Roy Teal
482 Oak Hill Road
Averill Park, NY 12018

ROY TEAL INC.
METALS CONSULTANT

Phone/Fax: (518) 283-7278
Cell: (518) 441-3373
e-mail: royteal@aol.com

Executive Summary Report:
FHWA Bay Bridge Pile Connection Plate Welding Investigation

Attached please find a summary report of independent testing done by Roy Teal, Inc. at the project site of the San Francisco-Oakland Bay Bridge, FAP ACIM-080-1 (085) 8N, Pier E4W.

Background: Certain welders alleged that they were instructed to deliberately hide weld defects from the inspectors by covering them with weld metal in certain partial joint penetration (PJP) welds joining the pile head connection plates to the pile sleeves. Each pier foundation typically consists of six (6) battered steel pile shells, surrounded by a steel pile sleeve. The steel pile head connection plates are inserted into vertical slots in the pile shell and pile sleeve at eight locations per pile. PJP welds join the vertical pile head connection plates on both sides to the pile sleeve and the pile shell, totaling thirty two (32) PJP's per pile. Weld joint preparation was reportedly such that the PJP welds were placed from inside the pile and inside the pile sleeve. Base metal for the pile sleeve and for the pile head connection plates is reported to be ASTM A709, Grade 345 (50). Reportedly the Contractor was ordered to stop work until the allegations were resolved. Two locations joining the pile head connection plate to the pile sleeve in Pier E4W have reportedly been identified as containing inferior quality weld metal. Welds joining the pile head connection plate to the pile shell have not been identified as inferior quality, and are not being evaluated at this time.

Scope of Work: Two independent companies, Mayes Testing Engineers, Inc. and Roy Teal, Inc. were contracted by the Federal Highway Administration (FHWA) to perform independent testing and evaluation of certain predefined weld locations at Pier E4W at the above project site.

Summary Report:

1) **Planning:** Several meetings were held with FHWA, Dr. John Fisher, CALTRANS, Mayes Testing Engineers, Inc., Mactech Engineering and Consulting, Inc. and Roy Teal, Inc. representatives to discuss methods of sampling and testing the weld metal in question. A decision was made to completely remove both PJP's joining the pile head connection plate to the pile sleeve, including the adjacent heat affected zones and pile head connection plate within one inch minimum from the weld fusion lines, as a single unit at three designated locations. A Weld Sample Removal Procedure was prepared and distributed to CALTRANS for issuance to the Contractor. The weld samples were determined to be removed from Pier E4W, pile head connection plate to pile sleeve locations 3G and 5D, which were both alleged to contain inferior quality welds. A baseline sample was randomly selected to be taken at location 2B. The designated locations are identified on CALTRANS quality assurance pile head connection plate location plan.

2) Quality Assurance Visual Inspection (VT)

Roy Teal made a visual inspection of all PJP welds joining the pile head connection plates to the pile sleeve in piles 2, 3 and 5. In general, many of the welds were works in progress at the time the Contractor stopped work. As a result, surface profile irregularities were noted. Weld terminations were typically not completely prepared for testing and inspection at many locations. Heat tape pins remained at many locations.

Several linear indications were found. These indications appeared to propagate from a failed PJP groove weld joining the run-off tab to the pile head connection plates at the top of the joint only. At weld sample locations 3G and 5D, the indications were removed by grinding, retested by MT, and determined that the indications were completely removed prior to weld sampling. Comments were made by on-site personnel that this type of indication was found at the top of many PJP weld joints, and that others were removed in a similar manner. Based on visual inspection, no major, unacceptable discontinuities were found other than described above, when evaluated in accordance with Section 3 of ANSI/AASHTO/AWS

D1.5-96. There was no visual evidence of porosity, excessive undercut, excessive overlap, fusion discontinuities, or cracks other than the linear indications described.

3) Weld Sample Removal

Weld samples were removed by oxygen cutting by KFM personnel in accordance with the Weld Sample Removal Procedure issued by FHWA and a more detailed procedure following the prescribed guidelines and prepared by KFM. Work began by preheating prior to the start of each cut to 150 degrees F. The PJP weld joints were removed from the pile shell side of the pile head connection plate first, using an automatic oxygen cutting technique similar to that prescribed for the sample side. The PJP weld samples were removed by automatic oxygen cutting in accordance with the prescribed procedure. Similar procedures were used to remove the weld samples from the FHWA designated locations 2B, 3G and 5D. The weld samples were immediately marked for identification and orientation before leaving the removal site. The weld samples were then lifted out of the pile sleeves by come-a-long and crane, and placed in waiting wooden boxes. Additional detail and documentation will be provided in the final report.

4) Chain of Custody

After all three weld samples had been lifted from the pile sleeves to the waiting boxes, they were placed by crane on a waiting boat, and were accompanied during transportation to shore by Mr. Roland Nemis and Mr. Roy Teal. The weld samples were then packaged for shipment, the wooden boxes nailed closed and placed in a waiting truck, all under the direct supervision of Mr. Nemis and Mr. Teal. The truck was padlocked by Mr. Nemis, and Chain of Custody letters were prepared for transferring the weld samples to Dwight Testing Laboratories under the care of Mayes Testing Engineers personnel.

5) Conclusions

Roy Teal, Inc. was requested to provide a quality assurance role while performing independent tests to determine the quality of partial joint penetration welds at specified locations in Pier E4W. Work was done on the specific weldments as presented. Confirmation of the welding processes used, actual welding parameters, prior quality control, prior quality assurance and prior nondestructive testing was not within the scope of work assigned at this time, and therefore was not done. The conclusions stated herein apply only to those locations specifically designated.

Based on general visual inspection of weldments at Pier E4W, and specifically the 47 partial joint penetration welds joining the pile head connection plates to the pile sleeve at piles 2, 3 and 5, I found that most welds, although incomplete at many locations, generally conformed to the quality requirements of ANSI/AASHTO/AWS D1.5-96, and therefore conformed to the quality requirements of the Contract documents. The welds were deemed incomplete, since they appear to be a work in progress when the Contractor stopped work at Pier E4W. In my opinion, minor weld profile blending and completion of grinding at the weld terminations would satisfy the quality provisions of the Contract documents. I found no evidence of major or unacceptable discontinuities, including porosity or fusion type discontinuities, in any of the weldments inspected. This visual inspection is supported by similar verbal results of magnetic particle tests performed independently by Mayes Testing Engineers, Inc.

Weld samples were successfully removed on April 22, 2005 as a single sample at the FHWA designated locations 2B, 3G and 5D and transferred to the shipper.

Respectfully submitted,

Roy Teal, May 3, 2005
President, Roy Teal, Inc.