Memorandum

U.S. Department
of Transportation

**Federal Highway
Administration**

6300 Georgetown Pike
McLean, Virginia 22101-2296

Subject: ACTION: LTPP Directive IMS-48

Date: August 21, 1997

From: Aramis López, Jr.
Pavement Performance Division

Reply to
Attn of: HNR-30

To: Dr. William Phang, Ed Lesswing, Gabe Cimini (NARCO)
Dr. Brent Rauhut, Mark Gardner, Peter Jordahl, Amy Simpson (SRCO)
Dr. Michael Darter, Tom Wilson, Prasad Alavilli (NCRCO)
Mr. Dennis Morian, Doug Frith, Raj Basavaraju (WRCO)

Attached is the Long-Term Pavement Performance (LTPP) Program Directive IMS-48 that transmits instructions to the RCOC's regarding automated entry of LTPP P46 (Resilient Modulus of Unbound Base, Subbase and Subgrade) materials testing data generated by the FHWA LTPP Laboratory Testing Contractors. This directive should be implemented to facilitate the upload of the M data from the laboratories.

If you have any questions concerning this transmittal, please do not hesitate to call me at 703-285-2013.

Aramis López, Jr.

Attachment

FHWA:HNR-30:lopez:mep:285-2013:8/20/97
File: c:\mpesut\wp\lopez\ims.p46.mem
cc:
PCS/LAW
Sandra Harris (SAIC)
Barbara Ostrom
LTPP Staff
Directive File
Official File (240.13)
Chron

LONG TERM PAVEMENT PERFORMANCE PROGRAM DIRECTIVE

For The Technical Direction Of The LTPP Program

Program Area: IMS **Directive Number: IMS-48**

Date: 21 August 1997

Subject: Automated Entry of LTPP P46 (Resilient Modulus of Unbound Base, Subbase and Subgrade) Materials Testing Data from the FHWA LTPP Laboratory Testing Contractors

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This Information Management System Directive No. IMS-48 transmits information and instructions to the RCOCs regarding automated entry of unbound materials resilient modulus testing data from the FHWA LTPP laboratory contractors (Braun Intertec, Minneapolis, MN and Law Engineering and Environmental Services, Inc., Atlanta, GA). This directive should be implemented in the RCOCs as soon as possible to facilitate the entry of all resilient modulus testing data produced to-date from these laboratories.

Any questions regarding this directive should be submitted to the FHWA Pavement Performance Division with a copy to the LTPP Technical Assistance Contractor (TAC).

Approved by:

for Monte Symons
LTPP Team Leader

Automated Entry of Materials Testing Data from the FHWA LTPP Laboratory Testing Contractors

Introduction

The FHWA LTPP Laboratory Testing Contractors are performing resilient modulus testing of unbound base, subbase and subgrade for the GPS and SPS programs. The data that is generated from this effort is stored in a standard electronic format. A filter program (P46LOAD) has been designed to allow the data to be automatically transferred to the IMS. P46LOAD will be transmitted to the RCOCs in the very near future.

Instructions

Each RCO will receive the electronic data files from the TAC along with a paper inventory detailing the samples that were sent with the data set. Any electronic data files received from the laboratories should not be used.

The RCOC should perform their standard procedure for verifying the sample layer numbers, sample numbers, etc. It is assumed that each RCOC has a system in-place to log the receipt of the materials testing data and a method with which to check the validity of a given test sample (SHRP_ID, STATE_CODE, LAYER_NO, TEST_NO, FIELD_SET, LOC_NO, etc.). This should include checking between the L04 form (GPS and SPS) and the laboratory tracking tables (SPS) to ensure that the proper samples were tested and the proper identifiers have been attached to the sample test results.

Any and all discrepancies should be reported to the TAC. The TAC will coordinate with the laboratory and resolve the discrepancy.

P46 Resilient Modulus Data Filter Process

This section contains the specifications for the P46 testing filter program (P46LOAD). P46LOAD will be used to automatically populate IMS tables for data generated by Braun Intertec's Mechanical Testing Laboratory and Law Engineering's Atlanta Branch Testing Laboratory for the following IMS tables:

TST_UG07_SS07_A,
TST_UG07_SS07_B,
TST_UG07_SS07_WKSHT_CYCLES, and
TST_UG07_SS07_WKSHT_SUM.

File Naming Convention

Summary data for each test result will be stored in its own uniquely named ASCII data file in a comma-delimited format. Raw data will be stored in a tab delimited ASCII file format. ***At this time, the RCOC will only receive SUMMARY data files from the TAC.***

The P46 summary data files have the following file naming convention:

XXYYYY.CSV

where: XX = LTPP Region Designation (WT,ST,NA,NC)
YYYY = Laboratory File ID Number
(1000-4999 - Braun)
(5000-9999 - Law)
(CSV = comma separated value)

For example, sample 6000 from the Western region would have a summary file name of WT6000.CSV.

