



MINIMIZING ADDITIONAL WORK ORDERS ON NYC TRANSIT CAPITAL PROJECTS

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OVERVIEW

The MTA New York City Transit (NYC Transit or NYCT) Department of Capital Program Management (CPM) is rehabilitating 12 stations and segments of the elevated steel structure on the West End Line (the West End Rehabilitation), which carries the **D** train in Brooklyn. The work, originally valued at \$154 million, is being done as two construction contracts—one for the northern section and one for the southern section. As of July 2012, the contracts' cost to repair the structural steel had increased by \$5.2 million, with that amount expected to grow as the project advances. The Office of the MTA Inspector General (OIG) has been regularly monitoring the progress of this project because it is funded through the American Recovery and Reinvestment Act of 2009 (ARRA).¹ OIG initiated a review of the steel repair work specifically to understand why the cost was significantly higher than anticipated. Notably, during this review it became clear that the problems we encountered on this project are systemic.

For starters, CPM had hired a design consultant to conduct specific inspections and to develop a design for the construction work in order to determine at the outset which work to include in the construction contracts. However, OIG found that the consultant did not perform all contractually required inspections, and CPM did not have adequate procedures in place to ensure that the consultant performed those inspections before completing the design.

OIG also found that CPM did not ensure that the construction contracts provided the contractors with sufficient design details for repairs of steel encased in concrete such as that found at the base of a column that supports an elevated subway line. Consequently, critical repair work not included in the construction contracts had to be added later as Additional Work Orders (AWOs), which increased costs and engendered delays. In turn these delays affected the quality of neighborhood life in various ways, including impinging on limited street parking availability and fostering unsanitary conditions.

Further, the agency did not include any provision in its fixed-price contract for effectively and efficiently addressing a change in the quantity of repairs of concrete-encased steel. Because the condition of the steel is obscured by concrete, the nature and extent of any repairs can only be

¹As part of ARRA, the federal government provided money to state and local governments to invest in infrastructure projects. To help ensure that the federal stimulus funds provided under ARRA are utilized with transparency and accountability, staff from the OIG's Construction Fraud Unit attends progress meetings of ARRA funded projects, provides fraud awareness training and assists other state and federal agencies in their oversight efforts.

estimated. Consequently, it is a virtual certainty that the repairs actually needed will vary from the estimate in the contract, and thus trigger the need for costly and time consuming AWOs.

In total, OIG found that at least \$3 million of the \$5.2 million in AWOs on the West End Rehabilitation was for work that should have been anticipated, bid on, and included under the original contract.

Going forward, it is critical that the scope and price of work be addressed in the original contract as comprehensively as possible, because AWOs cost more than if the same work were included in the contract. This is because the price of an AWO is obtained through negotiation with a single contractor—the company to whom the contract was awarded—rather than through the competitive procurement process. While there is no industry standard for estimating the premium for this additional work, it can be considerable.

Summary of Findings

- Of the \$3 million in work that should have been anticipated and included under the original contract, more than \$1.6 million was overlooked because the consultants hired to design repairs to the West End Line project did not perform all contractually required inspections. As a consequence, critical work was not included in the bid proposal.
- CPM did not provide sufficient oversight of the West End Rehabilitation design consultants in that it provided neither input from relevant engineering disciplines into inspection planning nor any direct observation of inspections to determine whether consultant personnel actually implemented required procedures.
- NYC Transit does not use a unit pricing approach on capital construction projects for steel repairs involving hidden defects, thereby requiring costly and time-consuming additional work orders. Regarding the West End Rehabilitation, the construction contractors designed and quantified repairs and obtained NYC Transit approval on a repair-by-repair basis after award. This approach resulted in nearly \$1.4 million in AWOs and contributed to 12 months of project delays.

