World Trade Center Construction

Fact Sheets

May 2012

Rebuilding the Future

The new World Trade Center embodies a bold vision: to remember, renew, and rebuild the future.

With One World Trade Center, the National September 11 Memorial & Museum, a state-of-the-art Transportation Hub, Vehicular Security Center, and more, the new site represents the triumph of the human spirit.

The new World Trade Center is destined to become, once again, the world's premier destination for commerce, culture and community.

The 1271 perimeter beam on its way up to the top of 1 World Trade Center on April 30, 2012, making Tower 1 the tallest building in Manhattan.

THE PORT AUTHORITY OF NY & NJ

PROJECT PARTICULARS

- Steel erection commenced on September 2, 2008, with the erection of a 7,700 pound column located near the footprint of the original World Trade Center's North Tower.
- A 65-foot-high by 62-foot-wide piece of the original foundation wall, or slurry wall, is being preserved to allow visitors of the Memorial Museum to view it. A reinforcing wall was built behind this section to ensure the slurry wall's integrity.
- A total of 65,000 cubic yards of concrete, coupled with 8,658 tons of steel, were used to build the Memorial.
- The design for the Memorial was conceived by architect Michael Arad and landscape architect Peter Walker. More than 5,200 entrants from 63 nations completed in the Memorial Design Competition.

9/11 Memorial

The National September 11 Memorial & Museum at the World Trade Center will memorialize the victims of the September 11, 2001 attacks, a national tragedy that changed the course of history. Visitors will be able to learn, remember and pay tribute to those who lost their lives in New York, N.Y.; Shanksville, P.A.; and Washington, D.C., as well as the World Trade Center bombing in 1993.

"Reflecting Absence," the Memorial, consists of two massive voids sized over the footprints of the original Twin Towers with waterfalls cascading down their sides. The names of those who perished as a result of the attacks are inscribed around the edges of the Memorial waterfalls. The Memorial Plaza serves as a contemplative space amid the cacophony of sights and sounds of Lower Manhattan. A state-of-the-art museum, featuring interactive exhibitions, artifacts, memorabilia, a resource center, and areas for reflection will complement the Memorial.

MONTHLY HIGHLIGHTS

The Plaza is now open to the public daily. Visitors use kiosks with interactive displays to direct them to the names on the bronze parapets. The concrete slab for the PATH Hall roof, which is under the northeast quadrant of the plaza, is complete and ready for fit-out.

CONSTRUCTION PROGRESS

Pavilion

The Pavilion electrical contractor is installing fire alarm conduits. The miscellaneous metals contractor is installing handrail support on the 2nd floor. Island will be framing the roof parapets and welding for Fix Two. The chopping of Fix Two has commenced, while W&W is grouting for Pavilion Fix One at the high roof. ThyssenKrupp is installing passenger elevators 1A and 1B.

Memorial Museum

The plumbing contractor is installing seismic braces and working on punch list items in the museum ceilings at elevation 284' northwest. In addition, 4Js is installing temporary bathrooms at elevation 284'. Five Star is working on IT and fire alarm systems throughout the site. They are also installing permanent lights in Stair A3 and supports for the West Chamber light pockets while simultaneously removing temporary lights.

Aluminum panel mockup in the South Footprint of th Museum

SPECIAL FEATURES

- Spread over 8 acres, accented with over 400 Swamp White Oak trees; with each tree, planter, and associated soil weighing 37,000 pounds. The Swamp White Oak trees, reaching heights of up to 60 feet, are exceptionally long-lived trees, living up to 300 years.
- The reflecting pools and perimeter waterfalls are constructed over the footprints of the original World Trade Center Twin Towers.
- The Museum's 110,000 square feet of exhibition space will tell the story of 9/11 through multimedia displays, archives, narratives and a collection of monumental and authentic artifacts, which include open views of the original slurry wall and the supporting bedrock sub strata.

Fun Fact

The weight of the trees to be used in the plaza to complement the Memorial and Museum bring an equivalent total weight equal to about 30 times the weight of the Statue of Liberty.

