East River Bridges

A $3.6 billion reconstruction program is underway to rehabilitate all four East River crossings. In 2008, these bridges carried some 477,211 vehicles per day. In 2002, working in coordination with the NYPD and other law enforcement agencies, the Division implemented enhanced security measures on these bridges. This work is ongoing.

In 2009, the Manhattan, Queensboro, and Williamsburg Bridges were designated National Historic Civil Engineering Landmarks by the American Society of Civil Engineers, which had previously landmarked the Brooklyn Bridge in 1972.

Water Taxi and NYFD Fireboat near the Brooklyn Bridge in 2009. (Credit: Jagtar Khinda) Motor Yacht Eastern Star Preparing to Pass Under the Brooklyn and Manhattan Bridges in November 2009. (Credit: Bernard Ente)

BROOKLYN BRIDGE

Arguably the most influential bridge in American history, the Brooklyn Bridge remains one of New York City's most celebrated architectural wonders. Designed by the brilliant engineer John Augustus Roebling, and completed by his equally ingenious son Washington Roebling and daughter-in-law Emily Roebling, this elegant structure was, at the time of its completion in 1883, the longest suspension bridge in the world. It was declared a National Historic Landmark in 1967.

Moon Over the Brooklyn, Manhattan, and Williamsburg Bridges. (Credit: Michele N. Vulcan)

Engineering Landmark Plaque. (Credit: Michele N. Vulcan) 1899 Plaque Near the Franklin Truss of the Bridge, Marking the Site of George Washington's First Presidential Mansion, Franklin House. (Credit: Hany Soliman) 1991 New York City Landmark Plaque. (Credit: Peter Basich)

Historic Landmark, 1954 Reconstruction, Two Cities, and Roebling Memorial Plaques. (1954, Cities & Memorial Credit: Michele N. Vulcan)

The Brooklyn Bridge carried some 123,781 vehicles per day in 2008. The $832 million reconstruction commenced in 1980 with Contract #1, and continues with Contract #6, scheduled for completion in 2014. This contract includes the rehabilitation of both approaches and ramps, the painting of the entire bridge, as well as the seismic retrofitting of the structural elements that are within the Contract #6 project limits.

Brooklyn Bridge Ramps and Arches. (Credit: Maria Mikolajczyk)

Seismic retrofitting of the remaining bridge elements requiring strengthening will be carried out under a separate contract by the end of 2017. Work completed on the bridge to date includes reconditioning of the main cables, replacement of the suspenders and cable stays, rehabilitation of the stiffening trusses, and the replacement of the suspended spans deck.

The $25 million recently completed construction contract replaced the four existing travelers with a new state-of-the-art technology system including motors, reducers, braking systems, electrical controls, programmable logic controller system, and trouble shooting devices, as well as AC motors that provide enhanced operational performance and gear boxes that increase life cycle and reliability of the new travelers. A Notice to Proceed was issued to the contractor with a start date of November 22, 2006. During 2007, the existing track beams, supports and electrical equipment (including conductor bars, transformers, conduits, wires and breaker boxes) were removed. All four travelers were removed in November 2007. The fabrication work for the new travelers to be installed was underway at the end of 2007.

2007: Brooklyn Side Traveler. (Credit: Michele N. Vulcan) 2007: Working on a Traveler. (Credit: Peter Basich)

Removing the Brooklyn Bridge Main Span Travelers in 2007.

During 2008, approximately 2,500 feet of new track beams, their supports and new electrical equipment were installed. The first new traveler was installed in June 2008, and the remaining three were installed in November and December of 2008.

The remaining work was completed in 2009, including the field testing of the travelers' electrical system, the installation of the approximately 250 feet of track beams, their supports and

conductor bars, painting, and finally, the removal of the temporary platform and demobilization. The traveler replacement contract was substantially completed on July 8, 2009, and all work was completed by August 31, 2009.

Track Beam Removal in January 2008. First Platform Lift in June 2008.

Lifting Traveler #4 in June 2008. Lifting the New Manhattan Main Span Traveler to the Underside of the Bridge on November. 20, 2008. (Main Span Credit: Bojidar Yanev)

Contract #6

A Notice to Proceed for this $508 million project was issued to the contractor with a start date of January 19, 2010. The ramps and approaches to the Brooklyn Bridge are in need of rehabilitation and repair, to improve safety and reduce congestion along both the Brooklyn-side and Manhattan-side approaches, particularly from the FDR Drive. With stimulus money from the federal government's American Recovery and Reinvestment Act, the ramps in Brooklyn and Manhattan will be rehabilitated and widened and the entire bridge will be repainted to prevent steel corrosion on the structure.

Ramps A , C, and F Will be Widened.

The approach roadway to the Brooklyn Bridge is aging, with a failed membrane system and deteriorated closure walls. The existing roadway pavement above the historic arch blocks and masonry structures will be rehabilitated. A precast concrete roadway slab will be installed in

segments, over sprayed-on waterproofing membrane. Rusted historic railings at Franklin Square, York, and Main Street structures, some from the original bridge construction, will be refurbished and reinstalled. The existing ramp from the FDR southbound roadway will be widened from one to two lanes to reduce bottlenecks and pinch points in traffic flow. All steel structures, including the ramp structures and the main span, will be painted, restoring them to their original Queensborough Tan color, as chosen by the Landmarks Preservation Commission.

On all the bridge approach structures on both the Manhattan and Brooklyn sides, the existing deck will be removed by lifting out sections and replacing them panel by panel with precast concrete-filled steel grid deck panels. This approach will greatly reduce noise from drilling and jackhammers, and will also increase the reliability of the start and end times of construction activities every night.

Painting work, to prevent steel corrosion and improve aesthetics, will likely be the first phase of this project, and will occur in negative-pressure containment units that travel along the bridge structure, high above the traffic. All three travel lanes will be maintained during the course of this work, and painting will take approximately two years. Equipment will be placed on barges anchored to the Manhattan tower, and on land abutting the Brooklyn tower. Dust collection, vacuum and recycle units will be employed to minimize environmental air quality risks, and there will be continuous air monitoring during operations. All painting work will be conducted in accordance to the US Environmental Protection Act and NYS Department of Environmental Conservation requirements. Noise generated by these units will conform to the NYC Noise Code standards adopted in 2007.

On the Brooklyn side, two lanes of free-flowing traffic will be created at the Cadman Plaza exit, and approach roadways will be rehabilitated to replace the membrane system and deteriorated closure walls. On the Manhattan side, the Franklin Square Arch will undergo seismic retrofitting, rusted railings and safety barriers will be replaced, and two lanes of free-flowing traffic will be created from the southbound FDR Drive onto the Brooklyn Bridge.

The contract allows for 24 weekend closures over the four year period; however, the contract also contains clauses that encourage fewer weekend closures with monetary compensation. Although the promenade will be open, there will be sections immediately under the painting area, which will be narrowed by a foot on each side to facilitate work.

In the fall of 2008, to compare options for energy efficiency, we replaced 20 100-watt mercury vapor lamps of the necklace lights on the Brooklyn and Manhattan Bridges with 10 LED fixtures and 10 induction fixtures. The test was completed in spring 2009; we chose an LED fixture in a dish style and will obtain them for the Queensborough, Williamsburg and Brooklyn Bridges. The test fixtures were removed on April 24, 2009. The replacement of the existing mercury vapor lights on the Queensboro and Williamsburg bridges will take place in 2010. The replacement of the Brooklyn Bridge necklace lights will not be scheduled until the completion of Contract #6.

Supervisor Electrician Ben Cipriano in October 2008 With Both Mild and Bright Induction Light Fixtures for Testing. For Comparison Purposes, There is a Mix of Clear and Frosted Globes. (Credit: Russell Holcomb)

MANHATTAN BRIDGE

The youngest of the three NYCDOT suspension bridges that traverse the East River, the Manhattan Bridge carries some 395,841 commuters – 70,341 vehicles and 325,500 mass transit riders - between Manhattan and Brooklyn daily. It was designed by Leon Moisseiff and completed in 1909. The bridge supports seven lanes of vehicular traffic, a bikeway and walkway, as well as a subway transit line upon which four different train lines operate.

Water Taxi Approaching the Manhattan Bridge. (Credit: Peter Basich) Bridge Detail and Coleman Playground at Monroe Street Under the Bridge. (Credit: Bernard Ente) Construction Plaque. (Credit: Peter Basich) Bridge in July 2009. (Credit: Bernard Ente)

The $900 million reconstruction commenced in 1982 with Contract #1, progressed with Contract #10, and continued with Contract #11, substantially completed on April 29, 2008. This work now

continues with Contract #14 to rewrap the cables and replace the suspenders and 168 necklace lights. Completion is expected in 2013. The reconstruction will end with a seismic retrofit of the bridge, slated to begin in 2016. Work completed on the bridge to date includes reconstruction of the south and north upper roadways, reconstruction of the north and south subway lines, installation of a truss stiffening system to reduce twisting, restoration of the Manhattan Plaza, including the historic arch and colonnades, reconstruction of the south walkway, installation of a new north bikeway, replacement of the lower roadway, and rehabilitation of the Brooklyn Plaza.

"The Spirit of Commerce" Sculpture and the Underside of the Arch. Part of the Colonnades. (Credit: Peter Basich) The Historic Arch. (Credit: Earlene Powell)
The "Native American Buffalo Hunt" Sculpture Panel. (Credit: Peter Basich)

Contract #14

Most of the existing suspenders on the Manhattan Bridge were installed under a $2.2 million contract with Roebling and Sons in 1956 and was one of their last before closing their Bridge Division in 1964. Under Contract #14, the existing cable wrapping of the 622 vertical cables will be replaced with wire wrapping and a neoprene barrier to insulate from weather. A Notice to Proceed for this $149 million project was issued to the contractor with a start date of December 28, 2009.

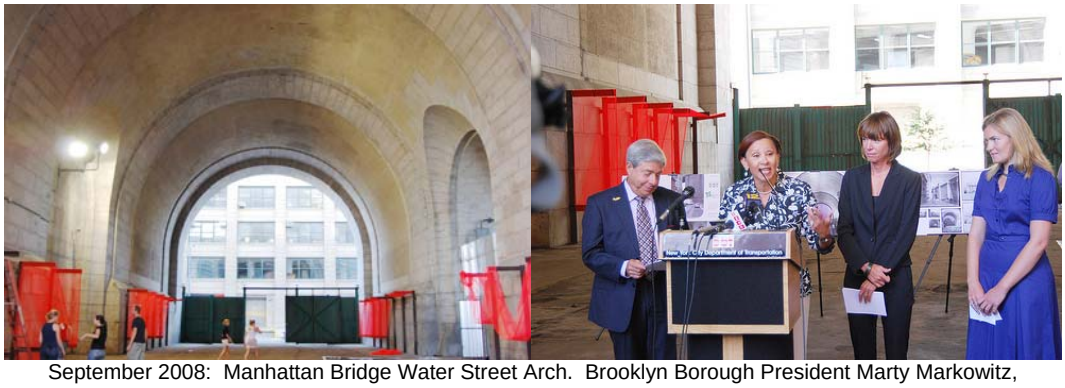
Water Street Arch

For nearly two decades, DUMBO was split in two. The Division of Bridges had long used the 46-foot-wide archway beneath the Manhattan Bridge as bridge metal storage space, which worked well enough when DUMBO was more of an industrial zone. Now, one of the City's hottest neighborhoods, where new developments are springing up daily, DUMBO's denizens are clamoring for more public space.

With our demonstrated commitment to creating public space citywide, the Agency moved quickly to answer the call and "bridge" this long-standing divide. By moving the Division of Bridges' storage materials out of the Water Street archway, we were able to re-open the archway and connect the two parts of the neighborhood that were separated for 17 years. The space, along Water Street between Adams Street and Anchorage Place, is now a unique destination for

residents, public space aficionados, and one day will be a key link in the Brooklyn Waterfront Greenway route. It was partially reopened on September 8, 2008.

But moving the materials out and re-opening the archway was just the first step. The Agency worked with the DUMBO Improvement District to remove the asphalt to reveal the passageway's historic cobblestone, and to add lighting and wooden benches to the archway where users can linger and relax. Opening the DUMBO archway builds on the public plaza built last year at Pearl Street triangle, adjacent to the archway. The archway completely opened on April 19, 2009, coinciding with the Manhattan Bridge's 100th birthday.



September 2008: Manhattan Bridge Water Street Arch. Brooklyn Borough President Marty Markowitz, Congresswoman Nydia Velazquez, Commissioner Janette Sadik-Khan, and DUMBO Improvement District Executive Director Kate Kerrigan. (Credit: DUMBO NYC)

Completely Repaired Water Street Arch in April 2009.
(Credit: DUMBO NYC)

On September 8, 2008, Researchers From Columbia University and Engineer-In-Charge Brian Gill (at Right) Climbed the Manhattan Bridge and Installed Accelerometers and GPS Sensors to Monitor the Overall Dynamic Behavior of the Bridge to Improve Computer Modeling Techniques for a Possible Reduction of Seismic Retrofit Modifications.
(Bridge Climb Credit: Bojidar Yanev)

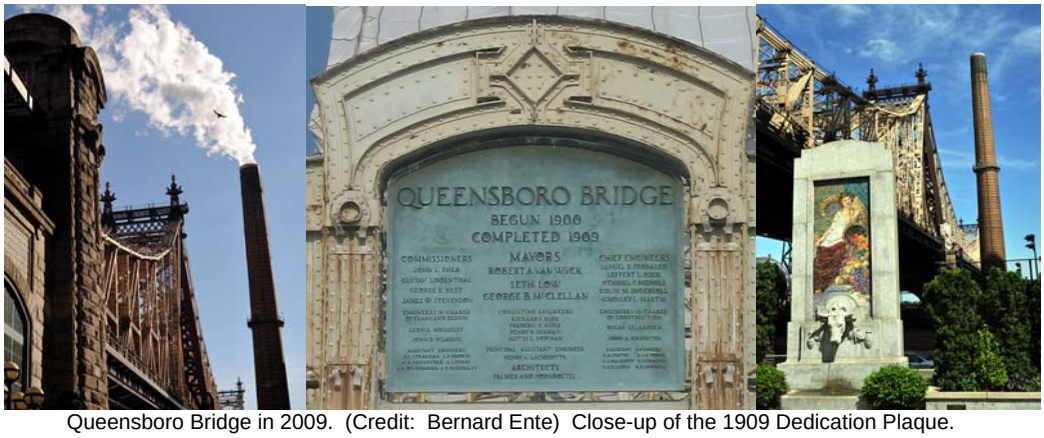
Conducting Soil Borings in November 2008 as Part of the Seismic Retrofit Design of the Manhattan Bridge. Drilling to a Depth of Approximately 210 Feet to Obtain an 8-foot Long Hard Rock Sample. A 2 1/2 –Foot Long Hard Rock Sample Taken From a Depth of Between 202 and 204 ½ Feet.

Installing the National Historic Civil Engineering Landmark Plaque on the Manhattan Bridge on September 30, 2009: Area Selected for the Plaque. (Credit: Earlene Powell) Bricklayers Vincent Sciulla and Luigi Cuffari, Cement Mason Frank Finizio, Supervisor Bricklayer Edward Alfano, and Highway Repairer Thomas Engelken. The Plaque was Recessed in the Granite Stone. (Credit: Thomas Whitehouse) The Plaque. (Credit: Jagtar Khinda)

New York City celebrated the centennial of the bridge in October 2009, in a celebration organized by the NYC Bridge Centennial Commission. Festivities included art shows, lectures a light show and fireworks, and the unveiling of the National Historic Civil Engineering Landmark plaque. A capstone for the celebration will occur in 2010 when the bridge's history will be memorialized with a time capsule. It will contain items such as a photo of the Bridge Commission, a newspaper from December 31, 2009, the Division's Bridges and Tunnels Annual Condition Report, a sample tool commonly used by Bridge Maintenance and a list of the names of Division staffers who currently maintain the bridge. The capsule will be placed on the Manhattan side of the bridge.

QUEENSBORO BRIDGE

At the time of its completion in March 1909, the Queensboro Bridge (popularly referred to as the 59th Street Bridge), was the longest continuous cantilever-truss bridge in the world. While its starring role in the hierarchy of bridges has since been eclipsed by longer and larger structures, the Queensboro Bridge's importance to the mobility and unity of New York City remains undimmed. The bridge was designated as a national landmark on November 23, 1973. The $806 million reconstruction commenced in April 1981 with Contract #1, and continued with Contract #6, which began on October 31, 2003, and was substantially completed on September 30, 2007, and will end with a seismic retrofit of the bridge, slated to begin in 2016. Work completed on the bridge to date includes the rehabilitation of the lower inner roadways, the lower outer roadways, and the restoration of the Guastavino arches and Bridgemarket area. The south outer roadway is open to automobile vehicular traffic, and the north outer roadway is open to pedestrians and bicyclists. The work on this vital link between Manhattan and the outer boroughs will enable this 75,000-ton workhorse to better provide the citizens and commerce of New York City with a second century of reliable, prosperous transport. The Queensboro Bridge carried 176,306 vehicles per day in 2008.



Queensboro Bridge in 2009. (Credit: Bernard Ente) Close-up of the 1909 Dedication Plaque. (Credit: Peter Basich) The Granite Fountain, Built in 1918 for a Farmers' Market Beneath the Bridge, was Rededicated in June 2003 After Restoration. Evangeline Blashfield was the Model for the Fountain's Glass Mosaic of a Woman With a Cornucopia. Her Husband, Artist Edwin Blashfield, Designed the Work. (Description: Greater Astoria Historical Society, Roosevelt Island Historical Society. Credit: Bernard Ente)

Contract #6

Contract #6, which began on October 31, 2003, included the following: condition investigation of the eyebar heads and pins, replacement of the protective screening drainage improvements, rehabilitation of the overhead sign structures in Manhattan, the upgrading of roadway lighting (by replacing all low-pressure sodium lights on the bridge and ramps with high-pressure sodium lights), cleaning and miscellaneous repairs of the anchor piers, the geometric improvement of Crescent Street, bikeway and walkway improvement, and repair of the south upper roadway concrete overfill and overlay, the promenade platform, the traveler platform, the sidewalk between 61st and 62nd Streets, and the underside of the 59th Street overpass. The work also included the rehabilitation of the Sanitation Department area's arch infill, and modifications to the maintenance facility beneath the Manhattan approach plaza. In addition, the kiosk in the plaza on the Manhattan side of the bridge was restored. This small historical structure was in an advanced state of disrepair and had been damaged by repeated vehicular impacts. This $43 million project was complete by the end of December 2008.

A separate contract to replace the bridge aviation lights is expected to begin in spring 2010.

September 2008: Looking West From Tower 1. (Credit: Russell Holcomb)
Bridge Detail in 2009. (Credit: Bernard Ente)

Protective Coating

The $168 million Queensboro Bridge painting contract commenced in January 2004. The Department and its contractor strictly adhered to the safety requirements regarding lead paint removal as approved by the United States Environmental Protection Agency and the Occupational Safety and Health Administration, New York City Departments of Health and Environmental Protection, and the New York State Departments of Health and Environmental Conservation.

The work was performed within an entirely sealed Class 1A containment system (under negative pressure) which acts as an added safety measure to prevent any materials from escaping into the air. Filtration of the enclosed air prevents paint waste dust from being released. The Department placed several air monitoring stations in the area around the bridge. The Department performed continuous monitoring and testing of the soil and air quality as well as noise levels in the area surrounding the containment enclosure to minimize impacts and ensure the safety and quality of life for workers and residents nearby.

Platform Installed for Painting of the Queensboro Bridge. (Credit: Vadim Sokolovsky)
Working Inside the Containment. Protected Roadway.

By the end of 2005, the contractor completed cleaning and painting the Manhattan and Queens anchor piers; the Manhattan approach; ramp A; the off ramp and ramp B over the Silver Cup Studio parking lot; the off ramp over Queens Plaza South towards 13th Street; approaches B and C from 23rd Street to Thompson Avenue (except over the railroad tracks); the Queens approach underside of the lower roadways (from 21st Street to Vernon Boulevard); the main bridge underside of the lower and upper roadways from PP123 to PP68; and the main bridge above the upper roadway from PP77 to PP109.

By the end of 2006, the contractor completed cleaning and painting the Queens approach at the inner roadways from PP0 to PP39; at the main span's inner and under upper roadways above Roosevelt Island and one half of span #2 from PP75 to PP37; the main span trusses above the upper roadway from the Manhattan anchor pier to the Roosevelt Island west tower has been completed from PP0-PP15, PP30-PP47, and PP109-PP123; and the ramps on the Queens side

over the LIRR tracks. Installation of cables and platform, on the main span under the lower roadway from PP17 to PP37, was also underway.

Protective Coating in 2006: Inside the Containment Rigging at Span #1. Finish Coat on the Trusses at Span #5 on the Upper Roadway. Class 1A Containment Installed on the Trusses at Span #2, And the Working Platform Above the South Outer Roadway.

By the end of 2007, the contractor completed cleaning and painting the Queens approach at the inner roadways from PP90 to PP39; at the main span's inner and upper roadways from PP1 to PP37; and the main span trusses above the upper roadway from PP30-PP15 and PP47-PP55. The installation of containment rigging along the upper roadway on Span 3 was also underway.

Protective Coating in 2007: Middle and Last Part of the Year.

Bridge Detail in 2008. (Credit: Bernard Ente)

By the end of 2008, the contractor completed cleaning and painting the upper roadway trusses on Span 3, the entire Queens approach the entire structure at the main span's inner and upper roadways; and the main span trusses above the upper roadway.

In winter 2008 and spring 2009, the contractor completed touch-up of the work areas and various punch list items including the towers' interiors, the travelers, and the curbs on the outer roadways.

Active measures were taken to reduce noise at its source, such as the use of mufflers, sound screens, low noise producing equipment, and noise blankets. Light shields were utilized to reduce glare from work lights. The painting contract was substantially completed on July 8, 2009.

DEP Sludge Boat "Red Hook" Passing Under the
Queensboro Bridge in June 2009.
(Credit: Bernard Ente)

WILLIAMSBURG BRIDGE

The largest of the three suspension bridges that traverse the East River, the Williamsburg Bridge carries some 206,783 daily commuters – 106,783 110,545 in vehicles and 100,000 via mass transit - on eight traffic lanes, two heavy rail transit tracks, and a pedestrian footwalk, between Manhattan and Brooklyn. The bridge supports a subway transit line upon which three different train lines operate (J, M, and Z). The $1.2 billion reconstruction commenced in 1983 with Contract #1, and continues with Contract #8, which began in March 2003 and is scheduled for completion by the end of 2010.

Williamsburg Bridge. Bridge Subway Structure. (Credit: Peter Basich).
Contract #: Looking South at a Cable Band Retensioning Crew.

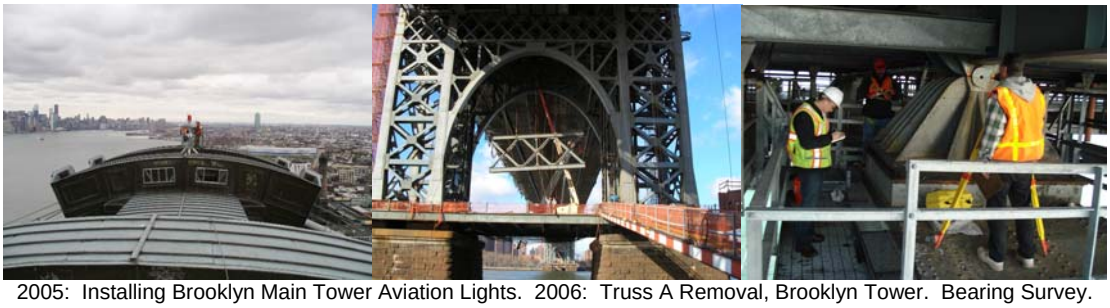
In order to minimize disruption to the riding public and ensure that traffic is maintained across the bridge, the rehabilitation of the Williamsburg Bridge was divided into several contracts. In the contracts completed to date, all four main cables have been completely rehabilitated, the south and north roadways of the bridge have been replaced and the BMT subway structure across the bridge was completely reconstructed.

View From the South. Fireboat on Patrol. (Fireboat Credit: David Paul Gerber)

Contract #8

Contract #8 began on March 3, 2003, and is scheduled to finish by the end of 2010. This $277 million project will see the rehabilitation of the tower bearings, the truss system, the steel structure of all eight towers, and the north comfort station houses, the replacement and/or adjustment of the cable suspenders, the installation of maintenance travelers (inspection platforms) under the main span, as well as painting of the stiffening trusses. Architectural work will include the restoration of decorative lights on the main towers and in the Manhattan Plaza. Work inside the anchorage houses on both the Manhattan and Brooklyn sides will include the construction of new stairs, a hoisting system, ventilation and lighting, and oiling platforms. The project will also include the installation of several Intelligent Transportation System components, including variable message signs and closed circuit television cameras.

2004: Steel Arch Replacement. Cable Band Bolt Retensioning. 2005: Rehabilitation of the Brooklyn Main Tower Steel.



2005: Installing Brooklyn Main Tower Aviation Lights. 2006: Truss A Removal, Brooklyn Tower. Bearing Survey.

The seismic retrofitting of the steel portions of the intermediate towers was completed on July 20, 2007. The Brooklyn and Manhattan maintenance travelers were delivered on barges and raised into position in August and October 2007. The maintenance travelers are currently undergoing pre-operational testing and inspection and are expected to be completed in 2010. Installation of

the top chord transverse bearings at the main towers was completed in October 2007. Installation of the Brooklyn anchorage maintenance platforms, the Manhattan anchorage hoist and new staircases for both anchorages were also completed in 2007.

2007: Seismic Retrofit Concrete Work in Brooklyn. Raising the Manhattan Side Traveler at the Manhattan Tower. Manhattan Tower North.

As Contract #8 concludes the reconstruction of the bridge, extra items deemed necessary were added later, extending the length of the contract. These items included: modification of the footwalk joints, replacement of the south outer roadway overlay system, the seismic retrofit of the steel and concrete portions of the intermediate towers, traffic signal and sign modifications of Delancey Street for the contraflow operation, additional steel flag repairs after the biennial inspection, replacement of some truss bearings at the intermediate towers, rehabilitation of wind tongue casting assembly at the main towers, and the contraflow barrier system installation at the Brooklyn and Manhattan approaches.

Work completed in 2008 includes the installation of the Brooklyn anchorage hoist, the bridge indentification system, the barrier transfer machine, the removal of the main bridge flexible shield system, the top chord transverse truss bearings, the erection of the new Manhattan entry electroliers and rehabilitated main tower electroliers, and the seismic retrofit of the intermediate tower bases.

2008: Installation of Luminares at the Manhattan Plaza Bridge Entrance. Erection of the Manhattan Entry Electrolier. Brooklyn Tower in October 2008. (Tower Credit: Russell Holcomb)

Contract #8 in 2009: Testing the Intermediate Tower Bearings at Lehigh University in January 2009. Assistant Engineer-in-Charge Anil Rudra on the Bridge in July 2009. Resurfaced South Outer Roadway. (Roadway Credit: Bojidar Yanev). Looking South at the Manhattan Main Tower Electrolier in December 2009.

Contract #8 in 2009: Looking Southeast at the Installation of the Triangular Jacking Frame for the Intermediate Tower Bearing Replacement in January 2009. Main Tower Pier Fender System Installation in July 2009.

Work anticipated to be completed in 2010 includes the installation of the intermediate tower truss bearings, maintenance traveler installation, main tower pier fender system, aviation light lightning protection system, wind tongue pin rehabilitation, dry fire standpipe system testing, the implementation of a contraflow of the south inner roadway with local control of movable barriers, the rehabilitation of the south roadway and anchorage modular joints, the rehabilitation of the PP29 orthotropic deck hinged pressure relief joint, and the rehabilitation of the Kent Avenue yard voids.

Movable Bridges

As NYCDOT completes reconstruction work on the East River Bridges, more attention is being devoted to other key City-owned bridges, such as the movable bridges. Building on the success of the East River Bridge projects, the Department is implementing many of the innovative concepts originated during the rehabilitation of East River Bridges on these other major reconstruction projects.

