One World Trade Center
Facade

The tower's base as seen from the grounds of the National September 11 Memorial and Museum, pictured in the foreground.
Facing The tower under construction in 2011.

This page: Tex Jernigan; facing page and opening spread: James Ewing/OTTO

An icon before it was ever built, the tower in Lower Manhattan is known throughout the world by a shimmering facade that protects those within even as it enhances the city around it.

THE COMPLETION OF ONE WORLD Trade Center marks a milestone in New York's post-9/11 recovery. The emblematic nature of the building, located just north of the massive pools set within the footprints of the fallen Twin Towers it is meant to replace, brought continual challenges to a design team that briefly included World Trade Center site master planner Daniel Libeskind. All that remains of his original concept for the building, once referred to as the Freedom Tower, is the iconic 1,776-foot height, coinciding with the year the Declaration of Independence was signed, and making One WTC the tallest building in the Western Hemisphere, surpassing Chicago's Willis Tower.

What emerged instead—after a decade of endless dialogue, design, re-design, and construction—is a gleaming tower whose monolithic appearance masks a heavily reinforced structure. (The building's structural design is detailed in a feature on page 26). "Our most convincing attribute is that you look at the building and it looks like an office building, and you have no idea how robust it is," says Kenneth Lewis, managing partner at Skidmore, Owings & Merrill (SOM). According to Lewis, the architects at the New York office of SOM, led by chief designer David Childs, wanted to make the façade as uniform as possible to create the image of a building that was aspirational rather than defensive.

To achieve that seamless look, SOM worked with Viracon to specify glass panels that were extremely large, building a special production line for that purpose. While most glass panels at the time of fabrication a few years ago were configured to be about 10 feet tall with an additional spandrel piece, the glass panels at One WTC are 13 feet, 4 inches and span the entire floor-to-floor height without intermediary mullions. "What we did that was unique with this project back then is that we chose to run the glass fully by the slab edge so the horizontal mullion at the bottom doesn't break through the glass," explains Nicole Dosso, a director at SOM. The design also maximizes the vision area for building occupants and facilitated the installation process of the unitized curtain wall during construction. Reinforced mullions, some as heavy as 60 pounds each, are clipped at the edge of the slab and attach the curtain wall to the building.

The glass itself is a single, low-iron insulated glazing unit (IGU). Its outer lite is thicker than what normally would be required for wind or hurricane force winds, a minimum of ⅜ inches when standard thickness is ¼ inch. The inner lite—laminated for the safety of occupants—varies in thickness depending on location. The end result is a crisp, clear panel that produces pure reflection rather than the oil-canning effect that can create an impressionistic appearance. "That makes the form of the building read as a whole instead of as an articulated surface," says Lewis.

Though the shimmering glass façade stands as a kaleidoscopic display of refracted light as the sun and clouds move through the sky, the prismatic structure nevertheless is articulated with stainless steel panels spanning the full height of each floor at its

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>
> **Kenneth Lewis, Skidmore, Owings & Merrill**

corners as the square plan at the bottom of the building shifts and tapers to a smaller square at the top. Measuring 200 feet by 200 feet at its base—the same size as the footprints of the original Twin Towers and the memorial pools—One WTC is capped by a 150-foot by 150-foot square, which is rotated 45 degrees so that the midpoints of the square at the bottom are the corners of the square at the top. The imposing shaft that gives form to this transition—producing eight isosceles triangles that run the length of the shaft and a series of octagonal floor plates at its center—comprises over 70 floors of office space rising above the 186-foot-tall concrete podium at the base and culminating in three levels of observation decks spanning the 100th to 102nd floors. The 6-foot-tall steel band at its roof has an upper elevation of 1,368 feet and a lower one of 1,362 feet—the two heights of the original Twin Towers. A series of communication platform rings and a 441-foot-tall mast crown the observatory.

Just below and above the observation decks are mechanical areas. In order to eliminate any louvers exposed on the exterior wall, the designers created a plenum behind it, housing an interior walkway. Set back approximately 5 feet from the curtain wall is a continuous louver that conceals all mechanical distribution. The empty vertical slots over these areas that are visible from the exterior are a result of smaller curtain wall panels there. Rather than the typical 5-foot-wide panel, the glass stops short by just over a foot, allowing intake and exhaust to occur through those open slots.

A third major mechanical level is located in the podium. The podium wall base consists of vertical laminated glass fins and horizontal stainless steel slats. The more than 4,000 glass fins, each measuring 13 feet, 4 inches by 2 feet, are positioned at varying angles in a regular pattern over the height of the podium. This pattern accommodates ventilation for the mechanical levels behind the podium wall. A reflective coating refracts and transmits light to create a dynamic glass surface in an attempt to assuage the fortress-like appearance of the podium’s 28-inch-thick concrete walls. Glass over the lobby entrances feature a dichroic coating that reflects and absorbs different portions of the color spectrum, resulting in a range of red, purple, and green casts, depending on the angle of vision.

Perhaps the greatest achievement of the curtain wall however, is not what is visible from the outside, but what is experienced from the inside. The extra large, unobstructed glass panels flood the narrow floor areas around the building’s core with daylight, creating bright, sunny office space that requires very little artificial lighting. And of course, there’s always the view. □

Above More than 4,000 laminated glass fins and stainless steel slats form the face of the podium, accommodating mechanical ventilation and breaking down the mass of the building’s base.

This spread: James Ewing

ONE WORLD TRADE CENTER FACADE

Location: **1 World Trade Center, New York, NY**
Architect: **Skidmore, Owings & Merrill LLP**, *New York, NY*
Developer: **1 World Trade Center LLC** (a wholly owned corporation by the Port Authority of New York and New Jersey and the Durst Organization), *New York, NY*
Structural Engineer: **WSP Cantor Seinuk**, *New York, NY*
Mechanical Engineer: **Jaros Baum & Bolles**, *New York, NY*
Spire, Communications Rings, Cable Net Wall Engineer: **Schlaich, Bergermann und Partner Gmbh**, *New York, NY*
Protective Design Engineer: **Weidlinger Associates**, *New York, NY*
Construction Manager: **Tishman Construction Corporation** (An AECOM Company), *New York, NY*
Curtain Wall Commissioning Consultant: **Israel Berger and Associates**, *New York, NY*
Structural Steel Erector: **DCM Erectors Inc.**, *New York, NY*
Architectural and Ornamental Metal Erector: **Tower Installation**, *New York, NY*
Curtain Wall Fabricator and Erector: **Benson Industries, Inc.**, *New York, NY*
Metal Deck Erector: **DCM Erectors Inc.**, *New York, NY*