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**INDEPENDENT STATE AUDITOR'S  
REPORT ON CERTAIN ACTIVITIES OF THE  
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY  
JULY 1, 1996 TO DECEMBER 31, 1999**

**OFFICIAL AUDIT  
REPORT  
AUGUST 8, 2000**

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## INTRODUCTION

Background

Our examination of the Massachusetts Bay Transportation Authority (MBTA) included a review of the MBTA's activities regarding its capital construction costs for the South Station Transportation Center - Bus Terminal and proposed moving walkway; the Newburyport Commuter Rail Extension Project; and the disposition of surplus locomotives leased by the Cape Cod and Hyannis Railroad (CCHR). We also conducted a follow-up review of the conditions noted in our prior audit reports No. 97-0583-3 and No. 97-5583-3.

a. South Station Transportation Center: In 1991 the Massachusetts Bay Transportation Authority (MBTA) initiated design work for the South Station Transportation Center (SSTC) Bus Terminal. Included in this project was an enclosed West Link moving walkway that would connect the bus terminal/parking facility with the West Entrance Plaza. This moving walkway was to provide an enclosed passenger connection between the MBTA's different modes of transportation (i.e., commuter rail, bus, and rapid transit) at the SSTC facility. In addition, according to the MBTA's Environmental Impact Report (EIR), this moving walkway was to serve as a pedestrian mitigation path through Section C11A1 of the Massachusetts Highway Department's (MHD) Central Artery/Tunnel Project (CA/T).

b. Newburyport Commuter Rail Restoration: This project involves the restoration of commuter rail service to Newburyport and the replacement of the old rail and ties on the Eastern Line from the Ipswich commuter rail station to the City of Newburyport. This section of rail line was actively used for commuter rail service until 1976, when the service was discontinued due to low utilization and rising costs. In 1987 an MBTA feasibility study concluded that the restoration of commuter rail service was financially and operationally feasible. The restoration would include the replacement of railroad ties, drainage improvements to the railbed, bridge repair, and improvements to grade crossings. In addition, stations were planned for Rowley and Newburyport.

c. Disposition of Surplus Locomotives Leased to the Cape Cod and Hyannis Railroad: Periodically the MBTA will declare certain railroad equipment surplus and will offer these assets for sale on a sealed

bid basis. Included in a most recent sealed-bid sale were three locomotives that were formerly leased to the Cape Cod and Hyannis Railroad (CCHR). Although CCHR had an option to purchase these locomotives in December 1997 for \$95,000, it chose not to exercise this right. Accordingly, in June 1999 the MBTA advertised and sold nine surplus locomotives, including the three locomotives formerly leased by CCHR, for \$185,008.

#### Audit Scope, Objectives, and Methodology

Our audit, which covered the period July 1, 1996 to December 31, 1999, was conducted in accordance with applicable generally accepted government auditing standards for performance audits.

The objectives of this audit were to:

- Determine the reasonableness of construction costs for the SSTC, including the status of the proposed people mover and associated contract costs to date.
- Determine the reasonableness of construction costs for the Newburyport commuter rail restoration project.
- Review the final disposition of surplus locomotives leased to CCHR.
- Conduct a follow-up review of the conditions noted in our prior audit reports regarding the recoupment of extra construction costs incurred by the MBTA due to designer engineer errors (No. 97-5583-3) and the status of the collection of outstanding fines and penalties due the MBTA for untimely repairs of its elevators and escalators by its maintenance contractor (No. 97-0583-3).

Our methodology included reviewing (1) the MBTA's enabling legislation and applicable laws and regulations; (2) capital budgets and accounting records; (3) contract bidding and award procedures; (4) contract specifications; (5) approved work change orders and cost overruns; and (6) MBTA correspondence, staff summaries, and board review and approvals. We also interviewed MBTA officials and personnel.