BELT PARKWAY BRIDGE OVER MILL BASIN (BROOKLYN)

Opened on June 29, 1940, the Mill Basin Bridge is adjacent to the Jamaica Bay Wildlife Refuge and the Gateway National Recreation Area. It is the only movable bridge on the Belt Parkway. The current clearance over Mean High Water is 35-feet. When the Mill Basin Bridge was constructed during the first half of the 20th century, New York City's inland waterways were among the most heavily navigated thoroughfares in the country. However, as maritime traffic in New York City steadily decreased since the mid-1960s, the need for movable bridges lessened as well. In 1941, during its first full year of operation, the Mill Basin Bridge was opened 3,100 times; by 1953, that figure decreased to 2,173; by 2009, the number of openings declined further to a total of only 183 openings.

In addition, significant and costly traffic congestion results from the operation of this outmoded drawbridge. In 2008, the Mill Basin Bridge carried 144,010 vehicles per day. The average opening and closing time for the bridge (and others like it) is ten minutes. Thus, this structure's operation has a negative and significant effect on the efficiency of New York City's vehicular traffic flow.

In 2009, on a New York State-mandated scale from 1 to 7, this bridge had a condition rating of 3.284, or "fair." While the bridge is not in any immediate danger of structural failure, its reconstruction is required in order to maintain mobility and public safety on this vital artery.

The existing Mill Basin Bridge is 864-feet long and 14 spans, including double movable leaf bascule spans and a steel superstructure, supported on reinforced concrete pier on timber piles, and abutments supported on pre-cast concrete piles. The existing structure and immediate approaches will be demolished and replaced.

Belt Parkway Bridge Over Mill Basin. Aerial View.

The replacement will be a 1,757-foot, 11 span fixed bridge, north of the existing structure. The bridge will have a 36-foot wide roadway with a 12-foot wide right shoulder and a 4-foot wide left shoulder in each direction. The eastbound side will carry a dedicated pedestrian/bike path along

the south fascia. The new bridge will be a fixed structure with a 60-foot clearance over Mean High Water, obviating the need for opening and closing the structure to accommodate tall vessels. The new design of the bridge will result in increased sight distances, an increase in lane width from 11-feet 4-inches to 12-feet, and the inclusion of safety shoulders in both directions. The channel will remain navigable during construction, and the clear channel width will remain the same after the new structure is in place. A new fender system will be installed to protect the bridge substructure from marine traffic. Currently in its final design phase, the reconstruction of the Mill Basin Bridge (part of the second Belt Parkway Group) is scheduled to start in fall 2011, and to last approximately 4 years.

BORDEN AVENUE BRIDGE OVER DUTCH KILLS (QUEENS)

The Borden Avenue Bridge over Dutch Kills is located just south of the Long Island Expressway between 27th Street and Review Avenue in the Sunnyside section of Queens. It is a retractile-type movable bridge. The original bridge construction was completed in 1908 and was opened to traffic on May 25, 1908.

1908 Borden Avenue Bridge Plaque. Waterside View. (Credit: Bernard Ente)

The bridge structure carries two lanes of vehicular traffic with sidewalks on either side. The roadway is 34 feet wide and the sidewalks are 8 feet wide. In 2008, the bridge carried approximately 15,002 vehicles per day.

In the spring of 2008, the Department observed that an existing crack in the west abutment's wingwall had opened up further. Following a series of subsequent inspections, it was determined that there is continuing movement of the west abutment wall. In an effort to mitigate this condition, two pressure relief joints were installed in the roadway, and the speed limit for eastbound traffic was posted at 15 miles per hour. Unfortunately, these measures did not stop or slow the abutment wall's movement.

The movement of the wall is undermining the stability of the bridge. Due to the potentially serious danger to life, public safety and property posed by the current condition, it is critical that the repair work be performed as expeditiously as possible.

On October 16, 2008, in the interest of public safety, pursuant to Section 103(4) of the General Municipal Law and Section 315 of the New York City Charter, the Department declared that an emergency exists relative to the movable bridge carrying the Borden Ave. over the Dutch Kills in Queens.

The repairs will include the following: removal of the fill material under the roadway and sidewalks from behind the west abutment and between the wingwalls; relocation of the existing utilities; digging of a test pit to inspect the supporting piles; inspection of the condition and the taking of measurements; and the implementation of the appropriate repair solution based on the inspection findings.

The bridge was closed at noon on December 31, 2008. A Letter of Intent for the emergency repair of this bridge was issued to the contractor with a start date of January 6, 2009. Construction is expected be complete by August 2010.

Diver Preparing to Inspect the Borden Avenue Bridge in April 2009. (Credit: Bernard Ente)

A project to replace the existing steel bridge and repair the west abutment is scheduled to begin in April 2017. The work will also include upgrades to the mechanical and electrical components of the bridge. Construction is expected to be completed in December 2018.

BROADWAY BRIDGE OVER THE HARLEM RIVER (BRONX/MANHATTAN)

Broadway extends from the southern tip of Manhattan, through the Bronx and terminates in Westchester County. The Broadway Bridge, a lift type movable bridge crossing the Harlem River, is located between West 220th Street in Manhattan and West 225th Street in the Bronx. In 2008, the bridge carried 33,266 vehicles per day, and three tracks of the IRT subway are carried on its upper deck and a five-lane two-way roadway with sidewalks on either side is carried on its lower deck. The two roadways each measure 34 feet and the sidewalks are 7 feet wide.

The vertical lift bridge is the third movable steel structure at this location. The original steam powered single-deck swing span built in 1895 carried only highway and pedestrian traffic. The second structure was built in 1905 to accommodate the extension of IRT subway into the Bronx from Manhattan. The second bridge was again a double deck swing span to carry the subway line on the upper deck and highway traffic on the lower deck. The current structure, a double deck vertical lift bridge to carry the subway and vehicular traffic, was built in 1960.

Broadway Bridge in December 2008. (Credit: Sergey Parayev)

The bridge underwent a protective coating project to protect the steel components of the bridge

against the effects of corrosion. This project was completed in October 2003 at a cost of approximately $8.7 million.

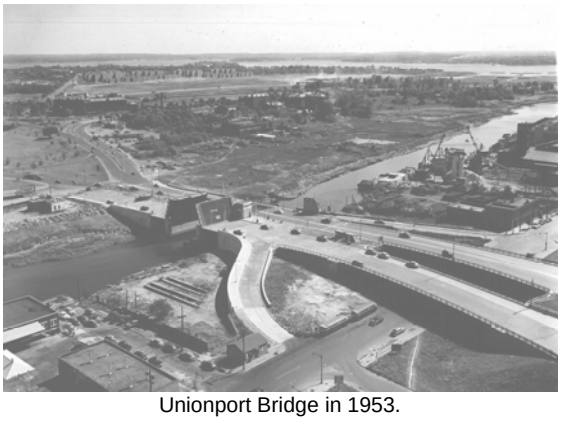
The bridge also underwent recent component rehabilitation, including miscellaneous steel repairs, grating replacement, sealing and waterproofing of its deck, repair of spalled concrete pavement, new expansion joints and new median barrier at an approximate cost of $2.14 million. This project was completed in May 2004.

Currently in its final design phase, the reconstruction of the bridge is scheduled to start in August 2013. The project's scope of work includes a major rehabilitation of the roadway deck, superstructure steel and substructure elements of the vertical lift span, as well as the approach spans. It will also include the replacement and rehabilitation of the electrical and mechanical components of the vertical lift span. Construction is expected to be complete in July 2016.

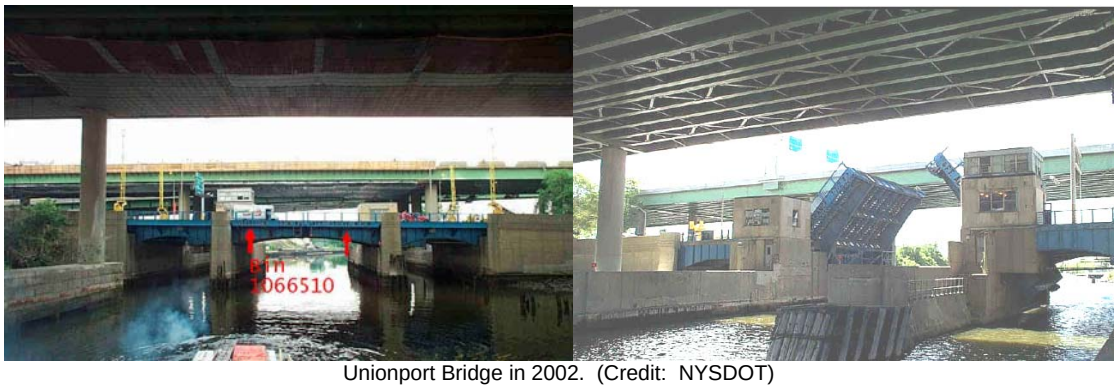
BRUCKNER EXPRESSWAY (NB & SB SERVICE ROAD) OVER WESTCHESTER CREEK (UNIONPORT BRIDGE) (BRONX)

This double leaf bascule bridge opened in 1953. In 2008, the bridge carried 62,342 vehicles per day. The 17 span structure (three waterway and fourteen concrete approach) carries five lanes of the Bruckner Boulevard Expressway service road traffic over Westchester Creek. Currently in its final design phase, the reconstruction of the bridge underwent a Value Engineering Study by the Office of Management and Budget which recommended several changes to the design that are being incorporated. The reconstruction is scheduled to start in October 2014. The project will now incorporate temporary movable bridges to maintain a better flow of traffic during the bridge construction.

The estimated construction duration will be a total of 36 months with approximately 18 months lead time to procure and install the temporary bridges prior to taking the existing bridge out of service. The project's scope of work includes replacement of the bascule, flanking, and approach superstructures, rehabilitation of the substructures, replacement of the existing mechanical and electrical systems for the bascule span, reconstruction of the bridge operator and control houses, and replacement of the existing fender system, drainage system, street lighting, traffic signal facilities, and gates. The "float out the old/float in the new" technique may be incorporated into the replacement scheme for the bascule span.



Unionport Bridge in 1953.



Unionport Bridge in 2002. (Credit: NYSDOT)

HAMILTON AVENUE BRIDGE OVER THE GOWANUS CANAL (BROOKLYN)

The Hamilton Avenue Bridge opened in 1942. It links Carroll Gardens to Park Slope and points south along busy Hamilton Avenue. In 2008, the bridge carried 52,731 vehicles per day. As part of the $55 million reconstruction of this bridge, the new bascule spans with trunnion towers were shop-assembled and tested off-site, then shipped to the site and erected on the rehabilitated piers. This reduced the roadway closure time for the construction of each span from 14 months to only 2 months. In addition, the project team devised a system of hydraulic cylinders and a temporary hydraulic power unit to permit operation of the bridge while the existing electro-mechanical systems were disassembled. In order to maintain safety on-site, the team also opted for hydraulic shears and lances in lieu of torches.

Other reconstruction work included: the rehabilitation and seismic retrofitting of the existing piers; the replacement of all electrical and mechanical and control equipment; the removal and replacement of the approach slabs of both sides of the bridge; the rehabilitation of the backwalls and abutments; and the renovation and extension of the bridge operator house.

While each of the spans only spanned 47 feet between fenders and measured 42 feet wide (which had to be enlarged to 44 feet as part of the replacement), each new span would still weigh 660 tons. Overall, the materials included 380 tons of structural steel, 1,960 cubic yards of concrete, and 51,000 pounds of reinforcing steel. The heavy-duty lifting and scope of the replacement was met with scalpel-precision demands of the site: Just 90 feet above the Hamilton Bridge runs the Brooklyn-Queens Expressway, which complicated placement of the 300-ton and the 550-ton cranes necessary for the removal and reinstallation of the spans via barge.

A Notice to Proceed for the reconstruction of this bridge was issued to the contractor with a start date of August 4, 2005. The contract includes an incentive of $25,500 per day for early completion of Milestone B and $13,500 per day for early completion of Milestone D.

Old Hamilton Avenue Bridge. (Credit: NYSDOT)

The bridge's appearance was enhanced artistically. A permanent new lighting art structure was installed in summer 2009 on the bridge buildings that is viewable by pedestrians, motorists, mariners and the general public as part of the Percent For Art Program administered by the Department of Cultural Affairs. The masts of lights are installed above the existing buildings. The lights consist of clusters of long-life L.E.D.'s. The work is by the same artist, a faculty member of the Pratt Institute, who designed the 50-foot high color changing iconic illuminated beacon at the elevated acre plaza at DOT's headquarters at 55 Water Street, and the lighting of the newly reopened Manhattan Bridge Water Street Arch.

Mock-up of the Hamilton Avenue Light Sculpture in 2004. (Credit: Gholamali Mozaffari)

"Assent Ascent" Hamilton Avenue Light Sculpture by James Conti.

"Assent Ascent" Hamilton Avenue Light Sculpture by James Conti. (Night Credit: James Conti)

In Stage I, the Manhattan-bound span was closed from June 29, 2007 to August 31, 2007, and it was replaced. The Manhattan-bound bascule span was removed in halves on July 2 and July 6, 2007. Due to the contractor's chosen means and methods, the new east leaf of the Hamilton Avenue Bridge was not "floated-in" as originally proposed, but was trucked-in, and assembled at the site. The Manhattan-bound span reopened three days earlier than scheduled on the morning of August 31, 2007. The contractor will earn an incentive for early completion of this milestone.

Removing the East Span in July 2007.

2007: Hamilton Avenue Bridge Construction.

Open Manhattan-Bound Span in August 2007. Traffic on New Span.

Construction work completed in 2007 included lead and asbestos abatement work in the control and gate tender houses and the replacement of the Manhattan-bound bascule span and all related tasks, including the installation of new submarine cables, the reopening of all roadways and sidewalks, the replacement of the fender system, and the installation of new dolphin clusters. At the end of 2007, fabrication of structural steel and machinery for the Brooklyn-bound span was in progress.

Open Hamilton Avenue Bridge in August 2007.

In Stage 2, the Brooklyn-bound span was closed from June 29, 2008 to August 16, 2008, and it was replaced. The Gowanus Canal was reopened to navigable vessels on August 12. Utilizing the lessons learned from the Manhattan-bound span, the contractor was able to complete the work 16 days early and will earn the maximum incentive of $216,000 for early completion of the work relating to early opening of the west bridge to traffic.

Removing the Existing Hamilton Avenue West Bridge Structural Steel in June 2008. Removing the Existing Southwest Toe Joint and Installing New Reinforcement of the Southwest Approach Slab in July 2008.

Placement of New Concrete on the Hamilton Avenue Southwest Approach Slab, Installation of New West Bridge Structural Steel, and Installation of New West Bridge Deck and Counterweight in July 2008.

Installation of New Hamilton Avenue West Bridge Structural Steel, and Placement of Concrete for the New Northwest Sleeper Slab in July 2008. Installation of New Southwest Sidewalk in August 2008.

Completion of the New Hamilton Avenue West Bridge Installation in August 2008. Construction of the New Back Up Generator Building in September 2008. New Granite Pavers at the South Median Area in October 2008.

At the end of 2008 the project was in its final testing and acceptance phase, which was followed by training of the Division operations and maintenance forces in preparation for their takeover of the bridge in 2009. The project was substantially completed on April 17, 2009.

Installation of New Hamilton Avenue Parking Fence at the North Median Area in November 2008. Painting the Existing Control House Staircase in December 2008.

MACOMBS DAM BRIDGE OVER THE HARLEM RIVER (BRONX/MANHATTAN)

The Macombs Dam Bridge, which has one of the longest swing spans in the world, was opened in 1895. In 2008, the bridge carried 38,897 vehicles per day. The $145 million reconstruction of this landmark bridge, which was completed in May 2007, included the West 155th Street viaduct, the west approach plaza over the Harlem River Drive and Seventh Avenue, the swing span over the Harlem River, the deck and camelback trusses over Metro-North Railroad and Conrail, the Major Deegan interchange (consisting of the east approach and four ramps), and the Jerome Avenue viaduct. The rehabilitation work not only strengthened the structure, it returned the bridge's appearance to its turn of the century grandeur.

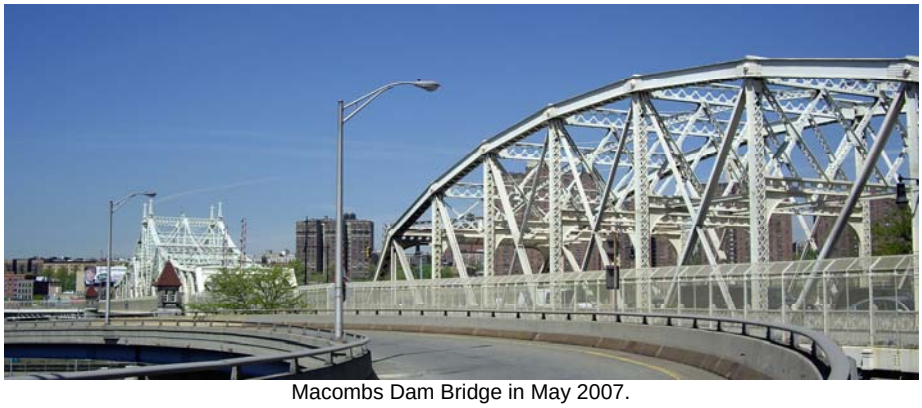
2004: East View of Macombs Dam Bridge Swing Span and Camelback Truss. (Credit: Peter Basich)
Architectural Detail of the Bridge. (Credit: Michele N. Vulcan) Close-up of a Gate House. (Credit: Peter Basich)

Close-up of the 1894 Dedication Plaque. (Credit: Hani Faouri)
View of the Swing Span Control House. (Credit: Michele N. Vulcan)

As part of this project, the historic John Hooper Fountain, which dates from 1894, was fully rehabilitated in 2000. After studying detailed old photographs, the globe and weather vane were recast and replicated. Cast aluminum was used with high impact glazing similar to the lanterns installed in Central Park in the 1980's. Just east of the fountain, a garden of rose bushes was added for the community's pleasure. Other additions included a new paved island, new curbs, and a steel fence. Bollards were installed at the western end of the island to protect the fountain from vehicular traffic.

2000 – 2002: John Hooper Fountain Globe. New Trusses at the Jerome Avenue Approach to the Bridge. View of the Roadway in 2004 From Above the Control House – Old Yankee Stadium is on the Right. (Roadway Credit: Peter Basich)

Bridge Protective Fencing and Staircase. (Credit: Michele N. Vulcan) Detail of the Bridge – Old Yankee Stadium Banner is Visible on the Right.



Macombs Dam Bridge in May 2007.

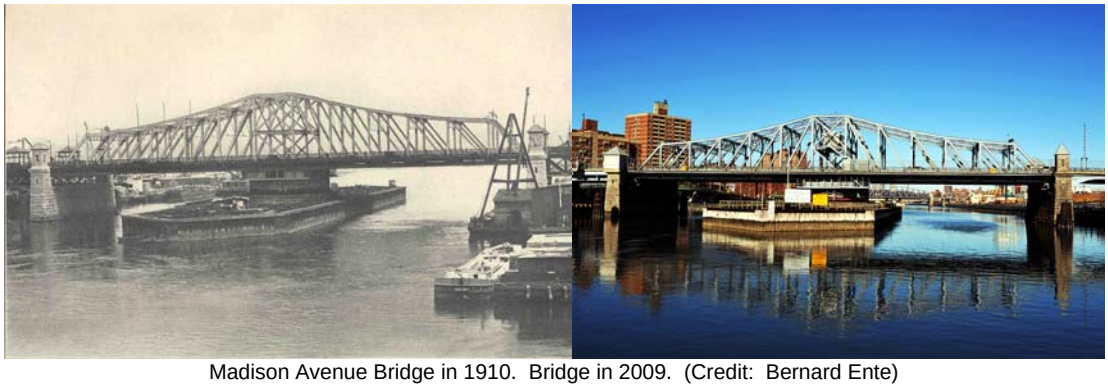
Macombs Dam Bridge in February 2009 - New Yankee Stadium is on the Right. (Credit: Duane Bailey-Castro)

The bridge is also being assessed for seismic vulnerabilities. A seismic retrofit of this bridge will include strengthening the existing foundations and superstructure steel members. Retrofitting work will be completed throughout the length of the structure from the 155th Street Viaduct to the

Jerome Avenue Approach. This will include installation of mini-piles in the existing piers that support the swing span, strengthening of the steel columns and floor beams of the 155th Street Viaduct and installation of lock-up devices to disseminate loads during a seismic event. The contract will also include replacement of the existing fender system protecting the center pivot pier and structural steel repairs identified by ongoing regular inspections. The seismic retrofit project is currently scheduled to start in July 2014 and end in January 2017.

MADISON AVENUE BRIDGE OVER HARLEM RIVER (BRONX/MANHATTAN)

A project for seismic retrofit, electrical, mechanical, masonry and miscellaneous work is scheduled to be performed between March 2017 and September 2018. A preliminary seismic assessment indicates that a new center pivot pier may need to be constructed to support the swing span to meet seismic demands. If this assessment is confirmed by a further detailed analysis, the construction duration will be longer since it will require construction of new foundations for the swing span located in the Harlem River. The final design phase of this project is expected to begin in spring 2010. In 2008, the bridge carried 41,740 vehicles per day.



Madison Avenue Bridge in 1910. Bridge in 2009. (Credit: Bernard Ente)

Bridge Sign in 2007. (Credit: Duane Bailey-Castro)

PARK AVENUE TUNNEL OVER 34TH STREET (MANHATTAN)

The Park Avenue Tunnel was originally built as an open cut in 1836 to accommodate horse drawn trolley cars between East 33rd Street and East 42nd Street. In 1854, a five course brick arch roof was constructed and the underground tunnel was used by the New York and Harlem

River Railroad steam engine trains from East 42nd Street to its terminal then located at East 30th Street and Park Avenue. In 1870 the rail road was converted to electric powered trolleys.

The tunnel in its present form was converted to vehicular traffic only in 1917, when trolley tracks were covered with fill and roadway pavement was built. In its present form, the tunnel is located under the center mall of Park Avenue South. The roadway width inside the tunnel varies from 19'-2" to 22'-5" and carries single lane of traffic in each direction. On August 3, 2008, the tunnel was converted to single lane one-way (northbound).

Some rehabilitation work was completed on the tunnel in November 2005. That contract included the rehabilitation of the fans and the ventilation system. The new project is currently in its preliminary engineering phase. The scope of work includes complete rehabilitation of civil and structural components of the tunnel as well as upgrading of fire detection and ventilation system of the tunnel. Construction is expected to start in July 2016 and be complete in January 2019.

Park Avenue Tunnel in 2003. (Credit: NYSDOT)

ROOSEVELT ISLAND BRIDGE OVER EAST RIVER/EAST CHANNEL (MANHATTAN/QUEENS)

This lift bridge opened in 1955. In 2008, the bridge carried 10,161 vehicles per day. The 8 span structure carries two lanes of traffic over the East Channel of the East River. It is the only vehicular access to Roosevelt Island from the Borough of Queens.


Roosevelt Island Bridge Under Construction in 1952.

American Institute of Steel Construction 1955 Award Plaque.

A Notice to Proceed for the $86.5 million reconstruction of this bridge was issued to the contractor with a start date of March 12, 2007. The project's scope of work includes rehabilitation of the existing bridge superstructure, substructure and approaches, replacement of some of the existing mechanical and all of the electrical systems for the lift span, rehabilitation of the bridge operator house, installation of safety fences on the sidewalk, replacement of the street lighting, resurfacing of the approach roadways, installation of pigeon proofing systems and re-painting the entire structure. The project will also include the installation of a dedicated right-hand turn lane onto the southbound Vernon Boulevard in Queens, and the construction of a new back-up generator building under the Queens approach to provide power to allow operation of the bridge in an emergency. Fabrication and testing of mechanical and structural components was in progress by the end of 2007.


Roosevelt Island Bridge in 2005. (Credit: Peter Basich) Bridge Tower and View From Deck in 2005. (Credit: Michele N. Vulcan)


2007: Construction of the Below Deck Shield for the Queens Approach of the Roosevelt Island Bridge. Above Deck Containment on the Lift Span. The Lift Span Shield Looking Northeast.

By the end of 2008, the rehabilitation of the existing bridge superstructure, substructure and approaches was nearly complete. The roadway was returned to full service on December 2, 2008 after the complete re-decking of the main bridge and approaches. The sidewalks were returned to service in 2009. Due to a design change, the replacement of some of the existing mechanical and all of the electrical systems for the lift span, and the rehabilitation of the bridge operator house will be performed during a Navigation Channel closure between October 2009 and August 2010. The installation of safety fences on the sidewalk, replacement of the street lighting, resurfacing of the approach roadways, and installation of pigeon proofing systems was completed in 2009.

Concrete Filled Grid Deck of the Queens Approach in April and May 2008. Stage I Roadway Construction of the Queens Approach in July 2008.

Open Lift Span During United Nations General Assembly Week in September 2008. Stage II Roadway Construction of the Queens Approach in October 2008. Asphalt Placement on the Queens Approach in November 2008.

Open Queens Approach Roadway of the Roosevelt Island Bridge in December 2008.

The cleaning and repainting of the bridge began in January 2008, and the structure painting was complete by the end of 2009. The only remaining painting will be local touch up areas after installation of the new machinery. The Department and its contractor strictly adhere to the safety requirements regarding lead paint removal as approved by the United States Environmental Protection Agency and the Occupational Safety and Health Administration, New York City Departments of Health and Environmental Protection, and the New York State Departments of Health and Environmental Conservation.

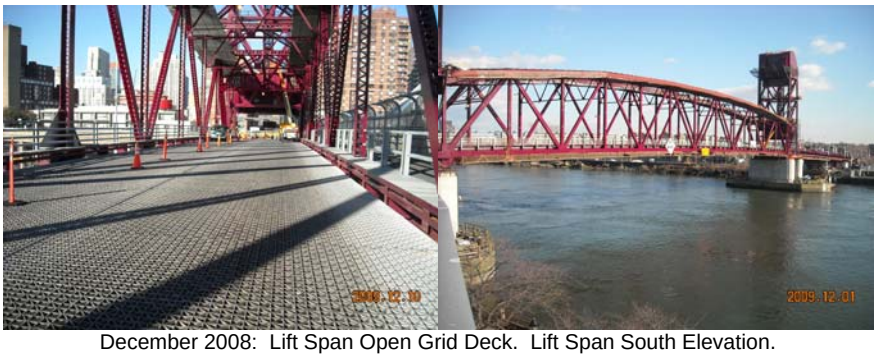
Lead Paint Removal Containment on the Roosevelt Island Bridge Lift Span in January 2008. Scaffolding Erection on the East Tower in July 2008.

Tower Containment in August 2008. (Credit: Bernard Ente) Lift Span and West Tower in September 2008.

The work was performed within an entirely sealed Class 1A containment system (under negative pressure) which acted as an added safety measure to prevent any materials from escaping into the air. Filtration of the enclosed air prevented paint waste dust from being released. The Department placed several air monitoring stations in the area around the bridge. The Department performed continuous monitoring and testing of the soil and air quality as well as noise levels in the area surrounding the containment enclosure to minimize impacts and ensure the safety and quality of life for workers and residents nearby.

December 2008: Roosevelt Island Bridge West Tower West Elevation. Lift Span Sidewalk.

December 2008: East Approach Roadway and Sidewalk.

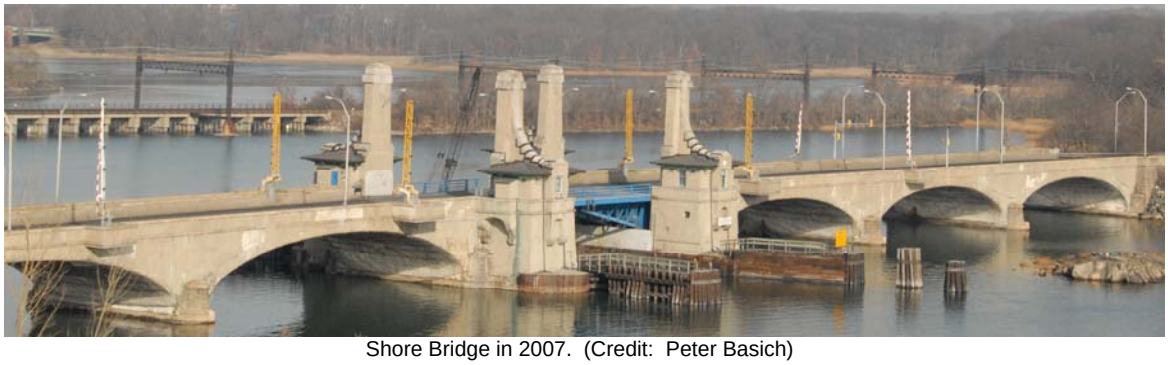


December 2008: Lift Span Open Grid Deck. Lift Span South Elevation.