File Format/Order

Each line of the summary file (*.CSV) begins with one of four characters - namely "A", "B", "W" or "S." This designation dictates the table to which the data belongs and the order of the data. The first line of each summary file begins with either an "A" (compacted samples) or a "B" (thinwall tube) as appropriate. The second through sixth lines of the files are the cyclic results from the testing. Lines seven and eight are summary data for the five load cycles. The pattern established in lines 2-8 is repeated for the remaining load sequences. As a general note, a line of data from form T46A (*TST_UG07_SS07_A*) will begin with the letter "A". A line of data from form T46B (*TST_UG07_SS07_B*) will begin with a "B." Data from the cyclic testing results (*TST_UG07_SS07_WKSHT_CYCLES*) will begin with a "W" and data from the summary of the cyclic loadings (*TST_UG07_SS07_WKSHT_SUM*) will begin with a "S." The filter program will read the first entry in the line and process the data based on this designation.

Generally, but not always, each data file will consist of 106 lines. The first entry of the first line will either be an "A" or a "B." The remaining 105 lines of the file follow a repetitive pattern composed of seven lines per pattern. The pattern consists of five lines that start with a "W" (worksheet) followed by two lines that begin with a "S" (summary). The "W" lines are independent records that will be filtered into *TST_UG07_SS07_WKSHT_CYCLES* (along with header information extracted from line number 1). The two paired "S" lines combine to form one record in *TST_UG07_SS07_WKSHT_SUM* (along with header information extracted from line 1).

Attachment A contains the sequential order that is required by the laboratory for resilient modulus data in each data file. This table contains the sequence within the line of data, units and LTPP IMS field name.

Data Handling Procedures

The following step-by step procedures shall be followed by the RCOCs to filter this data.

0. The RCOC will create the following directories on the drive of their choice:

<Drive>:\TESTDATA
<Drive>:\TESTDATA\P46DATA
<Drive>:\TESTDATA\P46DATA\QCGOOD (input files)
<Drive>:\TESTDATA\P46DATA\QCGOOD\FILTGOOD (empty)
<Drive>:\TESTDATA\P46DATA\QCGOOD\FILTGOOD\LOG (log of filtered data)
<Drive>:\TESTDATA\P46DATA\QCGOOD\FILTBAD (data not filtered successfully)
<Drive>:\TESTDATA\P46DATA\QCGOOD\FILTBAD\LOG (log of rejected data)

These directories will serve as repositories for the P46 data as it moves from one data handling stage to another.

A. The TAC will submit the data to the RCOC. It is recommended that the RCOC backup the original data set before proceeding with the remainder of the instructions.

B. The files should be copied to <Drive>:\TESTDATA\P46DATA\QCGOOD.

C. From the <Drive>:\TESTDATA\P46DATA\QCGOOD directory, the P46LOAD filter program will be initiated by the RCOC. The filter program will perform logical error checking procedures (explained in a later section) and based on these checks, either filter the data or fail the data.

D. If a given file is filtered successfully, P46LOAD will load the summary data into the IMS and make a notation in the log file resident in the FILTGOOD\LOG directory.

E. If a particular record is not filtered successfully, P46LOAD will delete the appropriate file from the QCGOOD directory and place the data files in the FILTBAD directory. This directory will serve as the storage area for all "bad" data and the problems with the data will require resolution by the RCOC's and/or the TAC. The unsuccessful attempt to filter the record will be noted in an error log and contain an appropriate error message (described later in this memorandum) in the FILTBAD\LOG directory.

F. Once the problem has been resolved, the RCOC will edit the record in the appropriate file and place the data file in the QCGOOD directory for subsequent refiltering.

Error Checking

Please be advised that it is envisioned that changes only to STATE_CODE, SHRP_ID, LAYER_NO, TEST_NO, FIELD_SET, SAMPLE_NO, LOC_NO and TEST_DATE will be necessary to correct the errors noted below. Also, if changes are made to STATE_CODE, SHRP_ID, LAYER_NO, TEST_NO, FIELD_SET, SAMPLE_NO or TEST_DATE, they must be carried through for every line in the data file (i.e. every line in the data file contains these values).

The error checking for the filter generally follows the checks that are in the IMS data entry forms and are as follows:

1. The following directories must exist:

\TESTDATA
\TESTDATA\P46DATA
\TESTDATA\P46DATA\QCGOOD
\TESTDATA\P46DATA\QCGOOD\FILTGOOD\
\TESTDATA\P46DATA\QCGOOD\FILTGOOD\LOG
\TESTDATA\P46DATA\QCGOOD\FILTBAD
\TESTDATA\P46DATA\QCGOOD\FILTBAD\LOG

If the directory does not exist, the user will be notified with:
"Unable to open file DIRECTORY_NAME for loading."
"Please check that the directory and file exist."

