IMPROVING STRUCTURAL INSPECTIONS AT MTA NEW YORK CITY TRANSIT

Barry L. Kluger
MTA Inspector General
State of New York

OVERVIEW

MTA New York City Transit (NYC Transit) operates over 240 route miles of subway structures with 468 stations system-wide. Responsibility for the structural integrity of this vast system rests with the NYC Transit Department of Subways Maintenance of Way and Station Maintenance divisions, as well as with the NYC Transit Department of Capital Program Management. To safeguard riders and employees, these units must regularly inspect NYC Transit structures for defects. These inspections are also vital to the agency's proper management of its limited resources for maintenance and capital repair.

Our audit of structural inspection practices, though, finds that NYC Transit has not inspected some critical support structures on a regular and timely basis, and in some cases has not inspected certain critical structures for decades. Examples of the overlooked structures we found include steel supports at elevated stations on the J line; truss bridges (one of the oldest types of modern bridges); abandoned sections of stations that serve as supporting structures for active sections of stations;[1] and the concrete Rockaway Viaduct that spans Jamaica Bay in Queens. While it is certainly disturbing that inspection records for some critical structures are many years old, there are other structures for which inspection records do not even exist.

Certainly, the absence of timely inspection increases the risk of serious structural failure. Therefore, NYC Transit must promptly ensure that all of its critical structures either pass inspection or are on the path to prompt repair, and it must dedicate the labor and other resources necessary to ensure regular and timely inspection of these structures in the future.

[1] Some underground stations were originally built to have train service on two levels. While NYC Transit eventually discontinued service to these lower levels, their physical structures still support the upper levels of the stations. There is also a group of station sections that are located adjacent to, and provide structural support to the sides of, currently active station sections.

Summary of Findings

- Although annual inspections of elevated station supports are required by NYC Transit's guidelines, the appropriate in-house unit has not been conducting such inspections.

- No unit within NYC Transit is assigned responsibility for regularly inspecting the over-water portions of the Rockaway Viaduct.

- While NYC Transit previously agreed to implement our recommendations to regularly inspect hard-to-reach station ceilings in accordance with our earlier related report,[2] it has not yet done so. Indeed, these inspections are currently two years behind schedule, with inspection consultants not yet even hired.

- Although NYC Transit has identified 11 truss bridges, ten high elevated structures (such as the one at Smith and 9th Street in Brooklyn, which is the highest subway station in the world), and four underwater structures to be regularly inspected beginning in 2013, this timeframe is questionable given the lack of agency planning for this critical project.

- NYC Transit has not been inspecting abandoned sections of stations that provide structural support for the active sections of the stations; agency officials did not even have an inventory of these abandoned structures.

Summary of Recommendations

NYC Transit must devote all necessary financial and human resources to make certain that its infrastructure is safe, and agency management must document the condition of each of its assets to effectively plan and prioritize maintenance and repairs. Toward these ends, our seven recommendations are designed to promote safety, and to make structural inspections broader in reach as well as more timely, effective, and efficient.

Summary of Agency Response

At the outset of the NYC Transit response to our preliminary report, Thomas Prendergast, the President of NYC Transit, asserted that:

> *The report and the ongoing discussions with your office during the analysis have been instrumental in helping us look at our overall responsibilities related to structural inspections in a way that will help ensure we not only address any/all deficiencies, but also get the maximum benefit from [our inspections]. We are in agreement with the substance of your findings and all recommendations and are taking a number of actions with respect to the structural inspection process at NYC Transit.*

[2] MTA/OIG Report #2010-05, *Improving Inspections of NYC Transit Stations*.

To improve its structural inspections NYC Transit has now re-emphasized to its inspectors that the elevated station platform supports are a required part of the annual inspection. Further, the agency will issue a revised policy instruction for structural inspections "*planned for no later than the second quarter of 2013*," (emphasis in original), which will serve to reinforce and clarify the responsibilities for structural inspections and their frequency.

Regarding inspection schedules, NYC Transit asserted that it has reviewed its schedules and established a five-year inspection cycle for the over-water portions of the Rockaway Viaduct, hard-to-reach station ceilings, truss bridges, and underwater structures. The agency explained that it determined the five-year cycle based on the particular characteristics of these structures. NYC Transit also asserted that it planned to hire a consultant to inspect these special structures and expects to complete consultant selection and issue a notice-to-proceed to the winning bidder by July 2013. The agency made clear that inspection frequencies may be revised, depending on the results of these special inspections.

As for abandoned facilities that still serve a structural purpose, NYC Transit confirmed that it has recently completed an inventory of these facilities and is developing an inspection cycle for them.

Finally, NYC Transit also confirmed its plans to monitor its structural inspection process on an ongoing basis to identify and implement inspection improvements as well as any needed changes to inspection frequencies.