PROJECT PARTICULARS

- Base Shape and Dimensions: cubic, measuring 200 feet by 200 feet
- Below Grade Footprint: 42,000 square feet
- Pedestrian access from Vesey, Fulton and West Street at grade and from Transportation Hub East-West Corridor below grade
- 104 floors
- Office Space: 3,000,000 square feet, with typical office floors at 13' 4" floor to floor height
- Structural Steel: Approximately 48,000 tons
- Concrete: 200,000 cubic yards
- The 187-foot-high base will be clad in specially designed glass panels
- Lobby Height: 50 feet (Part of Building Base)
- 9 Escalators and 70 Elevators: 44 high-rise passenger, 10 high-rise shuttle, 5 high-rise service, 5 high rise express to Restaurant and Observation Deck, and 6 low rise
- Tower Height (with spire): 1,776 feet (408 ft. spire atop 1368 ft. tower)
- Original Twin Towers: WTC 1 at 1,727 feet above grade (with antenna) and WTC 2 at 1,362 feet above grade (both 110 floors)
- Exterior cladding will be composed of 1,000,000 square feet of glass

One World Trade Center

One World Trade Center features 3,500,000 square feet of space, composed of offices, an observation deck, parking, and broadcast and antennae facilities—all supported by above and below-grade mechanical infrastructure for the building and its adjacent public spaces. Below-grade tenant parking and storage, shopping and dining options, along with access to the PATH and subway trains and the World Financial Center are also provided. One World Trade Center was designed by architect David Childs.

MONTHLY HIGHLIGHTS

Ironworkers erected the perimeter columns past the Empire State Building's 1250' roofline to make One World Trade Center the tallest building in Manhattan. The 100th floor is framed and the metal decking is in progress. This is now the derrick floor for staging the erection of columns to 1271' above grade, just above the 102nd floor.

CONSTRUCTION PROGRESS

Superstructure Steel
Framing of the 100th floor and the 93rd floor Mezzanine is in progress. The next tier of perimeter columns extends beyond the 102nd floor.

Ironworkers continue to complete temporary walkways in the plenum spaces outboard of the inboard perimeter of the 91st, 92nd, and 93rd floors, and prepare the 91st floor metal deck for turnover to the concrete contractor.

Superstructure Concrete
Shear walls at both north and south cores were cast to one lift above the 89th floor. The 89th floor is a double height floor. Two lifts are required to extend the shear walls from the 89th to the 90th floor.

Core infill slabs, stairs, and related structural elements were cast through the 84th floor. Floor slabs are complete to the 90th floor.

Building Enclosure
Ironworkers are setting panels between floors 70 and 71. Installation of slab edge anchors is underway at the 91st floor.

Interiors
Two of three stair sections for the Grand Stair at the B2 Observation Deck lobby are on site. Installation of the Grand Stair is expected to begin during the first week of May.

Also at the B2 level, stone setters and derrickmen continue installing curved marble veneer panels and flat panels for the interior walls at the west elevation of the core.

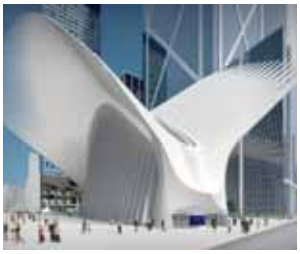
At the ground floor, marble is complete at the lobbies of elevator banks A and B. Ornamental metal entry portals arrive on site for elevator banks E and F on Friday.

SPECIAL SECURITY FEATURES

- Structural redundancy, enhanced fireproofing, and extra-wide pressurized stairs
- Concrete-protected sprinklers, emergency risers and communication systems
- Interconnected redundant exits
- Enhanced emergency communication cabling
- Dedicated stairs for use by firefighters
- Elevators are housed in a protected central building core and a protected tenant collection point located on each floor

Fun Fact

One World Trade Center will utilize 48,000 tons of structural steel, the equivalent of 22,500 full-size passenger cars. The Empire State Building and the Chrysler Building utilized 60,000 tons and 20,961 tons respectively.



