Office of the Inspector General

Commonwealth of Massachusetts

Gregory W. Sullivan
Inspector General

A Big Dig Cost Recovery Referral: Paving Mismanagement by Bechtel/Parsons Brinckerhoff

January 2005

The Commonwealth of Massachusetts
Office of the Inspector General

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January 2005

Dear Chairman Amorello:

I am forwarding for your review the most recent findings from my Office's continuing review of potential Big Dig cost recovery cases. These findings refer to poor contract redesign and construction management on the part of the joint venture of Bechtel/Parsons Brinckerhoff (B/PB).

Specifically, my Office found that B/PB failed to properly manage the paving of the East Boston roadway. A number of issues point to B/PB mismanagement that include:

- B/PB approved and designed seven years of a quick fixes instead of a permanent roadway replacement;
- B/PB's design failed to account for manhole frames and covers in the roadway; and
- B/PB paid a section design consultant for work that knowingly would never be used.

As a result of B/PB's mismanagement, taxpayers have paid approximately $7 million for seven years of quick fixes and the eventual permanent pavement replacement. This is particularly troubling because paving occurs regularly in construction projects not only in the Commonwealth but also across the country. Yet, it took B/PB over seven years to permanently repair the East Boston roadway.

I recommend that this matter be referred to the Turnpike Authority's cost recovery team. My staff is available to assist you in any continuing examination of this or any other issue. Thank you.

Sincerely,

Gregory W. Sullivan

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Inspector General

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Introduction

This report is a referral to the Massachusetts Turnpike Authority (Turnpike Authority) from the Office of the Inspector General (Office) concerning a potential cost recovery case against the manager of the Central Artery/Tunnel Project (CA/T Project), Bechtel/Parsons Brinckerhoff (B/PB). Cost recovery is the process by which owners may file claims against design and construction management professionals for costs associated with possible errors, omissions, or other deficient practices. This report deals specifically with the B/PB approved pavement repair and replacement of the East Boston roadway.

Barletta Engineering Corporation (Barletta) was awarded the C07C1 (East Boston Toll Plaza) contract with a low bid of $7.3 million and received a notice to proceed with the work in November 1999.[1] The contract scope at this time did not include any paving work. However, in late 2003, $4.5 million was added to increase the scope of Barletta's contract to include the permanent replacement of the failed roadway pavement on the East Boston side of the Ted Williams Tunnel (Tunnel). This stretch of roadway is four tenths of a mile long. Without benefit of competition, B/PB increased the value of Barletta's contract by more than sixty percent of the value of their original contract. Moreover, even though the pavement showed signs of failure one month after installation, for seven years thereafter, B/PB approached the failing pavement problem with a series of patchwork repairs. Instead of a comprehensive approach to addressing the problem of the failed pavement, B/PB continued designing patches, which were applied by three different contractors.

[1] As of June 2004, the value of the East Boston Toll Plaza contract increased to approximately $18.6 million due to additional change orders. The Office's December 2003 report, *A Big Dig Cost Recovery Referral: Contract Mismanagement by Bechtel/Parsons Brinckerhoff May Have Increased Big Dig Costs* details cost increases on a number of CA/T Project contracts including the East Boston Toll Plaza contract.

This Office has found B/PB's management of the East Boston Toll Plaza contract particularly problematical. The East Boston Toll Plaza contract receives no federal funding. Instead, it is supported entirely with state taxpayer dollars. In this Office's November 2004 cost recovery referral to the Turnpike Authority regarding trench drains, this Office found that trench drains on this same contract cost the taxpayers $3 to $5 million. Rather than manage this contract in a cost effective manner, B/PB appears to have simply charged the taxpayers significant sums to support its poor management and redesign decisions.

This Office has issued ten reports [See Appendix A] specifically related to CA/T Project cost recovery and has referred a number of potential cost recovery issues to the Turnpike Authority. This report is another in a series of these referrals. The Office brings this matter to the attention of the Turnpike Authority and recommends a further cost recovery investigation. It is this Office's opinion that B/PB's poor contract management, poor redesign, and poor project oversight caused state taxpayer dollars to be spent unnecessarily and a permanent paving fix to be delayed by seven years.

