Asbestos Abatement

Innovation drastically reduces construction duration

By Christopher Zanoni and Karamjit Singh

ENVIRONMENTAL HAZARDS—particularly those associated with asbestos abatement—can cause considerable delays in renovation and reconstruction projects. This adverse impact is exaggerated when the project involves reconstruction of a major public transportation facility because continued delays disrupt routine commuter travel and hinder normal facility operations.

In September 2000, the New York State Metropolitan Transportation Authority (MTA) was confronted with the need to assess the consequences of these impacts as they pertained to what was, at the time, the largest capital improvement project undertaken by New York City Transit (NYCT), a division of MTA. Asbestos-containing building materials (ACBM) had been identified throughout the Stillwell Avenue train terminal in Brooklyn; the terminal is to undergo an extensive rebuild over the next few years that will affect every aspect of the facility. ACBM were intergraded not only into structural components, such as platform canopies, but also into operating systems components, such as signal cable insulation. The construction management dilemma rested in the fact that asbestos abatement and component replacement could not take place until the new systems—both structural and electrical—were installed, tested and activated. Thanks to an innovative approach to asbestos abatement, however, the duration of the $250 million reconstruction project was reduced by eight months—from 56 to 48 months—resulting in an estimated cost savings of $35 million.

Background: The Reconstruction Project

The Stillwell Avenue train terminal was built between 1915 and 1919 as part of the Brooklyn-Manhattan Transit (BMT) subway system; it is an elevated station located on property owned by MTA (Photos 1 and 2). The terminal rests along the east side of Stillwell Avenue, between Neptune Avenue on the north and Surf Avenue on the south in the Coney Island section of Brooklyn. It is primarily a viaduct structure that consists of eight tracks and four island-type platforms. A 1989 engineering study found delaminated, spalled and porous concrete deck and encasements to be beyond repair due to severe water infiltration, which led to corresponding corrosion damage within the supporting steel members.

The proposed renovation calls for complete structural replacement; from the north end to the south end of the station platforms, support deck structures for platforms and tracks will be replaced with an entirely new open deck steel construction. Other station elements, such as stairway and ramp lighting, drainage systems, and public address and customer information systems, will also be replaced. The terminal's two existing fare control areas (currently on the north and south sides of the facility) will be reconfigured; this phase will include the installation of new elevators and an improved intermodel transfer capability for nearby bus service. Existing weather canopies—one for each of the four platforms—will be replaced by a new train shed that will span the entire structure (from track 1 on the east side to track 8 on the west side). Building integrated photovoltaic roof panels will be incorporated into the shed. (See IEC Standard 904-1 to 904-9.) The project is targeted for completion by the end of 2005.

The Need for a New Approach

Problems created by renovation and reconstruction of such facilities and their systems are confounded by their continued use during the construction process. For NYCT, altering, disrupting or detracting from the facility's routine function invariably leads to many complications, ranging from unmitigated noise pollution to general public stress and anxi-

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ety. Therefore, any engineered method aimed at addressing these complications must minimize (or preferably eliminate) them, while maintaining project safety factors and milestones.

As one of the largest capital projects on record for NYCT, with preliminary budget estimates for construction management and improvements estimated at $250 million, the project has received much attention. Beyond the high dollar commitment, it is crucial to maintain, to the greatest level possible, ridership access and continuous train service. NYCT faced a difficult and potentially contentious situation when planning this renovation. It had to deal appropriately with environmental hazards while minimizing service disruption and controlling the project's duration. This is particularly important between the months of May and September, when several thousand people pass through the site each day on their way to local attractions, such as the shore amusement parks, beaches, parks and a nearby minor league baseball stadium.

Structure demolition would impact asbestos in a diverse array of components throughout the facility. Although less of a regulatory burden, structural steel surfaces required deleading of delaminated, loose and flaking paint. Recognizing the costs and delays notoriously associated with asbestos remediation, the Environmental Engineering Div. (EED) of the NYCT Capital Program conceived an innovative asbestos abatement strategy: Rather than phase in removal of ACBM periodically as warranted during the project, the group decided to abate the material while the terminal was still in full operation—and before the reconstruction contract was awarded.

LiRo-Kassner Inc., EED's environmental consultant, conducted a detailed survey of the terminal. Based on the findings and negotiations with the project construction manager and environmental regulators, an abatement plan was formulated, developed and executed in a manner that respected facility operations and addressed the environmental safety and health concerns of riders, local tenants and merchants. Through the use of on-call remediation contractors, approximately 60 percent of the required abatement work was completed preaward, with another 25 percent to be completed during the mobilization phase. Only 15 percent of the remediation would remain to be completed after the award of the renovation project; this would be due to the need to replace existing train signal and communications systems before disconnecting them for abatement.