The contractor is currently working on the rehabilitation of the machinery, replacement of the bridge's power systems and the installation of the bridge control systems. Construction is expected to be completed in March 2011.

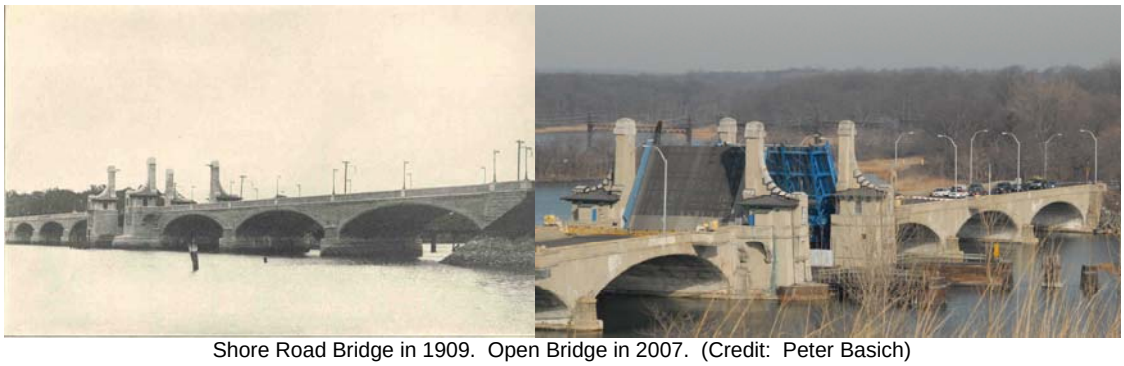
SHORE ROAD BRIDGE OVER THE HUTCHINSON RIVER (BRONX)

This bridge, built in 1908, was originally called the Pelham Parkway Bridge over Eastchester Bay. In 2008, the bridge carried 19,131 vehicles per day. The $5 million interim rehabilitation of the existing bridge superstructure and substructure enables the Department to keep it operational while a new bridge is being designed and built adjacent to the existing bridge. The existing bridge will be demolished once the new bridge is in service. The rehabilitation project began in April 2001, and all traffic lanes were reopened to traffic on April 24, 2002, three days earlier than scheduled. The interim rehabilitation of this bridge was substantially completed on June 17, 2002.



Shore Bridge in 2007. (Credit: Peter Basich)

As of the end of 2009, a mid-level, single leaf bascule movable bridge was in design. It will be constructed to the south of and parallel to the existing bridge, with a wider navigation channel. An environmental impact study, co-sponsored by the Federal Highway Administration, is expected to begin in Fiscal Year 2011. The project to construct a new Shore Road Bridge is scheduled for construction between October 2021 and January 2026.



Shore Road Bridge in 1909. Open Bridge in 2007. (Credit: Peter Basich)

WARDS ISLAND PEDESTRIAN BRIDGE OVER HARLEM RIVER (MANHATTAN)

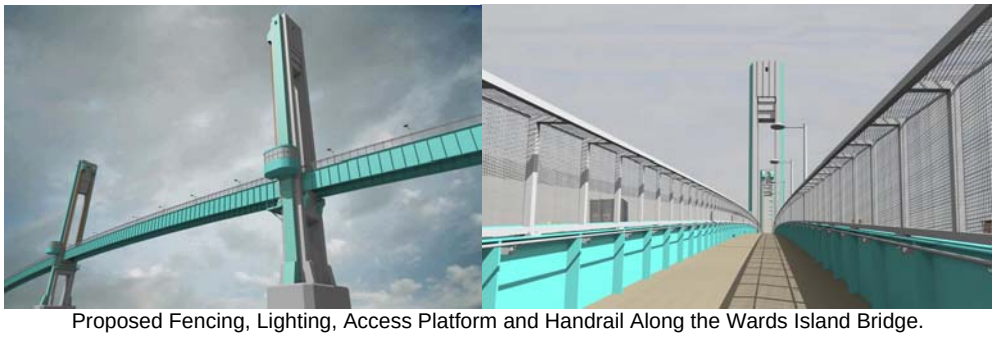
The Wards Island Bridge is a pedestrian bridge connecting the East River Housing Project at East 103rd Street in Manhattan to Wards Island. Located along the East River, the bridge is located between exits 14 and 15 of the FDR Drive. This vertical-lift bridge has a total of twelve spans. Spans one through four are located on the Manhattan side of the bridge and are oriented from south to north. At span five the bridge turns from west to east. The curb-to-curb width of the lift span is 3.66 meters, the clear width of the Manhattan approach ramp is 3.66 meters and the clear width of the Wards Island approach ramp measures about 3.76 meters. The bridge's Wards Island approach provides immediate pedestrian access to the 68-acre Wards Island Park.

Aerial View. Tower Detail in 2009. (2009 Credit: Duane Bailey-Castro)

The bridge was built by the U.S. Army Corps of Engineers in 1951 and was designed by Othmar Hermann Ammann. The bridge is open for use from April through October during daylight hours. During the months from November through March, the bridge is kept in the "open" position and cannot be accessed. Major reconstruction tasks will be performed during the time when the bridge is completely closed.

A protective coating project was completed in May 2003 at an approximate cost of $1.2 million. The reconstruction of the bridge is scheduled to start in May 2010. The project's scope of work includes the replacement of the electrical components, the replacement of the walkway deck on the lift span, the repair and overlay of the deck on the other spans and approaches, the rehabilitation of the steel superstructure members, new fencing and lighting, and restoring the control and tender houses to their original condition. Construction is expected to be completed in August 2012.

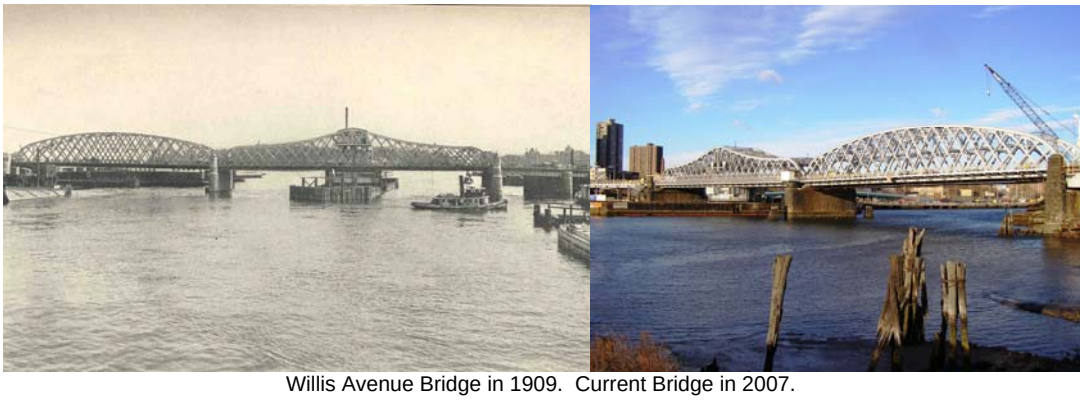
Wards Island Pedestrian Bridge After Completion of Painting in 2003.
FDNY Rescue Boat Near the Bridge in 2008. (2008 Credit: Bernard Ente)



Proposed Fencing, Lighting, Access Platform and Handrail Along the Wards Island Bridge.

WILLIS AVENUE BRIDGE OVER THE HARLEM RIVER (BRONX/MANHATTAN)

Measuring 3,212 feet in length and opened to traffic on August 23, 1901, the Willis Avenue Bridge remains one of New York City's most heavily traveled bridges. The bridge is a bowstring truss swing bridge which spans the Harlem River, and connects Manhattan's First Avenue and 125th Street to Willis Avenue and 132nd Street in the Bronx. Engineered by Thomas C. Clarke, the bridge was designed to relieve traffic congestion on the Third Avenue Bridge.



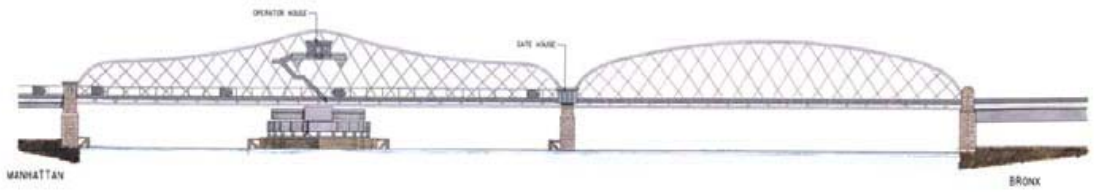
Willis Avenue Bridge in 1909. Current Bridge in 2007.

A major hub between the FDR Drive in Manhattan, the Major Deegan Expressway and the Bruckner Expressway in the Bronx, the Willis Avenue Bridge carried approximately 62,167 vehicles per day in 2008. Ten local and interstate bus lines use the bridge as a principal route from New York City to points throughout the northeastern United States.

Open Willis Avenue Bridge.

Because of substandard curves that are present on the structure's approaches, the Willis Avenue Bridge has been one of the City's most accident-prone crossings. Between 1992 and 1994, there were 809 vehicular accidents on the bridge, for an average of 269 per year. The ramp from the FDR Drive is now out of service and traffic enters the bridge from a temporary loop ramp installed as part of the project. Under the Department's proposed reconstruction program, these substandard curves will be eliminated.

Because of the advanced age and condition of the Willis Avenue Bridge, the City of New York will replace the existing bowstring truss swing bridge with a new swing span bridge constructed just to the south of the existing bridge. Elimination of the center median on the main span will greatly improve the traffic flow on the bridge.



Existing Willis Avenue Bridge Swing Span.

New Willis Avenue Bridge Span.

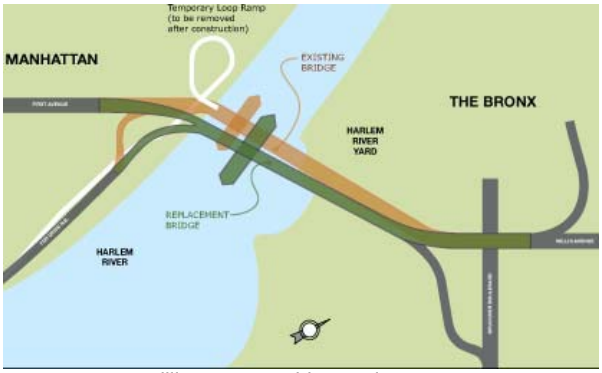
A direct connection to the northbound Major Deegan Expressway in the Bronx will be constructed. There will be wider travel lanes with shoulders, and a broader, combined pedestrian/bicycle pathway along the north side of the bridge.

New, tested and inspected materials will be used including placement of a solid riding surface on the swing span instead of the open grating deck currently in use. In addition, modern electrical, mechanical and communications systems will be installed.

Traffic will continue to use the current bridge until the new bridge opens, resulting in limited impact to motorists and nearby communities. The NYC Marathon will not be impacted: runners

will continue to use the current bridge each year until the new bridge is completed.

Throughout the project, little impact to marine traffic will be experienced. The new swing span is being fabricated and assembled off site, and will be floated into place once the foundations, center pier and rest piers are ready to receive it. A symbolic portion of the historic original Willis Avenue Bridge will be retained in place as a monument to the bridge in Harlem River Park.



Willis Avenue Bridge Project Map.

The project will also replace the FDR Drive approach ramp and the ramp onto Bruckner Boulevard. NYCDOT will also reconstruct Willis Avenue over the Major Deegan Expressway for the New York State Department of Transportation.

A Notice to Proceed for the replacement of this bridge was issued to the contractor with a start date of August 27, 2007. Foundation construction work was in progress by the end of 2007.


Open Willis Avenue Bridge in July 2008. Bridge in April 2009. (2009 Credit: Masroor Mahmood)

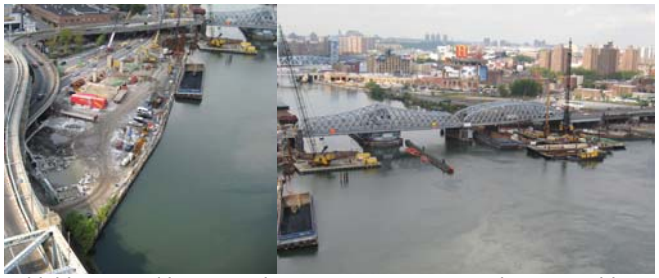

Rendering of the New Willis Avenue Bridge.

On January 3, 2008, the East 125th Street exit ramp off the northbound FDR Drive was closed. This closure was necessary so that work on the construction of a temporary ramp, as well as construction of the new north-bound FDR Drive ramp to the Willis Avenue Bridge, could begin. The East 125th Street exit ramp, which typically carries only a low volume of traffic, will not reopen until the temporary ramp is removed in June 2011.

Current Willis Avenue Bridge and Construction Site in July 2008.

Temporary Loop Ramp in July and October 2008.

Temporary Loop Ramp in October 2008. Pier 9 Drilled Shaft Footing in November 2008.



Shield Removal in September 2008 as Seen From the RFK Bridge.

The First River Pier in November 2008.

In 2008, the project focused on foundation construction work, along with construction of a temporary ramp from the north-bound FDR Drive onto the bridge. At the end of 2008 the loop ramp was nearing completion. It went into service on January 24, 2009. This will allow the removal of the existing ramp and the construction of the new ramp to proceed. One half of the foundations for the new FDR Ramp were installed. Additionally one of the four piers in the river was in place, and work on a second had begun. The foundations in the Harlem River Rail Yard were more than 50 percent complete, and work had begun on the footings for the new Bruckner Boulevard Ramp.

In 2009, the project continued to focus on foundation construction work, with the installation of footings and piers for the new ramp from the FDR Drive as well as the one-half of the 1st Avenue Approach. The precast concrete pier box for River Pier 5 was transported in February 2009 by oceangoing tug and barge from the fabrication yard in Virginia to the contractor's yard in Jersey City, New Jersey. Over 30 automobiles were removed from the Manhattan channel in spring 2009. At the end of 2009 the contractor began the installation of the steel superstructure over the FDR Drive. The work in the river consisted of the installation of the drilled shafts for the four river piers and the installation of three of the four precast pier boxes in the river. The assembly of the new swing span began in Coeymans, near Albany, New York, and is expected to be completed early in 2010. The span will be floated down the Hudson River in summer 2010. In the Bronx, a temporary pedestrian bridge was installed in May 2009 over the Major Deegan Expressway, just south of the existing bridge, to carry pedestrians until the new bridge is constructed. More than half of the paving and drainage work on the expressway is complete. One-half of the bridge over the Major Deegan was removed and work on the new abutment wall began. One-half of the abutment at Bruckner Boulevard was reconstructed and the piers to carry the south half of the new bridge were installed. The foundations in the Harlem River Rail Yard are complete and the first phase of the new Bruckner Boulevard exit ramp is nearing completion. It is expected that traffic will be switched onto the new ramp in early 2010 year, allowing for the demolition of the existing ramp and the installation of main line spans in phases up to 134th Street. The project is slated for completion in December 2012.

View From Harlem River Drive in February 2009. Manhattan Relieving Platform in July 2008 and February 2009.

April 2009: Willis Avenue Bridge Pier 5 Precast Footing, Pier 8 Footing, and Pier 9 Rebar Columns.

Pier 5 in November 2008 and Pier 6 in May 2009. May 2009: Temporary Pedestrian Bridge over the Major Deegan Expressway.

May 2009: Willis Avenue Bridge Construction Site. FDR Drive Ramp Demolition.

June and October 2009: Assembling the Willis Avenue Bridge Swing Span near Albany, New York.

Construction Barge in June 2009. (Credit: Edgardo Montanez)

Willis Avenue Bridge August 2009: Placement of Deck Concrete on New Ramp to Bruckner Boulevard. Curved Girders on New Ramp. Placing Concrete in Pier 7 Box.

Willis Avenue Bridge August 2009: Installation of Tub Girders on Temporary Supports. September 2009: Existing and New Ramps to Bruckner Boulevard.

September 2009: Administrative Engineer Hani Faouri at Pier 7. Pier 7 Box Concrete Infill.

Construction Site in December 2009. (Credit: Brian Gill)

Construction Site in December 2009. (Credit: Brian Gill)

145TH STREET BRIDGE OVER THE HARLEM RIVER (BRONX/MANHATTAN)

The existing 145th Street Bridge is a swing type bridge with two throughtrusses. An eight-span structure, it carries four lanes of vehicular traffic over the Harlem River Drive, the Harlem River and Oak Point Link Railroad. Spans one and two were constructed in 1957 when the bridge was extended to span the Harlem River Drive. Spans six, seven and eight were reconstructed in 1990 in place of the original Bronx flanking span to provide a right-of-way for the Oak Point Link. In 2008, the 145th Street Bridge carried approximately 23,148 vehicles per day. This makes it one of the most essential routes for vehicles and pedestrians traveling between Manhattan and the Bronx. Vehicles, which cross this rim bearing swing bridge each day between the two boroughs, include buses, trucks and cars.

A Notice to Proceed for the $69.4 million reconstruction of this bridge was issued to the contractor with a start date of July 15, 2004. Fabrication of steel components for the approach and new swing span occurred in Pennsylvania. The new swing span was assembled in Albany, New York in late 2005, and was floated-in on February 9, 2007.

The project included the complete replacement of the swing span and six approach spans, seismic retrofitting, partial reconstruction of substructures and the reconstruction of the approach roadways, sidewalks, and bridge railing. The design for the bridge utilized elements pre-fabricated off-site so as to allow a very quick replacement of the existing bridge in 3 stages totaling 18 months. Traffic was only impacted for the 15-month period of March 16, 2006 to June 18, 2007.

Floating In the New 145th Street Span in February 2007. (Close-up Credit: Bojidar Yanev)

Stage II was completed when two lanes of the bridge were opened to vehicular traffic at 12:20 AM on March 22, 2007. The north sidewalk was opened to pedestrians as well, while demolition work for stage III of the South side continued. The Manhattan and Bronx approaches as well as the Bronx bound lanes of spans 1, 2, 3, 6, 7 and 8 were demolished and rebuilt. All four lanes of the bridge were opened to vehicular traffic at 7:00 AM on June 16, 2007.

2007: New Bridge Ready for Traffic.

June 2007: New 145th Street Bridge Ready and Opening for Marine Traffic.

Bridge Sign. June 2007: New 145th Bridge at Night.

The south sidewalk was re-opened on September 12, 2008 after the bridge was hooked into the permanent electrical feed and the generator supplying power was removed from the sidewalk area. Other work performed in 2008 included installation of mechanical equipment, connection of the gate house plumbing to the city system, centering device alignment checks, pointing of the stone walls, and switching the bridge systems on to the permanent electrical feeders.

Work performed in 2009 included touch up painting, installation of several access platforms, new navigation lighting, installation of new electrical wire tracks in the swing span and the start of the final testing phase.

These upgrades will restore the structural integrity and extend the useful life of the 145th Street Bridge. The project is slated for completion in August 2010.

FLOAT OUT/FLOAT IN

A technique referred to as “float out the old/float in the new” is being incorporated into replacement schemes for many movable bridges. Under this scheme, the old spans are floated out in their entirety and the new spans are floated in. Replacing the spans avoids the need to make cumbersome repairs to the existing trusses, costly removal of lead base paint from the steel, and painting of the entire structure at the site. Having the new spans constructed off-site and barged to the project allows for quick and efficient replacement of the removed span. Current projects that will incorporate this technique are: Borden Avenue Bridge, and Grand Street Bridge. The float-in of the new swing span of the Third Avenue Bridge was successfully performed in October 2004, as was the float-in of the 145th Street Bridge in February 2007. The float-in of the new swing span of the Willis Avenue Bridge is expected to take place in summer 2010. The float-out of the existing swing span will follow by a few months once traffic is running on the new bridge.

Roadway Bridges

INNOVATIONS

Innovations in the design and construction of Roadway Bridges continued in 2009. Where feasible, the continued use of precast elements in bridge reconstruction reduces construction duration and the resulting negative impacts on the traveling public. In addition, the implementation of applicable Environmentally Preferable Purchasing (EPP) standards on bridge projects will ease the impact of the increased demands on resources and surrounding environment, and Best Management Practices (BMP) in all applicable projects will mitigate the impact of the project on the surrounding environment.

TEN CULVERTS: GALLOWAY AVENUE OVER MARIANNE STREET, FOREST AVENUE OVER CRYSTAL AVENUE, NAUGHTON AVENUE OVER PATTERSON AVENUE, MIDLAND AVENUE OVER HYLAN BOULVARD, ROCKLAND AVENUE OVER BRIELLE AVENUE, FOREST AVENUE OVER RANDALL AVENUE, GREGG PLACE OVER RANDALL AVENUE, ARTHUR KILL ROAD OVER MULDOON AVENUE, RICHMOND HILL ROAD OVER RICHMOND ROAD, AND ARTHUR KILL ROAD OVER RIDGEWOOD AVENUE (STATEN ISLAND)

The Galloway Avenue culvert is a single span timber pedestrian bridge supported on a concrete abutment. The reconstruction project is still in the design stage.

The Forest Avenue culvert over Crystal Avenue is a single span reinforced concrete box culvert. The reconstruction will consist of the demolition of the existing culvert, clearance of debris from the channel, replacement of the culvert with a concrete deck slab supported on steel beams on reinforced concrete abutment and wingwalls. The work will be performed in two stages with two traffic lanes maintained in each direction during construction.

The Naughton Avenue culvert consists of three parallel reinforced concrete pipes at the north and south ends separated by a twin barrel box culvert. The rehabilitation will include repairing the concrete cracks and spalls, cleaning the debris, and replacing the missing anchor bolts for the retractable steel grates.

The Midland Avenue culvert consists of a single span reinforced concrete box, which will be replaced with a new pre-cast box culvert. The work will be performed in two stages, with one lane of traffic maintained in each direction.

The Rockland Avenue reinforced concrete culvert project will include concrete repair and a lined and stabilized north embankment.

The Forest Avenue culvert over Randall Avenue is a single span concrete box culvert. It will be replaced with a new precast concrete box culver with new sidewalks and asphalt pavement. The work will take place in three stages while maintaining one traffic lane in each direction during construction.

The Gregg Place culvert is a single span reinforced concrete box culver. It will be replaced at the southern portion with a new precast box culvert with new pavement. The north side of the road will remain open to through traffic.

The Arthur Kill Road culvert over over Muldoon Avenue consists of a reinforced concrete pipe at north and a reinforced box culvert at south. The box culvert will be replaced with a new box culvert, and a structural lining will be installed in the pipe culvert. The construction will be performed in one stage with one lane of traffic maintained in each direction.

The Richmond Hill Road culvert consists of a single span stone masonry arch. The rehabilitation

work will include removing and re-pointing the stone masonry, removing and replacing the fill and asphalt wearing surface above the arch, and cleaning the vegetation and sedimentation. A temporary access bridge will be built over one lane so that one lane will remain open to traffic at all times.

The Arthur Kill Road culvert over Ridgewood Avenue consists of a non-reinforced concrete pipe at south and a corrugated metal pipe at north. The rehabilitation work will include installing a structural lining inside the concrete pipe and repairing the concrete at the head walls and catch basins. There will be two stages of construction and one lane of traffic will be maintained in each direction.

This project to rehabilitate and/or replace the ten culverts is expected to begin in November 2013, and is expected to be complete in 2014.

ANNADALE ROAD BRIDGE OVER SIRT SOUTH SHORE (STATEN ISLAND)

This project will replace the existing two span bridge with a single span bridge, including the removal of the existing pier, the replacement of the existing north abutment and the rehabilitation of the existing south abutment. In addition, the work will include removal and replacement of the existing concrete deck, sidewalks and curbs, and the replacement of the existing bridge railing system. The bridge will be replaced in two stages. One lane in each direction will be open to traffic at all times during construction. Pedestrian access will be provided at all times. A Notice To Proceed was issued with a deferred date of May 27, 2008, the date when the portion of an ongoing DDC area-wide sewer and water main installation project within the bridge limits was completed.

Construction began in May 2008 and is expected to be completed in September 2010.

Annadale Road Bridge in 2001. (Credit: NYSDOT)

In May 2008 the contractor mobilized and commenced Stage-1 construction activities. Stage I construction included the demolition and reconstruction of the eastern half of the bridge. The contractor completed Stage I deck removal on November 26, 2008. In 2009, the contractor completed the demolition of the super- and sub-structures of the existing eastern portion of the bridge, constructed the new east half of the north abutment, modified the top ten feet of the south abutment, erected the structural steel, placed the new concrete deck slab, installed telephone conduits, placed approach slabs, installed new bridge railings and protective fencing, completed roadway restoration work at the intersections of Annadale Road with Sneden Avenue on the south side and Posen Avenue on the north side, installed a temporary pedestrian walkway along the east fascia, and realigned the traffic configuration.

Stringer removal for Stage 1 was completed on February 20, 2009. Placement of concrete for the south abutment modification was completed on March 27, 2009. The joint was sealed between the new and existing concrete for the south abutment on May 6, 2009, and the area behind the south abutment was backfilled on May 7. The contractor removed and replaced the water main

along Sneden Avenue on the night of June 12, 2009. Installation of the formwork and re-bars for the reconstruction of the north abutment stem wall and a portion of the wing wall was completed on July 8, 2009. From August 31, 2009 to September 4, the contractor performed the gas main work on the south side of the bridge at the intersection of Sneden Avenue and Annadale Road. Stage II construction began on December 7, 2009. The completed eastern half of the new bridge was opened to traffic in December 2009. In 2010, the contractor will demolish and reconstruct the western half of the bridge.

Annadale Road Bridge: Stage I Construction in February 2009. Saw Cutting the Diaphragms, Removing the Stringers, And Placing a Temporary Truss to Support Utility Conduits.

Annadale Road Bridge: Removing the Eastern Bridge Railing Fence and the Stringer in February 2009.

Annadale Road Bridge: Removing the South Abutment and Center Pier in March 2009.

Annadale Road Bridge: Removing the North Abutment Footing and the Partly Embedded Abandoned Sewer Pipe Containing Asbestos in May 2009.

Annadale Road Bridge: Placing the Concrete Deck in October 2008.

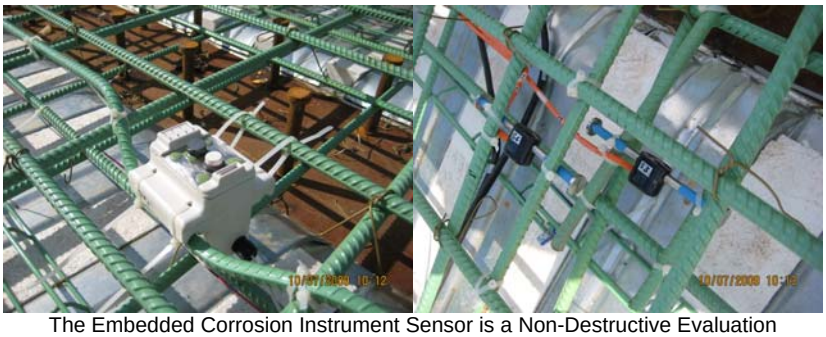
Corrosion of reinforcing steel bars in concrete leads to the premature failure of many structures exposed to harsh environments. Rust products form on the bars, expanding their volume and creating stresses in the surrounding concrete. This leads to cracking and spalling, both of which can severely reduce the service life and strength of structural concrete components.

A unique feature of Stage I construction was the installation of special sensor devices to monitor the corrosion of the epoxy coated steel reinforcing bars in the bridge deck slab; this is Phase I of a pilot study that is being conducted by City University to study the corrosion of reinforcing steel bars in bridge deck slabs. In Stage II construction, another set of sensor devices will be placed in the western half of the deck slab to monitor the corrosion of the stainless clad steel reinforcing bars that would be substituted for the epoxy coated steel reinforcing bars. The secondary objective of the study is to verify the accuracy and reliability of several advanced corrosion monitoring sensors in a field environment. The work is supported through a grant from the FHWA under the Innovative Bridge Research and Construction program.

