTA passengers deserve.

The new station extends the IRT 7 line from Flushing westward into this up-and-coming neighborhood. Since the 7 crosses all major north-south lines in the system, its extension past Times Square makes the West Side accessible throughout the MTA's service region, usually with only a single transfer. The station provides access to the High Line area and Hudson River Park, makes the far-flung Javits Convention Center reachable on foot at last, and brings riders within a few steps of Hudson Boulevard, the new four-acre angled greenway by Michael van Valkenburgh Associates bisecting the blocks

The angled elevators promote both rider convenience and construction efficiency. "Had we done normal elevators which went straight down from this entrance," says Richard Dattner, "that would have been half a block away from the station, and you would have had to go through a long, creepy, potentially dangerous-feeling tunnel. Putting the inclined elevators right next to the escalator, nobody feels cut off from visibility, so everybody feels safe. That was a very important consideration. Plus, it saved an incredible amount of tunneling through rock."



between 10th and 11th Avenues from 33rd to 39th streets. The station opened in 2015, well ahead of the ridership surge that will justify its size and relative opulence (carrying an estimated 30,000 to 35,000 passengers during daily peak hours); it is designed optimistically for the future.

In the works for some 15 years since the Department of City Planning (DCP)'s Far West Midtown master plan under Mayors Giuliani and Bloomberg, 34th/Hudson Yards benefits from multiple stages of scenario planning. "In the original early phases of the design," Greenberg recalls, "we were also planning for a stadium [and thus] a stadium crowd": the West Side Stadium first intended as a keystone of New York's bid for the 2012 Olympics, then reimagined for Jets football, then scuttled amid community and political resistance. Collaboration among DCP, the Hudson Yards Development Corporation, the MTA, and New York City Transit was "one of the really unsung miracles, in a way, of this station," she continues.

Subterranean conditions were complicated enough to make realization of the design even more miraculous. "Even though on the surface we were dealing with [a] vastly underutilized urban area," Greenberg says, "underground we were dealing with a very dense built-up infrastructure" that included Amtrak's Albany line and current Hudson tunnels plus the Lincoln Tunnel with its bus ramps into the Port

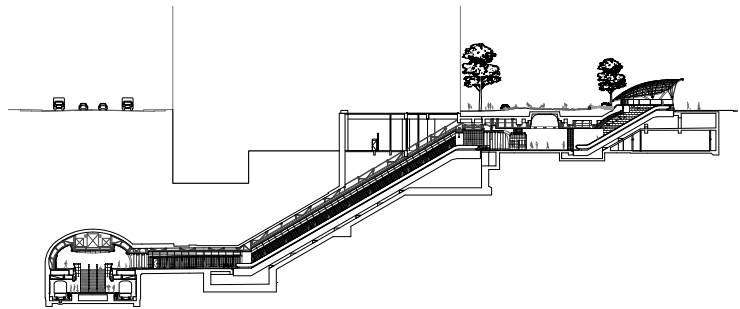
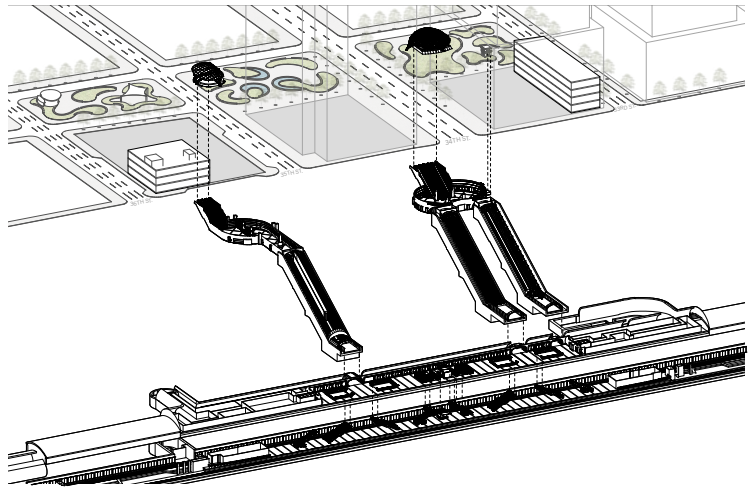
Authority terminal. Within this dense transit nexus, the Dattner team's initial design allowed for two stations, one at 10th Avenue and 41st Street (proposed but deferred, depending on future funding) and the 34th/Hudson Yards terminal station that opened in 2015. The total rock excavation for the project by tunnel-boring machines came to 326,700 cubic yards.