The Remediation Plan

Inspection and assessment of the terminal building and finishing materials (conducted between August 1999 and January 2000) revealed that the near-turn-of-the-century structure possesses a large amount of ACBM, as defined by EPA and the New York State Dept. of Labor, the regulating agencies for NYCT properties. (See EPA 40 CFR Part 763, Subpart E, and EPA 40 CFR Part 6.) The single most abundant ACBM were identified in the public areas of the station, most notably the weather canopies for the four elevated train platforms. These canopies, which collectively covered 31,780 sq. ft., were constructed of non-friable transite. This caused great concern because neighboring apartment complexes and other high-rise structures placed any planned asbestos remediation in full public view—even by those not passing through the facility.

The abatement plan devised focused on completing the remediation in as many locations as possible throughout the facility within the critical path of the reconstruction, while maximizing activities during off-peak train service times and the limited train service disruptions that had been planned. After

Photos 1 and 2: The Stillwell Avenue train terminal was built between 1915 and 1919 as part of the Brooklyn-Manhattan Transit subway system; it is an elevated station located on property owned by MTA. The train serves as a primary connection to local attractions such as the shore amusement parks, beaches, parks and a nearby minor league baseball stadium.

many meetings with the construction managers, details of the plan and its phasing were defined:

1) The four elevated island platforms serving the four different train lines into and out of the station were to be abated in full, including the associated dispatcher offices, cleaning stations and power distribution rooms. Special focus would be placed on the roof canopies for each platform, which would be abated separately during train service suspensions scheduled on the adjacent tracks at the beginning and end of the abatement timetable; this would allow construction and deconstruction of a custom-designed canopy envelope assembly.

2) Swing-occupancy space and swing-storage space were to be coordinated with the individual NYCT departments to provide temporary space for workers and materials displaced during short duration asbestos removal on platform areas and inside station rooms.

3) Abatement designers worked with MTA's Real Estate Dept. to phase in the abatement activities inside unleased retail spaces and those whose leases were being terminated. These areas, including the roof over them, were to be abated completely to allow for the demolition of the retail concessions area structure located at the south side of the station complex. Sufficient time was also needed to ensure the intact removal of the mosaic tile terra-cotta facade that marked the entrance to the early 20th century BMT train line; after removal, it was transported to the NYCT Transit Museum.

4) Decontamination units for use during abatement of platforms, concession areas and station rooms were to be centrally located within construction zones. These zones were created in a manner that would maintain, but redirect, passenger transfer routes and station access points from ramps to stairs, and stairs to elevators and underpasses. In addition, signage would be supervised by the construction manager and station manager offices.

5) Location of waste storage containers and the pathway from the station to those containers were to be defined for all phases of the abatement.

Remediation of the canopies required train service disruption and redirecting of trains into and out of the station through the bottleneck-inducing interlocking at the facility's north end. To reduce the burden through the interlocking—and thus minimize service disruption—it was determined that the transite canopies should be removed pre-award. The plan also included provisions to address public awareness, public accessibly, worker and rider safety, and operations continuity.

The main element of the abatement plan design called for use of a plywood envelope to isolate the canopy portion from the rest of the structure. Although preparation of containment is a requirement for most asbestos abatement projects, it is not typically an element for abatement of non-friable material in the open environment.

The multiple functions of the isolation envelope were detailed in the project specifications: 1) Account for the necessary loading created by equipment and workers on top of the structure.

2) Provide wind-resistance against the predictably high winds at the shore.

3) Maintain water-tightness and drainage since the envelope would be open to the elements on top.

4) Serve as a vision barrier that would inhibit the line of sight to the ongoing abatement work from neighboring properties.

5) Provide fall protection measures for abatement workers and inspectors above the canopy. (See 29 CFR 1926.)

To meet these requirements, the abatement contractor retained the services of a professional engineer who designed an intricate plywood and steel-clamped envelope structure (Figures 1 and 2).

For each platform canopy abatement, the envelope along the entire platform was constructed over a weekend during which the direct current feed to