Background

B/PB has been the project manager for the CA/T Project since 1985. Part of B/PB's responsibilities included the management and oversight of the East Boston Toll Plaza contract. The East Boston Toll Plaza contract was issued to Barletta in November 1999 to construct the tollbooths for the Tunnel. In late 2003, the Turnpike Authority authorized B/PB to change the scope of the contract, adding $4.5 million for the permanent replacement of pavement on a troubled East Boston roadway. The permanent roadway replacement included milling work, removal of the failed pavement, and the placement of new pavement.

The joint venture of Modern Continental Construction/Obayashi Corporation and Perini Construction completed the original roadway before the early opening of the Tunnel in December 1995. Within one month after the roadway opened, the pavement failed. Pavement failure meant that the pavement would not adhere properly to the concrete foundation of the roadway. In effect, the pavement became detached from the road underneath. This led to roadway cracking, potholes, and other structural problems. Eventually, the taxpayers paid approximately $7 million dollars to repair and eventually replace the East Boston roadway. In effect, taxpayers paid twice for the pavement of the roadway. Taxpayers paid over $3,000 per foot for the roadway to be repaired and permanently replaced.

From 1996 to 2002, B/PB planned and authorized a series of temporary fixes to the roadway using three separate contractors and costing approximately $2.5 million.[2] Instead of a permanent roadway replacement, the temporary repairs authorized by B/PB and paid for by taxpayers, resulted in a patchwork roadway.

[2] This Office identified pavement repair work in C07C1, C07D1 (I-90 Logan Airport Egress Ramp), and C07D2 (I-90 Logan Airport Interchange) contract modifications as of June 2004. Based on this Office's reviews of CA/T Project documents, it is difficult to determine the cost of the repair work in East Boston. The total cost of the East Boston pavement repair work is still under investigation.

Finally, B/PB designed a permanent fix for the roadway. However, B/PB's design for the permanent roadway replacement did not account for manhole frames and covers in the East Boston roadway. Manhole frames and covers protect utility access points in a roadway. B/PB allowed the contractor to pave over the manholes without an appropriate provision for uncovering them. That is, B/PB failed to ensure that a survey showing the location of the manholes was done before the roadway was paved over. After the pavement was laid, the majority of manholes could not be and have not been found. As a result, the Commonwealth may unnecessarily lose the use of certain utility access points.

Only approximately twenty-eight frames and covers have been re-identified in the East Boston roadway. An additional fifty-seven known frames and covers remain paved over. At taxpayer expense, B/PB has hired another contractor to attempt to find these remaining manhole frames and covers.

Furthermore, the Massachusetts Port Authority (MassPort) is scheduled to take ownership of this roadway including the responsibility for maintenance and operations. Therefore, MassPort must approve and accept the new roadway, which, to the knowledge of this Office, MassPort has not done.

Findings

Finding 1 – The Turnpike Authority allowed the roadway to be paved contrary to manufacturers specifications.

In a rush to open the Tunnel in December 1995, the Turnpike Authority authorized many extra costs for the early opening of the Tunnel. These costs are documented in a letter issued by this Office in December 1997 [See Appendix B].[3]

The work associated with the early opening of the Tunnel included paving of the roadway on the East Boston side of the Tunnel. According to B/PB staff and former Turnpike Authority staff, B/PB was orally instructed by state officials to pave the East Boston roadway for the early opening of the Tunnel. This Office could not find any evidence that the paving instructions were in writing. These instructions may have caused the contractor to ignore the contract specifications, which detailed how the job was to be done.

A CA/T Project deficiency report, written by a B/PB field engineer, states that the original contract specifications required that:

> No Latex [pavement] shall be placed at temperatures lower than 45°F. At temperatures below 55°F the engineer will require a longer curing period and compliance with applicable sections of the standard specifications for curing bridge deck concrete in cold weather. Surface shall be promptly covered with a single layer of clean, wet burlap as soon as the surface will support it without deformation.