Approaching such a deep platform beneath 11th Avenue, and mining through an ancient stream bed at 10th under the Lincoln and Amtrak tunnels, the station as built includes two intermediate levels, connected by five high-rise escalators and the pair of inclined elevators. An upper mezzanine 27.5 feet below street level, reachable by four low-rise escalators, two staircases, and an ADA-accessible elevator from the external park, houses the fairway and steel-and-glass "station service center" comprising the MetroCard/information booth and safety systems; a lower mezzanine 109 feet below street level leads to eight staircases and an ADA elevator descending the last 16 feet to the platform. There are interlockings (signaling systems) north and south of the station, facilitating the increased number of trains and improved service that this extension provides. A separate north entrance in Hudson Boulevard Park with four additional escalators is still under construction at this writing, with a structural shear wall between elevator banks for the Yards' overbuild integrated into the tunnel. Additional system buildings

Clockwise from above Steel girts following the contours of the tunnel support a system of porcelain panels. Diagrams of the station's angled elevator and escalator entrances. The entrance escalators of the station's upper mezzanine.

at 41st and Dyer Avenue, 36th and 11th, and 26th and 11th assist with heat exhaust; the station has the largest tunnel-ventilation fans in the entire subway system. The extension to 34th/Hudson Yards can more accurately be termed a complex of distributed components than a single station.

Dattner describes the station as “a hole in the rock with a concrete lining, but inside there, there’s steel armature that really makes the tunnel, because all these things that you see there are hung off steel.” Steel is essential to both the structure and the interior finish of 34th/Hudson Yards: the tunnel and escalator/elevator complex are supported by a large steel-truss understructure, and the facing of the lower mezzanine and platform is a system of porcelain panels supported by steel girts following the contours of the cavern. For the E2 tunnel structure above the finished ceiling, the arches are L5x5x $\frac{3}{4}$ at 5 feet on center (OC); the center top of arch running the length of the tunnels is a WT8x20; arches are tied back to the cavern at approximately 10 feet OC by three sets of two L3xL3x $\frac{1}{2}$. The truss structure in the inclined elevators (the E1 tunnel) at top and bottom uses a truss width 7 feet, 4.58 inches and height 5 feet, 6.93 inches, a 140x140x8mm tube, an HLS 300 runway beam 11.02 inches deep, and runway beam/rail support at approximately 19 feet, 6 inch intervals over a length of 181 feet. The high-rise escalators’ truss width is 5 feet, 4 $\frac{5}{8}$ inches (typical), with an HSS4x2x $\frac{1}{4}$ top chord and truss support at approximately 17-foot intervals. The 15-foot modules of tripartite panels between steel bands allude to the distance between steel columns found in many older stations, suggesting systemic continuity without actual columns interrupting the space.