PROJECT PARTICULARS

- The PATH Station and Transit Hall will be 300,000 sq. ft. (not including north/south and east/west corridors).
- Hub to feature 500,000 sq. ft. of retail and restaurant space.
- Designed by renowned architect Santiago Calatrava.
- Hub will serve more than 100,000 daily commuters along with millions of annual visitors to the World Trade Center and Memorial.
- The most integrated network of underground pedestrian connections in all of New York City: linking PATH service, 13 different subway lines, the Battery Park City Ferry Terminal to the WTC Memorial, Towers 1, 2, 3, and 4, and the World Financial Center.
- An enhanced level of security for those who travel through the Hub, including $591 million worth of security infrastructure.

WTC Transportation Hub

The WTC Transportation Hub will restore and enhance the level of services that existed prior to September 11, 2001. The Hub will feature climate-controlled platforms and mezzanines with superior lighting and finishes. Commuters and visitors will be able to choose from a range of retail services, and make seamless transit connections using the Hub's fully integrated concourse, which will provide pedestrian access between the World Financial Center Winter Garden, PATH and the MTA New York City Transit's Fulton Street Transit Center.

MONTHLY HIGHLIGHTS

Steel workers are removing the temporary erection supports to the permanent columns under the PATH Hall roof. Steel erection progresses in Area 3, to the eastern portion of Tower 3. The temporary truck ramp is now in full operation.

CONSTRUCTION PROGRESS

PATH Work–DCM
The East Box Girder wedges have been removed along the D13 gridline. The contractor continues welding the field joints of the architectural ribs below the East Box Girder. DCM has re-commenced erecting the precast ducts above Track 1.

Transit Hall–Sorbara
DCM continues to erect steel and metal decking along T-2, T-3, and Church Street, and continues to erect the southern portion of the Dey Street Arch.

PATH Hall–SGS
SGS is excavating the soil and hammering the concrete buttress slab at footing F1, F5, F6 and F7 at the Vesey Street Liner Wall. The central duct work is completed and the duct work connecting the HVAC fan units are being installed.

Greenwich Street Corridor–Tutor Perini / TTJV
Tutor Perini/TTJV is working on punch list items at elevation 254' in Areas 1-10, and in various locations in Areas 17-20.

Route 9A– Brookfield / Turner
Workers continue crack and joint injection on the underside of the roof slab and walls in Zones 4 and 5. In the North Projection, the contractor is installing rebar at various levels: for the new floor slab at elevation 288', for the floor slab at elevation 267', and for new walls at elevation 254'.

Southern portion of the Dey Street Arch, which will connect the Hub to the Fulton Street Transit Center.

SPECIAL FEATURES

- The below grade Transit Hall will be constructed with over 1500 pieces and 8000 tons of typical wide-flange beam steel.
- The Oculus structure will be constructed with over 500 pieces and 12,000 tons of special-shape steel fabricated in Italy.
- The longest rafter or "wing" of the Oculus will be about 200 feet.
- There are two types of specially designed arches supporting the East West Connector reaching upward over 30 feet; type "A" arches weigh 25 tons and type "B" arches weigh 10 tons.

Fun Fact

Just how far has public transit come in New York City? The first subway was opened in October of 1904 and was 9 miles long – today it's 842 miles. New York City rates fourth in the world by ridership with 1.6 billion riders per year.

PROJECT PARTICULARS

- The VSC will be the checkpoint through which vehicles heading for the WTC's underground roadways and delivery points will pass.
- There will be approximately 50 spaces for tour bus parking.

Vehicular Security Center

The World Trade Center Vehicular Security Center and Tour Bus Parking Facility (VSC) will offer visitors, business tenants, and lower-Manhattan residents, a state-of-the-art facility with their safety and security as the foremost concern. The VSC is a below-grade structure that will be used to screen buses, trucks and cars entering the World Trade Center (WTC) site and its wide-array of facilities. In addition, the VSC will connect to an underground roadway system that will serve all of the office towers within the WTC site.