Summary of Recommendations

Recognizing that its resources are already severely limited, NYC Transit certainly cannot afford the additional costs associated with work that should have been part of the original contract. We recommend that NYC Transit:

- Ensure that the CPM managers overseeing the consultants' work:
 - Have the proper expertise and support, to make certain that the consultants have appropriate inspection plans and adhere to all contract specifications;
 - Provide guidelines to consultants regarding track access and the use of equipment during inspections; and
 - Monitor the consultants' inspections in the field to make certain that these consultants are employing all appropriate inspection techniques for identifying structural defects.
- Assess Urbahn Architects, the consultant hired to design the West End Rehabilitation, for additional costs due to inspection and design mistakes, and assign the consultant an "Unsatisfactory" performance rating in the MTA All-Agency Contractor Evaluation database.
- Use unit pricing for those repairs with quantities that cannot be precisely ascertained before construction begins. To do so, NYC Transit should prepare a comprehensive list of potential repair elements that would address all conceivable defect types uncovered during construction and obtain agreement in the contract on a unit price for each.

Summary of Agency Response

NYC Transit agreed to move forward with all of our recommendations. To begin, the agency assured OIG that it will improve oversight by requiring its consultants to submit formal, detailed inspection plans for CPM's approval. Moreover, NYC Transit will modify its contracts to clarify inspection requirements for testing. Additionally, CPM personnel will conduct periodic site visits to ensure that consultants conduct proper inspections, including adherence to the formal inspection plan.

NYC Transit further assured OIG that it will review the AWOs for the West End Rehabilitation project, and if it finds that Urbahn Architects was responsible for design errors or omissions that led to the need for the AWOs, the agency will reflect this outcome in the MTA All-Agency Contractor Evaluation database and will explore the feasibility of claiming damages against the consultants.

Finally, NYC Transit agreed to use unit pricing for those repairs with quantities that cannot be precisely ascertained before construction begins. Specifically, for all future contracts that may reasonably require steel repairs, the agency will include unit price provisions in the contract for potential types of defects and the associated repairs.

BACKGROUND

NYC Transit's Capital Program Management department contracts with private construction companies to rehabilitate most of the agency's stations, signal systems, and support structures. Before a capital project is put out for bidding, its design must be completed and made part of NYC Transit's prospective contract. The completed design is the foundation of a capital project in that it contains the drawings and specifications necessary for advertisement, bidding, awarding, and construction of a capital contract. For 80 percent of NYC Transit's capital projects, CPM engineers and architects develop the necessary designs; for the remaining 20 percent of these projects, the designs are created by consulting firms hired for that purpose.

When NYC Transit contracts with a consultant to produce a design for a capital project, a team headed by a CPM design manager, with supporting CPM engineers, architects, and construction management personnel, oversees the consultant's design work, including the required drawings and specifications. Early in the design process, CPM may direct the consultant to base its design on the annual structural inspections performed by the NYC Transit Maintenance of Way Engineering unit (MOW Engineering).² Often, the consultant designers are also contractually required to conduct a thorough inspection of the structure to be rehabilitated, in order to better understand the structure and to ensure that all defects in need of repair are identified. A thorough inspection is critical to ensuring the development of a quality design and reliable cost projections. Conversely, an incomplete or improperly performed inspection can lead to a substandard design, and in turn, result in costly contract adjustments after construction begins.

Ideally, all of the work necessary to complete a capital project is included within its original construction contract. This is critical for controlling costs and maintaining schedules. In practice, however, a contract's required work may be increased, decreased, or otherwise altered after award. Any change in required work is treated as an Additional Work Order. While AWOs are not unexpected, especially during complex projects, a properly designed and managed system strives to minimize them. This report makes both findings about the high cost of the AWOs involved here and recommendations to reduce them in the future.

² MOW Engineering conducts annual inspections of most line structures, such as subways, bridges, retaining walls, and elevated track structures, as well as stations. The annual station inspections concentrate on steel and structural concrete at all underground stations, and on structural steel at elevated stations (where limited structural concrete is used).

SECTION I: IMPROVED OVERSIGHT IS NEEDED FOR CONSULTANT INSPECTIONS

An OIG representative attended biweekly progress meetings of the project to rehabilitate the West End Line as part of our overall monitoring of projects that have received federal stimulus funding.³ The work, which consists of repairs to twelve stations of the **D** Line in Brooklyn and the structure that supports the elevated line (see Figure 1), was valued at \$154 million and divided into two construction contracts: the northern five stations and the elevated line structure between them with construction work valued at \$65.5 million (and awarded to John P. Picone, Inc.),⁴ and the southern seven stations and line structure between those stations valued at \$88.5 million (and awarded to Citnalta/Judlau JV).⁵ Construction work began in August 2009, with substantial completion originally expected in the first quarter of 2012. The project was substantially completed on November 30, 2012 and is now expected to be fully complete by July 31, 2013.



