

# World Trade Center Construction Fact Sheets August 2011

## 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.



## 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, are being 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, NY; Shanksville, PA; and Washington, D.C., as well as the World Trade Center bombing in 1993.

"Reflecting Absence," the Memorial, will consist 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 will be inscribed around the edges of the Memorial waterfalls. The Memorial Plaza will serve 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 Port Authority is on schedule to complete the Memorial Plaza and Pools for the 10th anniversary as promised. With over 213 trees planted, contractors are punch listing the Plaza as they continue to test the water in both Pools. Cladding work is near completion at the West Vent Structure while significant progress is being made on the fit-out of the Museum interior spaces.

### CONSTRUCTION PROGRESS

#### Plaza

Contractors continue to install stone pavers, light poles, access hatches, irrigation piping, trench grating, edge angles and tree well covers. Final cleanup in completed areas of the Plaza is well underway with power washing of the stones occurring daily.

A perimeter fence is being installed around the boundary of the Memorial which will ultimately separate visitors to the Plaza from the ongoing work around the site. Power is being run along with the fence in order to install lights and cameras on top of the surrounding boundary

#### Pavilion

The Pavilion mechanical and electrical contractors are currently installing sleeves throughout the building while the curtain wall contractor is installing storefront glass on the south elevation of the Pavilion in addition to completing work in the soffit.

#### North Quadrant

The north pick opening was closed and the area was built up to final grade. The sitework contractor placed subslab east of the North Pool to complete the tie in to the Hub structure. Over 400 cubic yards of soil was placed in the northwest corner of the Plaza.

#### South Quadrant

The kneewall and bronze name parapets of the South Pool are in place and the installation of the bronze cap rail has begun. The lights in the South pool were tested after dark to ensure proper working order in preparation for the 9/11 anniversary.



### 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 being constructed over the footprints of the original World Trade Center Twin Towers.
- Exhibition space and a visitors' center will be housed above-grade in the Pavilion. Visitors to the expansive below-grade museum galleries will experience part of what previously stood; open views of the original slurry wall and the supporting bedrock sub strata.

### Fun Facts

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: 2,600,000 square feet
- Structural Steel: Approximately 45,000 tons
- Concrete: 200,000 cubic yards
- The 187-foot-high base will be clad in over 2,000 pieces of prismatic glass
- Lobby Height: 50 feet (Part of Building Base)
- 9 Escalators and 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

Soon to become New York City's tallest skyscraper, One World Trade Center was designed by architect David Childs. One World Trade Center features 3,500,000 square feet of space, composed of offices, an observation deck, world-class restaurants, 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.

### MONTHLY HIGHLIGHTS

Over 30,000 tons of steel (over half the building total) have been installed at One World Trade Center, and with more than 1,100 workers in the building each day, construction progress has been hitting one floor per week cycle for the past three months.

### CONSTRUCTION PROGRESS

#### Superstructure Steel

Steel erection is complete through the 76th floor. Tower cranes are jumped in preparation for erecting to the next tier—floors 77 and 78. Application of spray on fireproofing is near complete at the 58th floor.

#### Superstructure Concrete

The south core shear walls are cast to the 67th floor. The north core shear walls extend up to the 66th floor and floor slabs are complete through the 69th floor.

#### Building Enclosure

Curtain wall installation is in progress at the 51st floor. Installation of slab anchors is complete up to the 70th floor. The perimeter smoke seal is complete up to the 26th floor. Punch list work continues at the podium louver wall system.

#### MEP and Utilities

The electrical feeder cable has been pulled between all four electrical service points-of-entry (POE) to the power distribution center. Cable pulls between the POEs and the below grade Con Ed structures is complete at three of the four POEs. Structural modifications to the Vesey Street structure between Washington and Greenwich Streets to facilitate installation of the below grade steam service pipe is complete. Steam line supports are installed just west of the north access with the steam line installation itself following close behind.

#### Interiors

Interior fit-out continues at the core area between floors 21 and 33. Core bathrooms are framed to the 33rd floor. Support steel for granite vanity tops is installed to the 26th floor. Interior drywall partitions are framed to the 26th floor with wallboards installed and taped up to the 24th floor. The 20th bathroom mock-up awaits architect approval. Bricklayers resumed operations at the B3 level adjacent to the loading dock and stairwells K and I.



### 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 45,000 tons of structural steel, the equivalent of 22,500 full-size passenger cars. Recognized New York City buildings, 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

Significant progress was made this month with the erection of all 4 super columns and all 9 sections of the Vierendeel Truss. All segments of the West Arch Truss are erected and aligned. The East Box Girder is nearing completion as workers continue ongoing bolting, pre-heating and welding work at the site.