## AUDIT RESULTS

1. The MBTA Incurred Cost Overruns of Approximately \$14.7 Million at the South Station Transportation Center Due to Inadequate Planning and Designer Errors and Omissions

The Massachusetts Bay Transportation Authority (MBTA) incurred approximately \$14.7 million in additional construction costs associated with the completion of the South Station Transportation Center - Bus Terminal Complex. These cost overruns were the result of additional work necessary to complete the project that was not in the original contracts' specifications and scope of work, as well as legal claims settlements for delays and extra work required of the contractor. Because the MBTA did not properly oversee the activities of its design engineers and properly plan and coordinate the work schedule of the contractor, this extra work was obtained without the benefit of competitive bids. Instead, the work was obtained through negotiations with the respective project contractors.

This work was originally awarded by the MBTA via two construction contracts: S6CN15- Bus Terminal/Parking Facility for \$81,428,000 awarded on August 27, 1992, and S6CN18 - Bus Terminal Build-Out for \$8,988,000 awarded on August 18, 1995. These contracts were subsequently amended by approximately 200 negotiated change orders to include additional work not contained in the contracts' original work specifications. MBTA project files that we reviewed showed that these contractual inadequacies were due to inadequate planning between MBTA departments prior to the solicitation of contract bids, and insufficient oversight of the activities of the design engineer in preparing the contract specifications and scope of work. Some examples of these additional work change orders and legal claims settlements follow:

<u>Contract No.</u>	<u>Change No.</u>	<u>Description of Work and Reason for Additional Costs</u>	<u>Additional Cost</u>
S6CN15	4-6	Correct misalignment of structural steel box stub supports. (Designer error)	\$500,000
S6CN15	2-11	Install additional and larger structural steel members. (Designer error)	\$206,861
S6CN15	40-49	Install additional alarm status points to track ventilation system. (Inadequate interdepartmental planning)	\$115,514

<u>Contract No.</u>	<u>Change No.</u>	<u>Description of Work and Reason for Additional Costs</u>	<u>Additional Cost</u>
S6CN15	Claim #4	Modify fire alarm system per order of Boston Fire Department. (Designer error)	\$171,938
S6CN18	29-27	Install three additional dispatch booths for bus terminal. (Inadequate interdepartmental planning)	\$241,362
S6CN18	32-29	Install additional lighting at emergency exits to meet Department of Public Safety codes. (Designer error)	\$30,552

In addition, we noted that the MBTA's Construction Department determined that approximately \$4 million of these added construction costs were caused by errors and omissions in the plans and specifications prepared by the MBTA's design engineers. However, as of the date of this report, the MBTA has not attempted to recoup any of these extra costs from these designers.

Sound business practices advocate that, in order to procure necessary construction work in the most efficient and economical manner, the MBTA must ensure that all work items necessary to successfully complete proposed projects are contained in the original contract specifications distributed to contractors for the solicitation of competitive bids. Additional work that must be performed due to designer errors and omissions in the original contracts' specifications results in increased costs through extra work orders. Moreover, when extra work is not properly planned for and included in the original contract's scope, contractors are allowed to submit their cost proposals for the extra work based on a negotiated "lump-sum" price, and therefore extra work is not obtained through a competitive bid process.

Recommendation: In order to improve the efficiency and cost effectiveness of its construction activities, the MBTA should ensure that:

- All affected and concerned MBTA departments are included in the project planning phase to ensure that the proposed scope of work meets the needs of these departments as well as the overall needs of the MBTA prior to the solicitation of competitive bids, thereby reducing the need for subsequent costly and possibly unnecessary change orders.
- The MBTA's construction management department is adequately overseeing the activities of the design engineer for adequate preconstruction design, field testing, analysis, and resultant quantity

estimate calculations, thereby reducing the possibility of unnecessary extra work orders and quantity overruns.

- Every effort is made to recoup from its design engineers for these two contracts the \$4 million in added construction costs that were incurred by the MBTA due to errors and omissions in the contracts plans and specifications.

Auditee's Response: In its response, the MBTA stated, in part:

The South Station Transportation Center (SSTC) project is an extremely complex project. The SSTC Project held numerous regular coordination and planning meetings with the CA/T project, BRA, Transitway (TW) project, EOTC, Private Bus Carriers, all the required regulatory agencies and internal MBTA departments from the onset of the project through occupancy of the facility.