Figure 1: Segment of West End Line that was Rehabilitated

³See footnote 1.

⁴The single contract covering these five stations specifies three full station rehabilitations, which include repairs to all elements, and two “component” rehabilitations of stations, which include only specific station elements such as stairs, canopies, canopy column bases, and parts of platforms. The full rehabilitation stations are 9th Avenue, Fort Hamilton Parkway, and 62nd Street. The component stations are 50th Street and 55th Street. The contract’s elevated structure rehabilitation work is from 9th Avenue to 62nd Street.

⁵The contract for the seven stations includes one full station rehabilitation and six component rehabilitations. The full station rehabilitation is at Bay Parkway. The component stations are 71st Street, 79th Street, 18th Avenue, 20th Avenue, 25th Avenue, and Bay 50th Street. The contract’s elevated structure rehabilitation work is from 62nd Street to the Stillwell Avenue Station.

We initiated a review of this project after our meeting representative noted that the amount of steel to be repaired increased significantly after the contracts had been awarded. This increase occurred because construction contractors, while working on the structure, found more steel defects than those recorded by the design consultant. As of July 2012, a total of \$5.2 million in additional steel repair work had been added to the contracts as AWOs,⁶ with that amount expected to grow as the project progressed.

While by no means typical, an incident involving another MTA agency—MTA Bus—that occurred on a recent rehabilitation project for a bus depot dramatically illustrates the budget-busting potential of AWOs. A general contractor working on the rehabilitation proposed \$9.3 million for additional roof work. Fortunately, MTA Bus was able to solicit a proposal from a second contractor, one that happened to be working at the same depot because MTA Bus had hired it to remove and dispose of asbestos. The second contractor proposed to perform the same work for only \$1.6 million, a savings of 83 percent over the first bid. However, the MTA rarely can turn to another contractor while construction work is in progress, which is why minimizing AWOs is critical for helping to control the costs of capital work.

As part of our review of the West End Rehabilitation, we reviewed Urbahn Architects' consulting contract. Further, to help determine whether structural defects later covered by AWOs were potentially visible during the consultant inspections, we analyzed the construction contracts' structure-related AWOs and conducted post-construction site visits of the relevant structures. Because neither NYC Transit construction management personnel nor construction company officials could provide us with pre-construction pictures for these structures, we took our own photographs during these visits. Our findings follow.

CPM Must Improve Inspection Oversight

The design contract for the West End Rehabilitation was awarded to Urbahn Architects for \$4.1 million. Urbahn Architects in turn hired Dewberry, an engineering company, as its sub-consultant for structural matters. CPM's vice president for engineering services explained that the additional steel repairs should have been included in the original designs, but that in drafting the designs, including the drawings and specifications for each contract, Dewberry was contractually required to rely on the condition assessment produced by MOW Engineering from its annual inspections. According to this CPM engineering manager, MOW Engineering's assessment failed to identify many steel defects. The CPM design manager for the project echoed this view.

Yet, upon reviewing NYC Transit's contract with Urbahn Architects, and contrary to what the vice president and the design manager told us, we discovered that the consultant was contractually required to use MOW Engineering's annual inspection data only for the design of

⁶ \$3.2 million was added to the five-station project and \$2 million was added to the seven-station project.

line structure repairs.⁷ Indeed, for the repair of the twelve stations and their supporting structures, the consultant was contractually required to conduct its own inspections and base its designs on the results.⁸ Significantly, our review of the AWOs found that \$3.8 million (73 percent) of the additional structural work was actually in the station areas and their supporting structures, precisely the areas that the consultant was responsible for inspecting.