According to manufacturers specifications, the pavement could be placed between temperatures of 35°F and 50°F but only by means of temporary enclosures and external heat. However, the project deficiency report further stated:

[3] In total, these extra costs exceeded $23 million. However, this $23 million does not include the $2.5 million in costs of the temporary pavement repairs.

> LMC [pavement] was placed at a surface temperature of 34°F. No heat was provided … Inadequate protection after placement [of the pavement] has resulted in numerous imprints into the LMC. Improper wetting of burlap resulted in washout of LMC …

The recommended action for the failed pavement is to "repair all substandard LMC [pavement] placements." This Office did not review any documents that suggest that B/PB warned Turnpike officials that installation of pavement contrary to manufacturers specifications could void applicable warranties and could cause the roadway to fail.

As a result of the improper application of the pavement, the East Boston roadway pavement failed almost immediately. According to Turnpike Authority staff, the then Turnpike Authority employees considered not conforming to the manufacturers specifications an acceptable risk for the Commonwealth.

Finding 2 - B/PB's poor management led to seven years and $2.5 million of quick fixes that failed to permanently repair the roadway.

For seven years after the pavement on the East Boston roadway failed, B/PB addressed the problem by designing short term patching solutions. B/PB used three separate construction firms to make the repairs. This inadequate approach subjected drivers to a patchwork roadway and resulted in taxpayers paying approximately $2.5 million for the cost of this temporary repair work.

Additionally, the Turnpike Authority paid B/PB for design solutions, construction management, and repair work oversight. As the section design consultant (SDC) for the pavement repair work, taxpayers compensated B/PB to design and oversee the

patchwork repairs on the failed roadway. B/PB's compensation for this design, management, and repair work oversight is unknown.[4]

Due to the pavement failure, vehicular impact took its toll on construction joints, trench drains, and manhole frames and covers. This is not the quality of work taxpayers paid B/PB for.

Finding 3 - B/PB's substandard design of the roadway replacement did not account for the location of the manhole frames and covers in East Boston.

After seven years of patchwork repairs, B/PB finally issued a modification for the permanent repaving and replacement of the roadway, which was paid for only with state taxpayer dollars. B/PB designed the roadway replacement without accounting for manhole frames and covers. In addition, B/PB approved and issued specifications that did not require the contractor to remove the manhole covers or require the contractor to conduct a survey to show the location of the existing frames and covers.

Removal of manhole covers

In order to place a new roadway, milling of the existing roadway is performed. Milling is the process in which a large machine scrapes and removes the road surface in preparation for repaving. Massachusetts Highway Department (MassHighway) *Standard Specifications for Highways and Bridges* (1988) state that in order to properly mill a roadway, manhole covers must be removed.

[4] B/PB might argue that the repaving of the roadway could have been required after seven years due to normal wear and tear. However, even with limited traffic, the pavement began to fail almost immediately.

The MassHighway *Specifications* state that:

> …the Contractor shall locate and protect existing drainage and utility structures … If the upper sections of utilities are removed to facilitate scarifying [milling] and pulverizing the existing pavement, the remaining part of the structure shall be immediately covered with a steel plate …

If manhole covers are not removed, damage will occur to the milling machine. Nevertheless, B/PB instructed the construction contractor to mill directly over the manholes without removing the covers [See Appendix C]. CA/T Project documents do not indicate whether damage was done to the milling machine. Four months later, a modification was issued that amended contract designs to reflect the proper removal of manhole covers. This modification had an estimated cost of $214,000.