We are encouraged by NYC Transit's response, which reflects appreciation of the concerns we expressed regarding structural inspections and of the value of reassessment in light of industry best practices and its own experience. We will continue to monitor the implementation of the agency's program as appropriate.

BACKGROUND

The engineering unit of NYC Transit Maintenance of Way (MOW Engineering) is responsible for inspecting most structures to ensure safety and operational capability. This unit conducts annual inspections of stations and line structures, such as subways, bridges, retaining walls, and elevated track. Station inspections concentrate on steel and structural concrete at underground stations, and structural steel at elevated stations.[3]

MOW Engineering conducts visual inspections, looking for cracks and corrosion in the steel "members" (components) of a structure and for loose, cracked, or deteriorated concrete. According to the unit's chief engineering officer (Chief Engineer), underground structures are more robust than elevated structures because of the way they were constructed. For example, the columns that support the roof and sides of an underground tunnel are much closer together—typically five feet apart longitudinally—than the columns on an elevated structure, which are typically 50 feet apart longitudinally. Defects identified during inspections of both elevated and underground structures are classified as "A" or "B," depending on the type of defect,[4] the extent of the defect[5] and/or the location of the defect on the steel member.[6]

"A" defects on elevated structures are to be repaired within 90 days, usually by in-house crews. The process is different for underground structures. The Chief Engineer told us that "A" defects in underground structures tend to pose far less risk and that there is no corresponding timeframe for repairing defects in the underground structure.

"B" defects, which are less severe, are identified for annual monitoring purposes, and their eventual repair is conducted by in-house crews or a contractor as part of a capital project. For efficiency reasons, "B" defects are more likely to be repaired by contractors than by in-house crews when large numbers of such defects are concentrated in one area.

Lists of all uncorrected 'B' defects are forwarded annually to NYC Transit's Division of Capital Planning & Budget, which then works with MOW Engineering and the Capital Program Management department (CPM) to prioritize future capital projects. Once a capital project is approved, CPM manages its design and construction. From the defect lists provided by MOW Engineering, CPM determines the details of what needs to be repaired, and how repairs should be performed. The contract is then bid out and awarded to a construction company.

Once a contract is awarded, but before construction begins, the winning company is contractually required to perform a comprehensive inspection, overseen by CPM and MOW

[3] Station inspections examine all structural elements, including floors, walls, and ceilings of platforms, mezzanines, and stairways. While structural concrete is abundant below ground, its role at elevated stations is often limited to mezzanine and platform floors, with the station's structural components made of steel.

[4] Types of defects include parts or materials that are cracked, corroded, broken, missing, or loose.

[5] The extent of a defect means how many of the parts or how much of the material is affected.

[6] Predictably, a defect is considered more serious when it occurs on or near the part of the steel member that provides the greatest structural support.

Engineering, which is conducted with sufficient attention to detail to allow for the design of precise repairs. While the inspections of steel performed routinely by MOW Engineering are visual and sometimes conducted at a distance from the structure, the comprehensive inspections required of the contractor are performed up-close and often utilize instruments, such as gauges that measure exactly the extent of deterioration in steel components. This comprehensive inspection is called a "pre-construction survey."

In addition to MOW Engineering, a second group, the Station Maintenance Division (Station Maintenance), is responsible for annual inspections of 18 concrete viaducts[7] that pass over land. In contrast to the visual methods used by MOW Engineering inspectors for steel, Station Maintenance uses an industry-standard technique for concrete called tap-and-sound inspection.[8] This method provides "a means of detecting loose or spalling concrete,[9] voids, and other defects in concrete and concrete-covered structures."[10] Further, because of MOW Engineering's limited equipment and staffing, independent consultants are often hired to examine structures in difficult-to-reach locations.

Our present audit stems in part from our finding in a companion report[11] that the inadequacies of one consultant's structural inspection resulted in faulty designs for NYC Transit's West End Line rehabilitation project. As a consequence of that finding, we (a) reviewed two other selected capital projects—the rehabilitation of the Jamaica Line and the over-water portions of the Rockaway Viaduct—to determine whether there were other inadequacies in the inspections of NYC Transit's structures and (b) followed up on our previous recommendations to improve structural inspections. Our current findings and recommendations follow.

[7] A viaduct is a bridge composed of a series of short spans or arches.

[8] MOW Engineering also uses the tap-and-sound technique, and even incorporates it in its Policy Instructions (see footnote 10, infra), but only for inspecting concrete in underground structures. This technique is used to detect defects in concrete, which are often hidden below the surface, because the sound-reflecting quality of concrete changes depending on its condition.