When we spoke with senior Dewberry managers, we found that company personnel had inspected the stations and their supporting structures, but did not use all of the inspection methods necessary to fulfill its contractual requirements to reasonably ensure that it had identified all defects. Thus, while Dewberry's inspectors conducted visual observations from the platforms, mezzanines, and street levels of the twelve stations, they did not walk the tracks at any of the stations nor did they use either bucket trucks or scissor lifts to perform up-close inspections at eight of them. Further, the consultant inspectors did not use destructive testing (i.e., removal of the concrete covering structural steel) as part of their inspections. Predictably, having not performed the inspections required in the contract with Urbahn Architects, Dewberry prepared an incomplete design for repairs of two critical structural categories: the canopy column bases and the steel girders that support elevated station platforms. These deficiencies in turn led to the need for AWOs to perform repairs that should have been accounted for in the original design.

The pictures in Figure 2 and Figure 3, which were taken during our site visits and show the location of the additional repairs, help illustrate the deficiencies of Dewberry's inspection techniques. Almost all of the added canopy column base repairs, which totaled \$933,000, had to be made to the steel below the station platform level. The first picture in Figure 2 depicts the structure below the platform. We found during our site visits that these structures are only partially visible from the street or the platform. Similarly, the picture in Figure 3 shows that the steel girders that support the station platforms are also only partially visible from the street, and not visible at all from the platform. Additional platform girder repairs totaled \$210,000. Had Dewberry personnel employed inspection methods such as using bucket trucks and walking on the tracks, they would have been in position to identify the defects in these structural components, as required by the contract.

⁷ Line structure is the section of an elevated structure that supports tracks and signals, as opposed to station structure, which supports elevated stations.

⁸ Addendum No. 3 to the contract provides that, "Inspection of the line structure will be by NYCT forces. NYCT will provide a written tabulation of the results to the Consultant [Urbahn Architects] via the Design Manager. The Consultant however, will be required to inspect each station for the structural work requested in the scopes of work."



**Figure 2: Examples of Repaired Column Bases
(View from Below Station on Left; and Side View on Right)**



Figure 3: Example of steel girder used to support one of the elevated station platforms at 55th Street on the D Line, viewed from street level

Furthermore, not only did Dewberry fail to perform more advanced inspection methods, we found during our site visits that many of the components that had other defects that were missed and later added through AWOs were entirely visible even during our simple walk-through of the structures and facilities. Presumably, the consultant inspectors should have seen the defects in these components during their inspections, even without techniques beyond simple walk-throughs. As illustrated in the pictures in the following figures that we took during our site visits, this is clearly the case regarding the additional repairs for canopy wood rafters (Figure 4); steel beams that support new platform panels (Figure 5); and entry posts and landing pads at the bottom of station stairs (Figure 6). The additional repairs for these three categories totaled \$465,500.⁹

In sum, of the \$5.2 million in additional structural repairs, OIG found that at least \$1.6 million of that work included observable defects, which should have been noted by Dewberry inspectors.¹⁰

