Memorandum

U.S. Department
Of Transportation

Federal Highway Administration

6300 Georgetown Pike
McLean, Virginia 22101

Subject: **ACTION**: LTPP Directive GO-42
AIMS Electronic Data Format, Submission Standards, and Dates

Date: May 5, 2009

From: Jane Jiang
Long Term Pavement Performance Team

Reply to
Attn of: HRDI-13

To: Dr. Frank Meyer, PM - LTPP North Atlantic Regional Contract
Dr. Frank Meyer, PM - LTPP North Central Regional Contract
Mr. Mark Gardner, PM - LTPP Southern Regional Contract
Mr. Kevin Senn, PM - LTPP Western Regional Contract

Attached is the Long-Term Pavement Performance (LTPP) Program Directive GO-42: AIMS Electronic Data Format, Submission Standards, and Dates. This directive supersedes Directive GO-41 and provides instructions on the electronic format, file naming conventions, and directory structure for the submission of files included in the Ancillary Information Management System (AIMS) to the Long-Term Pavement Performance (LTPP) Customer Support Service Center. Please ensure that all personnel are aware of this new directive.

Should you have any questions or would like to discuss this directive, please do not hesitate to contact me at 202-493-3149.

Attachments (1)

FHWA:HRDI-13:JJiang:mdeeney:493-3149:5/05/09
File: c:/mdeeney/directive/go/GO-42dir.doc
cc:
Jonathan Groeger
Directive Binder
LTPP Team
Official file
Chron

LONG TERM PAVEMENT PERFORMANCE PROGRAM DIRECTIVE

For the Technical Direction of the LTPP Program

Program Area:	General Operations	Directive Number:	GO-42
Date:	May 5, 2009	Supersedes:	GO-41
Subject:	AIMS Electronic Data Format, Submission Standards, and Dates		

This directive provides instructions on the electronic format, file naming conventions, and directory structure for the submission of files included in the Ancillary Information Management System (AIMS) from the Long-Term Pavement Performance (LTPP) Regional Support Contractors (RSC) to the LTPP Federal Highway Administration (FHWA) Customer Support Service Center (CSSC). The objective is to provide a central archive of electronic data files and electronic copies of paper data collection forms that were used to populate the LTPP Pavement Performance Database (PPDB) or contains ancillary data, images, or video not contained in the PPDB.

AIMS Upload Dates

The AIMS upload dates are:

- September 1, 2009
- August 3, 2010
- June 10, 2011

Future upload dates beyond June 10, 2011 will be specified by the FHWA, as appropriate.

For the September 1, 2009 upload, submittals shall include files previously submitted plus new files acquired or created and files modified since the last submittal.

For the August 3, 2010 and June 10, 2011 AIMS uploads, submittal requirement will be either a full submission or only submission of new and changed files. Full submission is required unless the FHWA provides instruction to submit only the new and revised files, at least 30 day prior to the upload dates.

Data types covered in this directive and their completion dates are listed below.

Complete uploads of the following data types are to be submitted in the September 1, 2009 and the August 3, 2010 uploads for data collected 40 days prior to the upload date**:**

- Electronic Falling Weight Deflectometer (FWD) data containing deflection-time history measurements
- Longitudinal profile data stored at 25-mm intervals (excludes DNC 690D data)
- Profile measurements at Weigh-In-Motion (WIM) sites in 25-mm intervals
- Transverse profile measurements
- ProQual archive files
- Digitally scanned hand-drawn distress maps from manual distress surveys
- Digital images from manual distress surveys
- Digital distress maps generated from photographic film

All other AIMS data types defined in this directive shall be submitted to the extent possible in the September 1, 2009 and August 3, 2010 uploads.

The backlog of all non-monitoring data types shall be submitted by the June 2011 upload. Monitoring data types not included in the backlog are FWD, profile, pavement distress, and traffic measurements collected within 40 days of the AIMS upload date.

Electronic AIMS File Standards

The following file standards specify required and preferred standards for electronic data files converted from paper, video, and photographic images.

Specifications for Scanned Paper Data Forms

Scanned paper data forms shall conform to the U.S. National Archive (NARA) Standards for Expanding "Acceptable Transfer Requirements: Transfer Instructions for Permanent Electronic Records" at http://www.archives.gov/records-mgmt/initiatives/pdf-records.html. References to this standard can be found at http://www.archives.gov/records-mgmt/initiatives/scanned-textual.html.

For LTPP purposes, the following minimum specifications shall be used:

- Data forms shall be scanned at a minimum resolution of 300 pixels per inch (12 pixels per mm).
- All data forms in a defined category shall be combined into PDF files.
- Bitonal (Black and white) scanning is preferred provided a relatively small electronic file is produced.
- Image compression in the PDF creation process shall use lossless compression methods. (JBIG2 Lossless)

The preferred practice is to scan paper data forms formatted primarily in portrait up-right orientation when they are opened for viewing.

Specifications for Digitized Video

At this time, NARA has not developed national standards for digitized video due to the rapidly evolving nature of digital video formats and the lack of any open, national or international consensus standards for the creation and preservation of digital video. Due to business requirements for smaller file sizes, the following file types and minimum standards shall be used.

