

Progress Report

TPF-5(039) Task Order #1	Falling Weight Deflectometer (FWD) Calibration Center and Operational Improvements		
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Reporting Period:	November 5, 2007 through June 30, 2008		
Project Status:	Work effort (hours) through end of period:		37.9%
	Project funds expended (pct. of total budget):		12.3%
	Contract termination date:		Sept. 6, 2009

Status of the Project

The first phase of the project (Tasks 1-5) ended on December 8, 2006. The goals of Tasks 1-5 were met, and new equipment and new software were delivered to the four LTPP-sponsored FWD Calibration Centers located in Pennsylvania, Texas, Colorado and Minnesota in November and early December 2006. A two- to three-day training program was given at each center at the time of delivery. A draft report covering Tasks 1-5 was delivered to FHWA in April 2007.

The project was reactivated via a Task Order in November 2007 after a hiatus of nearly one year. Following negotiations, work got underway in early January, 2008. Task Order #1 includes seven (7) tasks, as follows.

Task 1 FWD Operations Manual

Prepare an Operations Manual that will include recommendations on traffic control, test point locations, equipment warm-up and maintenance, calibration procedures, and data processing and storage. Where possible, procedures will be manufacturer independent.

Task 2 FWD Calibration Center Technical Support and Service

Provide technical support to the existing four Regional LTPP FWD Calibration Centers. In addition, provide support to each new FWD Calibration Center after the initial installation.

Task 3 FWD Calibration Video

Produce a 10-15 minute video that addresses the question “Why you should calibrate your FWD?”

Task 4 Documentation

Complete and update the draft Final Report submitted in April 2007, responding to comments submitted by the COTR. Additional information gained since April will be incorporated into the Final Report.

Task 5 Communication and Coordination

Participate in and make presentations at one TAC meeting and one FWD Users Group Meeting. Support for TAC travel will be provided from project funds.

Task 6 Software Updates and Upgrades

Software updates will be made in an on going basis with periodic releases of new versions of *WinFWDCal*.

Task 7 FWD Calibration System Fabrication, Installation and Training

Provide installation and training for up to three new FWD Calibration Centers.

Activity during Calendar Year 2007

Although no contract or task order was in place, work continued actively during 2007. Based on suggestions received from the Calibration Centers, the need for changes and improvements in the *WinFWDCal* software was established. New releases of the software were made in January, April, July, and September 2007.

In mid-2007 two new calibration centers were established at the JILS and Carl Bro FWD manufacturing facilities in California and Denmark. Also, the calibration equipment was updated at the Dynatest manufacturing facility in Florida and at the Main Roads Western Australia highway department in Perth, Australia. During installation the 3-day training program was given at each location. (These activities are not part of the study; however, these additional centers increase the availability of FWD calibration services so they are reported here.)

Support was provided to all of the calibration centers throughout 2007. After the initial visit for training, support for all eight centers was given via e-mail and telephone calls.

New equipment was developed to allow calibration of KUAB FWDs that have geophone deflection sensors, using the *WinFWDCal* software. It was tested in the Cornell lab in June 2007 using a KUAB FWD owned by the New York State Department of Transportation. After the

equipment was shown to work correctly, it was delivered to the PennDOT Calibration Center in Harrisburg, PA for future general use.

Work began in September 2007 on the design of a new type of reference load cell that could be used for calibration of both FWDs and HWDs (heavy weight units). One goal of the load cell project is to reduce the production cost (as compared to the custom load cell that is currently in use). The new design is patterned after a design developed by the Carl Bro firm, and we have their permission to adapt it to our needs.

In late fall 2007 the original project (Tasks 1-5) was closed out by Cornell University, and unused funds were returned to FHWA for inclusion in Task Order #1. The Task Order was issued in early November, and after negotiations, it was signed in late December.

Activity during the reporting period

A new COTR, Jane Jiang, took over as the new Task Order began. A meeting was held with her in Harrisburg, PA on March 3, 2008. Input and discussion points for the meeting were also received from the former COTR, Eric Weaver.

In accordance with instructions received following the meeting, work is moving forward on Tasks 2-7. Task 1 has been given a low priority and put on indefinite hold pending further developments with other, related, FHWA-sponsored projects that are on going. Task 3 was put on temporary hold until sufficient funds were in the project account.

In conjunction with the meeting, a two-day retraining program was given at the Pennsylvania Cal Center due to a change in personnel there. The COTR attended a major portion of the training.

Activity by Task

Task 1 – Operations Manual

This task is deferred indefinitely, as explained above.

Task 2 – Technical Support

A major focus during the reporting period has been the quality assurance and certification visits to the operating calibration centers. We developed new Q/A checklists based on the new calibration protocol. These were submitted to the Calibration Center Operators and to the COTR for review and comment. Separate checklists were created for the calibration facilities and for the operator performance.

A trial run was conducted at the PennDOT Calibration Center in early March 2008. Based on the experience in Pennsylvania, the checklists were revised, and Q/A visits were made in March and April to Colorado, Minnesota and Texas. All of the operators were able to be certified without any exceptions.

For each agency we prepared a QA visit memo summarizing the procedure and discussions. Each report was reviewed by David Orr and Lynne Irwin before sending it to the Calibration Center with a copy to the FHWA COTR. Certificates of compliance were issued to each center.