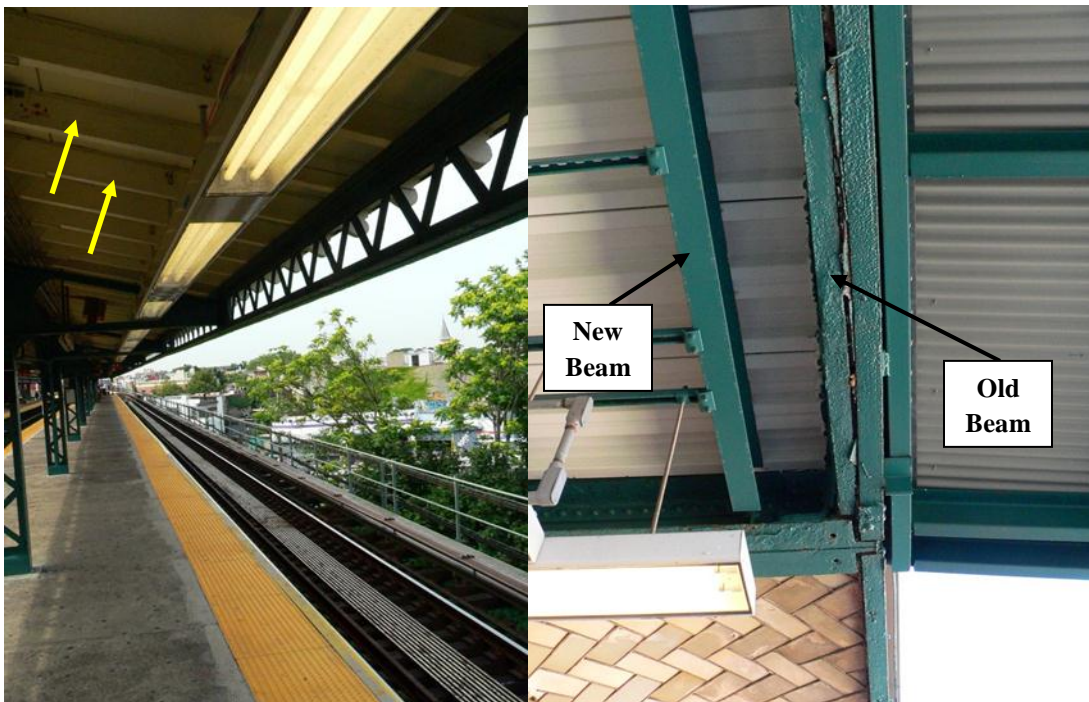


Figure 4: Canopy wood rafters are visible from the station platform.

Figure 5: New and old, corroded floor support beams are clearly visible from the station mezzanine

⁹ These repairs are broken down as follows: \$238,000 in additional repairs to canopy wood rafters; \$142,500 in additional repairs to entry posts and landing pads at the bottom of station stairs; and \$85,000 for new steel beams to support new platform panels.

¹⁰ As noted above (footnote 6), \$5.2 million in structural work was added to the contracts. Of this amount, \$3.8 million was for station or station support work. Due to the timing of our review of station and station support AWOs, our review was limited to the \$2.8 million in such AWOs that had been issued by April 2012. Thus, the figure of \$1.6 million for AWO work that should have been previously noted would probably be higher if we had been able to review the full \$3.8 million of station and station support AWOs.



Figure 6: Example of entry posts and landing pad at a station entrance.

As previously noted, Dewberry's inspections on behalf of Urbahn Architects did not meet contractual requirements. Equally important is that weaknesses in CPM's procedures for overseeing consultants allowed design deficiencies to affect the construction phase of the project. For example, the design manager assigned by CPM to manage the consultant for this project is an architect by profession, with no significant prior experience involving elevated stations and structures. While the West End Rehabilitation did include some typical architectural elements, this project also included elements that demanded specialized knowledge in structural engineering, which the architect lacked. Nevertheless, CPM design managers typically oversee the inspection part of the design on their own. CPM compounds this deficiency by not requiring design managers to include in-house engineering and architectural expertise as needed in the oversight of consultant inspections.

OIG concern regarding the design manager involved in the West End Rehabilitation, however, goes beyond his limited expertise. Specifically, when we asked him to describe how the consultants had inspected the stations, the manager answered that they had walked the tracks, consistently used bucket trucks, and also used destructive testing, if needed. The manager appeared surprised when we informed him that the consultants had actually used none of these methods. Additionally, the manager never asked for or received proof that the consultants were using the appropriate methods; indeed, he never went to the field to personally observe the inspection process and confirm that the consultants were performing it as required.

Subsequently, we met with the CPM senior vice president/chief engineer along with two of his program officers, and proposed that CPM revise its procedures in order to improve oversight of consultant inspections. These officials expressed openness to our proposals, but noted that

implementation of these proposals might require additional staffing to provide support to the design managers' oversight of inspections. At least as to additional engineers (and architects when appropriate) whether from new or existing staff, our own analysis confirms that design managers need more of this support.

Recommendation 1: To improve the oversight of inspections conducted by consultants, NYC Transit should:

- a. Require that in-house design managers work with in-house engineers and architects to ensure that consultants' inspection plans are appropriate and that contract specifications are adhered to during inspections.
- b. Create written inspection guidelines for consultant engineers and architects that include instructions on the use of track walks, bucket trucks, and destructive testing.
- c. Require that in-house engineers and architects conduct site-visits during consultants' field inspections to ensure that these consultants are employing all appropriate inspection techniques for identifying structural defects. These include, when appropriate, track-level viewing and using bucket trucks from the street to enable viewing of otherwise inaccessible defects.