Survey of existing manhole frames and covers

B/PB failed to ensure that a survey to locate the existing manhole frames and covers was completed prior to the placement of the pavement on the East Boston roadway. As a result, there was no complete and accurate count of the existing frames and covers, including the location of the manholes. Instead, after the pavement was placed, B/PB hired a separate contractor to attempt to identify the manhole frames and covers. This task was done in accordance with a design drawing from an unrelated contract.[5]

A survey identifying the existing manholes should have been done prior to the paving of the roadway, as stated in the MassHighway *Specifications*. This allows the construction contractor to locate all of the manholes and uncover them after paving occurs. If a survey is not done, utility access points in the roadway may remain paved over and inaccessible. Survey work can be done after paving has occurred, however, this method does not guarantee locating all frames and covers in a roadway. As is the case here, identification of only twenty-eight of the identified eighty-five frames and covers have been completed to date.

[5] The design drawing was the 1991 C07A1 (I-90 Bird Island Flats Tunnel) drawing.

Finding 4 - B/PB unnecessarily paid a section design consultant for design work that was never used.

As of November 2001, B/PB had issued a contract modification estimated to cost $30,000 for paving work in the East Boston Toll Plaza contract. This modification was specifically for paving of the tollbooth area. B/PB instructed the contract's section design consultant (SDC) to prepare the designs for this added work. While the SDC worked on the designs, B/PB attempted to negotiate the price of the added work with Barletta, the East Boston Toll Plaza construction contractor. Barletta, however, refused to add the paving work for B/PB's estimated cost, demanding a higher price. The two parties could not reach an agreement and, as a result, B/PB formally withdrew the modification. Barletta did eventually agree to do the paving work for a total of $4.5 million. However, B/PB allowed the SDC to continue to work on the design for two additional months.

Internal B/PB emails reveal that B/PB staff discussed whether or not the SDC should be contacted and told to stop all further design work.

The internal email states that:

> As you know, we have decided to not execute the work called out for in FCN 064 [Field Change Notice] i.e. incorporating wearing course replacement into scope of C07C1 contract. My question is, do we notify [SDC] of this decision…

The B/PB response to the question posed in the email was as follows:

> …they were finalizing the FCN [Field Change Notice] for the new wearing course placement, and I told him to continue and issue it. We'll just hang onto it and see what happens. I don't know if we have to formally notify him that the work won't be done.

CA/T Project documents do not provide a reason why B/PB permitted the SDC to continue the design process.

Finding 5 - MassPort has not approved the roadway.

Eventually, MassPort will be the final owner of the roadway. Therefore, MassPort will be responsible for the cost of operations and maintenance of the roadway. According to B/PB officials, all work, including pavement repair and replacement, must be accepted or approved by MassPort before the roadway is transferred. However, over the past seven years, documents reveal that MassPort has continuously refused to accept the roadway.

Conclusion

This Office recommends that the Turnpike Authority pursue a cost recovery investigation against B/PB for poor redesign and inadequate oversight of the East Boston pavement work. B/PB failed to provide adequate design solutions and failed to take corrective action in a timely manner prolonging the repair and replacement of the failed roadway. B/PB's first attempts amounted to seven years of quick fixes.

As a result of B/PB's failures, the taxpayers paid approximately $2.5 million for the seven years of quick fixes and an additional $4.5 million for the final roadway replacement. What makes the prolonged repair of the pavement particularly troubling is that paving is a very common component of construction.

At a minimum, Turnpike Authority cost recovery efforts should include the costs of the seven years of quick fixes, the costs of the permanent replacement, the costs of B/PB's substandard design that did not account for manhole frames and covers, as well as, B/PB's charges for redesign and construction management related to the paving issue in East Boston.

This Office also recommends that the Turnpike Authority investigate whether current and former Turnpike Authority employees should be held financially responsible for this faulty roadway. If Turnpike Authority employees assumed unacceptable risks on behalf of the Commonwealth by ordering pavement placed contrary to the manufacturers specifications, the Turnpike Authority should consider holding these employees financially responsible along with B/PB.

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Appendix A:

Cost recovery related reports:

1) *A Big Dig Cost Recovery Referral: Trench Drain Failures Led to Cost Increases*. November 2004.

2) *A Big Dig Cost Recovery Referral: Poor Contract Oversight by Bechtel/ Parsons Brinckerhoff May Have Led to Cost Increases*. February 2004.