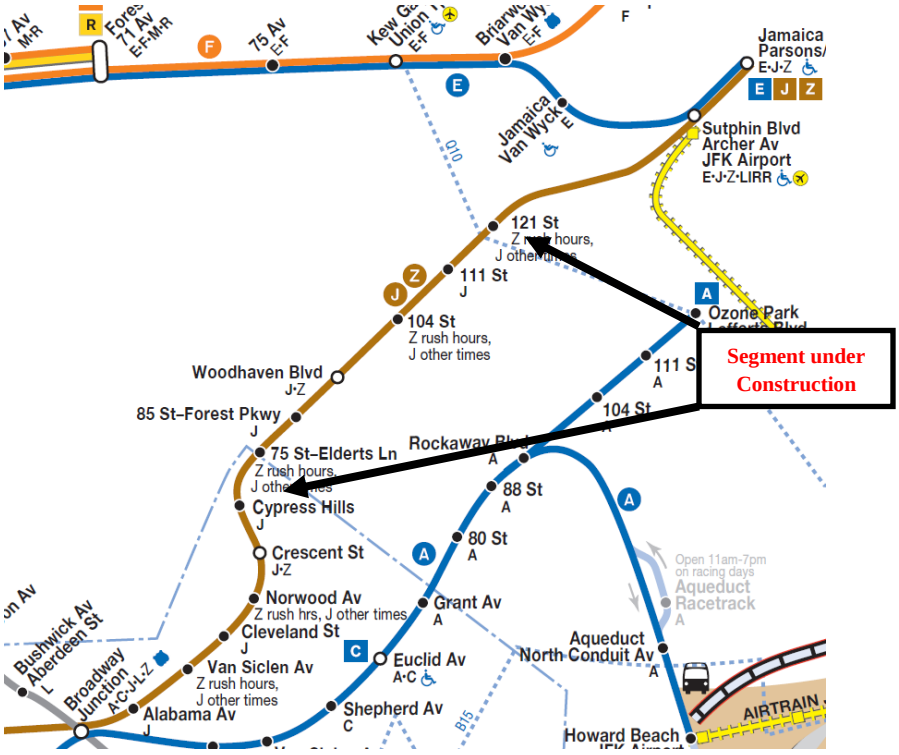
[9] Spalling is when chips or fragments are breaking off of concrete.

[10] MOW Engineering's *Structural Inspection Policy Instructions*, p. 7.

[11] MTA/OIG Report #2012-10, *Minimizing Additional Work Orders on NYC Transit Capital Projects*.