MONTHLY HIGHLIGHTS

The VSC is taking shape as steel erection and deck installations are progressing both in Phase I and Phase II.

CONSTRUCTION PROGRESS

In Phase I, workers continue detailing in Sequences 20 and 21, installing temporary water lines, forming walls and columns at the 223' elevation, installing rebar on decks in Sequences 11, 12, 13, 14, 15, 16, 18, and 19 at the 253', 274', and 302' elevations, and installing MEP conduits in Sequences 11, 12, 13, 14, 17, 18, and 19. In Phase II, workers continue steel erection, installing underslab MEPs, forming and pouring concrete for the Greenwich St. plenum, and pouring concrete flowable fill behind the T5 wall. Workers also continue hauling excavated material off the site as they continue with mass and rock excavation.

View of work at the VSC

SPECIAL FEATURES

- Structural redundancy, enhanced fireproofing, and extra-wide pressurized stairs
- Enhanced Security and Structural Integrity: Since ground water is close to the surface at the location of the VSC, foundation walls called slurry walls are being constructed. These walls isolate the excavated area from the surrounding soil and prevent water infiltration. The slurry walls are being constructed in a panel configuration composed of 29 panels.
- Innovative Panel Installation for Bathtub Walls: 29 interconnected concrete panels form the basement, or "bathtub," walls. These panels are 22 feet wide, by 3 feet thick, by 65 feet deep. They are created by digging a hole in the ground for a panel, placing a reinforcing steel cage in the hole, and finally filling the hole with concrete. Each rebar cage weighs approximately 25 tons.
- A Comprehensive and Challenging Logistics Plan: The panel wall operation requires close coordination with NYSDOT's Route 9A project, the National September 11 Memorial and Museum, and with access roads into the 130 Liberty Street deconstruction project.
- State-of-the-Art Construction Machinery with our Neighbors in Mind: World Trade Center Construction utilizes state-of-the-art equipment to dig, drill and erect as quickly as possible. Contractors are also required to retrofit construction equipment in order to mitigate noise in the surrounding community.

Fun Facts

The weight of the steel reinforcing bars used in the VSC foundation walls is equivalent to 1/10th of the total weight of the Eiffel Tower.

10,701 tons of structural steel.

700 tons of reinforcing steel at slurry walls.

Each rebar cage weighs approximately 25 tons.

Tower 2

PROJECT PARTICULARS

- Tower 2: 79-story tower (1270 feet tall) and 2.4 million square feet
- Tower 3: 69-story tower (1079 feet tall) and 2.0 million square feet
- Tower 4: 65-story tower (977 feet tall) and 1.8 million square feet

WTC Towers 2, 3 and 4

TOWER 2

Located at 200 Greenwich Street, this tower incorporates World Trade Center (WTC) site master planner Daniel Libeskind's "wedge of light" concept, and will cast no shadow on the Memorial Park on September 11. Tower 2 will feature a glazed crystalline form and a diamond-shaped summit. Designed by architectural firm Foster and Partners, the 79-story tower will be the second-tallest skyscraper on the WTC site and in New York City. Located east of the proposed Performing Arts Center and north of the WTC Transportation Hub, Tower 2 will rise to 1,270 feet and be topped by an 80-foot antenna.

The tower will consist of a central concrete core—steel encased in reinforced concrete—and an external structural steel frame. Safety systems will exceed New York City (NYC) building code and Port Authority of New York and New Jersey (PA) requirements.

TOWER 3

Located at 175 Greenwich Street, the tower's corners are column-free, to provide unobstructed panoramic 360 degree views. Tower 3 will be the third-tallest building on the WTC site. Designed by Richard Rogers of Rogers Stirk Harbour + Partners, the tower will be situated at the center of the various buildings around the Memorial. The 69-story tower will rise 1,079 ft feet above street level, and include 2.47 million rentable square feet of office space spread across 54 floors and five trading floors.