3) *A Big Dig Cost Recovery Referral: Contract Mismanagement by Bechtel/ Parsons Brinckerhoff May Have Increased Big Dig Costs*. December 2003.

4) *Proposal to Pursue Big Dig Cost Recovery: Ceiling Installation in the Ted Williams Tunnel*. October 2003.

5) *A Recommendation for Cost Recovery Against the Big Dig's Management Consultant: Grout Heave-Related Contractor Claims on the C11A1 Contract*. February 2003.

6) *A History of Central Artery/Tunnel Project Finances 1994-2001: Report to the Treasurer of the Commonwealth*. March 2001.

7) *A Review of the Central Artery/Tunnel Project Cost Recovery Program*. December 2000.

8) *Statutorily Mandated Reviews of Central Artery/Tunnel Project Building Construction Contracts 1997-1999*. December 1999.

9) *A Review of the Central Artery/Tunnel Project's use of Anchor Bolts on the C05B1 Tunnel Finishes Contract.* December 1998.

10) *Statutorily Mandated Reviews of Central Artery/Tunnel Project Building Construction Contracts 1994 - 1996*. December 1996.

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Appendix B

For a copy of the “1997 Early Opening Letter” contact the Office of the Inspector General at 617-727-9140.

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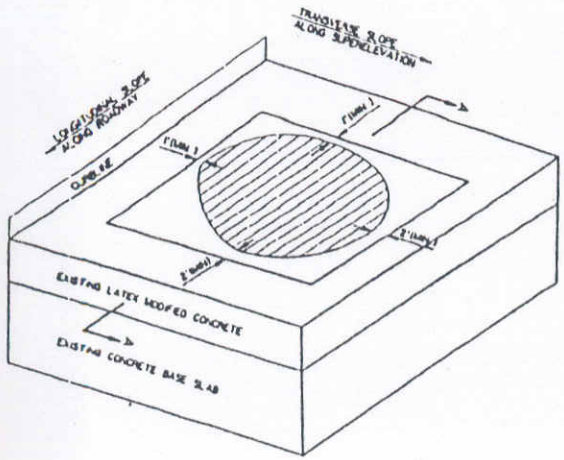
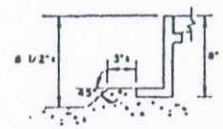
Appendix C: Pavement Repair Details & Notes

SHEET	OF SHEETS	ST.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
1	MASS			8	30

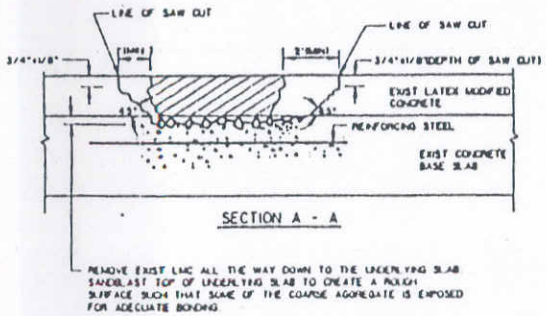


DETAIL 1
THREE DIMENSIONAL VIEW
OF A DELAMINATED AREA

DELAMINATED AREA

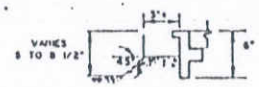


DETAIL 2
OVERLAY REMOVAL IN E-T BOAT SECTION
AT STORM DRAIN MH FRAME & COVER



SECTION A - A

REMOVE EXIST LMC ALL THE WAY DOWN TO THE UNDERLYING SLAB SANDBLAST TOP OF UNDERLYING SLAB TO CREATE A ROUGH SURFACE SUCH THAT SOME OF THE COARSE AGGREGATE IS EXPOSED FOR ADEQUATE BONDING



DETAIL 3
OVERLAY REMOVAL IN E-T BOAT SECTION
AT ELECTRICAL MH FRAME & COVER

NOTE :

THE EXTENT OF WORK ON RAMP E-T VIADUCT HAS BEEN REVISED TO FULL REMOVAL AND REPLACEMENT OF THE OVERLAY IN LIEU OF PARTIAL REPAIR ONLY AT DELAMINATED AREAS. HOWEVER DETAIL 1 AND NOTES 1 & 3 ON THIS DRAWING REMAIN FOR INFORMATION PURPOSES.