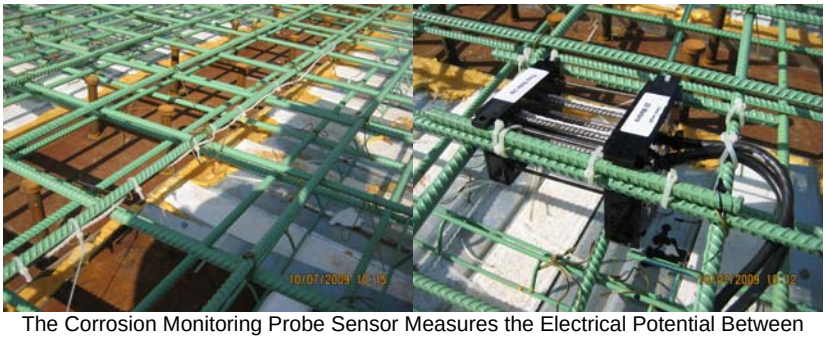
On October 6 and 7, 2009, the contractor installed, activated, and tested the sensors for the corrosion monitoring system. A representative from City University was present during deck slab

placement to ensure the safety of their newly installed sensors. City University will install the second set of sensors next year in Stage II of construction.

The Annadale Road Bridge has four different types of embedded corrosion monitoring sensors distributed across two spans of the bridge.



The Embedded Corrosion Instrument Sensor is a Non-Destructive Evaluation Instrument. The Variable Wire Strain Sensor Gauges Strain.



The Corrosion Monitoring Probe Sensor Measures the Electrical Potential Between the Rebar and the Electrode. The Corrosion Penetration Monitoring Probe Sensor Measures Corrosion Caused by Chlorine Containing Moisture.

BELT PARKWAY BRIDGES OVER PAERDEGAT BASIN, FRESH CREEK, ROCKAWAY PARKWAY, GERRITSEN INLET, MILL BASIN, BAY RIDGE AVENUE, AND NOSTRAND AVENUE (BROOKLYN)

On a New York State-mandated scale from 1 to 7, these seven bridges possess a condition rating of “fair” (3.001 – 4.999. In 2009, the Paerdegat Basin Bridge was 3.222; the Fresh Creek Bridge was 3.250; the Rockaway Parkway Bridge was 3.917; the Gerritsen Inlet Bridge was 3.418; the Mill Basin Bridge was 3.284; the Bay Ridge Avenue Bridge was 3.313; and the Nostrand Avenue Bridge was 4.014. All are original structures, which were built beginning in 1939. While none of the bridges are in any immediate danger of structural failure, their reconstruction is required in order to maintain mobility and public safety on this vital artery.

The Seven Belt Parkway Bridges.

Reconstruction of the seven bridges and their approaches on the Belt Parkway (over three local streets and four waterways) began in the fall of 2009. Group 1 (Paerdegat Basin, Fresh Creek, and Rockaway Parkway Bridges) is expected to be complete in fall 2014. Group 2 (Gerritsen Inlet and Mill Basin Bridges) is expected to start in November 2011, and to be complete in November 2015. Group 3 (Bay Ridge Avenue and Nostrand Avenue) is expected to start in September 2012, and to be complete in May 2015.

During the past 60 years traffic demand along the Belt Parkway corridor has increased dramatically. The opening of New York International Airport (now JFK Airport) in 1948, the development of suburban communities on Long Island post World War II, and the opening of the Verrazano-Narrows Bridge in 1964 have dramatically increased demand on the Belt Parkway. When the parkway first opened the two-way average daily traffic was about 20,000 vehicles per day. Presently it is about 150,000 per day.

Reconstruction of these bridges and their approach roadways is necessary to alleviate substandard conditions and bring these areas into compliance with current state and federal standards. These standards require wider lanes, 12-foot safety shoulders, median barriers, super-elevation of the roadway around curves, and realignment of the approach roadways resulting in improved sight distances. The Department anticipates that these improvements will reduce the current accident rate on this section of the Belt Parkway by approximately 45%.

NYCDOT conducted research to provide recommendations and design guidelines for the treatment of the parkway corridor. The goals of the analysis were threefold: first, to propose improvements to the parkway to satisfy safety and accessibility standards; second, to preserve and re-establish the historic character of the parkway; and third, to retain and improve public access for all parkway users. The recommendations also include complementary designs of the seven bridges.

The research provided detailed recommendations on how common elements should be incorporated to achieve a consistent and historical character to the corridor. Items considered included trees and vegetation, lighting fixtures, railings and fences, design of bicycle and pedestrian paths across the bridges, as well as stonework detailing on bridge abutments with relief detailing on bridge parapets.

On July 18, 2006, the Art Commission (now known as the Public Design Commission) selected the Seven Belt Parkway Bridge reconstruction project for a Design Award in its 24th annual Excellence in Design Awards.

Belt Parkway Bridge Design Renderings.

All of the bridges except for the Bay Ridge Avenue and Nostrand Avenue Bridges are either located within, or adjacent to, the Gateway National Recreation Area, (GNRA) a division of the US Parks Service. This bridge and highway program will be in full compliance with New York City Department of Environmental Protection (NYCDEP) requirements for the initiation of a long-term plan that will increase wetlands, decrease pollution into the bay, and decrease the highway's footprint around the rim of Jamaica Bay. NYCDOT is also working closely with New York City Department of Parks and Recreation (NYCDPR), New York State Department of Environmental Conservation (NYSDEC), GNRA, the US Coast Guard (USCG), and the US Army Corps of Engineers (USACE) to ensure compliance with all environmental protocols. In addition to mitigating environmental impacts along the Belt Parkway corridor, an off-site Wetland Mitigation Plan has been approved. This plan focuses on compensating for wetland losses by increasing and improving the quality of habitats. Approximately 2.3 acres of land at Floyd Bennett Field will be cleaned of rubbish and debris and converted to wetland area.

The existing Paerdegat Basin Bridge is a 692-foot long, 13 span, multi-girder, simple supported steel superstructure, supported on reinforced concrete pier cap beams and abutments supported on reinforced concrete piles. The bridge has two 34-foot wide roadways carrying three lanes of traffic in each direction; with a 3-foot safety walk on the north side, a 4-foot wide center median/barrier, and an 8-foot wide south pedestrian/bicycle sidewalk. The existing structure and immediate approaches will be demolished and replaced by two new bridges and new approach roadways on split alignments.

The existing bridge consists of 12 cast-in-place concrete bents. Two navigation channels cross under the bridge. At one of these channels (bent number 7) a concrete pier has been damaged. Because of this damage and other structural concerns, the Paerdegat Basin Bridge has been under continuous monitoring since September of 2004.

The replacement bridges will consist of two angled trapezoidal steel box girder structures: the 825-foot, 3 span westbound bridge, north of the existing structure, and the 1,227-foot, 5 span eastbound bridge, south of the existing structure, remaining at 28 feet over the navigable channel. Both bridges will have a 36-foot wide roadway with a 12-foot wide right shoulder. The eastbound bridge will have a 4-foot wide left shoulder, while the westbound bridge will have a 10-foot wide left shoulder. The southern structure will carry eastbound traffic while the northern structure will accommodate westbound traffic. Both the horizontal and vertical alignments will change resulting in improved sight distances on the bridge and its approach roadways. The bridge carrying eastbound traffic will also have a dedicated pedestrian/ bicycle path along the south side. The pedestrian/bicycle path will be separated from traffic lanes by a concrete barrier on the bridge, and by a 15-foot wide grass mall on the approach roadways.

Paerdegat Basin Bridge.

Proposed Paerdegat Basin Bridge.

The existing Fresh Creek Bridge is a 264.5 foot, 5 span, multi-girder, simple supported steel superstructure, supported on pre-cast concrete columns founded on four reinforced concrete piers on concrete piles with concrete gravity abutment walls on timber piles. The bridge has two 34'-2" wide roadways, a 5-foot wide center median/barrier, and a 10-foot wide south sidewalk. The parkway east and west of the bridge has a 10-foot wide bike footpath on the south side. The existing structure and immediate approaches will be demolished and replaced.

The replacement bridge will be a 309-foot, 3 span structure; the new structure will have only two support piers, resulting in a wider channel. The proposed construction will result in improved landscaping on the bridge approaches. The bridge deck and approaches will be widened to 120 feet from the existing 86 feet to accommodate three 12-foot lanes in each direction, 12-foot wide shoulders, and a 12-foot wide bike path, separated from the traffic lanes by a barrier system. The pedestrian and bicycle pathway will be maintained at all times.

Fresh Creek Bridge in 2002. (Credit: NYSDOT) Proposed Fresh Creek Bridge.

The existing Rockaway Parkway Bridge is a 150-foot, 4 span, multi-stringer, simple supported steel superstructure, supported on steel cap beams on concrete filled steel pipe columns, and reinforced concrete abutment walls supported by concrete pile foundations. The bridge has two

34'-2" wide roadways, a 5-foot wide center median/barrier, and a 10-foot wide south sidewalk. The existing structure and immediate approaches will be demolished and replaced.

The replacement bridge will be a single span structure to improve visibility along Rockaway Parkway. The new structure will be built in the same alignment as the existing bridge. The bridge deck will be widened to 109 ½ feet from the existing 84 feet to accommodate three 12-foot lanes with a 12-foot wide right shoulder and 4-foot left shoulder in each direction, including 5 ½ feet for median and parapet width. The right shoulder lane on each approach will be 10 feet (while the width of the right shoulders on the bridge structure will be 12 feet), with the other dimensions the same width as those on the bridge. In addition to reconstruction of the bridge, four access ramps will also be reconstructed as will Rockaway Parkway in the vicinity of the Belt Parkway.

Rockaway Parkway Bridge in 2002. (Credit: NYSDOT) Proposed Rockaway Parkway Bridge.

A Notice to Proceed for the reconstruction of the Group 1 bridges was issued to the contractor with a start date of October 26, 2009.

Milestone A consists of all work required to complete the reconstruction of the Paerdegat, Fresh Creek, and Rockaway Bridges, including all roadway sections and ramps, within the limits of the construction, adjacent to and between the bridge structures. The contract provides for an incentive of $35,000 per day for each day that milestone A is early, with a maximum incentive of $14.98 million. There is a similar disincentive if the milestone is exceeded, with no maximum.

The existing Gerritsen Inlet Bridge is a 520-foot long, 9 span, steel girder and reinforced concrete beam superstructure, supported on reinforced concrete piers, and abutments supported on timber piles. The existing structure and immediate approaches will be demolished and replaced.

The replacement bridge will be a consist of a 496-foot, 3 span bridge, aligned 10'-6" north of the centerline of the existing structure, and remaining 35 feet over the navigable channel. The bridge will have a 36-foot wide roadway with a 12-foot wide right shoulder and a 4-foot wide left shoulder in each direction. The eastbound side will carry a dedicated pedestrian/bike path along the south fascia.

Gerritsen Inlet Bridge in 2002. (Credit: NYSDOT) Proposed Gerritsen Inlet Bridge.

Opened on June 29, 1940, the Mill Basin Bridge is adjacent to the Jamaica Bay Wildlife Refuge and the Gateway National Recreation Area. It is the only movable bridge on the Belt Parkway. The current clearance over Mean High Water is 35-feet. When the Mill Basin Bridge was constructed during the first half of the 20th century, New York City's inland waterways were among the most heavily navigated thoroughfares in the country. However, as maritime traffic in New York City steadily decreased since the mid-1960s, the need for movable bridges lessened as well. In 1941, during its first full year of operation, the Mill Basin Bridge was opened 3,100 times; by 1953, that figure decreased to 2,173; by 2009, the number of openings declined further to a total of only 183 openings.

In addition, significant and costly traffic congestion results from the operation of this outmoded drawbridge. In 2007, the Mill Basin Bridge carried 148,802 vehicles per day. The average opening and closing time for the bridge (and others like it) is ten minutes. Thus, this structure's operation has a negative and significant effect on the efficiency of New York City's vehicular traffic flow.

The existing Mill Basin Bridge is 864-feet long and 14 spans, including double movable leaf bascule spans and a steel superstructure, supported on reinforced concrete pier on timber piles, and abutments supported on pre-cast concrete piles. The existing structure and immediate approaches will be demolished and replaced.

Pier 3 Column Repair in December 2008. (Credit: NYSDOT)

The replacement will be a 1,757-foot, 11 span fixed bridge, north of the existing structure. The bridge will have a 36-foot wide roadway with a 12-foot wide right shoulder and a 4-foot wide left shoulder in each direction. The eastbound side will carry a dedicated pedestrian/bike path along the south fascia. The new bridge will be a fixed structure with a 60-foot clearance over Mean High Water, obviating the need for opening and closing the structure to accommodate tall vessels. The new design of the bridge will result in increased sight distances, an increase in lane width from 11-feet 4-inches to 12-feet, and the inclusion of safety shoulders in both directions. The channel will remain navigable during construction, and the clear channel width will remain the same after the new structure is in place. A new fender system will be installed to protect the bridge substructure from marine traffic.

Mill Basin Bridge. Proposed Mill Basin Bridge.

The existing Bay Ridge Avenue Bridge is a 58-foot long, single span, reinforced concrete deck on a multi-girder system superstructure over Bay Ridge Avenue. The superstructure is supported by concrete gravity type abutments on pile foundations. The underpass is access to the NYCDEP Owl's Head Waste Treatment Plant. The existing superstructure will be demolished and replaced.

The replacement bridge superstructure will consist of pre-stressed concrete box beams and a reinforced concrete slab. The bridge will have three 12-foot wide lanes in the eastbound direction and two 12-foot wide lanes separated by a 4-foot wide painted stripe flush median in the westbound direction. There is no pedestrian/bike path on the structure. The existing bridge will be reconstructed using pre-cast deck sections. The clearance will be increased to 14-feet 6-inches, which removes the need for clearance signs currently posted for a substandard condition and will obviate the need for underdeck wood shielding.

Bay Ridge Avenue Bridge in 2002. (Credit: NYSDOT) Proposed Bay Ridge Avenue Bridge.

The existing Nostrand Avenue Bridge is a 140-foot long, 3 span, multi-girder superstructure, consisting of a concrete deck with an asphalt overlay over Nostrand Avenue. The superstructure is supported by concrete pier columns with a steel cap beam, and abutments on concrete filled steel pile foundations. The existing structure and immediate approaches will be demolished and replaced.

The replacement will be a single span bridge consisting of standard steel girders with a cast-in-place deck superstructure and reinforced concrete abutments on pile footings, thus eliminating the need for intermediate support piers and resulting in improved sight lines on Nostrand Avenue. The bridge will have three 12-foot wide lanes with a 12-foot wide right shoulder. The approaches will have a 10-foot wide right shoulder and a 4-foot wide left shoulder in each direction. Nostrand Avenue will be widened to 81 feet and realigned with the existing approaches. On the Belt Parkway, the bridge will be widened in order to provide new safety shoulders in both directions. New safety-shape parapets will be installed and the existing corrugated metal center guide-rails will be replaced with a reinforced concrete center median, which will result in a safer condition.

Nostrand Avenue Bridge. Proposed Nostrand Avenue Bridge.

A computerized traffic simulation model was developed to analyze traffic conditions in connection with the Division's plans to reconstruct these seven bridges on the Belt Parkway. This model was a useful tool for understanding the impact of construction on the traveling public and helped us determine appropriate construction schedules. It enabled us to rapidly evaluate the impact of a variety of combinations of construction staging.

BEVERLY ROAD BRIDGE OVER BMT SUBWAY (BROOKLYN)

This bridge is a three span structure and was built in 1907. The superstructure consists of two built-up through girders, floor beams and stringers. The stringers are encased in a concrete jack arch deck. The superstructure is supported by concrete gravity wall abutments and piers. The project will involve the replacement of the existing deck with a new floor system using a concrete exodermic deck, and the repair of the existing primary members. The work will also include cleaning and painting the steel, and repairing the bridge seat and deteriorated concrete abutments. The bridge will be constructed in three stages and will remain open to traffic and pedestrians at all times. This project, currently in the final design stage, is expected to begin in April 2014, and is expected to be completed in April 2016.

Beverly Road Bridge in 2006. (Credit: NYSDOT)

BROOKLYN-QUEENS EXPRESSWAY (WB) & (EB) OVER CADMAN PLAZA AND FULTON STREET (BROOKLYN)

The Brooklyn-Queens Expressway over Cadman Plaza and Old Fulton Street, oriented East to West, and located just west of the Brooklyn Bridge, consists of two-level two-span superstructures, one above the other, founded on concrete abutments and piers sharing a common footing on H piles. The bridge was constructed in 1948.

The westbound side (the lower of the two-level structure) is a two-span continuous steel stringer, concrete deck superstructure supported by concrete abutments and a solid concrete center pier. The stringers are supported by fixed bearings at the center pier and with expansion bearings at the abutments. The bridge deck is a reinforced concrete slab overlaid with an asphalt wearing surface.

The eastbound side (located on the upper level) is a cantilever two span continuous steel rigid frame structure of built-up riveted girders. The girders are concrete-encased and rigidly framed into the framing at both abutments and center pier. The existing railings are substandard, and the granite veneer on the substructures has been removed from both of the abutment stems and the south side wing walls.

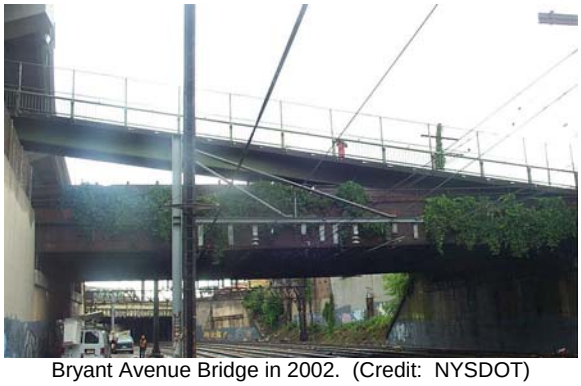
BQE Bridge Over Cadman Plaza in 2008 – Upper Level is Eastbound, Lower Level is Westbound. (Credit: NYSDOT)

Structural demolition will include removing the existing wearing surface, demolishing and removing the existing bridge railings, safety walks, concrete deck (WB), deck expansion joints, concrete approach slabs, and the top portion of existing abutment and pier stems (WB). New construction for both the westbound and eastbound structures will include new top portions for the abutment stems and pier caps, new abutment expansion bearings and pier fixed bearings, new shear stud connectors on top flanges at existing stringers, new exodermic deck on steel stringers, new approach slabs at the westbound and deck/underdeck repair at the eastbound structure, half-size permanent concrete barriers at both fascias, new deck plug joints, a new wearing surface, and a new waterproof membrane over the concrete deck surface.

The project is currently in its final design phase. Construction is expected to begin in March 2014, and is expected to be complete in April 2015.

BRYANT AVENUE BRIDGE OVER AMTRAK AND CSX (BRONX)

This project will include replacing the existing superstructure with a concrete filled steel grid deck, new multi plate girder stringers, and new elastomeric bearings. The existing substructure will be rehabilitated by replacing the top portion of the concrete abutment, and installing new bearings, and the abutments will be retrofitted to meet seismic criteria. The bridge will be closed during construction, but a temporary pedestrian bridge will be constructed and maintained. Construction is expected to begin in October 2011, and is expected to be complete in April 2013.



Bryant Avenue Bridge in 2002. (Credit: NYSDOT)

CITY ISLAND ROAD BRIDGE OVER EASTCHESTER BAY (BRONX)

The existing City Island Road Bridge was built in 1901 and is the only vehicular, bicycle and pedestrian access between the mainland Bronx and City Island. In 2008, the bridge carried 15,955 vehicles per day. The bridge is part of City Island Road, which is located within Pelham Bay Park and crosses over Eastchester Bay. With seven spans and six piers in the water, the bridge has outlived its useful life and requires extensive continuous maintenance.

Original Bridge in 1873. Bridge in 1928. Aerial View of Current Bridge.

The existing bridge will be replaced along the same alignment with a new single span, single tower cable-stayed bridge which will be a unique structure type in the NYC area. The new bridge will be approximately 17 feet wider than the existing one to accommodate three standard 12-foot wide traffic lanes, a 6-foot wide bicycle lane and a 6-foot wide pedestrian walkway on each side. The tower and concrete counterweight for backstay anchorage of the new bridge will be located in Pelham Bay Park. The new bridge will be designed to current standards and with its wider roadway width, will allow future repair and rehabilitation to be carried out while maintaining one 12-foot lane in each direction. In order to maintain traffic during the demolition of the existing bridge and construction of the new bridge, a temporary bridge will be constructed on the south side of the existing bridge.

City Island Road Bridge. Vertical Clearance Posting. (Credit: NYSDOT)

The project is currently in its final design phase. The construction phase for this project is scheduled to begin in November 2011 with an approximate duration of 3 years.

Rendering of New City Island Road Bridge.


Side View Rendering of New City Island Road Bridge.

CLAREMONT PARKWAY BRIDGE OVER METRO NORTH RR (BRONX)

The Claremont Parkway Bridge was built in 1889, with major reconstruction in 1938. Claremont Parkway is a roadway link in the Crotona Park section of the Bronx where the street system features few continuous east-west routes. The existing bridge is a steel superstructure encased in concrete supported on the original stone masonry abutments. It spans the tracks of the extremely busy Harlem Valley and New Haven lines of Metro-North Railroad, an essential regional commuter link between the northern areas of the metropolitan region, key points in the Bronx and Harlem, and the Manhattan central business district. Reconstruction will extend the life of the bridge by 40 years.

Claremont Parkway Bridge. (Credit: NYSDOT) Looking Northwest in 2008

This project, currently in its final design phase, will include removal of the entire superstructure and approaches. The new bridge will consist of pre-stressed concrete box beams supporting a reinforced concrete deck and approach slab, concrete sidewalks and reinforced concrete parapet walls with protective fencing, and reconstructed approach roadways. A portion of both existing abutments will be removed to accommodate the new bridge profile. The utility work will include the installation of two new water mains, a gas main, and electrical conduits. The bridge will be constructed in four stages, with one traffic lane open in each direction at all times during construction. Construction is expected to begin in December 2010, and is expected to be complete by January 2013.

Existing North Side Guardrail and Fence. Proposed Guardrail and Fence.

CONCOURSE VILLAGE AVENUE BRIDGE OVER METRO NORTH (BRONX)

This project will include demolishing the existing bridge deck, removing loose encasement on the structural members, localized steel repairs, and restoring the encasement. A new concrete deck will be installed, and new approach slabs, an east parapet, steel faced curbs, and concrete sidewalks will be built. The existing granite blocks will be repointed as necessary. The bridge will be reconstructed in four stages, with one 14.11 foot wide southbound lane maintained during construction. Construction is expected to begin in November 2019, and is expected to be complete in May 2021.

Concourse Village Avenue Bridge. (Credit: NYSDOT)

CROOKE AVENUE AND NEWKIRK AVENUE BRIDGES OVER BMT SUBWAY (BROOKLYN)

The existing four span Crooke Avenue Bridge was constructed in 1916. A recent inspection revealed significant deterioration of the superstructure. This project, currently in its final design phase, will include removal of the superstructure in the right of way only, approaches and two piers. The new single span bridge will consist of pre-stressed concrete box beams supporting a reinforced deck and approach slabs, concrete sidewalks, reinforced parapet walls with protective fencing and reconstructed approach roadways. The top portion of the abutments will be removed and reconstructed. The utilities will be relocated within project limits. The new bridge will also meet current NYCT sight distance and horizontal clearance standards. The bridge will be constructed in two stages, with one vehicle lane and one sidewalk maintained. Construction is expected to begin in April 2019, and is expected to be complete in October 2020.

The Newkirk Avenue Bridge is a three span structure between East 16th Street and Marlborough Road. This project, currently in its final design stage, will include the removal of the entire superstructure, including girders, deck slabs, approaches, and existing steel caps on the steel pier columns. The new three span bridge will consist of steel stringers and light weight concrete deck. The exterior and middle columns will be replaced with new steel columns. The top portion of the abutments will be removed and reconstructed. New utilities will be installed. Pedestrian access to the Newkirk Avenue station will be maintained during the three stage construction. During Stage III of construction the bridge will be closed to vehicular traffic. Construction is expected to begin in April 2019, and is expected to be complete in September 2020.

Crooke & Newkirk Avenue Bridges. (Credit: NYSDOT)

GRAND CONCOURSE BRIDGE OVER METRO NORTH (BRONX)

The bridge was originally built in 1906. It is a single span bridge consisting of a concrete deck supported on five steel plate girders, one truss, and a steel truss subway structure located in the center of the bridge. The bridge carries three lanes of vehicular traffic in each northbound and southbound direction as well as NYCT subway traffic underneath the Grand Concourse Boulevard and above the Metro North railroad right of way. The upper portion of the bridge carrying the roadway is now structurally supported by the lower portion carrying the subway. The two portions of the bridge are dependent upon each other for support and stability but are being maintained individually by two separate agencies, the NYC Department of Transportation, and NYC Transit Subways respectively. The subway portion of the structure, comprised of four warren trusses, is stabilized by the roadway portion floor beams and the roadway portion is supported by the subway trusses.

Red flag repairs were made in the first half of 2006.

Red Flag Repairs in February 2006: Ironworkers Removed the Plates From the Holes and Replaced Them at the End of Each Day. They Also Placed Reinforcing Bars for the New Concrete Slab. Supervisor Bridge Repairer and Riveter Gean Pilipiak Monitoring Red Flag Repairs in 2006. (Credit: Peter Basich)

In the new rehabilitation scheme, the roadway will be supported independently from the subway structure: the structures will be physically separated. Steel members will be added to the subway trusses to provide the stability previously provided by the roadway portion floor beams. The substructure consists of two concrete abutments bearing on rock ledges. The tops of these abutments lie at two levels, an upper level which supports the bridge stringers and a lower level which supports the subway trusses. The bridges stringers over the subway tracks bear on a composite steel beam/concrete backwall which will be replaced as part of this project. The foundation for the new trusses being installed to carry the roadway superstructure will bear on the rock behind the existing abutments.

The reconstruction project will also include building new sidewalks, as well as bridge railings with protective fencing, expansion deck joints, electrical conduits and fixtures, and the relocation of the existing water main under the sidewalk. Two lanes of vehicular traffic and the pedestrian walkway will be maintained in each direction on the Grand Concourse. This project, currently in

the final design phase, is expected to begin construction in September 2012, and is expected to be complete in December 2014.

Grand Concourse Bridge over Metro North in 2002.
(Credit: NYSDOT)

HIGHLAND PARK PEDESTRIAN BRIDGE OVER PEDESTRIAN PATH (QUEENS)

The Highland Park Pedestrian Bridge, built in 1935, is a single span arch structure with a clear opening of 60 feet under the bridge. Unlike a conventional steel or concrete bridge structure, the main structure is a brick masonry arch, with wing walls and parapet walls consisting of stacks of random size rocks set in mortar. The height of the parapet walls from the roadway surface varies from four to five feet. The bridge, located inside Highland Park, spans a hiking trail, and carries pedestrian and bicycle traffic. It is 27 feet wide with neither sidewalks nor shoulders.

A recent inspection revealed significant deterioration of the masonry arch. The project, currently in the preliminary design phase, will include the rehabilitation of the existing brick masonry arch structure and the specialized wearing surface. The bridge will be closed to all traffic and will be reconstructed in one stage. Construction is expected to begin in July 2014, and is expected to be complete in July 2016.

Highland Park Bridge. (Credit: NYSDOT)

HILL DRIVE BRIDGE (TERRACE BRIDGE) OVER PROSPECT PARK LAKE (BROOKLYN)

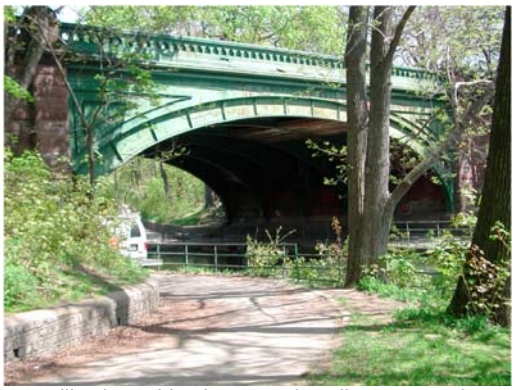
The landmark Hill Drive Bridge was built in 1890, and was previously known as the Breeze Hill Bridge. The existing bridge is a three span simply supported steel girder/beam structure, with the center arch span crossing Prospect Park Lake, and the other two spans consisting of underground masonry cellular structures with multiple interior masonry-bearing walls and non-

composite concrete deck and concrete sidewalk. The substructure of the bridge consists of solid gravity masonry abutments with U-type wing walls.

This project will include the replacement of the existing masonry cellular abutments with new reinforced concrete abutments clad with existing stone and new brick masonry; the removal, storage, and reinstallation of the existing stone wing walls with a new reinforced concrete core; the replacement of the existing stringers and floor beams with new steel stringers; the reinforcement of the existing arch girders with new cover plates; the reinstallation of the steel arch girders at their current locations to replicate original construction; and the replacement of the existing masonry arches spanning between floor beams by masonry cladding on the underside of the new arched concrete deck. The concrete deck, approaches, sidewalk, and roadway will be replaced within the project limits.