The tower will consist of a central concrete core—steel encased in reinforced concrete—and be clad in an external structural steel frame. Safety systems are planned to exceed NYC building code and PA requirements.

TOWER 4

Located at 150 Greenwich Street, the tower's minimalist, angular design completes the WTC master plan's descending spiral to the Memorial. Tower 4 will face directly onto the WTC Memorial Park from the west. Rising 977 feet, it will be the fourth-tallest skyscraper on the WTC site. Designed by Maki and Associates, the 65-story tower is intended to assume an understated but dignified presence at the site while also serving to enliven the urban environment as part of the redevelopment efforts.

The building will feature many structural enhancements, including a reinforced concrete core and columns with steel girders and beams. Safety systems will be designed to exceed NYC building code and PA requirements.

CURRENT CONSTRUCTION STATUS

Steel erection continues from the 58th through the 60th floors as core area walls are complete to the 50th floor at Tower 4. Curtain wall panels have been partially installed up to the 41st floor. Workers continue to install panels (mullions) and glazing at the ground floor west lobby.

Rebar and formwork are moving forward throughout Tower 2 and Tower 3.

Tower 3

Tower 4

PROJECT PARTICULARS

- The Central Chiller Plant (CCP) will utilize cool river water of up to 30,000 gallons a minute to cool and dehumidify air in the Memorial and Museum, the Shopping Concourses, the Vehicular Security Checkpoints, and the Performing Arts Center.
- Water discharged back into the river will not exceed 91 degrees Fahrenheit.
- The energy performance of the CCP will support its stakeholder's commitments to attain a level of energy efficiency that is at least 20% higher than the currently effective energy code.

Central Chiller Plant

WTC Infrastructure & Related Projects

CENTRAL CHILLER PLANT & RIVER WATER PUMP STATION

The Central Chiller Plant (CCP) is a 13,500-ton capacity system designed to provide air conditioning to the WTC Transportation Hub, National September 11 Memorial & Museum, retail space and other non-commercial areas. Located roughly in the same location as the pre-9/11 chiller plant, the CCP uses Hudson River water to make chilled water for distribution to these areas. This program includes the construction of the CCP, the renovation of the existing River Water Pump Station (RWPS), and the construction and commissioning of the chilled water distribution system.

STREETS, UTILITIES & RELATED INFRASTRUCTURE PROJECTS

The program encompasses creating and reconfiguring streets and rights-of-way, street lighting, public spaces and landscaped park areas, as well as creating new sidewalks and traffic controls. Work also includes installation of public utilities such as storm drainage, domestic water, sanitary sewers and fire protection. This scope-of-work facilitates the needs of various projects within the program.

PERFORMING ARTS CENTER

The Performing Arts Center (PAC) is included as part of the master plan and is in the early planning stages. The PAC will be located at the northwest corner of Fulton and Greenwich Streets, where it is separated at grade from One World Trade Center by a 60 feet wide public plaza. The center is anticipated to contain a 1000 seat auditorium, where it will be the permanent home of the Joyce Theater, one of the premier performance venues that supports the art of dance and choreography.

CONSTRUCTION PROGRESS

The Central Chiller Plant is currently operational, providing conditioned air to the below-grade spaces of the site, including the Museum. In total, six chillers are in place totaling 13,500 tons of capacity. Across the West Side Highway, work is substantially complete in the River Water Pump House, which serves as the main entry point for the Hudson River, providing the plant's main water supply.

Board materials for Streets Phase II-Package 2 (Tower 2) have advanced to the March Board, and submissions for Streets Phase II–Package I and the Pre-Purchase of Granite Pavers are being reviewed as contractors continue to develop shop drawings. Submission and Requests for Information (RFI) for the Pre-Purchase of Bollards are being reviewed. Logistics and construction sequence coordination for the subsequent Phase II–Final Streets and Sidewalk Surfaces contract packages continue.