The MBTA evaluated all change orders to determine the most cost effective process to complete the work and have the least impact on the taxpayers dollar.

The SSTC Bus Terminal project was on the critical path of the CA/T project and needed to be operational before CA/T or TW design was even complete.

Each change order that was processed was reviewed and evaluated by the designer and the MBTA to determine if the work was required for the completion of the project and if the cost was fair and reasonable. All change orders met these criteria.

The MBTA did perform an error and omission (E&O) analysis of all the change orders for the SSTC project. A settlement agreement has been proposed by the Authority, and it is currently under review by the consultant.

The MBTA has implemented a Capital Management Group (CMG), which is responsible for approving and monitoring all capital project budget and schedules. This group issues a monthly report on the projects. Once a project budget is set, if additional funding for the project is required, then a submission is made to the CMG for approval. This program now requires that, not only the Design & Construction department, but also all other departments requesting changes to a project be required to secure the additional funding, above the project budget, from the CMG prior to the project change being issued.

Auditor's Reply: Project files that we reviewed clearly indicate that these cited cost overruns were the direct result of either designer error or a failure to properly plan between MBTA departments (construction and operations), between MBTA's construction department and SSTC's management company; and between the MBTA and the MHD. Moreover, all extra costs were the direct result of sole source negotiations and not open competitive bids, thereby resulting in higher costs to the Authority. We again recommended that the MBTA aggressively seek restitution from the design consultants for this project.



Although the MBTA has established a capital management group to oversee all capital budgets and schedules, its emphasis is on securing approvals and funding for change orders as submitted. More emphasis should instead be placed up-front in the design review phase to reduce or eliminate errors and omissions before they become costly change orders once construction begins.

2. The MBTA's Inability to Properly Plan and Coordinate the Design and Construction of a Proposed Moving Walkway at the South Station Transportation Center Resulted in Additional Costs Totaling over \$6.2 Million

The MBTA originally included a moving walkway as part of the South Station Transportation Center - Bus Terminal Complex, Contract No. S6CN15, designed in 1991 and awarded in 1992. However, the scope of this work ultimately conflicted with two other contracts that were also in the design stage at this time: the MBTA's South Boston Piers Transitway Project and the Massachusetts Highway Department's (MHD) Central Artery/Tunnel (CA/T) section. The inability to properly plan and coordinate the design and construction work for these MBTA projects with MHD officials caused the deletion of the moving walkway from MBTA Contract S6CN15. Since MBTA Contract S6CN15 did not separately identify the cost for the moving walking, the MBTA had to negotiate a settlement with the contractor for a credit to the contract for not building the walkway. Subsequently, the MBTA negotiated a settlement with the contractor for a credit of \$1,435,954 for not building the walkway. We compared the negotiated credit to subsequent bids to build the moving walkway under a proposed change order. The total additional cost to the MBTA to complete this walkway would have exceeded \$6.2 million if the moving walkway was constructed as part of a change order, therefore the credit appears inadequate and unreasonable. Moreover, as a result of these conditions, commuters using the South Station Transportation Center have been unnecessarily inconvenienced due to the MBTA's inability to properly plan and supervise this work. In addition, approximately \$1 million of material purchased for the original contract remains in storage in MBTA custody and may never be used.

MBTA officials indicated that the foundation supports for the contracted walkway interfered with the MBTA's design specifications for the proposed turnaround loop for the electrified buses to be deployed for its new Silver Line. In addition, the design specifications for the foundation for the proposed CA/T

section were also in conflict with the contracted walkway. As a result, the MBTA formed a task force consisting of the MBTA, MHD, the designers for the piers transitway, the CA/T, and moving walkway projects to determine the best solution to coordinate these projects. Ultimately, the taskforce recommended that the moving walkway be deleted from the bus terminal contract, with the subsurface work for all three projects to be done via the CA/T's C11A1 Contract. Building all three projects as designed would have necessitated underpinning the moving walkway in order to build the transitway underneath it, creating a very difficult and tight construction space and making the cost to build this portion of the transitway very expensive. At the conclusion of our audit, MBTA senior management indicated that the proposed change order to build the moving walkway was never awarded and that the original walkway will never be built. Instead, the MBTA envisions that a series of elevators and escalators may be built to assist the riding public.