### CONSTRUCTION PROGRESS

#### PATH Work

DCM erected the last of 9 pieces of the Vierendeel Truss. The contractor has erected additional backspan roof ribs at the south east corner of the PATH Hall roof, and continues welding and fit-up across the roof at previously erected members. Additional members of the East Box Girder have been erected at the southern end. Bolting, welding and fit up continues at previously erected members. Cap plates for the eastern super columns have been delivered and erected. Welding and fit-up continues on all four super column base plates, and at both the East and West Tied Arches. Additional pieces of the east arch have been delivered to the site and are being prepared for erection. Invert and roof beam connections continue to be bolted up.

#### Greenwich Street Corridor–Tutor Perini / T/TJV

Vertical blast plate installations continued at the South Tunnel in Areas 7–9, at elevation 262'–241', while both the construction of the concrete slab on grade floors in Areas 1–2, and the additional work for the sanitary sewer and electrical conduit installation at in Areas 3–6 were completed. Work continued on the removal of existing invert concrete and waterproofing, along with construction of new wall footings and liner walls in the North Tunnel, Areas 17–20 at elevation 236'–241'. Concrete placement for columns C-222, 223, and 225, PAC liner wall footing in Area 19–20, and the last footing no. 19.3 at elevation 241' were also completed.

#### Route 9A– Brookfield / Turner

Backfill operation to elevation 300' was completed in Zone 2. Excavation down to sub-grade for the floor slab continued in Zone 3, while workers continued to install whaler beams at the north and south secant wall in Zone 4. For Zone 5, the chopping of the demising wall (lower section) between Zones 4 and 5 was completed.

*Final sections of the Vierendeel Truss are in place.*



### SPECIAL FEATURES

- There are two types of specially designed arches supporting the East-West Connector: Type "A" arches weigh 25 tons; Type "B" arches weigh 10 tons.
- The arches reach upward over 30 ft.

### Fun Facts

Amount of steel to build the Hub (over 22,000 tons) is equal to the weight of the USS New York or roughly twice the steel used to build the new Yankee Stadium.

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.



## 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.

### 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.

### MONTHLY HIGHLIGHTS

The steel contractor W&W has been mobilized with the first delivery of steel to the Phase I site. Jet grouting around the eastern part of the site is nearly complete as workers continued to demolish the demising wall.

### CONSTRUCTION PROGRESS

At Phase I, workers placed slabs and walls in the mechanical room lower area and prepared the areas between the buttresses for slabs at elevation 253'. Soil was loaded out in the east side as workers began coring Greenwich tiebacks. At Phase II, workers began production welding on brackets and walers on Greenwich Street and started to chop slabs at elevation 278'.



### 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 will 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 Fact

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.



## 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 71-story tower will rise 1,140 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 975 feet, it will be the fourth-tallest skyscraper on the WTC site. Designed by Maki and Associates, the 64-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

Construction is currently ongoing on Tower 4. The layout of foundations and footings for Tower 2 and Tower 3 has begun.



### PROJECT PARTICULARS

- Tower 2: 79-story tower (1270 feet tall) and 2.4 million square feet
- Tower 3: 71-story tower (1140 feet tall) and 2.0 million square feet
- Tower 4: 64-story tower (975 feet tall) and 1.8 million square feet





### 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

### THE CENTRAL CHILLER PLANT

The Central Chiller Plant (CCP) is a 12,500-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 will use Hudson River water to make chilled water for distribution to these areas. In addition to the construction of the CCP itself, the scope of this program includes the renovation of the existing River Water Pump Station (RWPS) and the construction of the chilled water distribution system.

### STREETS, UTILITIES & RELATED INFRASTRUCTURE PROJECTS

The Downtown Redevelopment 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. The redevelopment also calls for infrastructure modifications to essential systems 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 60 feet. The center is anticipated to contain a 1000 seat auditorium, where it will be the permanent home of the Joyce Theater, a prestigious modern dance company.

### CONSTRUCTION PROGRESS

The Central Chiller Plant is quickly taking shape, with all of the major equipment in place less than a year since construction began. In total, six chillers are in place totaling 13,500 tons of capacity. Across the West Side Highway, work is well underway in the River Water Pump House, which will serve as the main entry point for the Hudson River, which provides the plant's main water supply.

The Streets Project Team has started steamwork south at South Greenwich Street as the 16" main is being installed. The telecom vault on top of the east girder is now in place and the installation of utilities and interim surfaces in the Greenwich Street area is ongoing. Design and construction coordination continued for the subsequent Phase II - Final Streets and Sidewalk Surfaces contract packages. The Pre-purchase of the granite pavers was approved by the July Board.

Last year, 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.

### Fun Fact

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



## 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.

### 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.

*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.

### 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.

### 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<sub>2</sub> 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](http://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<sub>2</sub> 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.*

## 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 PARTICULARS

- 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 and bodies.
- 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

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.

#### 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 that 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 Bath tub, 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.



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.