In 2010, Mayor Bloomberg, former Governor Paterson, and Assembly Speaker Silver announced an agreement to create a $100 million fund for the Performing Arts Center at the World Trade Center Site with federal funds directed to Lower Manhattan. This agreement will help finalize details regarding infrastructure and program design in the future.

Model of Performing Arts Center

SPECIAL FEATURES

- Life Expectancy: The Chiller Plant has been designed to have a service life expectancy of 100 years.

KEY SITE SECURITY MEASURES DURING CONSTRUCTION

- Perimeter fence with anti-ram gates
- SWAC access required for contractor access
- Iris scan readers at MAC units, Smartcard passes, and new wireless scanners provide enhanced identity security
- Video Surveillance System for exterior perimeter, Memorial fence & eye-in-the-sky cameras (5)
- Off-site screening of box trucks destined for Gate 2A
- Random patrol of K-9s at Gate 1A
- Share CCTV feeds with NYPD
- PAPD, FDNY & WTC Security monitor cameras and access control through SAPS at SLCC and remotely

Fun Fact

The chiller plant will circulate enough river water every minute sufficient to fill 750 bath tubs or flush 10,000 toilets.

PROJECT PARTICULARS

- 1 WTC was completed in December 1970 and 2 WTC was finished in July 1971.
- 13.4 million square feet of office space.
- In addition to the twin towers, other buildings included the Marriott World Trade Center; 6 World Trade Center (the United States Customs Office); and 7 World Trade Center.
- About 50,000 people worked in the towers with about 200,000 visitors.
- The WTC site was so immense that it had its own zip code: 10048.
- 7 World Trade Center, which was 47-stories, was completed in the 1980s in the northern area of the site.

The Original World Trade Center

In the 1940s and 1950s, midtown Manhattan was bustling with commerce, while lower Manhattan was very much underutilized. To encourage revitalization of downtown New York City, banker and real estate developer David Rockefeller created the Downtown Lower Manhattan Association in 1959.

The following year, Mr. Rockefeller presented a visionary plan to develop a new world trade and finance center along the East River. The Port Authority of New York and New Jersey carefully reviewed the plan and subsequently issued a positive report on the feasibility of developing a new world trade center in lower Manhattan.

Since the Port Authority required consensus from both New York and New Jersey, it was decided in 1962 to move the new world trade center to the west side of Manhattan. This decision provided more easy access for New Jersey commuters who utilized business facilities via the Hudson & Manhattan (H&M) Railroad lines. As part of the agreement, the Port Authority acquired H&M Railroad, now known as PATH.

SPECIAL FEATURES

- Tube-Frame Design: Introduced by Fazlur Khan, this design approach allowed open floor plans rather than columns distributed within the interior to support building loads.
- Vierendeel trusses were spaced closely together to offer high strength support.
- The twin towers featured narrow office windows, which were only 18 inches wide.
- The building facades were sheathed in aluminum alloy.

Construction began on the North Tower in 1968 and on the South Tower in 1969. A "bathtub" was built with a slurry wall along the West Street side of the site, eliminating the infiltration of water from the Hudson River.

During the early 1960s, the Port Authority selected architect Minoru Yamasaki to design the original World Trade Center. His designs were unveiled to the public in January 1964. Once home to the Windows of the World restaurant, located in the North Tower, and the Top of the World Observation Deck, located in the South Tower, the twin towers were completed in the early 1970s, with an official ribbon cutting ceremony taking place on April 4, 1973.

Firms behind the original Twin Towers included: Worthington, Skilling, Helle & Jackson for Structural Engineering; the Port Authority Engineering Department for Foundation Engineering; Joseph R. Loring & Associates for Electrical Engineering; Jaros, Baum & Bolles for Mechanical Engineering; and Tishman Realty & Construction Company as the General Contractor.

Fun Facts

In October of 1970, the North Tower of the WTC exceeds the height of the Empire State Building, making it the tallest building in the world.

The final scene of the 1976 version of the King Kong film took place at the World Trade Center.