Recommendation: The MBTA should ensure that proper construction oversight and controls are in place for all current and future construction projects requiring the coordination of design activities between the MBTA and outside agencies, as well as between the MBTA's own departments, for conflicting MBTA projects. Oversight of in-progress or proposed design work should alert the MBTA to all possible conflicts in the proposed work, thereby eliminating needless costly design changes or contract change orders. MBTA management must properly monitor the activities of each project's designs to ensure that taxpayer funds are expended prudently and represent value received for work actually performed.

Auditee's Response:

The MBTA SSTC project did hold numerous meetings with the CA/T and TW projects on a regular basis to determine the most cost-effective manner for all three projects to be constructed.

The MBTA and CA/T created a task force to evaluate the interface issues. The task force returned with a recommendation to defer the moving walkway, build the CA/T and TW projects and then build the moving walkway. This was the most cost-effective process to construct all three projects.

The credit for the deletion of the moving walkway is only for the installation labor associated with lump sum items. There were unit price items that were not included in the lump sum

credit because they are paid on a unit basis and the units were not used. The materials have been received by the MBTA and stored in trailers for future use by the MBTA on the project.

The MBTA secured two bids, one from each of the existing contractors working at the SSTC facility to ensure that there was competition when pricing of the extra work. The proposed change order for the work had significantly more restrictions on the work hours and included a premium in it for these work restrictions. The MBTA determined this method would minimize any additional cost. In addition, a general escalation cost is included in the change order since the work was being performed years later.

It should be noted that the MBTA never processed a change order to construct the moving walkway. Currently, it is anticipated that the moving walkway will be incorporated into the office building construction project that will be managed by the Boston Redevelopment Authority.

Auditor's Reply: We reiterate that the MBTA must improve its coordination of design and development activities, between itself and outside agencies, to ensure that costly design changes and construction change orders are eliminated.

The final negotiated credit of \$1.4 million received by the MBTA was inadequate considering that the same contractor bid over \$7 million to construct the moving walkway as a separate item once it was deleted from his original contract, and that the lowest bid received by the Authority to complete this work was approximately \$6.6 million. As a result the MBTA may have allowed the original contractor to realize an unearned profit of over \$5.2 million for work not performed.

The contract for the SSTC does not specifically identify all the costs associated with constructing the moving walkway. Instead, its costs were included in at least 12 different contract items that covered numerous elements of the scope of work, of which the moving walkway was one. Therefore, it is impossible to determine the actual costs to construct the walkway when reviewing the contract's work items and bid amounts. Moreover, any assertion by the Authority that the negotiated credit represented only labor costs associated with lump sum items is impossible for the Authority to verify. Since no breakdown is available for these lump-sum items by their components of labor and materials, the Authority cannot accurately determine the true labor costs that the contractor would have incurred to complete the moving walkway as originally bid.

Moreover, we determined that no cost savings were realized by the MBTA on unit price items that were not used as a result of the deletion of the moving walkway. Instead, we determined that 100% of all unit price items were used and paid to the contractor as bid and an additional \$2.9 million was also paid to the contractor for unit price items that exceeded the estimated quantities contained in the contract specifications.

Finally, we question to what extent the MBTA's eventual decision to delete this moving walkway was influenced by the obstruction it would have created to the design and location of the proposed office building construction project.

3. Status of Prior Audit Results – \$10.8 Million in Construction Costs Incurred without Competitive Bids

Our prior audit report No. 97-0583-3 indicated that the MBTA incurred approximately \$10.8 million in additional construction costs associated with the completion of the Old Colony Line's Plymouth and Middleboro branches for work that was not contained in the original contracts' specifications and scope of work. In response to that audit, the MBTA stated that, in two of the instances that we cited, designer error was the primary factor for the change orders and that it would seek restitution totaling \$1,092,194 from the designer. However, our follow-up review indicated that the MBTA had yet to collect any of these disputed funds from the designer.