The ornamental cast iron and stones will be rehabilitated and reinstalled, replicating all the historic features and aesthetics of the original bridge. New bridge lighting and drainage systems will be installed. The park landscape will be restored, and trees identified by the Prospect Park Alliance as rare and/or historic shall remain undisturbed during construction.

The project is currently in its final design phase. Repairs requiring immediate attention will be performed by the When and Where contractor. This bridge is closed to vehicular traffic.

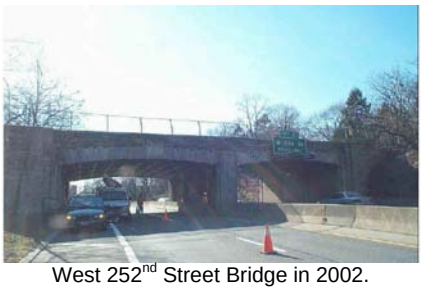


Hill Drive Bridge in 2001. (Credit: NYSDOT)

MANHATTAN COLLEGE PARKWAY, WEST 232ND STREET, WEST 239TH STREET, AND WEST 252ND STREET BRIDGES OVER HENRY HUDSON PARKWAY (BRONX)

This $6.6 million project reconstructed four bridges over the Henry Hudson Parkway. A Notice to Proceed was issued to the contractor with a start date of February 23, 2004. The reconstruction of the West 239th Street and West 252nd Street Bridges commenced after the substantial completion of the Manhattan College Parkway and West 232nd Street Bridges. Work on the Manhattan College Parkway, West 232nd Street, and West 239th Street Bridges included the demolition and removal of the existing pavement and roadway slab down to the concrete arch of each bridge, and replacing it with a new deck on a protected membrane waterproofing system. In addition, the reconstruction of these bridges included drainage, repointing the existing stone masonry, new signage and pavement markings, improving the under deck lighting systems, and private utility work.

The reconstruction of the Manhattan College Parkway and West 232nd Street Bridges was substantially completed on September 28, 2006. The reconstruction of the West 239th Street Bridge was substantially completed on December 5, 2006.



West 252nd Street Bridge in 2002.
(Credit: NYSDOT)

Work on the West 252nd Street Bridge included the demolition of the existing concrete arch bridge deck, and replacing it with a new prestressed concrete box beam superstructure. In addition, the reconstruction of this bridge included installing a new 12 inch diameter water main, improving the under deck lighting systems, private utility work, partial removal of the pier and abutments, new roadway lighting, and adjustment of the existing drain inlets, manholes, and catch basins. The work was completed in four stages. The work on this bridge began with Stage I on January 3, 2006.

West 252nd Street Bridge and Protective Chain Link Fence Before Reconstruction.

The removal of the existing bridge sections over the northbound Henry Hudson Parkway was performed at night on October 25 and 26, 2006. The removal of the sections over the southbound Henry Hudson Parkway was performed at night on October 31 and November 1, 2006. The demolition of the north half of the bridge was completed in November 2006.

2006: Cutting and Removing the Existing West 252nd Street Bridge Sections Over the Parkway.

2006: Wire Sawing the Deck and Removing the Existing West 252nd Street Bridge Sections Over the Parkway.

2007: West 252nd Street Bridge Formwork and Rebar Fabrication at the Pier and West Abutment. Concrete Placement in Progress.

The new superstructure for the north half of the bridge, comprised of pre-stressed concrete beams and cast-in-place reinforced concrete deck and sidewalks, was completed in May 2007. The approach pavements, steel-backed timber guide rails and ashlars veneer parapet wall on the bridge were completed in October 2007.

Grouting of the West 252nd Street Bridge Box Beams in February 2007.

West 252nd Street Bridge: Transverse Post-Tensioning of the Pre-Cast Concrete Beams in March 2007. Installed Asphalt on Bridge Approach in July 2007.

Stage I was completed in February 21, 2008 and the traffic was switched to this newly constructed portion of the bridge by continuing to maintain one westbound traffic lane. Stage II began on February 25, 2008.

The contractor completed the removal of the southern half of the bridge on April 23, 2008. In 2008, the contractor installed the new pre-stressed concrete box beams for the superstructure, completed the water and Con Edison gas mains across the bridge along with their connections to the mains in the approaches, placed the reinforced concrete bridge deck, as well the light weight concrete fill within the limits of the bridge approach slabs, and the back fill behind the concrete fill. In addition, the contractor also completed work on the left lanes of the service roads which included saw cutting and removing the existing pavement, placing roadway base course and asphalt pavement, installing the steel faced curb, pouring sidewalk slabs and constructing reinforced concrete approach slabs and sleeper slabs.

West 252nd Street Bridge: Placing New Precast Prestressed Concrete Box Beam on the Bridge Deck in June 2008. Installation of Water and Gas Mains in July 2008.

The southern half of the bridge was opened to traffic on November 26, 2008, thus restoring the two way traffic onto the bridge structure. The contractor also reopened the left lanes of the east and west service roads and restored all turning movements from the east and west service roads onto the bridge. At the end of 2008, Stage III and Stage IV construction were in progress.

The remaining work on the east and west service roads, and the weather-sensitive work such as placing the concrete base and asphalt pavement, were completed in the spring of 2009. The service roads were reopened to two lane traffic after the completion of Stage IV work. The reconstruction of the West 252nd Street Bridge was substantially completed on May 4, 2009.

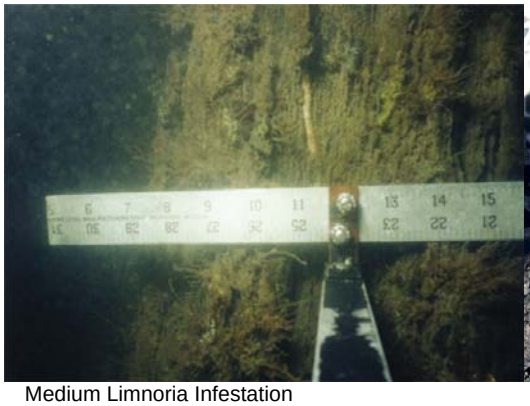
West 252nd Street Bridge: Installing the Protective Steel Picket Fence. View of the Sidewalk After Reconstruction.

MARINE BORER REMEDIATION (MANHATTAN & BROOKLYN)

Marine borers pose an immediate and serious danger to the thousands of piles and other structures of timber built in the marine environment. In New York Harbor, as the water quality improved due to many years of clean up efforts, marine borer (limnoria, teredo, etc.) activity has increased significantly in recent years. The recent inspections of timber structures by various local agencies (such as The Port Authority of NY & NJ, NYS Department of Transportation, NYC Department of Sanitation, and NYC Economic Development Corporation) indicate increasing damage to their structures resulting from marine borer activity. These agencies are implementing measures to protect the structures against marine borers.

Marine Borer – Limnoria Species

Marine Borer – Teredo Species



Medium Limnoria Infestation

Teredo Damage (holes up to ¼" diameter)

In October 1999, the Department began a study to assess the existing damage caused by marine borers as well as the potential for future damage at several waterfront DOT structures, including the supporting structures of the relieving platforms along the FDR and Harlem River Drives, and the timber piles and structures of the Carroll Street and Ocean Avenue bridges in Brooklyn. The underwater inspection of timber piles supporting the FDR Drive began on May 8, 2000. Inspection of the Brooklyn sites was conducted during the week of October 23, 2000. The inspections were completed in October 2000, and the Marine Borer Evaluation Report was published in June 2001. Using the results of the underwater inspections, preliminary plans were developed for the implementation of repairs and remediation measures to protect the structures from attack. These preliminary plans were completed in December 2001. The final design is complete. Mitigation work for the impact of the construction on the bodies of water will be done under a separate contract. A search for a suitable location for open water mitigation is being conducted with the assistance of the Army Corps of Engineers and NYSDEC.

The construction project will include barrier wrapping (placement of plastic barrier wrap around a timber pile to prevent marine borers from settling on and penetration into exposed wood); pile encasement (concrete encasement of selected severely damaged piles to reinforce and protect them from marine borers); pile posting (cutting off deteriorated upper portion of pile and replacing it with a new treated timber post); pile cap encapsulation (encapsulation of submerged timber pile caps and timber fascia with plastic lumber and synthetic mastic); bracing replacement (replacement of structural timber bracing with new treated lumber); timber removal (removing timber stays, bracing and formwork located at the top of the piles); installation of additional two-way bracing (installation of two-way bracing using tread lumber to upgrade the strength of piles by reducing the unbraced length); placement of light weight concrete fill (filling with light weight concrete where the distance from underside of the platform deck to the top of the mudline/water interface is less than one meter creating insufficient headroom for divers to wrap or jacket piles); and superstructure timber replacement (timber pile caps, railing members and other timber superstructure elements along with severely corroded steel correction hardware located above the high water line will be replaced in kind). The construction work is expected to commence in January 2011, and to be complete in November 2014.

NORTHBOUND FDR DRIVE AT EAST 53RD STREET (MANHATTAN) – EMERGENCY CONTRACT

The Department is currently engaged in the procurement process for the marine borer remediation construction contract. The contract is for the rehabilitation of the timber substructures at selected locations along the FDR Drive and other locations noted above. The rehabilitation project is intended to address the structural damage and infestation of marine borer organisms in the timber substructures.

On September 18, 2009, a Notice to Proceed was issued to the consultant to perform a diving inspection and determine the current condition of the timber piles, which were last inspected in 2005. The re-inspection began on October 5, 2009.

On October 29, 2009, the divers discovered a line of piles that are broken and severely deteriorated by marine borer infestation and are no longer able to function as designed. These timber piles support the bulkhead and relieving platform which in turn support the East River Esplanade and northbound FDR Drive in the vicinity of East 53rd Street. The consultant analyzed the diver's report and determined the structure's condition is serious. The consultant further recommended that the Department take immediate and appropriate action to constantly monitor the structure until the remedial work is completed. Failure of these timber piles could lead to the sudden collapse of the East River Esplanade and northbound FDR Drive at that location.

Based on these red structural flag conditions, the Department closed the adjacent East River Esplanade at East 53rd Street to visually monitor the structure for any movement and as a precaution for public safety. Due to the potentially serious danger to life and public safety posed by the current condition, it is critical that the repair work be performed as expeditiously as

possible.

On December 2, 2009, in the interest of public safety, pursuant to Section 103(4) of the General Municipal Law and Section 315 of the New York City Charter, the Department declared that an emergency exists relative to the northbound section of the FDR Drive at East 53rd Street in Manhattan.

The repairs will include the following: temporarily securing of the existing sea wall; repair of all of the piles within the designated emergency repair work area; installation of a new intermediate support between the existing bents (each new support will consist of two mini-piles, one drilled in-place outboard of the sea wall and one drilled through the existing relieving platform deck inboard of the existing sea wall); cutting off of the new mini-piles by divers below the relieving platform deck and installation of a new steel support beam. This will be shimmed to the existing deck to transfer load into the new piles.

A Letter of Intent for the emergency repair of this bridge was issued to the contractor with a start date of December 17, 2009. Construction is expected be complete in summer 2010.

ROOSEVELT AVENUE BRIDGE OVER VAN WYCK EXPRESSWAY (QUEENS)

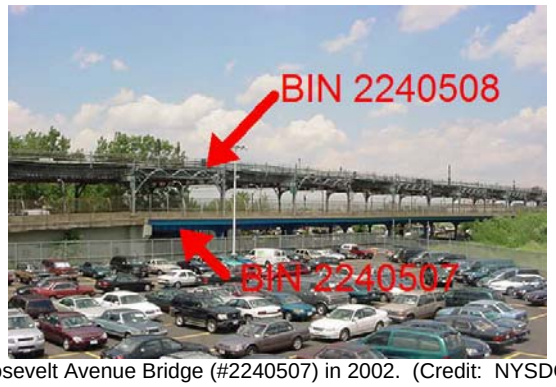
The existing bridge is a two level dual-use steel viaduct consisting of 27 spans. The first level, which carries Roosevelt Avenue, consists of a plate girder floor beam system supported by steel columns, intermediate piers supporting a bascule span spanning over the Van Wyck Expressway, and end abutments. The second level of the viaduct supports and carries the overhead NYC Transit Authority's #7 – Flushing line subway structure.

Concrete deck repairs were performed in July, August, and October of 2003, June and July of 2004, April, May, June, and July of 2005, and June and July of 2006. In the summer of 2005, the When and Where contractor repaired red and yellow flag conditions caused by damage by over-sized trucks using the Van Wyck Expressway. Red-flagged steel shoring and yellow-flagged cracked stringer connection angles were repaired in the spring of 2008.

In April 2009, the reconstruction plans of the bridge underwent a Value Engineering Study by the Office of Management and Budget which recommended several changes to the design that are being incorporated.

The project, currently in the final design phase, will include the construction of a new concrete-filled steel grid deck, rehabilitation of the existing east and west viaduct sections, bascule span, piers, abutments, and painting of the entire bridge. In addition, a new bicycle/pedestrian path will be constructed on the north and south sides of the bridge.

The lower level carrying Roosevelt Avenue will be reconstructed in three stages. Both vehicular and pedestrian traffic will be maintained throughout the construction of the bridge, with one lane in each direction. Construction is expected to begin in May 2012, and is expected to be complete in May 2015.



Roosevelt Avenue Bridge (#2240507) in 2002. (Credit: NYSDOT)

SHORE ROAD CIRCLE BRIDGE OVER AMTRAK (BRONX)

This project will include the removal of the existing two span bridge and the construction of a new single span bridge structure with a reinforced concrete deck over steel girders. The work will also include the construction of new reinforced concrete abutments and wing walls, as well as new parapet walls with protective steel fences. The bridge will be reconstructed in three stages, with one lane of traffic maintained in each direction during construction. A Notice to Proceed for the project was issued to the contractor with a start date of May 18, 2008.


Shore Road Circle Bridge in 2003. (Credit: NYSDOT)

Construction was expected to begin in May 2008, however, due to Amtrak's inability to provide the electric traction crew services for track outage, the construction activities on this project were on hold from September 21, 2008 until April 15, 2009. Construction is expected to be complete in January 2013.

SNUFF MILL ROAD BRIDGE OVER BRONX RIVER, EAST 175TH STREET BRIDGE OVER METRO NORTH, AND MOSHOLU PARKWAY BRIDGE OVER BRONX RIVER (BRONX)

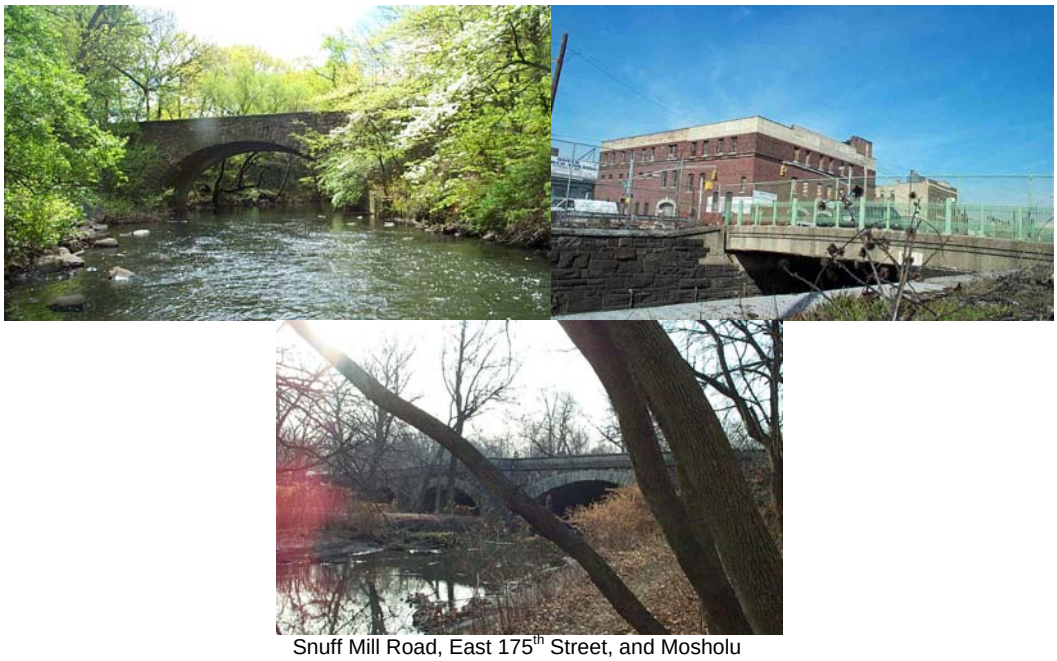
The Snuff Mill Road Bridge over the Bronx River is a two span concrete arch structure originally built in 1920 and subsequently reconstructed in 1947. It measures 104 feet long between abutments and 34' wide from parapet to parapet. The substructure consists of reinforced concrete stem walls of varying heights, widths, and thicknesses, supported by reinforced concrete footings founded on bedrock. The bridge consists of two 10-foot wide lanes, one eastbound and

one westbound. However, it is mostly used as a pedestrian bridge, as it is inside the New York Botanical Garden and Bronx Park.

The East 175th Street Bridge over Metro North was originally built in 1889 and it underwent reconstruction in 1938. The reconstruction work included a new steel superstructure, concrete deck slab and sidewalk in conjunction with repairs to the existing stone masonry substructure and relocation of various utilities. It is a single span multi-girder steel structure with a steel reinforced concrete deck, and it measures 61.68 feet long from abutment to abutment and 60 feet wide from parapet to parapet.

The Mosholu Parkway Bridge over the Bronx River was originally built in 1905 and it is located within the Bronx Park. It is a five-span stone masonry arch structure and measures 245 ½ feet long from abutment to abutment and 65 feet wide from parapet to parapet. It carries vehicular, pedestrian and bicycle traffic over the Bronx River. Component rehabilitation of the bridge was performed in 2000 including replacement of the concrete sidewalk, curb, concrete median barrier, box beam guide rail, under deck lighting, asphalt overlay, re-pointing of masonry joints and new pavement markings. The bridge consists of 3 lanes: one eastbound lane that tapers into two 12-foot wide eastbound lanes (towards the beginning approach), and one 14-foot wide westbound lane.

The consultant completed the field survey and in-depth inspection of the bridges in 2009. Construction is expected to begin in 2019.



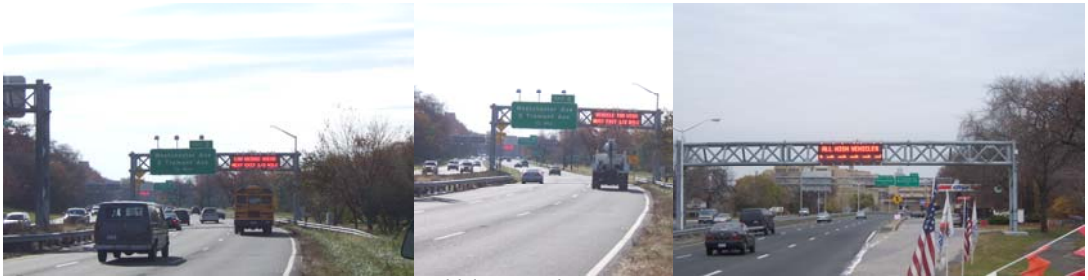
Snuff Mill Road, East 175th Street, and Mosholu Parkway Bridges in 2002. (Credit: NYSDOT)

WESTCHESTER AVENUE BRIDGE OVER THE HUTCHINSON RIVER PARKWAY (BRONX)

This two span bridge supports a transit structure overhead and has substandard clearance over the highway below. A project to install an ITS solution, which includes an overheight vehicle detection system that flashes signs directing vehicles identified as being over 9' in height to exit the parkway, was substantially completed on December 3, 2004. It also includes cameras that are activated by acoustics and that will document future damage to the bridge as well as the

offending vehicles' descriptions and plate numbers for recoupment of costs by the City. The contractor completed extra work associated with landscaping in the spring of 2006. The underdeck at both spans is currently covered by approximately 154 square feet of timber planking. In addition, the underdeck at span 1 is covered with approximately 18 square feet of steel wire mesh netting. A separate project is underway to reconstruct the bridge and lower the Parkway.

Westchester Avenue Bridge in 2001 and 2006. (Credit: NYSDOT) Overheight Sensor Unit on the Hutchinson River Parkway. (Credit: Roly Parroco)



Vehicle Detection System.

Video Stills From the Westchester Avenue Bridge BDSS.

The Westchester Avenue Bridge's vertical clearance over the Hutchinson River Parkway is sub-standard. Due to the number of truck and bus vehicles that mistakenly enter the Hutchinson River Parkway, where commercial vehicles are not allowed, the fascia steel girders of the bridge have been severely impacted and damaged numerous times. The planned lowering of the parkway will make it possible to eliminate the existing sub-standard vertical clearance of the bridge over the parkway without adversely impacting the NYCT elevated structure and its transit train operations. The total length for the lowering of the parkway will be 1000 feet (north and south), with a maximum lowering of the parkway of 2.5 feet under the Westchester Avenue Bridge.

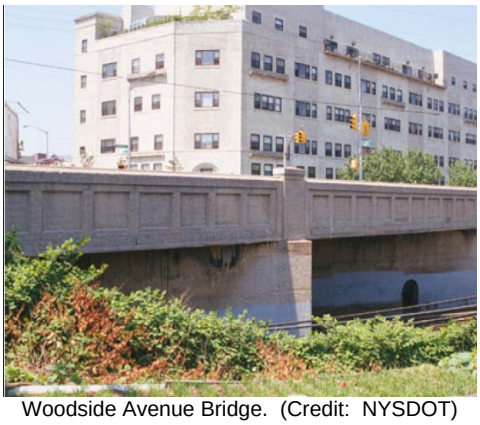
The rehabilitation of the bridge will include the replacement of the existing reinforced concrete

deck slab with a new reinforced concrete deck, steel faced curbs, a new parapet wall and protective screenings, concrete sidewalks, rehabilitation of the damaged steel fascia girders, and replacement of the diaphragms and other bridge elements, including a new steel water main.

This rehabilitation project is currently in final design. Computer traffic simulation models for the proposed maintenance and protection of traffic schemes for both the Westchester Avenue Bridge and the Hutchinson River Parkway were completed. The purpose of the models was to investigate traffic lane capacity/queuing, traffic signal timing optimization and traffic network simulation for the highway and streets during the construction phase. Construction is expected to begin in February 2013, and is expected to be complete in October 2015.

WOODSIDE AVENUE OVER LIRR (QUEENS)

This project, currently in its final design phase, will include the removal of the existing three span bridge and the construction of a new single span structure. The superstructure and abutments will be completely redesigned to comply with current seismic requirements. The bridge will be fully closed to traffic for ten months. Traffic will be detoured to adjacent streets during this period. Construction is expected to begin in December 2016, and is expected to be complete by December 2018.



Woodside Avenue Bridge. (Credit: NYSDOT)

5TH AVENUE BRIDGE OVER LIRR & SEA BEACH NYCT (BROOKLYN)

The bridge is a four span concrete-encased steel girder and floor beam structure, built in 1914. The reconstruction project will include replacement of the superstructure, rehabilitation of the abutments and wingwalls, reinforcement of existing piers, construction of new reinforced concrete sidewalks, approach slabs, new concrete parapet, and bridge fence. Construction is expected to begin in May 2020, and is expected to be complete in June 2022.

5th Avenue Bridge in 2006. (Credit: NYSDOT) Aerial View in 2009.

EAST 8TH STREET ACCESS RAMP (GUIDER AVENUE RAMP TO BELT PARKWAY) OVER BELT PARKWAY (BROOKLYN)

The East 8th Street access ramp (Guider Avenue ramp), built in 1942, provides vehicular access to the westbound Belt Parkway from Coney Island Avenue and the surrounding area, south of the Belt Parkway. The bridge also serves pedestrian traffic crossing the Belt Parkway. The bridge is a four span, simply supported, multi-girder steel superstructure with a reinforced concrete deck. The abutments and wingwalls are also reinforced concrete, as are the three piers. The entire substructure is supported on reinforced concrete pile caps and steel piles. The project will include the replacement of the superstructure with new steel stringers, a cast-in-place deck including a new sidewalk, a new steel bridge railing with protective screen fencing, and the replacement of the tops of the existing pier columns and abutments. In addition, the piers will be modified by adding two columns on new steel pile foundation, and underdeck and ramp lighting will be installed, as well as new catch basin frames. The ramp will be closed to both vehicular and pedestrian traffic for the duration of the reconstruction. Traffic will be diverted to local streets.

A Notice to Proceed for the project was issued to the contractor with a start date of August 10, 2009. Construction is expected to be complete in April 2011.

East 8th Street Bridge in 2002. (Credit: NYSDOT) Aerial View in 2009.

11TH AVENUE VIADUCT (WEST 30TH STREET TO WEST 33RD STREET) OVER LIRR WEST SIDE YARD (MANHATTAN)

This project will consist of the re-decking of the viaduct, the replacement of the sidewalks, the upgrading of the existing bearings to seismic isolation bearings, and the replacement of the street lighting. The work will also include performing repairs of the existing pier and abutment walls. The viaduct will be constructed in two stages, one half of the viaduct at a time. Three south bound travel lanes will be maintained at all times. A Notice to Proceed for the project was issued to the contractor with a start date of June 1, 2009.

11th Avenue Viaduct Site Overview.

11th Avenue Viaduct (West 30th Street to West 33rd Street) in 2006. (Credit: NYSDOT)

The installation of the LIRR horizontal and vertical protective shield was completed under Stage 1A. The west side sidewalk was modified for the traffic shift at Stage 1B. Demolition and reconstruction of the east half of the viaduct parapet and deck slab began under Stage 1B in December 2009. Construction is expected to be completed in February 2011.

11th Avenue Viaduct Stage 1A Construction. Traffic Enforcement Agent on Duty During Stage 1B Construction.

WEST 31ST STREET BRIDGE OVER AMTRAK (MANHATTAN)

This bridge between Ninth Avenue and Dyer Street, is a nine simple span multi-girder jack arch encased in concrete, and was built in 1909. The superstructure is supported by the west

abutment, the south retaining wall, and steel columns resting on spread footings. The project will involve installation of new floorbeams and steel stringers with a reinforced concrete deck slab, as well as the bridge seats and steel pier columns. Traffic will be maintained during the relocation of the utilities, but the bridge will be closed during the bridge replacement. This project, currently in the final design stage, is expected to begin in December 2019, and is expected to be complete in March 2023.

West 31st Street Bridge in 2004. (Credit: NYSDOT)

50TH STREET BRIDGE OVER LIRR BAY RIDGE (BROOKLYN)

This bridge is a two span skewed steel structure, and was built in 1928. It is a simply supported concrete-encased steel through-girder structure with multiple interior concrete-encased floor beams which crosses over an active LIRR track as well as abandoned LIRR tracks. The bridge deck consists of a concrete-encased steel multi-girder system with a non-composite reinforced concrete deck slab topped with a concrete wearing surface. The substructure consists of two reinforced concrete gravity wall abutments.

This project will replace the existing bridge with a single span superstructure; remove the top portion of the existing abutments, abandoning the remaining portions of the abutments and construct two new abutments at new locations; remove the existing pier and foundation; install new elastomeric bearings; construct a cast-in-place concrete deck, approaches and sidewalk; and install new reinforced concrete approach slabs. Construction is expected to begin in July 2014, and is expected to be complete in August 2016.

50th Street Bridge in 2003. (Credit: NYSDOT)

EAST 78TH STREET PEDESTRIAN BRIDGE OVER FDR DRIVE (MANHATTAN)

The current bridge is a nine span reinforced concrete structure over the FDR Drive. There is a ferry house on the East River Esplanade which was used for storage for the old ferry when the bridge was built in 1940. The bridge is supported on the ferry house structure on the Esplanade side. This project, currently in its final design phase, will include the removal of the entire superstructure; concrete deck, floor beams, parapet, girders, railing, protective screening, encased steel beams in the ferry house, existing concrete stair case on the esplanade side, existing substructure of piers, and ramp walls and wall of the ferry house, as well as a portion of the pier foundations below grade. The new fourteen span bridge will include steel piers with caisson foundations, a ramp retaining wall, and new superstructure using welded structural tubing, vertical steel railing, and horizontal hand rails, as well as protective fencing. A new cast-in-place reinforced concrete deck will be installed. The proposed west ramp will be enclosed with a stone masonry wall to match the existing park wall. The new bridge will comply with ADA regulations.