NYC Transit accepted this recommendation. The agency will improve oversight of consultants by requiring the consultants to submit formal, detailed "Inspection Plans" for approval by CPM engineers. NYC Transit will also modify its contracts to clarify inspection requirements for testing. Additionally, CPM personnel will conduct periodic site visits to ensure that consultants conduct proper inspections, including adherence to the formal inspection plan. Finally, NYC Transit will include a requirement in its contracts for the consultants to submit inspection reports describing the inspections' findings and recommendations.

CPM Should Hold its Poorly Performing Design Consultant Accountable

The MTA's All-Agency Contractor Evaluation (ACE) System keeps track of contractor and consultant performance so that MTA agencies can make informed decisions about using companies for future capital work. ACE guidelines require that every six months agency managers evaluate the performance of companies with active capital contracts, and assign ratings of Satisfactory, Marginal, or Unsatisfactory.¹¹ NYC Transit managers have given Urbahn Architects, the design consultant for the West End Rehabilitation, a rating of Satisfactory for all ten ACE evaluations performed between October 2007 and October 2012. However, now that it has come to light that Urbahn Architects did not ensure that its sub-consultant Dewberry properly performed inspections, thereby allowing Dewberry to make mistakes that led to at least

¹¹ For more information on ACE, see the following two OIG reports: 2009-08, *Assessing the Effectiveness of the MTA All-Agency Contractor Evaluation (ACE) Program*, and 2009-15, *Program Design Deficiencies in the MTA All-Agency Contractor Evaluation Program*.

\$1.6 million in design errors and omissions, NYC Transit needs to appropriately reflect this poor performance in Urbahn Architect's performance review.^{12,13}

Recommendation 2: NYC Transit should give the consultant's performance an unsatisfactory rating in the ACE system as is appropriate and immediately notify all other MTA agencies of the rating.

Recommendation 3: NYC Transit should also assess Urbahn Architects for the added in-house and contracted construction costs caused by the consultant's mistakes. These "added" costs essentially amount to the difference between those necessary even if the consultant had followed proper design procedures, and those incurred because the work was belatedly added as AWOs instead of as part of the original design.

NYC Transit stated that it will review the AWOs for the West End Rehabilitation project, and if it finds that Urbahn Architects was responsible for design errors or omissions that led to the need for the AWOs, the agency will reflect this outcome in the ACE system and "will explore the feasibility of claiming damages against the consultant in light of existing contract language." The agency also stated that it will "fully review our contract specifications and edit them to insure clarity with respect to inspection and survey requirements in our future contracts."

¹² Urbahn Architect's contract with NYC Transit (Article 7, Section A), states that "the Consultant shall be responsible for the performance of the work of all architects, engineers, cost estimators, experts and other such subconsultants so engaged by it."

¹³ Under the MTA ACE system guidelines, performance ratings, such as the ones given to Urbahn Architects, generally cannot be revised retroactively. However, NYC Transit can give the company an Unsatisfactory rating: (a) in the current evaluation, when the mistakes are on-going; or (b) in the final rating for the contract, if the magnitude of the contractor's deficiency so affects the overall performance.

SECTION II: CPM CAN HELP PREVENT AWOs BY IMPROVING ITS CONTRACTING METHODS

The West End Rehabilitation included repair of street-level columns that support line structures. Under CPM's direction, and consistent with the contract provision regarding line structures (see footnote 8), Dewberry (Urbahn Architect's sub-consultant) relied exclusively on MOW Engineering's annual inspection reports to prepare the designs, as well as the associated drawings and specifications required for the repair of these line structures. As shown in Figure 7 below, column bases are enclosed in concrete. The only way Dewberry could have assessed with absolute certainty the underlying condition of the column bases is if NYC Transit had authorized removal of the concrete enclosure from the approximately 1,100 column bases included in this project to expose the underlying steel. While such an approach by NYC Transit would not have been practical at that time, it is also true that performing destructive testing on a smaller sample of columns leaves some degree of uncertainty as to the condition of the underlying steel.¹⁴ Given these limitations, NYC Transit could not determine with certainty the type or number of repairs that it would need before it bid the contracts.



Figure 7: Concrete-Covered Column Base

¹⁴ Although the contractor will remove the concrete encasements from all of the bases at the time the contractor is ready to proceed with repairs, doing so in advance creates substantial problems including potential corrosion of the now-exposed beams.