MBTA officials stated that the MBTA has entered into negotiations with the designer to obtain future design engineering services and construction phase services valued at approximately \$1 million, at no cost to the MBTA. In exchange for these free design services, the MBTA will agree to release the engineer from all claims for damages incurred as a result of these aforementioned designer omissions. In addition, the MBTA provided us with a draft of a proposed settlement agreement dated February 17, 1999 that outlines these settlement terms for free design services. However, as of February 8, 2000, the design engineer has refused to accept the terms of this proposal, and the agreement remains unsigned.

Recommendation: We again recommend that the MBTA take all means necessary to secure restitution from the designer. If the MBTA is unable to immediately reach an amicable agreement, it should seek restitution from the designer's professional liability insurance carrier.

Auditee's Response: In its response, the MBTA stated in part:

The Authority continues to vigorously pursue recovery of damages from the consultant for the Old Colony project design errors. The draft settlement agreement referenced in the audit report has since been reviewed independently by outside counsel, with meetings held both in-house and with the design consultant. As a result, a revised draft settlement has been proposed which is currently under review by the consultant. The revised settlement requires a cash reimbursement as well as in-kind services.

A response from the design consultant regarding acceptance of this settlement is expected shortly. If this revised settlement is not accepted, the Authority will make a determination to go to litigation.

4. Status of Prior Audit Results – Management of Elevator and Escalator Maintenance Contracts

Our prior audit report No. 97-0583-3 revealed that the MBTA did not assess and collect fines and penalties for untimely repairs that were provided for in its elevator and escalator maintenance contracts. It was further noted that the grace periods and penalties provided for in the contracts were inconsistent. The MBTA responded that, in recognition of these inconsistencies, it was rewriting the elevator and escalator specifications for the new maintenance contract effective August 1, 1999.

During our follow-up review, we determined that the MBTA had incorporated our prior recommendations to improve the turnaround time and penalties for untimely repairs in the new contract specifications, which were effective December 13, 1999. Specifically, the MBTA awarded a five-year contract to Montgomery - Kone Inc., commencing on December 13, 1999 and ending on December 12, 2004, at a total cost not to exceed \$12,141,960, adjusted for inflation. This contract provides for the assignment of eight work teams to make necessary repairs, inspections, and maintenance on the MBTA's elevators and escalators seven days a week (6:00 am to midnight, Monday through Friday; 9:30 am to 6:00 pm, Saturdays; and 9:30 am to 6:00 pm, Sundays).

In addition, the MBTA standardized and increased the penalties to be assessed to the contractor for failing to repair all elevators and escalators in a timely manner. Specifically, the contractor will now be

liable for a penalty of \$500 per day for any elevator that is out of service for more than one calendar day, and the penalty shall be applied to each and every subsequent day that the unit is inoperable. Similarly, the contractor shall also be assessed a penalty of \$500 per day for each day that an escalator unit is out of service for more than three consecutive days, including weekends and holidays.

Finally, although our prior report urged the MBTA to insist on next-day repair service for all its elevators and escalators with penalties to be imposed after one day out of service, the turnaround time for the escalators has been reduced from the prior contract's limit of 14 days, including weekends, to the more reasonable limit of three days under the terms of the new contract.

Recommendation: The MBTA should:

- Closely monitor the activities of the contractor to ensure that all units are promptly repaired and returned to service in accordance with the terms of the contract.
- Review all repair turnaround reports to determine all mandatory per diem penalties that should be charged to the contractor during the life of the contract.
- Properly assess and collect all penalty funds that are owed to the Authority under the terms of the Contract.

Auditee's Response: In its response, the MBTA stated, in part:

The Authority is pleased that the . . . review had determined that previous recommendations were incorporated into the new contract for elevator and escalator maintenance. The Authority also concurs with the recommendations regarding contract monitoring and penalty assessment.