Phillippe Petit performs an unauthorized tightrope feat walking between the Twin Towers on April 7, 1974.

WHAT IS LEED?

Developed by the U.S. Green Building Council, Leadership in Energy and Environmental Design or LEED is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO_2 emission reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Learn more about the U.S. Green Building Council at: www.usgbc.org

Site Sustainability

With sustainability a vital factor in real estate development, the Port Authority of NY & NJ in conjunction with its stakeholders, have established the Sustainable Design Guidelines (SDG)—one of the most comprehensive sustainable criteria established to date. Realizing the immense scale of the project, the guidelines not only address the structures individually but also take into account the integration of each component and the site's overall impact on the environment. Combining the U.S. Green Building Council's LEED® Green Building Rating System™ with other urban scale/mixed used sustainable metrics, the guidelines go beyond the traditional models for green construction with the purpose of establishing a new level of sustainable quality for an urban model and identifying the pathways to higher performance over time.

KEY ELEMENTS

Four key elements are unique to the Guidelines:

1) Urban Environmental Quality – Attention to the sustainable qualities that the redevelopment site brings to the surrounding community and urban context of Downtown Manhattan

2) Whole System Compliance – Custom tailored guidelines for each development which integrate and overlap other project elements

3) Flexible Range of Options – Individual projects can draw from a large list of metrics all with a flexible range of scale

4) Integration of Building Design & Tenant Construction – Recognize the importance of integration of core and shell construction with tenant fit-out to capture maximum performance potentials

OBJECTIVES

In order to implement the Guidelines at the WTC Site, key objectives were developed to focus on the major components of sustainable design. Through proactive management plans and conservation initiatives, the objectives address critical measures of environmental requirements. In addition, awareness of the construction environment also plays a crucial role. The plans and initiatives focus on the following:

- Management Plans: Daylight/Solar Resources, Water Quality & Conservation, and Air Quality
- Conservation Initiatives: Energy and Materials

ALTERNATIVE COMPLIANCE PATH

As an additional measure of flexibility, compliance with the SDG's will also be satisfied through the Alternative Compliance Path. Some of the requirements include:

- Achievement of a LEED Gold certification from the U.S. Green Building Council
- Achievement of Net Zero CO_2 for all base building electricity consumption
- Reduce Whole Building energy consumption 20% below NY State Energy Code Requirements

SITE DEVELOPMENTS

Conforming to the Sustainable Design Guidelines will be:

- Transportation Hub
- Vehicular Security Center
- Central Chiller Plant

Conforming to the Alternative Compliance Path will be:

- One World Trade Center
- The 9/11 Memorial
- Towers 2, 3 and 4

Original WTC antenna that was once atop Tower 1.

HUDSON RIVER BULKHEAD

The Hudson River Bulkhead (HRB), on the west side of Route 9A, is eligible for listing on the State and National Register of Historic Places. Acknowledging this distinction and the reality that this resource would be impacted by construction activity at the WTC Transportation Hub, an Archaeological Resource Monitoring, Treatment and Mitigation Plan and a NYS Museum permit application was prepared, submitted, and approved in accordance with the Memorandum of Agreement.

Preserving History at the World Trade Center

The original World Trade Center complex (WTC) consisted of seven buildings and six below-ground levels, spread across approximately 16 acres. 1 WTC and 2 WTC were the Twin Towers (north and south respectively); 3 WTC was the Marriott Hotel; 4 and 5 WTC were low-rise commercial office buildings; and 6 WTC, which served as the U.S. Customs House.

PROJECT

- Scores of people raced down the Survivor Stairs to flee the World Trade Center attacks. The stairs once led down to Vesey Street from the Austin J. Tobin Plaza of the original World Trade Center.
- The Survivor Stairs is the only above-ground remnant of the Trade Center complex. The 5-foot wide, 37-step remnant will be showcased along side the main steps leading into the Museum. This 14,000 lb. remnant still has some of the top steps clad in granite.
- The Survivor Stairs provided a viable means of egress because they could be reached by walking alongside 6 World Trade Center, the U.S. Custom House, which had deep overhanging eaves that protected people fleeing the North Tower from falling debris.
- The Survivor Stairs remnant was relocated to an interim location at the WTC site in the area of the Memorial on March 9, 2008.