SECTION I: NYC TRANSIT NEEDS TO IMPROVE ITS INSPECTIONS OF STATION SUPPORTS

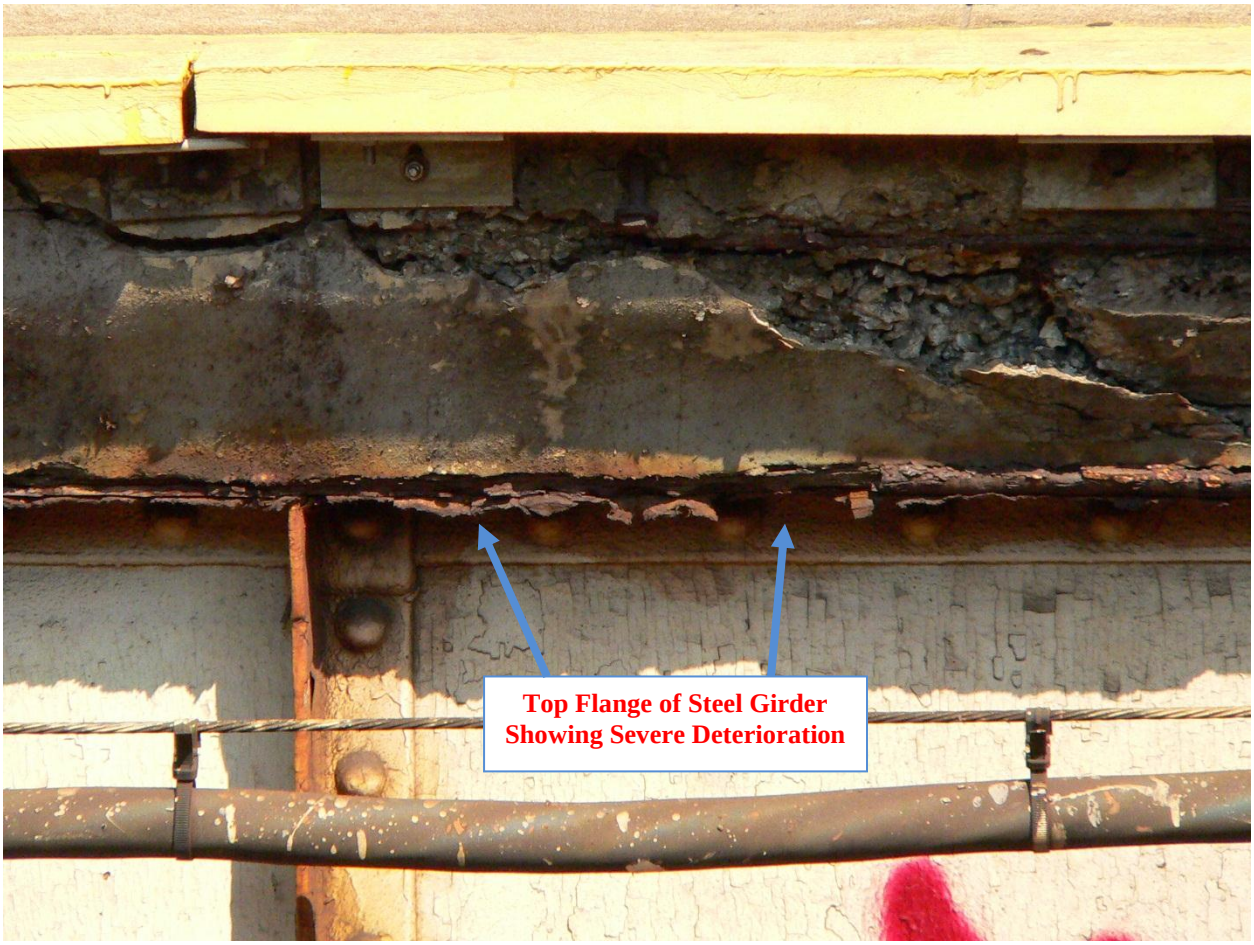
We reviewed the pre-construction survey of the Jamaica Line painting and steel repair capital project that was awarded to Kiska Construction for $20 million in December 2010. J and Z trains run on the Jamaica Line, and the section included in this project stretches from the Cypress Hills Station in Brooklyn to the 121st Street Station in Queens. The painting and steel repair components of the contract were valued at $11 million and $9 million, respectively. The design for the steel repair component was based on MOW Engineering's annual inspections, which had found deteriorated columns and beams in the structure that supports the tracks and signals.



Segment of the Jamaica Line Undergoing Rehabilitation

In addition to the defects found by MOW Engineering as part of its annual inspections, during the pre-construction survey Kiska Construction found 75 platform girders with severe deterioration in their top flanges[12] that MOW Engineering had not discovered. CPM determined that these ("B") defects did not pose immediate danger, but were nevertheless serious and should be corrected as part of a future capital project. It estimated a cost of $25 million for repair of the 75 girders.

[12] Platform girders support elevated platforms. Flanges are horizontal sections of these girders.



Up-close View of Deteriorated Steel Supporting the Platform

To better understand the nature of these defects and why MOW Engineering missed them, OIG staff visited the 111th Street Station, which is within the area to be worked on. We were able to identify platform girder defects while standing on the platforms, and concluded that MOW Engineering inspectors, who walk at both track and platform levels, would have been able to do the same. When questioned, MOW Engineering management replied that "these flanges are in deteriorated condition and should have been reported [during annual inspections of the structure] as 99.9 percent flange corrosion [and] as 'B' defect[s]." The officials stated that these deteriorated top flanges, while significant, would never be categorized as an "A" defect because, according to MOW Engineering's *Structural Inspection Policy Instructions*, top flanges do not impact the structural capacity of a girder to the same extent as do some of its other parts. Although MOW Engineering's *Structural Inspection Policy Instructions* requires that inspections of platform structures occur annually, the Chief Engineer told us that inspectors "had not focused" on elevated-station-related defects for the past several years. He believes that MOW Engineering stopped inspecting these structures because its inspectors had erroneously believed that Station Maintenance was responsible for conducting these inspections. He went on to state

that "our inspection staff has been instructed to pay close attention to this member type [platform girders] in the future."

Fortunately, MOW's oversight did not compromise the safety of NYC Transit's riders or its employees. However, this case study highlights why the structural condition of elevated stations must be thoroughly inspected before NYC Transit awards a contract for repair. Without accurate information, NYC Transit cannot properly plan for and prioritize capital projects at such stations. Because the value of the additional steel repairs identified by the contractor on the Jamaica Line was significant ($25 million), NYC Transit would not have been able to fund these repairs, without causing a delay in other capital work. Furthermore, bundling similar types of work provides NYC Transit with cost saving opportunities. In this case, since the opportunity to bundle Jamaica Line repairs was already lost, NYC Transit has decided to repair the platform supports under a separate contract in order to obtain the best price available for the additional work.