Figure 1

Canopy Envelope

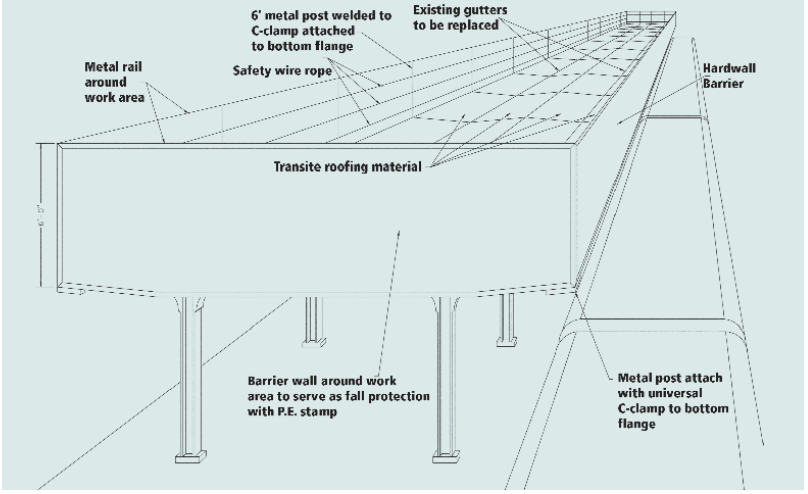

Figure 2

Platform Cross Section

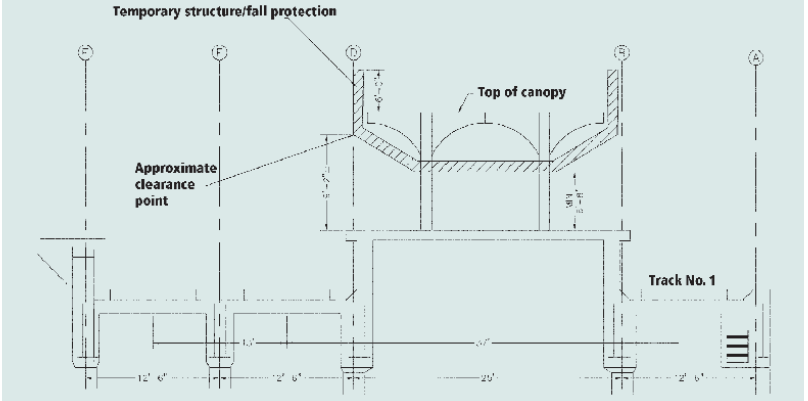

Photo 3: With the envelope in place above the canopy, the platform was able to remain open with normal rider activity while asbestos abatement work occurred directly overhead.

the third rail was discontinued and train service to the tracks nearest the platform consequently removed from service. This required significant advanced planning in order to determine which weekend would cause the least amount of service disruption. To further maximize the time available to construct the envelope, all necessary equipment and materials—including scaffolding and third rail protection gear—were mobilized and demobilized from the site using a work train that was loaded in advance at the Brooklyn 38th St. train yard.

This train, consisting of a diesel engine car and several flatbed cars, used the deactivated track. With the platform temporarily clear of passengers, the envelope was constructed with a minimal grade for water collection, measured precisely on the track side to ensure compliance with train clearance parameters once inside the station limits, secured to the steel lattice of the canopy structure, lined inside with reinforced plastic sheeting, and foamed sealed in time to restore train service and reopen the platform by the Monday morning rush. With the envelope in place above the canopy, the platform was able to remain open with normal rider activity while asbestos abatement work occurred directly overhead (Photo 3).

During the abatement, a temporary construction area was designated. It contained a waste holding area where all project-generated waste was stored until off-peak hours, when it was transferred to a waste container outside the station. Routine safety inspections of the envelope structure and the activities above the canopy (which is approximately 15 ft. above track level) were performed by the environmental consultant and representatives from NYCT's EED and Office of System Safety.

Obtaining approval to perform the work required an intense, collaborative effort. Before the start of the remediation, the Engineering Services Unit and the Enforcement Unit of the New York State Dept. of Labor (NYSDOL) visited the worksite and received a briefing on the proposed procedures. In the state of New York, potential hazards to public safety and health that may result from the removal, disturbance or handling of any material that causes a release of asbestos fiber are regulated by NYSDOL. (See Labor Law Section 906, Part 56 of Title 12 of the State of New York Official Compilation of Codes, Rules and Regulations.) This law conforms to federal requirements as established by the 1986 Asbestos Hazard Emergency Response Act (AHERA); it requires appropriate training and certifications of persons employed in all aspects of an asbestos project; mandates licensing of asbestos contractors; sets forth standards and procedures that must be followed when removing or handling ACBM; and requires that state officials be notified before large asbestos projects commence. Relevant EPA and OSHA regulations were also followed. (Incidentally, all states must have some level of government regulatory oversight with regards to ACBM in order to comply with AHERA, although AHERA is particular to schools.)

Many iterations of design drawings, photographic documentation and schematics detailing the location of decontamination units, work area access points, waste-out routes, stair closings, vision barriers and other issues were submitted to NYSDOL to obtain approval to utilize relief abatement measures from those otherwise required by Industrial Code Rule 56.

To educate occupants of neighboring facilities, awareness seminars were prepared with graphics illustrating the remediation plans and the planned physical alterations. To promote cooperation with transit workers, representatives from local unions attended weekly progress meetings at the jobsite and arrangements were made to provide swing space for specialized technicians who were temporarily displaced from an area made inaccessible by the abatement.

Once the abatement plan was implemented, routine troubleshooting was necessary to respond to project developments. With the help of local NYCT station management, issues such as the relocation of equipment staging areas, rescheduling of the installment of replacement materials, and the announcement of service and access changes were rapidly addressed.

A Lesson for the Future

Construction management cannot underestimate the extent of and time involved in performing environmental remediation measures incumbent on property owners and facility managers. Their potential impact on budgets and critical path tasks in a rehabilitation project are immense. Often, the measures required for regulatory compliance present unique challenges that may require those involved to reinvent and re-engineer solutions. This is especially true in public domains, where environmental health and safety issues have an exponentially greater potential impact and projects face greater scrutiny.

For a public project such as this transit reconstruction, professional staffing infrastructure, stable for the project's duration and in place to manage technical design side-by-side with maintaining a flow of information and communications between regulatory agency inspectors, labor groups and community representatives is indispensable. ■

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