During construction, pedestrian traffic will be detoured to the 71st and 81st Street pedestrian bridges. Construction is expected to begin in June 2010, and is expected to be complete in July 2011.

East 78th Street Bridge. Aerial View. Proposed Bridge and Fencing – Looking West.

153RD STREET BRIDGE OVER METRO NORTH (BRONX)

This project, currently in the final design stage, will construct a two-span, single tower, cable stayed vehicular bridge. It will be the first of its kind in New York City. The new four lane bridge will extend East 153rd Street in the Bronx across the Mott Haven rail yards from Morris Avenue to the Grand Concourse just north of Hostos Community College in the Melrose Section of the

Bronx. This bridge will complete a link the street lost in the early 1980's when the old turn-of-the-century bridge was closed and demolished because of its age and deterioration. The project to demolish the condemned buildings on the property is currently in the final design stage. Demolition is expected to begin in 2010, and is expected to be complete in 2011. Construction of the new bridge is tentatively scheduled to begin in March 2020 and be completed in April 2023.

Original 153rd Street Bridge. Bridge in Early 1980's.

The new bridge will significantly ease congestion on the current east-west streets in the South Bronx, along 149th and 161st Streets as well as on the local streets in this neighborhood. With this bridge, East 153rd Street will be a continuous east-west thoroughfare from the commercial hub of Third Avenue to the Civic Center area of the Grand Concourse. It will serve the new revitalization projects of Melrose Commons, the Concourse Shopping Plaza and the Bronx Criminal Court Complex.

The bridge's graceful design, similar to the Tampa Bay Bridge in Florida, will create a very prominent landmark for this neighborhood. The cable-stayed structure will contain a tower rising above East 153rd Street to add to the Bronx skyline, with ribbons of steel cables holding up the roadway structure. The roadway will run between the two towers, and the sidewalk and bicycle lanes will be located on cantilever sections outside of the towers. This will reduce the overall depth of the superstructure by reducing the floor beam depths. On July 14, 2003, the Art Commission selected the East 153rd Street Bridge project for a Design Award in its 21st annual Excellence in Design Awards.

Rendering of New 153rd Street Bridge

EAST 183RD STREET BRIDGE OVER METRO NORTH (BRONX)

The current bridge was built in 1896 and the superstructure was replaced in 1937. This project will include the removal of the existing single span bridge and the construction of a new single span bridge structure with a reinforced concrete deck over steel girders. The work will also include the rehabilitation of existing abutments and wing walls. The bridge will be closed during construction and will be reconstructed in a single stage. This project, currently in the final design stage, is expected to begin in July 2011 and is expected to be completed in September 2012.

East 183rd Street Bridge in 2002. (Credit: NYSDOT)

Specialty Engineering and Construction

Design-Build

In 2009 the Department continued to use the Design-Build process to expedite capital bridge rehabilitation. These contracts retain the same company for both design and construction on selected projects. It is evident that there are many advantages to the Design-Build program, including the use of one consolidated procurement rather than two or more, resulting in significant time savings; the ability to commence construction before design completion; the avoidance of project escalation costs as construction commences two or three years earlier than with the conventional design-bid-build method; minimization of design change orders; and better coordination between design and construction, as critical field issues are addressed expeditiously. In addition, the design is custom made and reflects the capabilities and strength of the specific contractor; the Department establishes a single point of contact for communicating its goals and objectives; and overall costs are reduced substantially.

RIKERS ISLAND BRIDGE OVER RIKERS ISLAND CHANNEL (QUEENS)

Cores taken from the bridge deck in 2003 revealed that the estimated useful life of the deck would soon expire, thus making bridge rehabilitation necessary. In 2008, the bridge carried approximately 15,621 vehicles per day.

Rikers Island Bridge in 2001. (Credit: NYSDOT)

The Division had previously completed the replacement of the bridge's substructure in 1998. The salty environment of the channel significantly contributes to the deterioration of the superstructure. This continued deterioration could also negatively impact the recently completed substructure work. The Division considered Design-Build to be the best delivery method for this project, as it can expeditiously bring projects to the construction stage, and is the preferred method in all cases where time is of the essence. As the bridge exclusively serves the Rikers Island Correctional Facility, the replacement of the bridge will require coordination with the Department of Corrections. Construction is expected to begin in 2020, and is expected to be complete in 2022.

As an interim measure, a project was planned to rehabilitate the bridge deck. The Notice to Proceed was issued to the contractor with a start date of August 24, 2005.

2006: Looking North at a New Bridge Slab And The Roadway Repairs. Painting Under the Bridge.

2006: Performing Underdeck Repairs. Working Inside the West Rebar Box Frame. Beam Repair. Concrete Placement.

The project work was expanded to include superstructure painting, various superstructure repairs, and repairs of the pier caps. The rehabilitation of the bridge deck was substantially completed on December 22, 2006. The painting was completed in 2006, and all of the other repairs were completed in summer 2007. This rehabilitation will allow the extension of the bridge's useful life to at least 2020, when the existing bridge will be replaced.

BRUCKNER EXPRESSWAY BRIDGES (NB AND SB) OVER AMTRAK & CSX (BRONX)

The Bruckner Expressway, named in honor of former Bronx Borough President and Congressman, Henry Bruckner (1871-1942), opened in 1973 and was one of the last roads on the New York City Expressway system to be built. The Bruckner Expressway Bridges are single span bridges on the Bruckner Expressway which run over the Amtrak/CSX railroads. Built over 60 years ago, the Bruckner Expressway Bridges carry over 140,000 motorists and cyclists daily.

A tanker truck carrying home heating fuel overturned and caught fire on the northbound bridge on the evening of October 4, 2005. The traffic on the bridge, and on the Amtrak and CSX railroad lines below, was adversely affected. The bridge was inspected and core samples of the concrete from the fire-affected deck were tested. Division crews assisted in emergency repairs and clean-up, re-setting all expansion plates on the abutment, and performing deck repair. The crews worked continuously, and the roadway was reopened in time for the morning rush hour on October 6, 2005.

Bruckner Expressway Bridge NB in 2002. (Credit: NYSDOT)

2005: The Tanker Truck. Repairs and Cleanup. (Credit: Bojidar Yanev)

To protect the trains and railroad facilities below the bridge after the October 4, 2005 tanker truck fire, contractor crews began the nighttime installation of protective timber shielding under the bridge on October 5, 2005. The project was completed on November 8, 2005. The Division's Surveying Unit assisted the Inspections Unit in monitoring the deflection of the bridge.

Deteriorated Bridge Deck With Exposed Rebar and Warped Steel Bracing Due to the Heat From the Fire. Timber Shielding on the Underside of the Bridge.

Arial View of the Bridges in August 2008. View of the Bridge in December 2009. (2009 Credit: Lacy Shelby)

The fire on the bridge weakened its members. While the immediate results of the fire were addressed by in-house forces, the aftereffects remain unresolved. The most recent inspection conducted on September 14, 2006 revealed that at least four girders have sagged and they are hit by CSX railroad cars below. The concrete deck has separated from the steel girder and there is a one to two inch gap between the top of the flange and the bottom of the haunches. In addition, the diaphragms between the girders have been burned and their capacity has been weakened. Repairs requiring immediate attention were handled by the When and Where contractor. The contractor installed additional timber bracing of the bridge's timber shielding in January and February 2007, performed emergency removal of loose underdeck concrete in July and August 2007, and repaired a red flag condition at the bridge stringers in September 2007. This will be followed up by the replacement of the bridge's northbound superstructure and the southbound deck, which will be done under a Design-Build contract. A Notice to Proceed was issued to the contractor with a start date of October 27, 2008. Due to delays in obtaining the railroad force account agreements, the contractor focused on work off-structure, such as the water main and the installation of complex maintenance and protection of traffic. Demolition of the northbound structure commenced in November 2009. Construction is expected to be complete in September 2011. The bridge carries approximately 140,000 motorists and pedestrians per day.

CROSS ISLAND PARKWAY BRIDGE OVER TOTTEN AVENUE (QUEENS)

A recent inspection by the Division revealed that the superstructure of the bridge has outlived its useful service life. The effects of age and weather have rendered reconstruction necessary. This project will include a new superstructure; pushing back the abutments to establish a longer bridge; adding one lane in each direction on 212th Street; geometric alignment improvements; and signal and lighting modifications. This project is currently in the preliminary engineering stage. Construction is expected to begin in winter 2020, and is expected to be complete in 2022.

Cross Island Parkway Bridge in 2002. (Credit: NYSDOT) Aerial View.

Cross Island Bridge Exit Ramp on the Northeast Side. Bridge Underdeck. South View of the Bridge. (Credit: Tamara Berlyavsky)

HARLEM RIVER DRIVE AT EAST 127TH STREET (MANHATTAN)

This project involves the replacement of the existing 11 span bridge and the reconstruction of the Harlem River Drive between the Willis Avenue and Third Avenue Bridges, in addition to various highway improvements. It eliminates a major weaving problem between the southbound Harlem River Drive traffic destined for the Second Avenue exit and the Third Avenue Bridge exit ramp, and allows at-grade access for a future Park/Promenade to be developed by the Department of Parks at 127th Street between the Harlem River Drive and the Harlem River. The viaduct currently carries two northbound and three southbound traffic lanes and serves approximately 79,000 vehicles per day. This area currently has 40 times the State average number of accidents. Construction is expected to begin in spring 2014, and is expected to be complete in spring 2016.

Harlem River Drive at East 127th Street.

EIGHT RAMPS AND ONE PEDESTRIAN BRIDGE AT THE ST. GEORGE STATEN ISLAND FERRY TERMINAL (STATEN ISLAND)

Ferry service between Staten Island and Manhattan began in 1898, and its operations were taken over by the City's Department of Docks and Ferries in 1905. Today it is run by NYCDOT's Passenger Transport Division and services more than 19 million passengers each year, according to Captain James C. DeSimone, the ferry's Chief Operations Officer. The St. George Ferry Terminal itself recently underwent a major reconstruction project. The old drab, dingy building was converted into a well-lit, modern multi-modal facility. In addition to ferry service, the terminal also includes a very active MTA bus station and a Staten Island Railway Station. The ramps that will be rehabilitated serve 23 NYC Transit bus routes that contribute significantly to ferry ridership. To complete the make-over of the St. George Terminal, the Division's Design-Build Unit is undertaking a major rehabilitation project to upgrade vehicular access to the site.

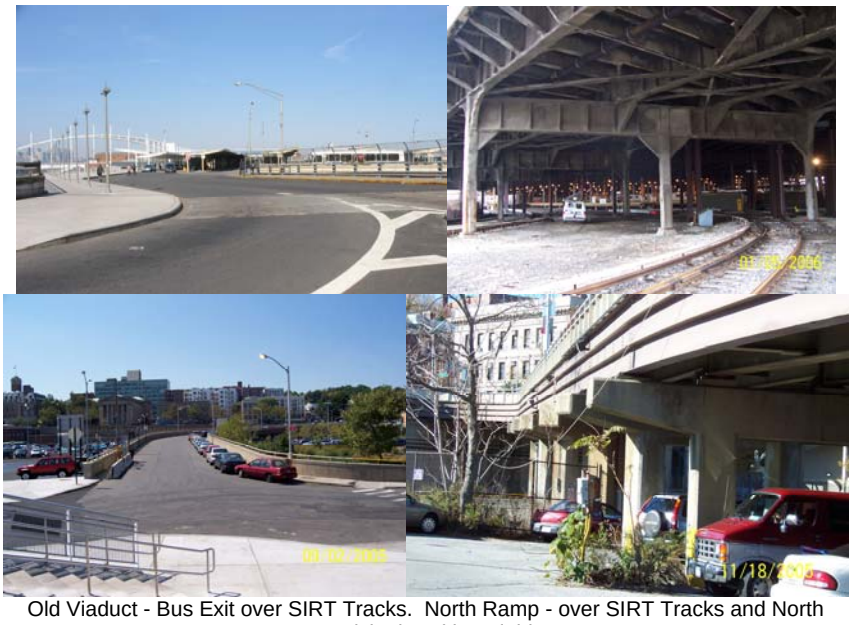
Arial Views of the Staten Island Ferry Terminal Ramps.

Currently a series of eight ramps carry bus and passenger car traffic in and out of the facility. The eight vehicular ramp structures consist of 73 spans that provide access to the Staten Island Ferry Terminal for pedestrians, private vehicles, taxis, and New York City Transit buses. The ramps span over the Staten Island Railway, terminal buildings, and terminal parking. Two of the structures serve as a bus station as well as providing a roof over the rail station below. Limited parking is provided on several of the ramps. The North Ramp provides access to the North Municipal Parking Field and the Richmond County Bank Stadium and stadium parking lot, which provides supplemental parking to the Ferry Terminal. The five span pedestrian bridge provides access between the main Ferry Terminal building and the 69th Street Terminal building as well as access to the Bus Entrance Ramp (Ramp B) above and the Commuter Pick-Up and Drop-Off Area below.

Ramp A - Borough Place over SIRT Tracks. Ramp B - Bus Entrance Ramp over SIRT Tracks & South Municipal Parking Field.

Ramp C - Commuter Entrance over SIRT Tracks. Ramp D - Commuter Exit over SIRT Tracks & Employee Parking Lot.

Bus Station North - over Terminal Building, SIRT Station and Employee Parking Lot.
Station South - over SIRT Station and Employee Parking Lot.



Old Viaduct - Bus Exit over SIRT Tracks. North Ramp - over SIRT Tracks and North Municipal Parking Field.

Pedestrian Breezeway - Over Commuter Drop-Off / Pick-Up Area.

North Municipal Parking Field.

Seven of the eight ramps were constructed in 1948, with the eighth dating back to the early part of the 20th century. The last major structural work on these bridges was a deck replacement project in 1985 that only addressed three of the eight bridge structures. The planned design-build project will upgrade these eight vehicular structures (and one pedestrian bridge), and provide a design life of 75 years. For seven of the ramps, the project will provide new decks and eliminate joints where feasible, retrofit poorly detailed steel connections, and rehabilitate/replace deteriorated steel superstructure and substructure members, as well as install new paint systems. Lead paint removal and the installation of a new drainage system as well as a pigeon deterrent system will also be included. The eighth ramp is the existing load-restricted north ramp adjacent to the Richmond County Bank Stadium. It will be demolished and reconstructed on a more efficient alignment in order to alleviate traffic congestion at the intersection of Richmond Terrace and Wall Street. In addition, this project will replace the superstructure of a pedestrian bridge (the 69th Street Terminal Building Overpass) connecting the terminal to an office facility, and will address traffic improvements for the entire stretch of Richmond Terrace outside the terminal. Construction began in summer 2009, and is expected to be complete by spring 2013.

A Notice to Proceed for the reconstruction of these structures was issued to the contractor with a start date of July 27, 2009. During the demolition of the concrete encasement at the old viaduct, which began in October 2009, lead paint on the underlying structural steel was discovered. The contractor will perform the concrete removal activities inside a Class 3P containment.

Emergency Contracts

BORDEN AVENUE BRIDGE OVER DUTCH KILLS (QUEENS)

The Borden Avenue Bridge over Dutch Kills is located just south of the Long Island Expressway between 27th Street and Review Avenue in the Sunnyside section of Queens. It is a retractile-type movable bridge. The original bridge construction was completed in 1908 and was opened to traffic on May 25, 1908.

The bridge structure carries two lanes of vehicular traffic with sidewalks on either side. The roadway is 34 feet wide and the sidewalks are 8 feet wide. In 2008, the bridge carried approximately 15,002 vehicles per day.

Borden Avenue Bridge. (Credit: Peter Basich) General View of the Crack in the Wingwall.

In the spring of 2008, the Department observed that an existing crack in the west abutment's wingwall had opened up further. Following a series of subsequent inspections, it was determined that there is continuous movement of the west abutment wall. In an effort to mitigate this condition, two pressure relief joints were installed in the roadway, and the speed limit for eastbound traffic was posted at 15 miles per hour. Unfortunately, these measures did not stop or slow the abutment wall's movement.

On September 11, 2008, the Department and its consultant met to discuss the problem, and it was determined that there were two possible solutions: either to install a tieback-suported anchoring system, which would restrain the west abutment wall's movement, or, to fully replace the bridge's west abutment wall and its wingwalls. The Department would not be able to determine which solution would be the best long-term solution until further detailed inspections of the abutment wall and wingwalls were performed.

In early 2009, based on the findings of the underwater inspection, the consultant provided its recommendation to the Department to proceed with the second option, and the Department concurred.

The movement of the wall is undermining the stability of the bridge. Due to the potentially serious danger to life, public safety and property posed by the current condition, it is critical that the repair work be performed as expeditiously as possible.

On October 16, 2008, in the interest of public safety, pursuant to Section 103(4) of the General Municipal Law and Section 315 of the New York City Charter, the Department declared that an emergency exists relative to the movable bridge carrying the Borden Ave. over the Dutch Kills in Queens.

The repairs will include the following: removal of the fill material under the roadway and sidewalks from behind the west abutment and between the wingwalls; relocation of the existing utilities; digging of a test pit to inspect the supporting piles; inspection of the condition and the taking of measurements; and the implementation of the appropriate repair solution based on the inspection findings.

The bridge was closed at noon on December 31, 2008. A Letter of Intent for the emergency repair of this bridge was issued to the contractor with a start date of January 6, 2009.

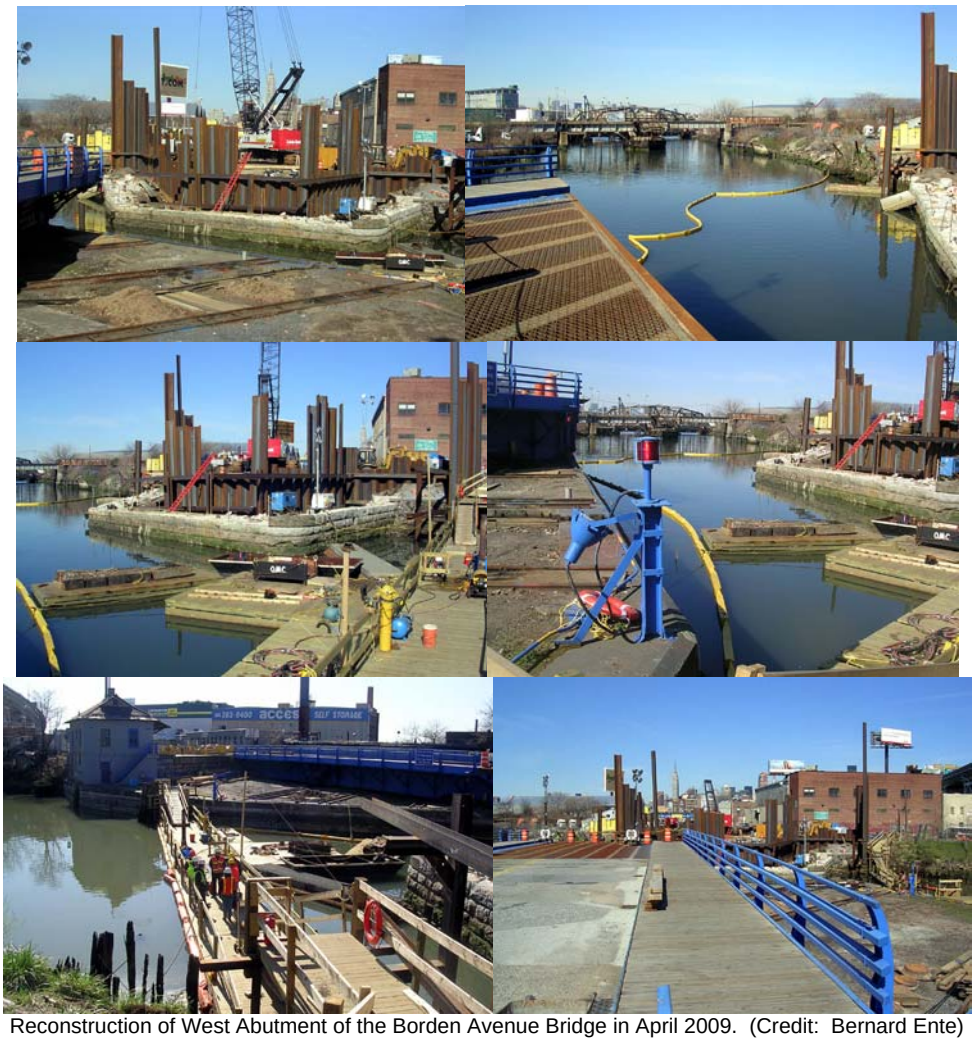
Borden Avenue Bridge Closed for Emergency Repairs in January 2009. (Credit: Bernard Ente) Roadway Excavation in January 2009.

The contractor began the excavation work behind the west abutment in February 2009. Installation of the cofferdam sheeting began in March 2009.

Demolition of the West Abutment and Wingwall in February 2009. (Third View Credit: Reza Lotfi)

Borden Avenue Bridge in February and March 2009. (Credit: Tamara Berlyavsky)

Demolition and Disposal of West Abutment Wall. (Credit: Reza Lotfi) Sheet Piling of Cofferdam. Closeup of Sheet Pile Driving Operation for the West Abutment. (West Abutment Credit: Reza Lotfi)



Reconstruction of West Abutment of the Borden Avenue Bridge in April 2009. (Credit: Bernard Ente)

Removal of Obstructions for the Sheeting Operation in May 2009. Deep Well Installation Southwest of the Bridge in June 2009.

A supplement to the Declaration of Emergency was added on August 3, 2009. During the excavation portion of the abutment wall repair work, the contractor encountered oil contaminated sediments in the Dutch Kills requiring the Department to notify the relevant federal and state regulatory agencies. The New York State Department of Environmental Conservation subsequently mandated that the Department prepare a Corrective Action Plan to address the contaminated sediments and dewatering fluids generated by the work. Since the environmental remediation work is incidental to the abutment wall repair work, the remediation work was added to the current emergency contract.

In addition, during the course of the abutment wall repair work, it was discovered that many areas of the superstructure of the moveable span exhibit deterioration. The additional repairs will include steel repairs on the stringers, floor beams and brackets; the installation of a new 5.5 inch concrete slab, and localized cleaning and painting.

The contractor began the demolition of the concrete deck in September 2009 and the repair of the structural steel in October 2009.

The Division identified a pocket of contaminated soil which was classified as "contaminated non-hazardous". As such, it poses no significant health risk to workers or the surrounding community. However, precautionary measures were taken and every effort is being made to remove and dispose of the contamination quickly, yet safely, within all New York City and State guidelines. A Corrective Action Plan (CAP) for the removal and disposal of the contamination was submitted to the NYS Department of Environmental Conservation (NYSDEC) for review and approval. Upon receipt of the NYSDEC approval in November 2009, the contractor proceeded with the environmental work. Construction is expected be complete by August 2010.

NORTHBOUND FDR DRIVE BETWEEN EAST 14Th AND EAST 16TH STREET (MANHATTAN)

The original construction of this structure was completed in 1947, and the last major rehabilitation was completed in 1998. Since that time, a series of undermining conditions of the north bound roadway have occurred, caused by the loss of fill in the relieving platform area. The northbound bridge structure is 40 feet wide and carries three lanes of vehicular traffic and a sidewalk.

On Friday, July 31, 2009, at 10:35 AM, a sunken roadway condition was reported in the left and center lanes of the northbound roadway, near the Con Edison 14th Street power plant. NYCDEP responded and closed the left lane. NYCDOT, NYSDOT, and Con Edison senior staff joined DEP on-site to evaluate the condition and determine responsibility for repair. The center lane was closed after rush hour as a Con Edison contractor excavated the left and center lanes. After finding a 10-foot deep void and no apparent defect in the Con Edison facility, the Department's When and Where contractor took over the site.

On August 1, Con Edison was directed to shut down the power plant so that divers could inspect the underside of the platform. The excavation was temporarily filled and traffic was restored around 1 PM on August 2. At approximately 10 AM on August 2, NYSDOT contracted divers inspected the underside of the platform.

Although this immediate temporary repair began the night of July 31, 2009 and was completed on August 2, 2009, review of the extent and degree of the emergency necessarily continued.

First Emergency Repairs at the FDR Drive in August 2009. Executive Director of Inspections and Bridge Management Dr. Bojidar Yanev (at Right) Visiting the Site.

Filling the Excavation on the FDR Drive.

The Department's preliminary assessment of the collapse was that a tidal surge from the East River apparently entered the supporting fill in the area of the undermined portion of the roadway.

A condition inspection commissioned by NYSDOT discovered that the support provided by the relieving platform became compromised at the beginning of August 2009. The City was directed to immediately take steps to protect the public under emergency conditions, and to make permanent repairs to restore the support of the roadway and sidewalk areas. As with the adjacent section to the north, it was decided that after interim repairs were made to restore the two lanes of the roadway to vehicular traffic, the entire area under the roadway and sidewalk would be filled in with concrete from the river bed to the underside of the pavement.

Emergency permanent repair of failed relieving platform on the northbound FDR Drive between East 14th Street and East 16th Street.

On August 19, 2009, in the interest of public safety, pursuant to Section 103(4) of the General Municipal Law and Section 315 of the New York City Charter, the Department declared that an emergency exists relative to the northbound section of the FDR Drive at East 15th Street in Manhattan. A Letter of Intent for the emergency repair of the failed relieving platform was issued to the contractor with a start date of August 19, 2009.

The right lane was closed on August 13, and the remainder of the northbound FDR Drive between Houston and 20th Streets was fully closed to traffic at 9:00 PM on August 18. The emergency contractor placed a timber mat across the entire width of the northbound FDR Drive near 15th Street. The mat was approximately 60 feet long, with 75 foot approach ramps to and from the mat. The Roadway Repair and Maintenance Division placed asphalt on the mat and ramps, and the Traffic Operations Division striped the roadway and placed appropriate signage. The northbound Drive was reopened to two lanes of traffic at 2:00 AM on August 20.

The conditions at the base of the timber piles were immediately addressed by placement of normal weight concrete around the exposed timber. The next phase included the "forming and filling" of the area beneath the platform. A light weight cementitious fill was utilized for the majority of the structure, and a 10-inch thick reinforced structural layer was utilized at the timber deck elevation. Due to lead time issues on material, the contractor used stay-in- place forms. Finally, for sealing purposes and additional lateral support, a steel sheet pile bulkhead backed with normal weight concrete was constructed in front of the platform. The full roadway was restored to traffic, and construction was substantially completed on October 16, 2009.

Emergency Repairs on the FDR Drive in August and September 2009.

When and Where Unit

In 2009, the following structures were worked on under the Division's When and Where contracts: Brooklyn-Queens Expressway WB over Furman Street, 51st Avenue Pedestrian Bridge over LIRR Main Line, 79th Street Pedestrian Plaza over 79 Street Boat Basin Garage, Boston Post Road Bridge over Hutchinson River, Belt Parkway Bridge over Mill Basin, Belt Parkway Bridge over Paerdegat Basin, Bus Station Exit Ramp over SIRT, Bus Station North over SIRT, Depot Place Bridge over Metro North, East 78th Street Pedestrian Bridge over FDR Drive, East 156th Street Bridge over Access to Housing, East 81st Street Pedestrian Bridge over FDR Drive, Flushing Meadow Park Pedestrian Bridge over Lawrence Street, Flushing Meadow Park Bridge over Stream North of Long Island Expressway, Flushing Meadow Park Bridge over Willow Lake and 76th Road, Flushing Meadow Park Bridge over Aquacade Lake, Forest Park Drive Bridge over Abandoned LIRR, Hempstead Avenue Bridge over BCIP, Henry Hudson Parkway over Amtrak 30th Street Line, Henry Hudson Parkway Viaduct over West 72nd to West 79th Street, Harlem River Drive NB Ramp over Harlem River Drive, Isham Park Pedestrian Bridge over Harlem River Inlet, Jamaica Avenue Bridge over BCIP, Knapp Street Bridge over Belt Parkway, Linden Boulevard Bridge over BCIP, Markwood Road Bridge over Jackie Robinson Parkway, Motor Parkway Pedestrian Bridge over Bell Boulevard, Parking Entrance Ramp over SIRT, Parking Exit Ramp over SIRT, Pedestrian Bridge at 73rd Street over Conrail, Pedestrian Bridge near Union Turnpike over Abandoned LIRR, Pulaski Bridge over Newtown Creek, Queensboro Bridge (LL) over East River, West 148th Street Pedestrian Bridge over Amtrak 30 Street Branch, West 181st Street Pedestrian Bridge over Henry Hudson Parkway NB, West 39th Street Bridge over Amtrak 30th Street Branch, West 41st Street Bridge over Amtrak 30th Street Branch, Winchester Boulevard Bridge SB over BCIP, and Woodhaven Boulevard Bridge over Atlantic Avenue.