Recommendation 1: NYC Transit must ensure that annual inspections are performed on schedule and include thorough examinations of elevated station structures and their components (e.g. platform girders), so that defects in these structural elements are identified and corrected on a timely basis.

NYC Transit accepted this recommendation. The agency informed us that "MOW Engineering has re-emphasized to its inspectors that the elevated station platform supports are a required part of the annual inspection."

SECTION II: NYC TRANSIT NEEDS TO IMPROVE ITS INSPECTIONS OF HARD-TO-REACH STRUCTURES

Over-water Sections of Viaducts

During our review of the rehabilitation completed in October 2011 of the over-water portions of the Rockaway Viaduct, a concrete structure that carries the A Line on the Rockaway Peninsula in Queens and that crosses over Jamaica Bay, we learned that no unit within NYC Transit is assigned responsibility for regularly inspecting this over-water portion. NYC Transit Department of Subways' Station Maintenance is responsible for annually inspecting concrete viaducts over land, but that responsibility ends when the Rockaway Viaduct passes over Jamaica Bay. CPM officials stated that the viaduct is currently in good structural condition owing to its rehabilitation by CPM in 2011.

However, we note that in future years, as the structure continues to age, periodic inspections will be essential to identify and address defects before they cause harm or become prohibitively expensive to repair. According to CPM and Capital Planning & Budget officials, the next rehabilitation is planned for around 2026—15 years after the most recent rehabilitation. These officials acknowledge that NYC Transit has no specific plans to inspect the over-water portion of that structure before that date. Significantly, prior to performing the rehabilitation in 2011, NYC Transit last inspected the over-water portion of the Rockaway Viaduct in 1997.[13] This long interval dramatically illustrates the inconsistent approach that NYC Transit takes with respect to the inspection of viaducts like the one on the Rockaway Peninsula. Specifically, while the agency's own requirements dictate that Station Maintenance annually inspect the over-land portion, there are no requirements for annual inspection of the portion over water—even though that portion is exposed to the corrosive salt water of Jamaica Bay. Clearly, the over-water portion of the viaduct must be inspected at least as often as the portion over land.

We also discovered that CPM did not use tap-and-sound testing during the design of the recent Rockaway Viaduct rehabilitation. As noted, tap-and-sound testing provides valuable information about the condition of the structure that is often hidden from view. CPM designers preparing contract designs only visually inspected the underside and lower portions of the viaduct from a NYC Transit boat. They explained that they did not use tap-and-sound testing to find deteriorated concrete sections because of the difficulty of doing such work from that boat, which is relatively small. However, as we also previously noted, tap-and-sound testing is a standard technique employed throughout the construction industry to inspect concrete and, indeed, is used by Stations Maintenance on concrete viaducts that pass over land and by MOW Engineering on concrete in underground locations. When the construction contractor subsequently conducted its pre-construction survey, it used tap-and-sound testing from a barge, discovering in the process that twice as many concrete beams as originally specified in the contract needed to be repaired. This additional work was added to the contract at a cost of $870,000.[14] While the same work

[13] NYC Transit Project #CM-951 (1997), *Special Structural Investigations*.

[14] This additional work equals about five percent of the contract's original value of $17.8 million

would have needed to be performed even if the defective concrete had been discovered earlier, work added to a contract after award almost always costs more than if the same work were included in the original contract. This is primarily because the price of a contract addition is obtained—at a premium—through negotiation with a single contractor, rather than through a competitive procurement process. CPM could have avoided that premium had it utilized the tap-and-sound technique for its original design.

Recommendation 2: NYC Transit should assign specific responsibility for conducting inspection of the over-water portions of the Rockaway Viaduct, require that inspectors use tap-and-sound testing, and provide them with the necessary equipment.

NYC Transit accepted this recommendation. The agency has designated the Infrastructure division within the Department of Subways as the unit responsible for performing annual visual inspections, and including tap-and-sound testing where visual inspection indicates it to be appropriate. In addition, the agency asserted that the over-water portions of the Rockaway Viaduct "will receive a comprehensive supplemental inspection, including sound-and-tap where appropriate, at five-year intervals by a professional engineering consulting firm retained by … CPM. Based on the results of these inspections, the frequency of inspection cycles set forth … may change." NYC Transit indicated that it plans to hire this consulting firm in July 2013.

High or Hidden Ceilings

Following the August 2009 ceiling collapse at the 181st Street Station on the 1 Line, OIG issued its report entitled "Improving Inspections of NYC Transit Stations,"[15] which found that NYC Transit had not been inspecting many of its hard-to-reach station structures, including brick arch ceilings and structural ceilings obscured by hung panels. We recommended that MOW develop a list of hard-to-reach and unique station components that require periodic up-close inspection and develop procedures to perform them. NYC Transit agreed with this recommendation and directed its newly created structural inspection task force to study and further recommend ways to improve such inspections.[16] The task force set goals for the agency to hire consultants to inspect six categories of hard-to-reach and unique structures.[17]

[15] See footnote 2.