During the reporting period we calibrated reference load cells for Pennsylvania DOT, Indiana DOT, Minnesota DOT, Montana DOT and also for the Australian Road Research Board and the Main Roads Western Australia department of transportation. Each calibration report was reviewed by David Orr and a signed Certificate of Calibration was issued for each load cell.

The rest stop that supports the calibration stand was redesigned using stainless steel to provide additional stiffness and durability. The replacement parts were delivered to the calibration centers in conjunction with the QA visits.

Task 3 – Video Production

Activity on the video project was delayed until sufficient funds to support the project were in hand. The task was activated in early June based on verbal approval from Eric Weaver.

Cornell's Media Services group will assist with the production of the video. A meeting to layout the story board for the project has been scheduled for August 6. FHWA's Mike Moravec plans to attend the meeting to assist the project. Video production is planned for September, and release of the video is expected near the end of November.

Task 4 - Documentation

Efforts to update the April 2007 draft report were begun in April 2008. The document has been assigned FHWA Report No. FHWA-HRT-07-040. The body of the report has been extensively edited to eliminate much of the redundancy that was in the draft report. Additional appendices have been added covering input/output requirements for PDDX file content, the annual QA review process and checklists, and suggestions for a successful annual calibration. Appendices on the FWD calibration protocol, the specifications and drawings, and the hardware use and installation guide are being revised to incorporate changes that have been made since late 2006.

Throughout the revised report the calibration procedure that is used once a year has been referred to as *Annual Calibration*. The procedure that is recommended to be performed monthly on site is referred to as *Monthly Relative Calibration*. This distinction was necessary due to the interest among the FWD manufacturers to offer on site annual FWD calibration services to their customers. While this option was not originally envisioned by the pooled-fund study, the portability of the new equipment has made it possible. Already the Dynatest firm has ordered a second set of calibration equipment to use for calibrations at their customers locations. The Australian Road Research Board anticipates operating two calibration centers in Melbourne and Brisbane with one set of equipment.

The Section 508 captions for all tables and figures in the report have been updated. And TIF-quality files of each of the 103 figures have been obtained.

In May and June a major effort was devoted to updating the AASHTO R 32 *Standard Recommended Practice for Calibrating the Load Cell and Deflection Sensors for a Falling Weight Deflectometer*. This was a time-consuming project because the old R 32 standard had to be completely rewritten according to AASHTO format requirements. The new R 32 document was submitted for ETG review in early June, and further revisions have been made. The new R 32 procedure will be voted upon by the AASHTO standing committees during summer 2008.

Task 5 - Communications

A brief meeting was held with the out going COTR, Eric Weaver, in conjunction with the January 2008 Annual Transportation Research Board Meeting. The principal items of discussion were the transition to the new COTR and the planned schedule for Task Order #1.

As noted earlier, a meeting was held with the new COTR, Jane Jiang, in early March 2008 in Harrisburg, PA.

The FWD Users Group Meeting will be held in Colorado Springs, CO on October 5-7, 2008. During the March 2008 meeting with the COTR the suggestion was advanced to hold a computer-based conference with the Technical Advisory Committee sometime before the FWD Users meeting. This would avoid incurring the heavy expense of travel costs for a face-to-face meeting. At the time, it was not clear whether the Task Order would receive full funding. The suggestion is under consideration.

Task 6 – Software Upgrades

Software revisions have been made continuously. An updated release was made in February 2008 (version 1.2.5), April 2008 (ver. 1.2.6), and June 2008 (ver. 1.2.7). Work is underway for a more extensive update, Version 2, which will enhance the user friendliness of the software, particularly during the set up procedure. The release date for this revision is targeted for mid-October.

All software updates and upgrades are thoroughly tested in our laboratory using our FWD before they are released to the calibration centers.

An issue has arisen in recent weeks concerning the calibration of the JILS FWD. While several calibration centers have been successful at calibrating these FWDs, including the JILS calibration center, the centers in Montana and at Main Roads Western Australia (MRWA) have had problems. After extensive investigation, it seems the problem may possibly be attributable to a small reduction in load coming from the FWD about 1 to 2 milliseconds before the mass strikes the load plate. We are working actively with the Montana and MRWA calibration centers, and with the JILS manufacturer, in an effort to resolve the problem.

Task 7 – Calibration System Installation and Training

Hardware has been ordered and received to upgrade the Indiana Cal Center, and to establish two new cal centers in Montana and California. In June site visits to Indiana DOT and Montana

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DOT were made for installation and training. A QA visit report with a Certificate of Compliance was issued to the Indiana center.

During the visit to Montana some problems were encountered with the test pad, which seemed to be due to a large area void under the concrete slab. We are working actively with the Center Operator there to resolve the matter. The Certificate of Compliance will be issued to the Montana center when the problem is resolved.

The CalTrans calibration facility is currently under construction on the University of California, Davis campus, about 10 miles west of Sacramento. Completion of the building is expected in late July or early August. Equipment for the new facility has been ordered and received. We plan to visit the site in late September or early October to deliver and install the calibration equipment and train the operators. At the present time we are waiting for some deflection data from the test pad.

We are also working with the Australian Road Research Board (ARRB), whose function is comparable to the FHWA Turner-Fairbank Highway Research Center, to assist them with setting up two new FWD calibration centers in Melbourne and Brisbane. Dynatest, Florida has ordered a second set of equipment which they plan to use to market calibration services to customers. (These activities are not part of the Task Order, nor is the time expended charged to the project. They are reported here for the sake of completeness.)