A more practical alternative for NYC Transit than post-award negotiation, one that would have minimized the potential for AWOs, would have had the agency prepare a comprehensive list of conceivable repairs of the concrete-encased steel and agree on their prices in advance before awarding the contracts. However, according to the senior program executive for CPM's Infrastructure and Facilities division, NYC Transit's policy is generally to award contracts for a single, lump-sum price so that the contract amount does not change when the actual number of repairs varies from the number estimated in the contract. The agency never seriously considered a quantity-based, pre-award price determination to be an option for this or any other contract that required structural steel repairs. Consequently, the project was saddled with almost \$1.4 million in unnecessary AWOs and 12 months of project delays that disrupted the community. What follows is our explanation of how the NYC Transit approach to contracting for the project's column base repairs resulted in these unnecessary AWOs.

NYC Transit's Contracting Approach Resulted in Costly and Time Consuming AWOs

In preparing the design drawings for the repair of these enclosed column bases, Dewberry, with CPM's guidance, established five categories of repairs (Types I-V) and estimated the quantity of work that would be needed for each type. Type I repair was basically limited to replacement of the concrete encasement. Because the concrete encasement is easily visible, Dewberry had no trouble designing repairs for this component, or estimating the quantity of repairs that would be needed.

Types II-IV repairs addressed mostly hidden steel defects in the part of a column that is directly above and below the top of the concrete encasement. CPM estimated that the contractor would need to complete 693 Type II-IV repairs. Because the steel structure is mostly hidden from view, however, CPM and the design consultant could not determine in advance which components of this part of each individual column would need repair, making any estimates of the quantity of Type II-IV repairs necessarily inexact. Moreover, while the design drawings prepared by Dewberry included a comprehensive list of the types of repairs that might be needed for this section of the column, NYC Transit did not require contractor agreement on a price for each type before the contracts were awarded. Instead, the estimated quantities for all types of expected repairs were included as part of the contract's lump sum bid price, without a built-in provision for handling variances from the estimates, despite the virtual certainty of divergence. When that divergence occurred, both NYC Transit and the contractors had to negotiate a price for the work, resulting in costly and time consuming AWOs. Indeed, the greater number of Type II, III, and IV repairs needed resulted in \$801,000 of work added to the contracts.

Type V repairs address the lowest part of a column and include the steel base plate that a column rests upon (see Figure 8 on following page). The defects involved in this type of repair are completely obscured from view until the concrete encasement is removed-which normally occurs after the contract award-again resulting in a pre-award estimate that is inherently imprecise. CPM estimated that the contractors would need to complete 118 Type V repairs. Once construction work began and concrete was removed from the column bases, it again became

apparent—predictably—that the number of repairs actually needed exceeded the estimate. The extra Type V repairs required another \$578,000 in AWOs.

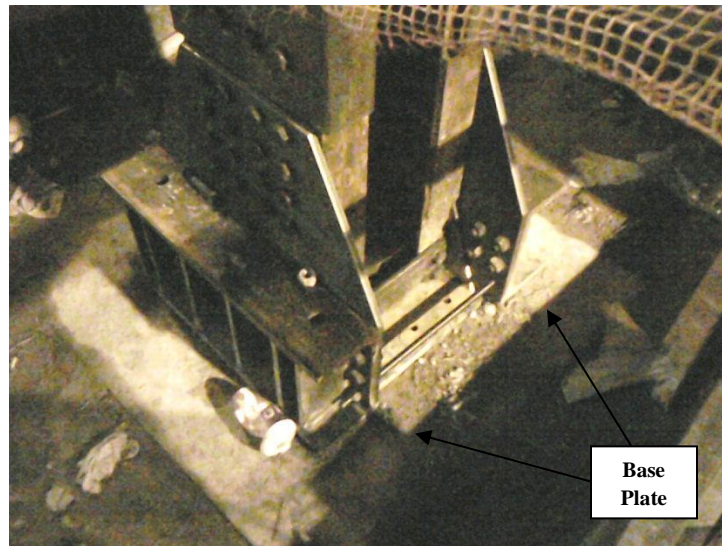


Figure 8: Lowest Part of a Fully Exposed Column Base

Compounding the considerable cost premium of these AWOs, the agency delayed the eventual repair process by not pre-establishing an itemized list of conceivable Type V repairs. Rather than a pre-established list, the contracts contemplated that the construction contractors, at the time they were ready to perform the repairs, would remove the concrete encasements from all the bases, determine which ones needed repair and the type of repair needed, and then present to the agency a list of proposed repairs at a proposed cost.