[16] NYC Transit created its structural inspection task force during our 2010 audit of NYC Transit's station inspections, which followed the collapse of the ceiling at the 181st Street Station.

[17] The six hard-to-reach and unique structures are: Masonry or brick arch ceilings; structural ceilings obscured by hung panels; elevated structures higher than 35 feet above street level; truss bridges; underwater structures; and the Steinway Tube, which MOW identified as being in need of a comprehensive inspection.

181st Street Station, Following August 16, 2009 Ceiling Collapse

Bowling Green Station with Missing Ceiling Panels, February 17, 2010

Pursuant to these goals, masonry and brick arch ceilings identified by the task force, including ones similar to the ceiling that collapsed at the 181st Street Station, were to be inspected starting in 2010.[18] Structural ceilings obscured by hung panels were to be inspected in 2011.[19] However, CPM missed these goals and has still not completed the planning activities needed to prepare the projects and obtain agency approvals. The structural inspection task force subsequently revised the goals and CPM now plans to start the ceiling inspection process in 2013. But given the history of this project, we are concerned that CPM will miss this goal as well.

In our view, NYC Transit simply can no longer tolerate the continued risk presented by critical-structure-inspection deficiencies that safety-related structural defects will go undetected and unaddressed.[20]

Recommendation 3: In accordance with our 2010 recommendation, which NYC Transit accepted, the agency must promptly complete all planning and other necessary preliminary measures and perform regular and timely inspections of masonry and brick arch ceilings, and structural ceilings obscured by hung panels.

NYC Transit accepted this recommendation. The agency asserts that it is "developing the Master Plan for masonry and arch ceiling inspections. We are at the stage where consultant selection and notice to proceed are anticipated by July 2013." We will continue to monitor NYC Transit's efforts in order to ensure that these critical structural inspections are performed.

[18] The ceiling inspections were originally proposed as follows: City Hall Loop in 2010; South of 9th Avenue Station in 2011; 168th Street Station in 2014; and the 181st Street Station in 2014.

[19] The proposal includes inspections of ceilings at 15 stations.

[20] As pointed out in MTA/OIG Report #2010-05, sections of hung ceiling panels at six stations had fallen in the four years prior to our 2010 audit.

Bridges, High Elevated Structures, and Underwater Structures

The structural inspection task force has set an inspection cycle of five years for truss bridges,[21] elevated structures higher than 35 feet above street level (high elevated structures), and underwater structures. NYC Transit has identified 11 truss bridges, ten high elevated structures, and four underwater structures[22] that should be regularly inspected; these inspections are currently scheduled to begin in 2013.

Bronx River Truss Bridge

High Elevated Structure: Broadway Junction Station

Previous inspections of these structures followed no apparent plan. After the 2007 collapse of a truss bridge in Minneapolis, NYC Transit used a consultant to inspect all of its truss bridges in 2008. But none of the ten elevated, non-bridge structures more than 35 feet above street level has gotten up-close inspection since 1997. For five of the ten structures, we could not determine how many years before 1997, if at all, they were last inspected. As for the underwater structures, two portions of retaining walls on the Harlem River were inspected in 2009-2010. We were not able to ascertain when inspections last occurred for the underwater portions of the two Jamaica Bay bridges and their adjacent viaducts.

Despite the goal of starting an inspection cycle in 2013, CPM has not completed the planning activities needed to prepare the projects and obtain agency approval. Specifically, in 2011, Capital Planning & Budget gave CPM the task of developing the "master plan," which would include, among other items, a scope of work, budget estimate, and preliminary project schedule. After the master plan is developed, it must be approved by multiple senior managers within CPM, as well as by senior managers in the user departments and Capital Planning & Budget.

[21] A truss is a rigid framework of straight components connected at their ends and arranged in triangles, and is generally used to support a bridge, roof, or other structure.

[22] The underwater structures to be inspected are portions of two retaining walls for rail yards on the Harlem River and portions of the two Jamaica Bay bridges on the A Line, as well as the viaducts next to them.

Once the master plan receives all needed approvals, the project can enter the design phase. As of October 2012, CPM had not even submitted the master plan for approval.

It seems unlikely, therefore, that inspections will begin in 2013. As with the ceilings discussed above, NYC Transit cannot accept failure to perform these inspections in regular and timely fashion, because such failure increases the risk that safety-related structural defects will go undetected and unaddressed.