Since the MTA's performance requirements included a ban on painted finishes to conserve maintenance labor, Greenberg notes, the station's interior uses a palette of three basic materials: granite flooring, perforated porcelain-enamel-coated steel for the upper walls and ceilings, and porcelain tile and stainless steel for the lower walls (textured stainless steel panels in between portal ribs, 14 gauge stainless steel Rimex panel, pattern 5-SM, finish/polish as supplied by the manufacturer; panels at ribs, fascia panels 16 gauge 316 stainless steel, polish #4; at the portal entry, ¼-inch-thick 316 stainless steel (shop-fabricated), polish #4; and between the lower-level mezzanine and platform, 14 gauge 316L stainless steel). The number and size of the perforations, she adds, were "carefully calibrated between the lighting requirements and the acoustic requirements"; the station is noticeably quieter than others in the system, owing to both the paneling and the use of resilient neoprene-padded rails, which minimize friction, heat, noise, and steel-dust generation by train wheels. The complex includes approximately 30,000 feet of running rail, and the station cavern (lower mezzanine and platform public areas) contains approximately 41,000 square feet of ceiling panels (stainless steel and porcelain enamel over steel combined), 6,500 square feet of stainless wall cladding, 6,000 linear feet of stainless trim of various heights (12 inches or less), and 2,000 linear feet of stainless railings, including about 1,000 feet with stainless mesh infill.

Another advantage of extensive panelization is that it facilitates access for upkeep and future


modifications. A knockout panel in the lower mezzanine on the west side allows for future expansion: "should Javits or the West Side Yards choose to add another circulation element," Greenberg says, "either elevator or escalator or some combination, there is the potential for connecting directly into the station."

Dattner and Greenberg studied the Jubilee line of the London Underground, the connector to once-remote Canary Wharf, as a prototype for 34th/Hudson Yards. "I think we got from that, ideas of openness, transparency, allowing people to flow," he says. "We're using bright materials, good lighting, no columns"—qualities afforded by the structural steel framing. "We looked to modern prototypes rather than to the historic New York City stations." Transition portals between the mezzanines and escalator/elevator banks use a common language of steel arches with rhythmic ribs, organically suggesting pedestrian flows.

For such an advanced station to appear at a site that looks peripheral on the subway map may strike some observers as disproportionate. Another way to look at 34th/Hudson Yards, however, is to invoke Berthold Lubetkin's maxim that "nothing is too good for ordinary people," a principle that should arguably enjoy wider application in a democracy. The station's function and aesthetics both rely not on glitz but on the sturdiness of steel. As the West Side sprouts more residences, workplaces, and cultural magnets, New York's center of gravity is shifting; this attractive new gateway will help the whole region discover the city's promising western frontier.

Above The station's stainless steel and glass entrance canopy was designed by Toshiko Mori.

Facing Xenobia Bailey's *Funktional Vibrations* (2014) hovers above the entrance escalators and upper mezzanine.



7 LINE STATION AT 34TH STREET/HUDSON YARDS

Location: **34th Street/Hudson Yards Station**, New York, NY

Owner/Developer: **MTA Capital Construction**, New York, NY

Funding Partner: **Hudson Yards Development Corporation**, New York, NY

Architect: **Dattner Architects** (Richard Dattner, FAIA; Beth Greenberg, FAIA), New York, NY

Structural, Civil, MEP Engineer & Lead Designer: **WSP Parsons Brinckerhoff**, New York, NY

Consultant Construction Management: **HLH7** (joint venture of **Hill International**, **LiRo Engineers**, **Lemley International**, and **Henningson Durham & Richardson Architecture and Engineering**), New York, NY

Heavy Construction of Running Tunnels and Station Structures: **S3 II Tunnel Constructors** (joint venture of **Shea Construction**, **Skanska Construction**, and **Schiavone Construction**), New York, NY

Station and Systems Buildings Fit-Out Construction: **Skanska/Railworks, JV** (joint venture of **Skanska Construction, Inc.** & **Railworks Transit, Inc.**), New York, NY

Inclined and Connector Tunnels Heavy Construction and 33rd Street System Building

Core and Shell: **Yonkers Contracting Company, Inc.**, Yonkers, NY

Structural Steel Erector: **Skanska Koch**, Carteret, NJ

Exterior Wall Systems/Cladding Erector: **Jordan Panel Systems Corp.**, East Northport, NY

Entrance Canopy Erector: **Enclos**, New York, NY