Currently scheduled projects include Harlem River Drive NB Ramp over Harlem River Drive, Henry Hudson Parkway Viaduct over West 72nd Street to West 79th Street, and the Footbridge over Brook Lake Dam.

Fixing the Railing at the West 148th Street Pedestrian Bridge over Amtrak 30th Street Branch in January 2009.

Installing Steel Shoring at the 81st Street Pedestrian Bridge over FDR Drive in January and February 2009.

Removing Loose Concrete at the West 39th Street Bridge over Amtrak 30th Street Branch in March 2009.

Installing Steel Grating for the Circular Gutter at the West 79th Street Rotunda in March 2009.

In response to a series of red flags for the deteriorated stringers supporting the Henry Hudson Parkway between 72nd Street and 96th Street, the When & Where contractor was mobilized to perform emergency steel repairs. Rapid coordination was achieved with Amtrak to enable these emergency repairs to proceed unimpeded. The work is still on-going, during night shifts.

Nighttime Repair Work in April 2009 at the Henry Hudson Parkway Viaduct over West 72nd to West 79th Street.

Repairs at the Henry Hudson Parkway Viaduct in May and June 2009.

MARINE WHEN AND WHERE

New York State DOT conducts the underwater inspections of our waterway structures. A contract was needed to facilitate the performance of marine repairs and to maintain structures in need. The objective is to perform marine structural repairs and maintenance together with other appurtenant work, which constitutes repairs of defective and deteriorated parts of bridge structures due to and in a water environment. The Department has neither the staffing nor the equipment to handle this type of special work. The work could not be handled under the usual time and materials When and Where contract, because the work is unique, in that it requires a consultant with underwater-licensed inspectors to supervise and inspect the work for compliance and adequacy. Furthermore, detailed note taking is necessary by the inspectors to check and approve payments for the contractor's work.

Marine bridge repairs already completed include 163rd Street Pedestrian Bridge over Hawtree Basin, Broadway Bridge over Harlem River, Brooklyn Bridge, Belt Parkway Bridge over Mill Basin, FDR Drive Viaduct over Ave C to East 25th Street, Ocean Avenue Pedestrian Bridge over Sheepshead Bay, West 207th Street Bridge/West Fordham Road over Harlem River (University Heights Bridge), and Wards Island Pedestrian Bridge over Harlem River.

Some of these locations experience repeated damage due to heavy marine traffic and/or a narrow channel. The issuance of new flags necessitates new visits to even recently completed projects. Timber fender systems are subject to recurring hits by barge traffic, and consequently require periodic restoration. In addition to damage due to impact, timber elements are also replaced because of deterioration and attack by marine borers, whose activity has vastly increased as the water quality in the New York City area has improved.

In response to a PIA safety flag received from NYSDOT requiring the removal of a "menace to navigation" hazard in the Harlem River (steel and concrete elements falling from the structure), our Marine When and Where contractor immediately mobilized at the Broadway Bridge. The work consisted of the removal of deteriorated, loose and unsound concrete and steel angles below the lift span deck. These elements are part of a stringer protection system which prevents rusting of the top flanges of the lift span stringers. The system consists of steel clip angles and concrete. Over the years, many of the steel angles became severely deteriorated to the extent that portions are in danger of falling into waterway channel. In addition, concrete areas behind these deteriorated angles have also deteriorated and pose the same risk. Removal of these

elements was extremely difficult, because large area work platforms could not be used on the lift span. This necessitated the use of barges and man lifts to access the numerous individual work areas.

Working on the Broadway Bridge in November and December 2009.

Currently scheduled projects include additional repairs to the Broadway Bridge over Harlem River and City Island Road Bridge over Eastchester Bay.

PAINTING

In 2009, the following bridges were painted: Atlantic Avenue Service Road EB over East New York Avenue, Atlantic Avenue Service Road WB over East New York Avenue, Atlantic Avenue Service Road over LIRR Atlantic Avenue, Boston Post Road Bridge over Hutchinson River, Brooklyn-Queens Expressway West Leg over Grand Central Parkway, Brooklyn Queens Expressway East Leg over 30th Avenue, Brooklyn Queens Expressway East Leg North Bound over 32nd Avenue, Brooklyn Queens Expressway (Southbound) over 32nd Avenue, Clintonville Street Bridge over Cross Island Parkway, Cross Island Parkway Bridge over Dutch Broadway – 115th Avenue, Cross Island Parkway Bridge over Fort Totten Entrance, Cypress Hills Street Bridge over Jackie Robinson Parkway, Grand Avenue Bridge over Long Island Expressway, Grand Concourse Bridge over Burnside Avenue, Grand Concourse Bridge over East Kingsbridge Road, Grand Concourse Bridge over East 175th Street, Grand Concourse Bridge over East 204th Street, Grand Street Bridge over Newton Creek, Hamilton Place Bridge over Long Island Expressway, Hempstead Avenue Bridges over Cross Island Parkway, Highland Boulevard Bridge (Westbound) over Jackie Robinson Parkway, Highland Boulevard Bridge (NB) over Vermont Avenue, Jackie Robinson Parkway and Union Turnpike over Austin Street, Markwood Place Bridge over Jackie Robinson Parkway, Northern Boulevard Bridge over Alley Creek, Ocean Avenue Pedestrian Bridge over Sheepshead Bay, Pennsylvania Avenue Bridge over Belt Parkway, Queensboro Bridge Ramp from 11th Street and Terrain, Queensboro Bridge (Upper Level) Exit Ramp to East 62nd/63rd Streets, Queens Boulevard Bridge over Access Road to BQE SB, Queens Boulevard Bridge over Jackie Robinson Parkway, South Conduit Boulevard Bridge over Belt Parkway, Union Turnpike Bridge over Cross Island Parkway, 32nd Street Bridge over BQE, 35th Avenue Bridge over BQE, 44th Street Bridge over Grand Central Parkway, 47th Street Bridge over Grand Central Parkway, 69th Street Bridge over Long Island Expressway, and the East 174th Street Bridge over Sheridan Expressway and Amtrak.

Bridge Painting in May and July 2009: Bridge Painters Willie Tyler, Nicholas Krevatas, Frank Hollen and William Budge. (Credit: Earlene Powell)

Painting Along the Grand Central Parkway in August 2009. Crew: Bridge Painters Joao Silva, Thomas Anzalone, Reynaldo Grant, Michael Scotti, Oswaldo Lima, Albert Pappas, and Supervisor Bridge Painter Georgeios Ploumis. (Credit: Earlene Powell)

During 2009, the following structures were also painted: DEP Plant at North River, DOT Ironworker Shop at 59th Street, DOT Facilities at 390 Kent Avenue, DOT Harper Street Maintenance and Repair Shop, Metropolitan Avenue Bridge Operator's House, Bridge Preventive Maintenance Facilities at the Pulaski Yard, 17 South 6th Street Shop, Mill Basin Bridge Operator House, DOT Facilities at the Brookville Yard, DOT Facilities at the Kew Loop Yard, and the DOT Parking Garage under the FDR Drive at Old Slip.

GRAFFITI REMOVAL

In 2009, 5,406,237 square feet of graffiti were eliminated. This program focuses its primary attention on the four East River bridges, as well as the following 21 arterial highways: Clearview Expressway, Gowanus Expressway/Belt Parkway, Major Deegan Expressway, Harlem River Drive, Van Wyck Expressway/Whitestone Expressway, Brooklyn-Queens Expressway, Jackie Robinson Parkway, Sheridan Expressway, Hutchinson River Parkway, Henry Hudson Parkway, West Shore Expressway, Richmond Parkway, Martin Luther King Jr. Expressway, Staten Island Expressway, Bruckner Expressway, Prospect Expressway, Grand Central Parkway, Long Island Expressway, Cross Bronx Expressway, Nassau Expressway, and Bronx River Parkway.

Pressure Washing Machine Used for Graffiti Removal. It is Set to 2500 psi and 212˚ F. Bridge Painters Frank Duic and Russell Newme Feeding the Spray Pump and Preparing the Paint.

Removing Graffiti From the Manhattan Bridge in September 2009: William Budge at the Railing. (Credit: Earlene Powell)

Removing Graffiti From the Manhattan Bridge in September 2009: Cleaned Area. Supervisor Bridge Painter Cesar Pazmino Inspecting the Next Area to be Cleaned. Bicycle Commuter on Newly Cleaned Path. (Credit: Earlene Powell)

Removing Graffiti From the Manhattan Bridge in September 2009: Assistant Civil Engineer Andrew Hoang Inspecting the Plaque. Bridge Painter William Budge, Supervisor Bridge Painter Cesar Pazmino and Bridge Painter Vlatko Zic. Plaque Details. (Credit: Peter Basich)

Manhattan Bridge Plaque Details. (Credit: Peter Basich)

During 2009, graffiti was also removed from the following structures: Atlantic Avenue at Woodhaven Boulevard, Austin Street Concrete Tunnel, Bedford Park Bridge and 205th Street, Borden Avenue Bridge, Burnside Avenue at Grand Central Parkway, Conduit Boulevard at Belt Parkway, Corporal Kennedy Street between 41st and 42nd Avenue, Cross Island Parkway, DOT Facilities at the Crescent Street Yard, DOT Facilities at the East 206th Street Yard, Dover Street and Water Street, Cross Island Parkway Bridge over Dutch Broadway – 115th Avenue, FDR Drive, FDR Drive at 23rd Street, Five Borough Bicycle Tour Route, Grand Concourse over Bedford Park Boulevard, Grand Concourse over East Tremont Avenue, Grand Concourse over East 161st Street, Grand Concourse over East 175th Street, Grand Concourse over East 204th Street, Madison Avenue Bridge over Harlem River, Marathon Route, North Channel Bridge, Pulaski Bridge, Queens Boulevard near Long Island Expressway, Randall Avenue and Clarence Avenue, St. Paul's Place and Caton Avenue, Summer Streets locations, Thomson Avenue and Queensboro Bridge, Whitestone Expressway / Shea Stadium, Yankee Stadium Vicinity, East 10th Street Pedestrian Bridge over the FDR Drive, 12th Avenue from 57th to 59th Streets, 32nd Street and 24th Avenue, 37th Street at 9th Avenue, 44th Avenue and 94th Street, 72nd Street and Henry Hudson Parkway, 94th Street Pedestrian Bridge over LIRR, 123rd to 138th Streets along Amtrak and the Henry Hudson Parkway, 138th and 145th Street Bridges over the Amtrak area, 138th Street at Henry Hudson Parkway, West 138th Street at 12th Avenue, 153rd to 158th Streets along Amtrak and the Henry Hudson Parkway, 163rd Street Pedestrian Bridge over Hawtree Basin, 167th Street & Station Road, West 181st Street Bridge over ramp to George Washington Bridge, East 222nd Street and Baychester Avenue, West 235th Street at Henry Hudson Parkway, and 256th Street over Boston Post Road.

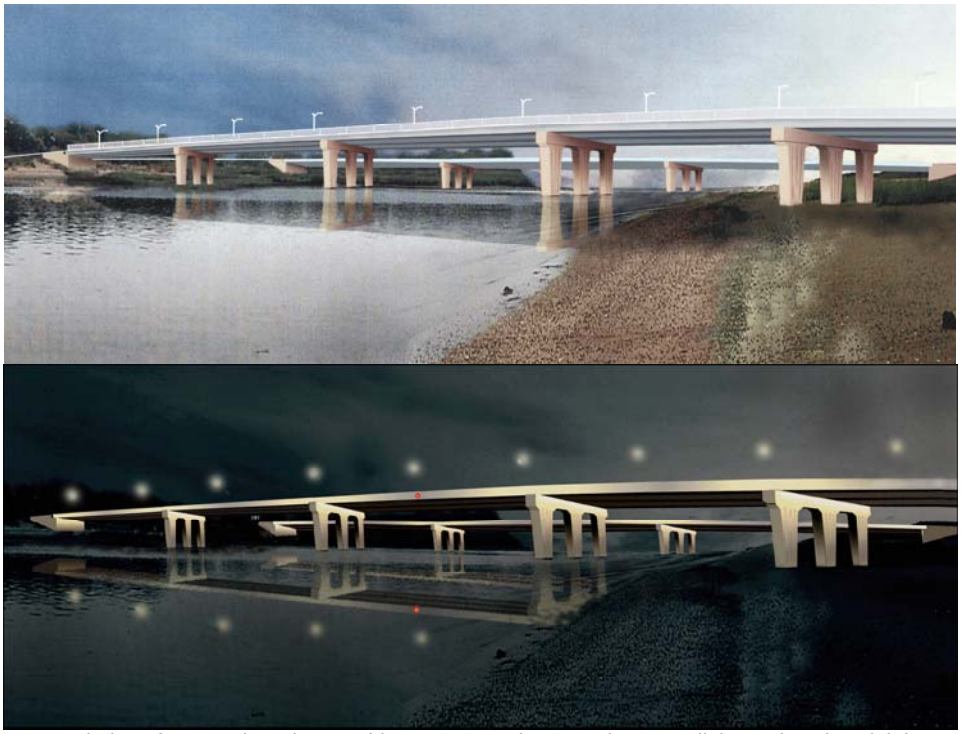
Performing Component Rehabilitation of Ramp G of the Queensboro Bridge in June 2009.

Engineering Review and Support

IN-HOUSE DESIGN

In-House Design staff prepares plans and specifications for bridge replacement/rehabilitation projects that enable the Division to restore bridges considered "structurally deficient" to a "very good" condition rating. This unit handles urgent Division projects, as well as special projects under construction by the Bureau of Bridge Maintenance, Inspections and Operations.

Projects underway in 2009 included the Belt Parkway Bridge over Paerdegat Basin in Brooklyn. The existing bridge with its nest of thirteen piers will be replaced in its entirety by two split bridges, one each for eastbound and westbound traffic. The bridge for eastbound traffic will have four piers whereas the bridge for westbound traffic will have two piers. This is the first bridge to be designed by NYCDOT with trapezoidal steel box girders utilizing high performance steel and seismic isolation sliding bearings. In addition, the aesthetics of the bridge will be enhanced by its nightly illumination utilizing light emitting diodes on both fascias and piers. This project will also include wetland mitigation and landscaping in the immediate vicinity of the proposed bridges. The construction commenced on October 26, 2009 along with two other adjacent bridges in the Belt Parkway Corridor as a combined contract.



Rendering of New Belt Parkway Bridge Over Paerdegat Basin, In Daylight, and Under Nightly Illumination. (Credit: Alexander Berens)

Rendering of Existing and Proposed Belt Parkway Bridges Over Paerdegat Basin. (Credit: Alexander Berens)

Final design was completed for the component rehabilitation project to replace the concrete-filled steel grid deck of the Greenpoint Avenue Bridge over Newtown Creek, which connects the boroughs of Brooklyn and Queens. Greenpoint Avenue is a key corridor that links light industry in northern Brooklyn with freight distribution hubs and Interstate highway routes in western Queens. The existing bascule span bridge was built in 1990 and carries two lanes of traffic in each direction. The bridge consists of eleven fixed spans and a bascule span. This project will also include the replacement of the cracked stringers and the compression seals at all of the joints, as well as the resurfacing of the approach pavement and the intersection at the Queens end, and will extend the useful life of the bridge structure by 10 years. The project is scheduled to start in spring 2010.

Arial View of Greenpoint Avenue Bridge. Elevation Right Span.

Other projects underway include the Union Turnpike Bridge over Cross Island Parkway (and Creedmoor Center Road), and Hillside Avenue Bridge over Cross Island Parkway in Queens. Both bridges are two span rigid frame concrete structures. The In-House Design staff prepared the scope of work and a sub-consultant performed surveys, borings, corings, hazardous material evaluation, and traffic studies. The unit then proceeded with the preliminary design. The construction project is scheduled to start in late 2016.

This unit is supervising the design of a proposed pedestrian bridge that will connect Park Row to the existing One Police Plaza overpass. The bridge will enhance the area while providing a safe

pedestrian connection from Police Plaza to Park Row. The new bridge will be part of a Park Row/Chatham Square reconstruction project, which is being handled by DDC. The project is currently in the final design phase.

In-House Design's Electrical Group reviews and/or prepares contract documents for all electrical and street lighting work on all projects on the Division's Capital Program. Some of the contracts reviewed during 2009 included the Willis Avenue, Broadway, 145th Street, and Wards Island Pedestrian Bridges over the Harlem River; Hamilton Avenue and Union Street Bridges over the Gowanus Canal; and Belt Parkway Bridge over Paerdegat Basin in Brooklyn; Roosevelt Island Bridge over East River Channel; Bruckner Expressway NB & SB Service Road (Unionport Bridge) over Westchester Creek in the Bronx; Shore Road Bridge over Hutchinson River; Queensboro Bridge; Williamsburg Bridge; the East River Waterfront; and City Island Road Bridge over Eastchester Bay.

FRESH CONCRETE INSPECTION AND TESTING PROTOCOL

Concrete is one of the major materials utilized in our bridge construction/rehabilitation projects. The Quality Assurance Section's in-place procedures to ascertain the quality of the fresh concrete delivered to our bridge sites require that all of its raw ingredients be obtained from NYSDOT-approved sources. Inspections are conducted at the batching plant during the manufacture of the concrete, in accordance with the design mixes reviewed and approved by the Section. Fresh concrete brought to the project site is then tested to ensure it meets its specification requirements, and concrete cylinder specimens are made at the point of placement by our own resident engineering staff. These specimens are then tested by an inspection firm in direct contract with us, without any influence from the contractor or its supplier, to confirm that hardened concrete has met its design strength.

When the indictment/conviction of some private testing firms, retained by builders or agencies other than NYCDOT, on grounds that they falsified concrete test results on their projects in the City raised concerns about the quality of concrete utilized on those projects and invoked an additional scrutiny by the Building Department, our Quality Assurance staff's independent and thorough procedures confirmed that we do not have issues with the quality of concrete provided to our projects. None of the indicted/convicted firms worked on our bridge projects.

Upon learning that a concrete supplier on our major on-going bridge project was being investigated by DOI for a possible connection with the indicted/convicted testing firms, we introduced a stepped-up inspection and testing protocol which not only reassured us that the concrete supplied by this vendor is of the utmost quality and conforms fully to our specification requirements, but also that our standard inspection and testing protocol was fully adequate.

ENVIRONMENTAL ENGINEERING

The Environmental Engineering staff of the Quality Assurance section provides environmental oversight and compliance on all capital projects in the Division. Lead paint abrasive cleaning projects underway or completed in 2009 included the Queensboro Bridge, Manhattan Bridge, Rikers Island Bridge, Roosevelt Island Bridge, Brooklyn Bridge, Willis Avenue Bridge, Williamsburg Bridge, and various bridges over the Brooklyn-Queens Expressway and Grand Central Parkway. In addition, the unit continued to provide emergency response related to environmental issues.

As part of the Environmental Committee for the Office of Environmental Assessment and Compliance (OEAC), the unit assisted in developing environmental procedures such as spill prevention, control and countermeasures protocols, roadway spill clean-up protocols, RCRA

contingency plans and the disposal of universal waste. The unit also worked with OEAC to develop and implement training for working over water as well as the Clean Water Act.

The unit performs quarterly water discharge monitoring in compliance with the NYSDEC SPDES system for bridges that cross waterways such as the Gowanus Canal, English Kills Creek and the Newtown Creek. Environmental oversight was provided to emergency work-over-water projects on the Brooklyn Bridge, Mill Basin Bridge, Roosevelt Island Bridge, Willis Avenue Bridge, Hamilton Avenue Bridge, Gerritsen Inlet Bridge, Paerdegat Basin Bridge, Third Avenue Bridge, Borden Avenue Bridge, Grand Street Bridge, Borden Avenue Bridge, Hutchinson River Parkway Bridge, Unionport Bridge, and Greenpoint Avenue Bridge. This environmental oversight ensured that there was no environmental impact to the city's waterways during emergency repair projects.

The unit also manages hazardous waste generated by both the in-house work of the Division and the capital projects. Through the use of environmental testing laboratories, the unit has continued to identify and dispose of out-of-date and expired chemical products stored in bridge facilities. Hazardous waste such as spent paints, solvents, oils and lead-paint debris is generated during maintenance and construction projects. This waste is managed in accordance with all applicable regulations for treatment and disposal. The unit is responsible for providing reports to the NYSDEC regarding the management and disposal of this waste.

The unit ensures compliance with storm water regulations, hazardous waste management, Clean Air Act requirements, Clean Water Act requirements, asbestos regulations, lead paint removal protocols, and health and safety on NYCDOT bridge projects. This includes projects such as the Willis Avenue Bridge, Belt Parkway Bridge over Paerdegat Basin, Belt Parkway Bridge over Rockaway Parkway, Belt Parkway Bridge over Fresh Creek Basin, and Roosevelt Island Bridge, where compliance with environmental concerns such as dredging and dewatering is required in conjunction with submarine cable installation, pier demolition, pier construction, and channel widening.

In preparation for the construction of a new 153rd Street Bridge over Metro North in the Bronx, the Agency acquired several private properties. One of these was a former car wash and oil change station located at 670 Grand Concourse. Oil contamination was found throughout the building from the previous site operations. The unit assisted in developing work procedures to remediate the site as well as to provide oversight during the clean up operations. Stored petroleum products and chemicals, oil spills and piping systems were cleaned and decommissioned prior to securing of the site for future demolition.

The unit also continued to provide environmental oversight during the environmental investigation of a gas station located over the Metropolitan Avenue Bridge. Numerous underground storage tanks needed to be removed, and the unit assisted in conjunction with Exxon/Mobil in the closing of the station as part of a planned bridge rehabilitation project. In accordance with NYSDEC requirements, the soil and groundwater continue to be tested and analyzed at the site to determine the extent of petroleum contamination.

In addition, the staff continued the implementation of a new quality assurance plan for coating inspection and application on Division bridge structures. Services are implemented through the use of consultant contracts. Coating inspection services and engineering were provided on numerous projects such as the Brooklyn Bridge traveler repair project, Roosevelt Island Bridge, Manhattan Bridge, Williamsburg Bridge, Grand Central Parkway Bridges, Brooklyn-Queens Expressway Bridges, Willis Avenue Bridge, and the Queensboro Bridge Painting Project.

BRIDGE PROJECT SPECIFICATIONS

In 2009, the Specifications staff of the Engineering Support Section prepared and/or reviewed contract proposal books and/or specifications for 13 bridge rehabilitation and reconstruction contracts. Nine of these contracts totaling approximately $730 million in construction costs were

either bid or advertised for bid. Six previously Law Department approved contracts totaling approximately $1.043 billion in construction costs were advertised for bid and were bid in 2009. Another 13 bridge projects were under active review, including the East River Waterfront Project for the Lower Manhattan Borough Office and the Park Row Pedestrian Bridge for DDC.

Notable among the bridge contracts prepared and/or reviewed, advertised and sent for bid are: rehabilitation of the Manhattan Bridge cables and suspenders; approach and ramp rehabilitation of the Brooklyn Bridge (as well as its complete painting); component rehabilitation of 12 bridges City-wide; protection of timber structures against marine borers; reconstruction of Borden Avenue Bridge over Dutch Kills; emergency maintenance of the Financial District security barriers and gates; component rehabilitation of Greenpoint Avenue Bridge over Newton Creek; reconstruction of Wards Island Pedestrian Bridge; installation of aviation lights on the Queensboro Bridge, and reconstruction of Belt Parkway Bridges over Fresh Creek Basin, Paerdegat Basin, and Rockaway Parkway.

CONVERSION OF DIVISION ENGINEERING ARCHIVES

Since the first digitizing contract of engineering records began 11 years ago, we have converted over 58,000 full-size contract drawings and 20,000 construction photographs into digital formats.

The next phase of the project consisted of the digitizing of the microfilm collection. Since we began microfilming bridge drawings in the early 1980s, we accumulated more than 450 microfilm rolls (over 110,000 frames of film). Microfilming of records is rapidly becoming an obsolete technology as it cannot be used to perform rapid searches, sort records, send/ share files via the Internet, or copy electronic files to CDs/DVDs.

Under the digitizing contract completed in July 2009, these microfilms were transferred to digital media, and the records were consolidated according to their BIN (Bridge Identification Number) for future use.

In order to expand our records database we were able to acquire a complete digital set of the NYSDOT contracts from 1930. The NYC-based bridge-related records consisted of about 1,000 projects, which we were able to extract, label and incorporate into our server-based database according to their BIN and contract.

Server-based records support quality communications and enhance our public image. They ensure faster, flexible and effective delivery, improve document security, and organize, retrieve, distribute and print all documents more efficiently.

The Records Management Unit updated the specifications for the preparation of record drawings and electronic media. This major revision of the specifications is concentrated on the elimination of the microfilming requirements, the deletion of hard copies at the end of projects, and conversion to the US custom system. The new specifications are concise, well-illustrated, and simple to follow. A copy of the specifications in PDF format is easy to transmit electronically and we do not need to print large quantities of books.

The switch to electronic media and server-based archiving will save money on drawing submissions as well, and will lead to the establishment of a unified electronic database for bridge archives. Digitizing documents and storing them online, where they are easy to access and print, will simplify contract submission process and cut project costs in a long run.

SURVEYING AND LOAD RATING

The Borden Avenue Bridge over Dutch Kills is over 100 years old. This retractile bridge is mounted on tracks which are positioned to one side of a navigational channel. To open the

bridge, it is withdrawn or retracted to shore. A recent bridge inspection report discovered signs of significant movement on the south corner of the west abutment, and the separation of the existing vertical crack was getting wider at the mid-section of the south wing wall. The staff performed weekly monitoring of the movement of the west abutment and wing walls until the emergency contract was awarded.

On February 27, 2003, one of the fascia columns of the concrete pier on the Belt Parkway Bridge over Paerdegat Basin collapsed after a hit by a barge. The staff monitored the movement of the first three existing concrete columns from the north fascia of pier #6 to pier #8 from that day until the reconstruction contract was awarded.

The stone masonry retaining wall at 2465 Palisade Avenue in the Bronx is approximately 252 feet long with a varying height of one to 30 feet. Overall, the wall is in poor condition with visible bulging, stone displacements, and settlement. The unit performed weekly monitoring of the movement of the west abutment and wing walls until a contract was awarded.

GRACE ASPHALT PLANT

The Department intends to acquire the Grace Asphalt Plant in Corona, Queens (both the real estate and the plant equipment) for its Roadway Repair and Maintenance Division. The acquisition of this private plant will help the City streamline its asphalt procurement and save costs. The Department will also be able to recycle some milled asphalt materials. The Land Use Unit coordinated the ULURP application process for this project. This process and the Phase I and II environmental site investigations are complete. DCAS will conduct the property appraisal. After that the property will be acquired either by negotiated acquisition or by condemnation.

CRP/EXTELL PARCEL H PROJECT

The CRP/Extell Parcel H, LP project (Riverside Drive between 59th and 72nd Streets) includes the construction of seven new bridges, a ramp, and connector roads along Riverside Drive as a part of the residential and commercial development over the former Penn Central Rail Yard. The project will also include a half tunnel section in what was formerly known as the Miller Highway Tunnel. When completed, the infrastructure network will be transferred to DOT for maintenance. The Division is providing engineering review of the design drawings, as well as quality assurance inspections, to ensure the developer's compliance with DOT's construction and design standards. Construction is complete for four of the bridges (which are open for traffic), and the other three bridges are under construction. The first phase of construction for the half tunnel section is complete and phase two is in progress. The project is now in its second stage, and is 92 percent complete overall.

BRIDGE SEISMIC DESIGN AND RETROFITTING

The seismic retrofitting of bridges in New York City is part of the inspection and rehabilitation program mandated by Congress and administrated by the FHWA through the local authorities. During the period of 1993 to 1996, four major bridge owners in the New York City area (NYCDOT, NYSDOT, MTA, and the Port Authority of New York and New Jersey) retained seismologists to study hard rock seismic ground motions. The rock motions generated by these studies differed from each other and from the AASHTO spectrum as modified by NYSDOT. The differences were such that the resulting retrofit costs varied widely, depending upon which motions were adopted. To resolve this issue, NYCDOT, in association with NYSDOT and the

FHWA, retained a consultant to assemble an expert panel to develop recommendations for rock motions that would be adopted uniformly by the New York City region. The panel consisted of a team of six internationally recognized experts in the fields of seismology, geology, earthquake engineering, ground motion, and geotechnical studies. There were several brainstorming workshops held in New York, where the senior officials from NYCDOT, NYSDOT, and the FHWA provided their input to the panel members.