Over many months, under this approach, the contractors performing the work made multiple repair design proposals and NYC Transit rejected each one. Resolution was eventually reached on a case-by-case basis, requiring the agency and the contractors to agree on which steel parts were to be replaced in each column. The back-and-forth over repair proposals and negotiations over price delayed the Type V repairs for 12 months, and caused disruptions to communities along the West End Line. Open pits where the bases' concrete covers had been removed became magnets for garbage and, according to the community, havens for rats. These pits were also barricaded, depriving densely-populated Brooklyn neighborhoods of already-scarce parking spaces. Significantly, these were some of the very problems that the agency sought to avoid by not utilizing comprehensive destructive testing of concrete encasements before awarding the contracts.

A Unit Pricing Approach for Steel Repairs Could Minimize AWOs

As indicated above, NYC Transit could have avoided substantial inconvenience and additional costs had it developed a comprehensive list of steel repairs for items that cannot be precisely quantified before the contract is awarded and required that all bidders provide a per-unit price for each. Under this approach, NYC Transit would list items in the proposed contract, with estimated quantities for each. The contractor's proposed per-unit price, multiplied by the estimated quantity, would then become part of its lump sum bid price. If more or fewer items than originally estimated were identified during construction, that identification would be the basis for a debit or credit using the agreed-upon per-unit rate, without the time and cost of belated (and belabored) negotiation.¹⁵ While the agency currently uses a unit pricing approach on some capital construction projects, it does not do so for steel repairs.¹⁶

As applied to such repairs, this approach would save time and money and greatly simplify the process. The contractor would remove the concrete from a column base and then propose repairs by selecting from the comprehensive list already included in the design documents. The NYC Transit representative would then approve or disapprove each proposal, with agreed-upon work proceeding at the previously agreed-upon price.

Recommendation 4: NYC Transit should use unit pricing for those repairs with quantities that cannot be precisely ascertained before construction begins. To do so, NYC Transit should prepare a comprehensive list of potential repair elements that would address all conceivable defect types uncovered during construction and obtain agreement in the contract on a unit price for each.

NYC Transit accepted this recommendation. The agency agreed to use unit pricing for those repairs with quantities that cannot be precisely ascertained before construction begins. Specifically, for all future contracts that may reasonably require steel repairs, the agency stated that it will include unit price provisions in the contract for potential types of defects and the associated repairs, allowing that it would "not be able to predict every type of repair that may be needed, especially on obscured infrastructure."

¹⁵ If NYC Transit has concerns that actual quantities could be much higher than estimated and that resulting unit prices would be much higher than if the agency bid out the work as a new, separate contract, the agency could reserve the right to renegotiate the unit price if the actual quantities exceed a certain percentage of the original estimate, e.g., more than 125 percent of the contract's estimated quantity.

¹⁶ Examples of projects where NYC Transit uses a unit pricing approach include contracts for the removal of underground obstructions at new bus depots and for the removal and disposal of asbestos.

CONCLUSION

Proper oversight of design consultants is critical to cost control. To that end, the design manager, often assigned responsibility for oversight of inspections involving multiple disciplines, must be provided all of the in-house engineering and architectural expertise needed to successfully manage consultants' work. Further, appropriate written guidelines for consultant inspections must be implemented and monitored to ensure compliance. Finally, design managers or their designated in-house staff must regularly travel to the work sites, to make sure that the consultants are performing their required inspection work and that they are following guidelines and approved plans.

When projects necessarily involve uncertainty, as when legitimate considerations strongly argue against the removal of concrete encasements until construction work begins, contracts need to be written to facilitate the smooth and cost-effective handling of that uncertainty. In particular, unit pricing should become the norm for the relevant elements of such projects.

By improving its approach to managing consultant inspections and changing how it contracts for steel repairs that cannot be precisely quantified before construction begins, NYC Transit can avoid the delay and expense of unnecessary Additional Work Orders on future projects.