NOTES:

1 - THE CONTRACTOR SHALL REMOVE DELAMINATED LATEX MODIFIED CONCRETE (LMC) AND REPLACE WITH NEW OVERLAY MATERIAL AT REPAIRED LOCATIONS FOLLOWING THE PROJECT SPECIFICATIONS AND STANDARD DRAWINGS ACCORDING TO THE FOLLOWING GUIDELINES:

A - DETECT ALL THE UNSOUND/DELAMINATED LMC.

B - REMOVE ALL THE UNSOUND/DELAMINATED LMC IN ACCORDANCE WITH THESE CONTRACT DOCUMENTS. THE LINE OF SAW CUT SHALL BE AT LEAST ONE FOOT ON THE UPHILL SIDE IN BOTH DIRECTIONS AND AT LEAST TWO FEET ON THE DOWNHILL SIDE IN BOTH DIRECTIONS OF THE DELAMINATED/PATCHED AREAS AS ILLUSTRATED IN DETAIL 1. THE DELAMINATED AREAS ADJACENT TO THE CURBLINE, UTILITY STRUCTURES ,EXPANSION JOINT DEVICE,ETC SHALL BE REMOVED BY HAND. USE OF A MILLING MACHINE IS RECOMMENDED FOR LARGE AREAS.

C - AFTER REMOVING THE UNSOUND/DELAMINATED LMC, BLAST OR SCARIFY THE UNDERLYING BASE SLAB SURFACE TO REMOVE ALL LOOSE MATERIAL AND TO EXPOSE AT LEAST 50% COARSE AGGREGATE AS ILLUSTRATED IN SECTION A-A ON THIS SHEET. CARE SHOULD BE TAKEN NOT TO EXPOSE REINFORCING STEEL.

D - BLAST CLEAN ALL ROUGHENED AREAS AND SOAK SURFACES TO RECEIVE NEW OVERLAY FOR AT LEAST 12 HOURS. CARE SHOULD BE EXCERSIZED TO ENSURE THAT HIGH POINTS OF THE AREA ARE SOAKED THE SAME AS THE REST OF THE AREA

E - APPLY BONDING GROUT, AND PLACE OVERLAY. LET OVERLAY CURE.

2 - FOR SAW CUT LONGITUDINAL CONSTRUCTION JOINT IN OVERLAY FOR TRAFFIC STAGING SEE STANDARD DRAWING NO. SD-C-304.

3 - DETAIL 1 ON THIS DRAWING IS FOR REMOVAL AND REPLACEMENT OF ONLY THE DELAMINATED AREAS ON RAMP E-T VIADUCT AS SHOWN ON DRAWING NO'S C-008, C-009 & C-010 AND SPEC SECTION 478.404. THE PAVEMENT ON RAMP S-T AND RAMP E-T BOAT SECTION SHALL BE REMOVED AND REPLACED IN ITS ENTIRETY AS SHOWN ON DRAWINGS C-011,C-012 & C-013 AND SPEC SECTION 467.403.

DESIGNED	R. GRD
DRAWN	R. HAYES
CHECKED	A. DARVISI
IN CHARGE	DONAHUE
DATE	24 MAR 93

MASSACHUSETTS HIGHWAY DEPARTMENT
Central Artery (I-93)/Tunnel (I-90) Project
SECTION DESIGNER: A.P. Famiglietti
SUBMITTED:
BECHTEL/PARSONS BRINCKERHOFF
SUBMITTED FOR APPROVAL: C.M. Wiley

PAVEMENT REPAIR
DELAMINATED AREAS
DETAILS, SECTIONS AND NOTES

SCALE	NOT TO SCALE
CONTRACT NO	C07C1
DRAWING NO	SHC-005
REV	3