Survivor Stairs to be showcased in the future Museum.

SPECIAL FEATURES

- Part of the Hudson River Bulkhead, approximately a 62-foot section, has been removed to allow construction of an underground passageway between the World Trade Center and the World Financial Center.

Hudson River Bulkhead

Fun Facts

The Hudson River Bulkhead was proposed in 1870 and took 60 years to construct. This engineering feat of the time runs from Battery to 59th Street. The structure, which made the ports of New York dependable to navigation, was the brainchild of General George B. McClellan, chief engineer of the City's Department of Docks—yes, the General George B. McClellan who once led the Union troops. The section that parallels the WTC site was built between 1899–1915.

As late as 1910, no railroad coming from the South or the West had a direct connection to New York City. Construction of the tubes running under lower Manhattan, the "Montgomery – Cortlandt Tunnels" began in 1902. These twin tubes were 5,976 feet long and were 92 feet below the river. Each tube had a diameter of 15 feet, 3 inches. Successful construction of these tubes utilized tubular cast iron construction. The tubes were an engineering marvel of the day; the first transportation tunnel under a major river—even pre-dating both those of the New York Subway system and the Pennsylvania Railroad's entry into Manhattan.

Original 9/11 PATH Cars in Storage

SPECIAL FEATURES

- The Port Authority acknowledges historic structures adjoining the WTC site. Fully acknowledging these adjacencies and their significance, the Port Authority and its contractors have maintained a program of vibration monitoring at locations near these historic properties.

Original PATH Station

Preserving History at the World Trade Center (continued)

CONSTRUCTION PROGRESS

- The Port Authority worked cooperatively with the State Historic Preservation Offices (SHPO) and the Lower Manhattan Emergency Preservation Fund (LMEPF), in accordance with The Lower Manhattan Development Corporation's (LMDC's) Final Mitigation Plan for Adverse Effects on the Vesey Stair Remnant, to develop the methodology for an intact move of the Survivor Stairs (remnant).
- The Port Authority continues to follow the requirements for protection of cultural and histories resources as described in the project Memorandum of Agreement (MOA) and, further described in the project Resource and Protection and Construction Protection Plans that involve a project history architect.
- Monthly site visits and reports are performed to address compliance with Environmental Performance Commitments (EPCs) for cultural and historical resources. The periodic site visits consist of inspecting the protection of the Footprints (North & South Tower Column Remnants), the West Slurry Wall of the West Bathtub, the E-Line subway entrance, and the Survivor Stairs (Vesey Street Stair remnant) to assess if any maintenance is required.

HUDSON AND MANHATTAN STRUCTURAL STEEL RINGS

As the Port Authority completed work to support or underpin the 1-Line Subway and remaining portions of the Hudson & Manhattan tubes were demolished, several sections of the iron rings were preserved and temporarily relocated to JFK Hangar, until the Museum is completed.

Last column returns in August 2009.

Rendering of original steel beams to be showcased in future Museum.

Fun Facts

April 4, 1909, marked the opening of the Hudson Terminal, the twin 22-story office buildings built over the terminal of the Hudson & Manhattan Railroad, located on the west side of Church Street between Cortlandt and Fulton Streets. Containing 815,000 square feet of office, this structure was proclaimed the world's largest office building at that time. Service in the Montgomery-Cortlandt Tunnels began on July 19, 1909.

Who was Austin J. Tobin (the namesake of the plaza for the original WTC)? Mr. Tobin joined the Port Authority in 1927, and devoted 45 years of service to the Port Authority. He served as Executive Director of the Port of New York Authority (precursor to the Port Authority of New York & New Jersey) from 1942 through 1972. Mr. Tobin oversaw the development of the original WTC.