On a related note, since the Stillwell Avenue Bridge, which carries the D and N Lines over Coney Island Creek, is not a truss bridge, NYC Transit does not plan to include it among the bridges inspected every five years. However, this bridge passes over water and MOW Engineering inspectors do not use boats during their annual inspection, making it difficult to impossible to properly inspect the bridge's underside. According to CPM and MOW Engineering officials, this is the only non-truss bridge that traverses water. NYC Transit should either include this bridge among the group of truss bridges to be inspected every five years or make other arrangements for timely, comprehensive inspection.

Recommendation 4: NYC Transit must adhere to its own rules requiring comprehensive inspections of all truss bridges, high elevated structures, and underwater structures every five years. The agency should also broaden the category of bridges to be inspected to include the Stillwell Avenue Bridge and any other similar structure.

NYC Transit accepted this recommendation. The agency stated that it "is in the Master Plan phase; we are revising our P/I [Policy/Instruction] and our processes to ensure scheduled inspections of all special structures. With respect to the special five-year inspections . . . consultant selection and notice to proceed are anticipated by July 2013. The Stillwell Avenue Bridge will be added to the list of Marine Structures. The revised project profile … will require a periodic comprehensive inspection of this structure and we anticipate that the consultant report will either confirm or suggest a modification to the frequency of such inspections."

Potential Use of Specialized Track Vehicles

NYC Transit management officials informed us that the agency must hire consultants to inspect the undersides and supports of its bridges, viaducts, and high elevated structures because it does not have the necessary equipment to perform such inspections. Other transportation agencies, including MTA's own Metro-North Railroad, use specialized trucks and trains for this purpose. These vehicles have jointed mechanical arms that pivot under the structure on which the vehicles ride. A large bucket or work platform positioned at the end of the mechanical arm holds the inspectors comfortably upright, giving them up-close views of a structure's underside.[23] OIG believes that NYC Transit may benefit from using this equipment in its inspections, and may be

[23] Companies that manufacture such specialized equipment include: MOOG GmbH, Barin, Wemo-tec, Hydra Platforms, Paxton-Mitchell, DFM Enterprises, and Aspen Aerials.

able to obtain it cost effectively. An Assistant Chief Engineer for Track and Structures at Metro-North Railroad indicated a willingness to work with NYC Transit on this effort.

Example of a Specialized Vehicle that Allows Up-close Inspections

Recommendation 5: NYC Transit should consider (1) using specialized track vehicles to enable up-close inspections of the undersides of bridges, viaducts, and high elevated structures and (2) obtaining such equipment by purchase or through a sharing agreement with the MTA commuter railroads for use by its own inspectors, or contracting with consultants who use such equipment.

NYC Transit accepted the concept of this recommendation, leaving for further research and analysis the methodology of implementation. The agency stated that it "will evaluate the specific operational and safety requirements for inspections requiring specialized equipment and will determine whether equipment purchase or sharing is the best alternative in each scenario, depending on the nature and specifics of the inspections required. [The agency] will also explore whether technology offers alternative means of conducting up-close inspections of hard-to-reach or obscured infrastructure."

SECTION III: NYC TRANSIT NEEDS TO INSPECT ALL ABANDONED FACILITIES THAT SERVE A STRUCTURAL PURPOSE AND ENSURE THAT REPAIRS UNDERTAKEN AT THESE FACILITIES ARE COMPLETED IN A TIMELY MANNER

During our review of the rehabilitation of the West End Line,[24] which carries the D train in Brooklyn, we found that MOW Engineering does not inspect all structures that are no longer used to provide service to passengers but that still serve as supports for structures above or adjacent to them. Most such structures are abandoned sections of stations that support structures above, such as active stations, tracks, buildings, or streets. Some of the other structures not inspected are completely abandoned stations.

In April 2012, we discussed our concerns about the lack of inspections with MOW Engineering management officials. In June 2012, two-and-a-half months later, the management officials acknowledged not only that MOW Engineering personnel do not currently inspect most of these fully or partially abandoned structures, but that the agency does not even have an inventory of them. The officials said that the agency's structural inspection task force was developing an inventory for these structures and would then create an inspection schedule for them. They further stated that while agency personnel will inspect many of these structures, consultants will likely also be needed to inspect at least some of them because of the limited number of agency inspectors. In August 2012, MOW Engineering officials informed us that it had already identified 33 structures to be included in the inventory and expected to add more in the coming months.