The expert panel formulated recommendations regarding rock motions and corresponding time histories. Subsequently, the consultant derived soil generic response spectra, based on the hard rock motions and NEHRP amplification factors. The consultant also established bridge performance criteria to be used for critical, essential or other bridges undergoing structural analyses. The recommendations are described in the report entitled "New York City, Seismic Hazard Study and its Applications, Final Report, December 1998." This report is now extensively used by NYCDOT, NYSDOT, the FHWA, their consultants, and other agencies in the New York area for bridge projects. Thus, NYCDOT's leading role and efforts to establish ground motion standards have brought uniformity in seismic design to the New York City area.

In 2002, the consultant convened a second panel of seismologists to update the 1998 Hazard Study and associated rock motions. On June 3, 2004, after the USGS national hazard maps were adopted by NEHRP, in a meeting attended by NYCDOT, NYSDOT and FHWA, it was unanimously agreed to adopt the new hard rock ground motions recommended by the panel of seismologists.

Following the adoption of the very hard rock motions, the consultant started the preparation of a new edition of the NYCDOT Seismic Design Guidelines for Bridges. Data from geotechnical bridge studies performed within the five boroughs of NYC were compiled. A series of generalized subsurface soil and bedrock profiles were developed to be representative of the range of soil profiles, overburden thickness, and rock types found within NYC. A fully probabilistic approach, utilizing Random Vibration Theory (RVT) in conjunction with the new hard rock ground motions, (from the 2002 Hazard Study) and the generalized NYC subsurface profiles, was used to develop vertical and horizontal Uniform Hazard Spectra (UHS), which, in turn, served as the starting point to derive design rock and soil response spectra. The method allowed computation of soil UHS, while preserving the hazard level of the very hard rock UHS. It accounted, in a rigorous probabilistic manner, for variations and uncertainties in soil stiffness, stress-strain nonlinearity, and material damping; depth of soil to rock; and, stiffness of the rock under the soil.

Generic horizontal and vertical design spectra were derived using the calculated UHS as the starting point. Generic design V/H ratios to be used in site-specific studies to generate site specific vertical motions, were also produced. All the generic soil curves are presented as a function of three parameters: soil class; depth to rock; and, rock class under the soil.

The development of these parameters for the NYCDOT Guidelines represent a significant improvement to the previous guidelines and other codes, since it will result in better representation of the ground motions at a bridge site, bringing closer the generic ground motions to those that could be obtained from site-specific studies. The fact that the new guidelines better fit the specific characteristics of the NYC region, will permit the engineers to evaluate the need for retrofitting existing bridges or strengthening new ones at the right places.

Recommendations for liquefaction evaluation are also provided in the guidelines, including recommendations for earthquake magnitude and peak ground surface accelerations, which are critical parameters for evaluating liquefaction potential and which have not been included in previous guidelines. The new document also includes recommendations for site-specific studies, providing guidelines and minimum requirements that must be satisfied. These include: procedures to establish soil horizontal and vertical design motions; recommendations to evaluate the effects of the depth to the rock surface; recommendations to account for uncertainties in the soil properties; minimum requirements to establish lower bound horizontal design motions; recommendations for time history analysis of bridges; recommendations for the incorporation of

spatial variation effects in the analysis; and different requirements for critical and non-critical bridges site-specific studies.

The final draft of the new NYCDOT Seismic Design Guidelines for Bridges was submitted in September 2008. Upon completion of a review by NYSDOT, these guidelines will be adopted for the seismic and retrofit design of bridges in New York State. The review is expected to be complete by the middle of 2011.

Bridge Maintenance, Inspections and Operations

EAST RIVER BRIDGES ANTI-ICING PROGRAM

Traditional snow and ice control practices rely heavily on the use of salt, a material known to corrode steel and accelerate the deterioration of concrete and asphalt surfaces. A new method of snow and ice control was needed to protect the City's $2.5 billion investment in the rehabilitated East River Bridges. This method, known as anti-icing, involves the application of a chemical freezing point depressant to the roadway surface to prevent snow and ice from bonding to the roadway. Frequent plowing removes any accumulation of unbonded snow or ice before traffic is affected.

The Division's Anti-Icing Program uses the liquid chemical potassium acetate and aggregate chemical sodium acetate. The anti-icing fleet consists of twenty-two spray trucks, six plow trucks and several smaller plows. Ten of the spray trucks are combination spray/plow trucks with a 1,000 gallon tank capacity, and five are spray-spreader/plow trucks with a 360 gallon spray capacity, and a nine cubic yard spreader capacity. There are twenty chemical storage tanks, with a total storage capacity of 114,250 gallons.

New anti-icing yards storing both chemicals have been established under all four East River bridges. Supervisors monitor the bridge decks during storm events by traversing them and using thermal instrumentation installed in their vehicles to make informed decisions as to when to apply chemicals. GPS capabilities have been installed in key vehicles to assist supervisors with the decision making process.

In the winter of 2008-2009, a total of 52,445 gallons of potassium acetate and 180 tons of sodium acetate were applied on the roadways of all four East River Bridges.

Anti-Icing Trucks. (Credit: Chris Gilbride)

Anti-Icing Trucks on the Queensboro Bridge During a Storm.
(Credit: Paul Schwartz)

INSPECTIONS

In 2009, Inspections covered 94 bridges and 538 spans. Emphasis was placed on ensuring public safety through the monitoring of potentially hazardous conditions and temporary repairs. The unit performed 544 monitoring inspections, and 254 special winter monitoring inspections of cellular structures, shorings, and potential fire hazards. In addition, 160 emergency inspections were conducted in response to hot line calls, in-house requests, or citizen complaints.

The Bridge Data System (BDS) allows inspection reports to be generated and transmitted electronically. It provides access to data from the latest inspection reports on all bridges to all Division units. In addition, when an emergency arises, our inspectors are able to send photographs and other information to the main office via a wireless connection to the internet. This feature enables bridge repair engineers to assess the condition and dispatch repair crews with the appropriate equipment in a timely manner. The test version of the system was field verified in 2006, along with the selected portable computers. The production version of the system was implemented in 2007.

Work is underway under a new contract to expand the BDS capabilities by incorporating data from capital reconstruction projects. Additional features will include in-depth inspection reports by consultants as well as GPS data.

In 2002, the Division began to receive State DOT bridge inspection reports in CD-ROM format. Flag reports are now also transmitted electronically. As of September 2003, standard inspection work is funded by a federal grant. Emergency response inspections and administrative support remain city funded.

Following the collapse of the bridge carrying I-35W in Minnesota on August 1, 2007, inspection practices nationwide were intensely scrutinized. On instruction of Commissioner Janette Sadik-Khan, Dr. Yanev assembled a panel of experts including representatives of the consultant community, academia and members of the Bridge Management and Maintenance Committees of the Transportation Research Board, of which he is a member. A questionnaire was circulated among the panelists in order to facilitate their responses. These responses and the opinion of in-house experts were taken into account in considering the potential benefits of using non-destructive techniques for the health monitoring of structures in the future. It was concluded that the current inspection methods and frequency are safe. As a result of the rehabilitations of the past decade, bridge conditions have improved significantly. The Bridge Inspection and Research and Development Units have pioneered the use of various nondestructive tests on City bridges, including X-ray diffraction, fiber optics, strain-gauging, ground penetrating radar, and ultrasonic testing. Future applications of such technologies are under consideration.

On September 17, 2007, Division representatives, along with engineers from NYS DOT, the Port Authority of New York and New Jersey, and the Metropolitan Transit Authority reported to the

New York City Council on the safety of the bridges and the methods of inspection and hazard mitigation.

Inspecting the Bridge over the Dam at the North End of Clove Lake in Staten Island in October 2009. (Credit: Syed Mahmood)

STRAIN GAUGE AND TELLTALE TESTING

Telltales for crack monitoring are installed at several locations, including three pre-stressed bridges in Staten Island and the FDR Drive at 92nd Street. These devices are attached to both sides of the crack and allow us to measure the changes from one inspection to the next. There is a grid on the face of the telltale that allows for precise measurements.

In 2008, the Research and Development Unit successfully used a new borescope and the acoustic emission equipment for monitoring inaccessible details at the Williamsburg Bridge, and the Bridge Inspection Unit retained consultants to inspect and evaluate the potential vulnerability to scour of bridges over the Bronx River.

Director of Bridge Management Kevin McAnulty (in Red Jacket) Utilizing a Borescope to Inspect the Joints of the Williamsburg Bridge in April 2009.

Snuff Mill Road Bridge is One of the Bridges Investigated for Scour Vulnerability and Found to be Structurally Sound, But it Remains Under Surveillance During Heavy Rains and Floods.

In December 2008, as a follow-up of the commitment to enhance bridge inspections by non-destructive remote monitoring techniques, two approach spans of the Brooklyn Bridge were instrumented with fiber optic sensors.

In January 2009, in-house forces assisted researchers from the University of Illinois at Chicago in the installation of fiber optic sensors on the Manhattan approach of the Brooklyn Bridge, designed to monitor the condition of two brick masonry arches. The sensors monitor the behavior of existing cracks with the results transmitted electronically to the website, using a computer system capable of monitoring up to 40 channels of information on displacements, vibration, and temperature. The project is sponsored by the FHWA and contracted by NYSDOT at no cost to the City. Dr. Yanev will be presenting its progress at the Non-Destructive Testing TRB Committee meeting in early 2010.

Director of Bridge Management Kevin McAnulty Utilizing a Borescope to Investigate the Suspension Cable Model at Columbia University. The Cable is 20 Inches Thick and 20 Feet Long, Made of 10,000 Steel Wires, Each Five Millimeters in Diameter. Sensors in the Cable Measure Corrosion Rates, Temperature, Humidity, Acidity and Chlorine Content, and Microphones Detect Cracking in the Steel Strands. (Credit: Bojidar Yanev)

CLEANING

In 2009, 8,527 cubic yards of debris were removed from bridges and their surrounding areas, and 1,807 drains were cleaned.

Highway Repairer Ruben Sanchez Cleaning the 174th Street Bridge Seat. (Credit: Louis Garzia)

Debris Removal Crew: Highway Repairer Eudosio Perez, Supervisor Highway Repairer Thomas Cruz, Highway Repairer Donald Riconda, and Assistant City Highway Repairer Sonia Lopez.

Cleaning a Drain: Supervisor Highway Repairer Michael Parise, Highway Repairer Anthony Irizarry, and Assistant City Highway Repairer Danny Alvarado. Darin Crew: Assistant City Highway Repairer Danny Alvarado, Highway Repairer Anthony Irizarry, Supervisor Highway Repairer Michael Parise, Assistant City Highway Repairer Claudia Wilkinson, and Highway Repairer Michael Cunningham. (Credit: James Campbell)

PIGEON DETERRENCE

Excessive numbers of pigeons cause property deterioration, unsafe working conditions and health hazards. Besides being unsightly, accumulation of pigeon droppings and feathers is corrosive to steel structures and raises concerns about health hazards. Many disease organisms have been associated with pigeons. They harbor ectoparasites which can infest or bite humans. Pigeon droppings also harbor fungi that can trigger serious, even fatal, lung diseases such as Histoplasmosis, Cryptococosis and Toxoplasmosis, when the spores are transmitted to humans who breathe in the harmful dust.

The Division utilizes a relatively low tech, and passive, approach to deterring pigeons. In 2006, the type of barrier used to cage out pigeons was changed from the drop ceiling method to netting. The netting is supported by steel cables that are clipped to the beams. This method is currently in use under the Brooklyn Queens Expressway (over Prospect Street), at the Pulaski Bridge, under the Brooklyn Bridge at “Ash Alley,” and at the anti-icing tank storage area under the Brooklyn Bridge at Dover Street. In addition, a pigeon deterrent system involving low voltage wires is in place at the Belt Parkway Bridge over Ocean Parkway. The wires are installed along the web of the girders and are hardly visible, yet highly effective. The system has been in operation for over three years now and no pigeons have been observed under or by the bridge ever since. The community is pleased that we addressed one of their most serious and longstanding complaints. The system requires minimum maintenance and is extremely easy to operate.

In 2009, pigeon dropping removal and/or pigeon proofing were performed at the 207th Street (University Heights) Bridge over the Harlem River; Bruckner Expressway over Westchester Creek (Unionport Bridge); the Madison Avenue Bridge (138th Street) over Harlem River; the Hutchinson River Parkway Bridge, the Northern Boulevard (Prince Street) Bridge over Flushing Creek; the Queensboro Bridge; the Brooklyn Bridge at Prospect Street; the Pulaski Bridge; and the Belt Parkway Bridge over Nostrand Avenue.

Nature's Pigeon Deterrent—A Falcon on the Brooklyn Bridge South Side Tower. Falcons Have Lived on the Brooklyn Bridge Since 1995. Falcon Family on the Williamsburg Bridge. According to the New York State Department of Environmental Conservation, New York State now has the largest population of peregrines in the eastern United States. There Are Now 17 Falcon Pairs in New York City. (Family Credit: Russell Holcomb) "Owl" Guarding the Machinery Room of the Broadway Bridge. A Hawk on the Broadway Bridge. (Owl and Hawk Credit: Albert Hong)

BRIDGE CLASSIFICATION

The Coast Guard regulations, which govern the operation of the City's movable bridges, define the owner's responsibility to the mariner by classifying a bridge as "open on demand" or "open on advance notice." An "on demand" bridge provides an immediate opening to any vessel wishing to pass the bridge. An "advance notice" bridge opens after the mariner requests an opening several hours in advance. "On demand" bridges must be staffed at all times. "Advance notice" bridges are staffed only when necessary. DOT redesigned the work process in order to reduce personnel costs to the City and improve the delivery of services to the maritime community.

In October 2000, the Department implemented the United States Coast Guard-approved changes, establishing a four-hour notice for the Harlem River bridges, and a two-hour notice for the remaining "advance notice" bridges. The "on demand" classification remains for three bridges. The revised advance notice requirements allowed the formation of mobile crews with

overlapping responsibilities, meeting the mariners' needs and, in some instances, improving service by providing two mobile crews to expedite a vessel's travel along a waterway.

The reduction in planned personnel will save approximately $1,042,480 annually. In addition, bridge operational capabilities, general maintenance, and debris and snow removal have been enhanced through the more efficient utilization of existing personnel.

The remaining task is the conversion of the three remaining bridges to "on demand" status. This will be achieved by the replacement of the Shore Road over Hutchinson River and the Belt Parkway over Mill Basin bridges with new bridges built with higher clearances, thereby reducing the number of times the bridges must be opened. The third bridge, Hamilton Avenue, does not require a higher elevation.

Summary of Vessel Openings 1995 - 2009

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Brdn Ave. (Q)	0	105	15	0	3	0	28	0	0	0	1	0	0	0	0
Brdwy (B/M)	7	24	7	2	0	6	27	83	49	16	2	18	42	58	57
Brcknr Expwy (Estrn Blvd) (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brcknr Expwy (Unnprt Brdg) (B)	431	386	363	257	345	385	420	332	300	309	253	250	281	323	349
Carroll St. (K)	432	245	142	110	174	102	80	124	186	49	22	28	13	38	91
Grand St. (K/Q)	239	189	37	23	24	17	50	19	10	8	5	2	5	0	0
Grnpoint Ave. (K/Q)	498	557	626	669	787	688	641	659	738	1093	1045	905	641	485	428
Hmltn Ave. (K)	1246	1191	1157	996	982	933	832	946	824	757	677	1077	354	0	150
Hntrs Point Ave. (Q)	0	113	15	0	1	0	36	0	0	0	0	0	1	0	0
Htchnsn River Pkwy (B)	37	31	32	75	46	5	120	30	5	37	10	2	51	61	170
Macombs Dam (B/M)	5	13	3	0	0	0	0	0	0	0	0	0	4	2	0
Mdsn Ave. (B/M)	0	0	0	0	0	0	0	0	0	7	0	9	35	8	0
Metrpltn Ave. (K)	272	407	423	448	513	279	366	339	342	153	0	104	329	245	240
Mill Bsn (K)	954	903	628	591	433	336	317	142	173	164	162	174	182	190	183
Pulaski (K/Q)	206	195	291	332	383	276	208	308	599	694	734	433	489	639	611
Rsvlt Islnd (M/Q)	0	0	0	4	0	58	48	125	63	669	150	54	48	0	62
Shore Rd (Pelham Pky) (B)	2190	2167	2158	2274	2162	2168	2222	1897	1910	2011	1683	1704	1645	1446	806
Union St. (K)	432	236	144	103	144	85	101	62	24	21	11	9	5	10	28
Ward's Isnd Pdstrn (M)	1	0	2	1	0	0	279	0	0	7	2	8	4	6	3
Willis Ave. (B/M)	24	17	9	0	4	4	40	0	7	25	2	41	67	17	9
3rd Ave. (B/M)	20	18	9	0	2	1	1	0	0	0	0	6	60	7	0
3rd St. (K)	432	256	149	112	157	178	117	212	152	99	43	31	39	49	89
9th St. (K)	0	0	0	0	192	513	808	733	547	457	360	480	333	287	387
145th St. (B/M)	24	24	3	0	0	1	6	0	0	9	0	0	0	0	0
W.207th St. (B/M)	4	12	7	2	0	6	14	4	6	10	1	12	24	2	3
TOTAL	**7454**	**7089**	**6220**	**5999**	**6352**	**6041**	**6761**	**6015**	**5935**	**6595**	**5163**	**5347**	**4652**	**3873**	**3666**

RESEARCH AND PRESENTATIONS

In 2009, research work and/or case histories of the Division were presented in the following proceedings:

ASCE Long Island Branch, ASHE Long Island, Levittown, Long Island, 15 January 2009. Nyman, W. *Willis Avenue Swing Bridge: Carrying a $612 Million Project From Design Into Construction*.

ASCE Metropolitan Section Structures Group Technical Lecture, New York City, 25 February 2009, Griesing, K. *Replacement of a Rare Hanover Skewed Bascule – The Hamilton Avenue Bridge*.

Yegin, M. K., Arzoumanidis, S., Strohman, B. P., Kishore, K., and Patel, J. *Appraising the Brooklyn Bridge*. Civil Engineering, February 2009, Volume 79, Number 2.

2009 International Foundation Congress and Equipment Expo, Lake Buena Vista, Florida, 15 – 19 March 2009. Krstic, V., Mankbadi, R., and Ramakrishna, A. *Willis Avenue Swing Bridge: Design and Construction of Drilled Shaft Foundations*.

National Association of Corrosion Engineers (NACE), Corrosion 2009, Atlanta, Georgia, New Orleans, Louisiana, 22 - 26 March 2009. Trapani, P. *The Challenges of Painting the Brooklyn Bridge*.

Polytechnic Institute of NYU, Advances In Coating Technologies for Infrastructure Corrosion Control Symposium: Sustainability, Durability, Performance Assessment, and Aesthetics, New York City, 5 May 2009. Yanev, B. *NYCDOT Coating Program*.

ASCE Metropolitan Section Structures Group Seminar, New York City, 12 May 2009. Nyman, W. E. *Willis Avenue Swing Bridge*.

ASCE Metropolitan Section Structures Group Seminar, New York City, 14 May 2009. Razzaq, A. *Queensboro Bridge Centennial*.

ASCE Metropolitan Section Structures Group Seminar, New York City, 19 May 2009, Olmstead, R. A. *Three New ASCE National Historical Civil Engineering Landmarks: The Queensboro, Manhattan, and Williamsburg Bridges.*

Municipal Engineers of the City of New York, New York City, 27 May 2009. Ahmad, H. *The Brooklyn Bridge Rehabilitation Project*.

Queensboro Bridge Centennial Celebration, New York City, 1 June 2009. Miscione, M., Perahia, H., and Schwartz, S. *The Queensboro Bridge - History, Construction Into the 2nd Century, Courage to Build the Bridge*.

Queensboro Bridge Centennial Celebration, New York City, 2 June 2009. Berdy, J., Singleton, B., and Frieder, D. *Different Aspects of the Queensboro Bridge: Consisting of the Trolley and Kiosk, Construction and Images*.

Queensboro Bridge Centennial Celebration, New York City, 3 June 2009. Regan, J. W. *How the Bridge Transformed the Life of NYC*.

Queensboro Bridge Centennial Celebration, New York City, 3 June 2009. Schwartz, S. *The Queensboro Bridge as Seen Through the Eyes of Gridlock Sam.*

Yanev, B. *New York City Bridges: Expenditures, Conditions and Services*. Public Works Research Institute, June 2009.

Department of Homeland Security 2009 Aging Infrastructures Workshop, Columbia University, New York City, 21 – 23 July 2009. Yanev, B. *Suspension Bridge Cables: 200 Years of Empiricism, Analysis and Management.*

5th New York City Bridge Conference, New York City, 17 – 18 August 2009. Csogi, R. *Reconstruction of the East River Bridges in New York City.*

5th New York City Bridge Conference, New York City, 17 – 18 August 2009. Griesing, K. *Replacement of a Rare Hanover Skewed Bascule – The Hamilton Avenue Bridge*.

5th New York City Bridge Conference, New York City, 17 – 18 August 2009. Perahia, H., and Gill, B. *Manhattan Bridge at 100 Years: An Innovation of Design and Construction*.

Construction Institute of ASCE: CI Student Day - New York 2009, New York City, 25 September 2009. Sauer, R., Mohr, T., O'Donnell, E., and Makabadi, R. *Willis Avenue Bridge Reconstruction Project*.

Manhattan Bridge Centennial Celebration, New York City, 5 October 2009. Tolle, B., and Lemmey, K. *Miss Manhattan, Miss Brooklyn and Their Creator, Daniel Chester French*.

Manhattan Bridge Centennial Celebration, New York City, 6 October 2009. Miscione, M., Perahia, H., and Schwartz, S. *Manhattan Bridge - History, Construction and Safety.*

Manhattan Bridge Centennial Celebration, New York City, 7 October 2009. Eng, P. *Bridges of New York*.

Manhattan Bridge Centennial Celebration, New York City, 8 October 2009. Frieder, D. *Engineering, Construction and History of the Manhattan Bridge.*

Manhattan Bridge Centennial Celebration, New York City, 9 October 2009. Olmsted, R., Miscione, M., Schwartz, S., Rasenberger, J., and Chan, S. *Panel Discussion on the Manhattan Bridge.*

25th US – Japan Bridge Engineering Workshop, Tsukuba City, Japan, 19 – 21 October 2009. Yanev, B. *Suspension Bridge Cables: 200 Years of Empiricism, Analysis and Management*.

Yanev. B. University of Tokyo, Japan, 23 October 2009. *The Difficult Relationship Between Bridge Engineering and Management*.

Ansari, F., and Yanev, B. *Remote Monitoring of the Brooklyn Bridge*. Technology Transfer News, Fall 2009, Volume 5, Number 3.

Drissi-Habti, M., Betti, R., and Yanev, B. *Structural Health Monitoring of Bridge Cables*. Materials Evaluation, November 2009, Volume 67, Number 11.

Frieder, D. *Happy 100th, Manhattan Bridge.* Rebuilding America's Infrastructure, November 2009.

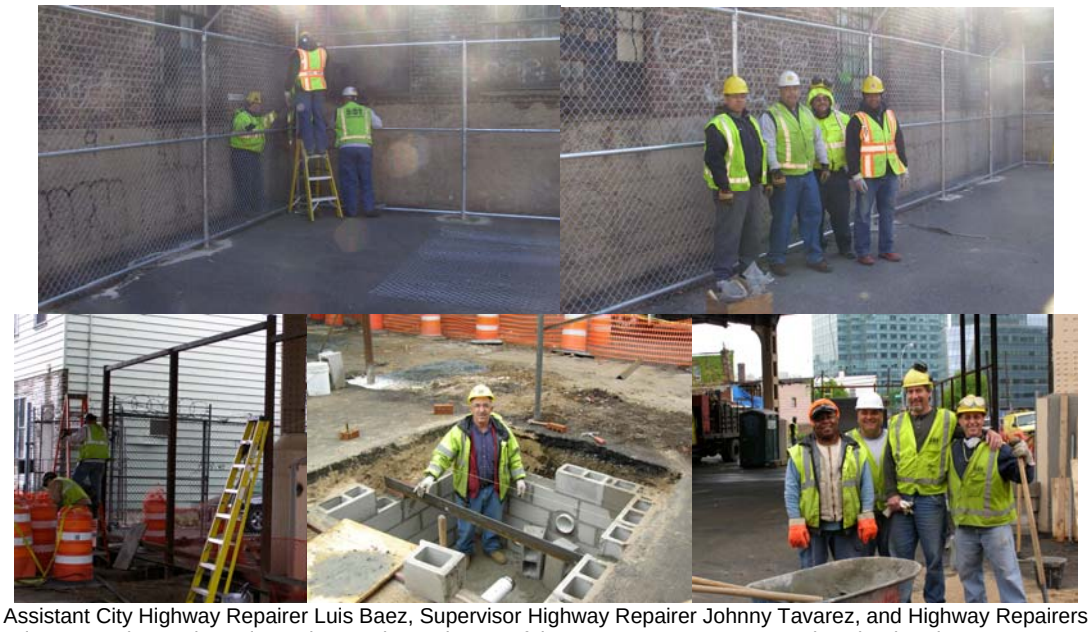
Transportation Research Board 89th Annual Meeting, Washington, D.C., 10 – 14 January 2010. Mayer, L., Yanev, B., Olson, L. D., and Smyth, A. W. *Monitoring of Manhattan Bridge for Vertical and Torsional Performance with GPS and Interferometric Radar Systems*.

Transportation Research Board 89th Annual Meeting, Washington, D.C., 10 – 14 January 2010. Talebinejad, I., Fischer, C., Ansari, F., and Yanev, B. *Structural Health Monitoring of the Masonry Arch Approach Spans in Brooklyn Bridge*.

In addition, Dr. Bojidar Yanev continued his participation on the FHWA project "Structural Safety Appraisal Guidelines for Suspension Bridge Cables" along with the principal investigator, Columbia University. He guided a team of researchers installing sensors on the Manhattan Bridge during the final phase of the project. He is a member of the expert panel reviewing the progress of the FHWA project "Long Term Health Monitoring of Bridges," along with principal investigator Rutgers University.

Dr. Yanev is on the review panel for NCHRP Project 20-07/Task 244 *Modifications for AASHTO LRFD Bridge Design Specifications to Incorporate or Update the Guide Specifications for Design of Pedestrian Bridges*. He is also a member of the Transportation Research Board Committees on Bridge Maintenance, Management, and Seismic Design.

In addition, the Division sponsors an in-house lecture series, inviting speakers from industry and academia several times a month. Highlight topics of the presentations in 2009 included: high performance polymer systems; non-destructive testing and evaluation of new and existing structures; structural health monitoring using optical sensing applications; anti-icing systems; Manhattan Bridge monitoring; electrochemical fatigue sensors; Port Authority New York/New Jersey study; metalizing for permanent corrosion control; weather and pavement information system; concrete repair methods, and inspection of steel suspenders and cable stays utilizing magnetic flux leakage.



Assistant City Highway Repairer Luis Baez, Supervisor Highway Repairer Johnny Tavarez, and Highway Repairers Luis Soto and Joseph Davis Setting Up the Perimeter of the New Crescent Street Yard Under the Thomson Avenue Ramp of the Queensboro Bridge in April 2009. Division Ironworkers Installing Expanded Metal Fence Supports, and Mason Crew Building a Water Shutoff Chamber in the New Yard in May 2009. (Credit: Joseph Flood)

In June 2009, Assistant City Highway Repairer Seveul Redzeposki, Highway Repairers Robert Bynes and Ruben Sanchez, Supervisor Highway Repairer Dionisio Matos, and Assistant City Highway Repairer E'boni Brown Removed Vegetation From the Fascia Girder and Performed Chain Link Fence Repairs on the City Island Bridge. (Credit: Paul Schwartz)

Bridge Repairer and Riveters Ignazio Trapani and Christopher Sabbagh Fabricating a New Grizzly for the Agency Asphalt Plant. (Credit: Russell Holcomb) Bridge Repairer and Riveters Michael Greenwood and Damian Venezia Replacing Deteriorated Planks on the Grand Street Bridge in October 2009.