2. Check for key fields.

   For each record in a given file, the filter will check for the existence of key fields (see the latest version of the schema for a list of key fields for these tables). If a key field is missing, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

   "Missing required key fields."

   This error should be relatively rare. Usually the RCO must resolve this problem with the TAC.

3. Check for a valid section.

   For each record in a given file, the filter will check for the existence of a valid section number in EXPERIMENT_SECTION. If a matching record is not found, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

   "Invalid section, not found in EXPERIMENT_SECTION."

   This error should be relatively rare and generally occurs when (Case 1) the section does not exist in EXPERIMENT_SECTION or (Case 2) the laboratory has entered an incorrect section number.

   For Case 1 failures, the EXPERIMENT_SECTION table should be checked to determine if the section is indeed missing. If missing, the RCO should determine if the section should be added to the EXPERIMENT_SECTION table. For Case 2 failures, the RCO should resolve the problem with the TAC.

4. Check for valid LOC_NO.

   For each record, the filter will check for the existence of a valid LOC_NO in ***TST_HOLE_LOG***. If a valid LOC_NO is not found, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

   "Invalid LOCATION_NUMBER, cannot find in TST_HOLE_LOG."

5. Check for valid SAMPLE_NO.

   For each record in a given file, the filter will check for the existence of a matching SAMPLE_NO in TST_SAMPLE_LOG.

   If the SAMPLE_NO is not found, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

   "Invalid SAMPLE_NO."

This is one of the more common errors likely to be found in the data. Some of the most likely reasons for this error are as follows:

- Field data has not been entered in RIMS for this sample.
- Sample number in field data present in RIMS is incorrect.
- Sample number in lab data incorrect.
- LOC_NO does not match between lab and IMS field data.
- FIELD_SET does not match between lab and IMS field data.

6. Check for valid LATER_TYPE.

For each record, the filter will check for the existence of a valid LAYER_TYPE in ***TST_L05B***. The LAYER_TYPE must be a "SS", "GS", or "GB". If a valid LAYER_TYPE is not found, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

"Invalid LAYER_TYPE, cannot find in TST_L05B."

This error is usually caused by the entry of an inappropriate LAYER_TYPE (SS, GB, GS) in TST_L05B.

7. Check for pre-existing record.

For each record, the filter will check for the existence of a matching record (same key fields) existing in the IMS. If a record already exists, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

"ORA-00001: unique constraint violated."

This error is generated if a record is present in a given IMS table with identical key fields as the record that P46LOAD is trying to filter. In this case, the RCO should check to make sure that the data in the IMS is identical to the record which is to be filtered. If it is, then the data can be deleted from the filter data. If the data is not identical, then the RCO should check all of the key fields in the data to ensure they are correct. If the problem cannot be resolved in-house, then the RCO should resolve this discrepancy with the TAC.

8. Check for TEST_DATE.

For each record in a given file, the filter will check for the existence of a TEST_DATE. If the TEST_DATE is null or earlier than 01-JAN-95, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

"Error on Record No. - 1 Reason:
INVALID KEY FIELDS: TST_UG07_SS07_B
STATE_CODE : 17
SHRP_ID : 1003
LAYER_NO 1-5 : 1
TEST_NO 1-4 : 2

FIELD_SET : 1
SAMPLE_NO : TS03
TEST_DATE >= 01-JAN-1995 : 11-07-94
LAYER_TYPE 1-2 : 1
LAB_CODE 1311 or 2711 : 2711
MR_MATL_TYPE 1-2 : 2"

9. Assignment of CONSTRUCTION_NO.

For each record in a given file, the filter will attempt to determine the CONSTRUCTION_NO to input into the table. To perform this action, the filter looks in *TST_HOLE_LOG*. If the CONSTRUCTION_NO cannot be determined, the data is not filtered, it is moved to the \FILTBAD directory and a notation is made in the FILTBAD\LOG directory similar to the following:

"CONSTRUCTION_NO not found for this record."

This is a relatively rare problem. Similar reasons as shown for the check for a valid SAMPLE_NO appear to be the cause of this error.

There are also several checks of the data format that are characterized by the following error codes:

Invalid file format, input files contain both A and B records.
Invalid file format, not enough W records.
Invalid file format, too many S records.
Invalid file format, not enough S records.
Invalid file format, too many W records.
Unknown file type.
Missing key fields, TST_UG07_SS07_WKSHT_CYCLES.
Missing key fields, TST_UG07_SS07_WKSHT_SUM.
Insert error, \ORA-01722: invalid number.

If any of these errors are seen in the data file, the RCOC should contact the TAC.

Summary

Input regarding possible improvements to this procedure are welcomed from the RCOCs. All questions and comments concerning this should be directed to FHWA with a copy to the TAC.

ATTACHMENT A

REQUIRED DATA FORMAT AND SEQUENCE