Lower Level of the 9th Avenue Station

During our review of the West End Rehabilitation, we asked the Chief Engineer about the condition of the lower level of the 9th Avenue Station in Brooklyn, which is part of the West End Line, but has been abandoned since 1975. The lower level supports the upper, active level of the station, including its platforms and tracks. The Chief Engineer told us that personnel from MOW Engineering have been inspecting the lower level on an annual basis. He added that the structure is deteriorated in that it has dozens of "A" defects. He also acknowledged that MOW has known for decades that the structure was in need of repair but had not corrected the conditions. When we asked the Chief Engineer why MOW had allowed the condition to persist for years, he had no explanation. However, he noted that while the structure was in need of immediate repair, in his judgment structural collapse was not imminent because it was "over-engineered."[25] The general superintendent for iron operations[26] echoed this view, and also told us that the station was further protected by the five mile-per-hour speed restrictions placed on trains because of the curve in track just south of the station.

[24] The subject of a companion report. See footnote 11.

[25] "Over-engineered" is a term used to describe a product that is deemed by engineers to be more robust than necessary for its application, often in order to ensure safety and sufficient functionality.

[26] The Iron Operations division is responsible for structural steel repairs.

Notwithstanding these explanations, we believe that NYC Transit should have corrected this condition years ago. Indeed, as part of our audit, OIG began inquiring about the condition of the lower level of the 9th Avenue Station in April 2012. Thereafter, in June 2012, shortly after we began our inquiry, NYC Transit initiated a $20 million capital repair project. The agency first placed temporary supports on the station's lower level, and plans to repair or replace 35 steel columns by the end of 2012. As part of this project, beginning in 2013, the agency further plans to remove concrete from the lower level's platforms to determine the condition of the station's foundation and whether more repairs are needed.

Recommendation 6: NYC Transit must promptly complete its inventory of abandoned facilities that still serve a structural purpose, establish an inspection cycle for these structures, and proceed to inspect and promptly repair them when necessary.

NYC Transit accepted this recommendation. The agency noted that is has "developed an inventory of these structures, which we have designated Non-Revenue Line Structures. An inspection schedule is being developed, as well as an assessment of the locations that may require third party assistance to inspect." Consistent with the concerns that led OIG to press for the inventory, we learned that through this inventory NYC identified 38 abandoned facilities that still serve a structural purpose.

SECTION IV: NYC TRANSIT SHOULD REASSESS ITS STRUCTURAL INSPECTIONS PROGRAM

In the wake of the ceiling collapse at the 181st Street Station in 2009, then NYC Transit President Howard Roberts, Jr. directed NYC Transit engineers to "identify areas where more comprehensive inspections … could be employed to spot potentially serious defects." To comply with the former president's directive, NYC Transit established a structural inspection task force made up of representatives from CPM and MOW Engineering. According to the Chief Engineer, the task force has met several times to expand on existing guidelines for inspections.

However, our current audit, culminating in this report, has brought to light critical structures such as platform supports and abandoned facilities that the agency has not been regularly inspecting. Consequently, OIG is concerned that the task force's mandate has been too narrowly cast, and that its approach to planning inspections has been primarily reactive in nature, with new inspection schedules simply being added to the existing program when agency officials discover that yet another critical structural category has gone uninspected for years, if not decades.

Rather, NYC Transit should direct the task force to reassess the agency's structural inspection program as a whole. As part of this effort the task force should make a comprehensive inventory of its structural facilities to help ensure that all critical structures are inspected on a regular and timely basis.

The task force should also use this opportunity to reassess its inspection cycles in light of industry best practices and its own experiences. For example, NYC Transit has established a schedule for its personnel to comprehensively inspect most elevated and underground structures on an annual basis, while planning to comprehensively inspect truss bridges only every five years. Given that all of the structures at issue are deemed critical but their inspection schedules are vastly different, and given further that the agency has not been uniformly complying with these schedules in any event, we believe an agency review of these cycles would help ensure that they are timely enough to identify structural conditions that present safety risks and thereby promote the safety of the agency's riders and employees. This review will also help ensure that the inspection cycles are cost effective.

By empowering the task force to broadly reassess the agency's structural inspection program, NYC Transit will help to ensure that this crucial program is appropriately comprehensive and is being carried out in a timely, effective, and efficient manner. At the same time, by this action, NYC Transit will further promote public confidence.

Recommendation 7: NYC Transit should broadly reassess its structural inspection program to ensure that the nature, extent, and frequency of it structural inspections best promote safety, effectiveness, and efficiency.

NYC Transit accepted this recommendation. The agency stated that it has already begun to review the agency's structural inspection program and to plan improvements to inspection policies and procedures. As part of this effort, NYC Transit has identified additional structures that require periodic inspections, designated the departments that will be responsible for inspecting these structures, and set preliminary inspection frequencies for many of the structures. The agency plans to formalize its structural inspection improvements in a new Policy/Instruction to be issued by the end of June 2013. It also plans to monitor its structural inspection process on an ongoing basis to identify and implement inspection improvements as well as any needed changes to inspection frequencies.