MPEG1 – This is appropriate for older video obtained from Super-VHS video recorders. Minimum frame size is 320x240.

MPEG2 – This is the preferred video compression standard since it is compatible with modern DVD players and is recommended for video collected using digital cameras. Minimum frame size is 320x240. Data rates shall not exceed 7 Mbps.

Other digitized video formats can be used if approved by the FHWA.

Still Digital Images

Still digital images obtained from digital cameras or scanned color photographs shall be submitted in Joint Photographic Expert Group (JPEG) JPEG File Interchange Format (JFIF) format (also known as JPG).

Minimum standards for JPG files include:

- 256 color
- Quality compression of 50 or greater
- 300 pixels per inch (12 pixel per mm)

Images previously submitted to LTPP CSSC not meeting these minimums do not have to be re-imaged unless directed by FHWA.

Details by Data/Format Type

The following sections provide details of AIMS file submission by data/format type depending on the nature of the raw data.

Automatic Weather Station (AWS) Data

For each AWS site the following directory structure shall be created:

AWS\STATE_CODE\AWS_ID

This directory shall contain all raw electronic data files downloaded from the AWS instrumentation, EDT files created by the AWSCheck software, and PPDB upload files created by the AWSCheck software. File naming convention shall be in accordance with directives existing at the time of data acquisition and/or file creation.

Deflection (DEF) - Falling Weight Deflectometer (FWD) Peak, Time History and Pavement Temperature Data

The electronic version of the following FWD files shall be stored in the AIMS:

- Version 10 "*.FWD" files, containing both peak deflection data and time history data
- Version 20 "*.FWD" files, containing both peak deflection data and time history data
- Version 25 "*.F25" files, containing peak deflection data only
- Version 25 "*.HXT" files, ASCII files containing converted binary encoded time history data
- FWDWin "*.DDX" files, ASCII files converted from Microsoft Access® containing peak and time-history data
- Highway agency data collected on LTPP sections, regardless of format

In addition, the pavement temperature gradient measurements, recorded on paper data forms, performed during FWD measurements shall be scanned following the guidelines in this document and stored in the AIMS. The following file naming convention shall be used for these files:

DEF+STATE_CODE+SHRP_ID+SURVEY_DATE (YYYYMMDD).pdf

The following directory/subdirectory structure shall be used to store both the FWD measurement data and scanned paper pavement temperature gradient data:

DEF\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD)

e.g.:*DEF\48\480102\20040905*.

Deflection Calibration (DEFCAL) – Falling Weight Deflectometer Calibration Files

The following data files are included under this heading:

- Raw electronic data files generated during a relative calibration test on a FWD used to collect data for the LTPP program. The raw data files should be submitted in the native data collection format with file names in accordance with applicable directives existing at the time of the test.
- Electronic data files produced RelCal software containing the results of the relative calibration test results
- Scanned output showing gain factors from results of a reference calibration test, as well as the scanned TSC (Temperature Sensor Checks) forms on a FWD used to collected data for the LTPP program. The files should be named: REFCAL_TEST_DATE (YYYYMMDD). pdf

The following directory structure shall be used:

DEFCAL\DEFL_UNIT_ID\4-digit Year\REF – for reference calibration data
DEFCAL\DEFL_UNIT_ID\4-digit Year\REL – for relative calibration data

Where DEFL_UNIT_ID is the FWD measurement unit identifier used in the MON_DEFL_MASTER table.

Example:

DEFCAL\8002-131\1994\REL\DATA Files (e.g. 13020394.RC1 & 13020394.CS1)

Note that this is an example of file names used during relative calibration. Other file names were used because of the number of attempts made to pass calibration.

DEFCAL\8002-131\1994\REF\DATA Files (SDX1926.GO1, Load188.LO1, Dyna131A.GO1).

Note that these are example of file names used during reference calibration. Other file name conventions were also used.

Pavement Distress Data (DIS)

This data type includes the manual distress, automated distress, DiVA and manual distress photo database categories.

Manual Distress Surveys (MDS)[1]

This category includes the manual distress maps (MDM files), manual distress survey photos/images (MDP files), and manual distress data (MDD files). The MDD files include all of the paper data collection forms for a linked manual distress survey[2] data set which may include the following types of data depending on the type of test section: Manual distress survey summary form (sheets 1, 2, 4, 5, 8, 9), rut depth measurements (sheet 3), faulting measurements (sheet 6), lane shoulder drop-off separation (sheets 7, 10), hand drawn distress maps, and transverse profile measurements with the Dipstick (sheets DS-7 and DS-8).

The file directory storage structure for this data is:

DIS\ MDS\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD)

The appropriate file naming convention for manual distress maps scanned before issuance of this directive shall be in accordance with the relevant LTPP distress directives (e.g. D-17, D-31, D-44 or their successors). File names for digitized manual distress photographs shall be in accordance with the relevant LTPP distress directives (e.g. D-17, D-31, D-44 or their successors).

Manual distress survey data form sets digitized after issuance of this directive shall contain all paper data forms, including manual distress maps, in a single PDF file named using the following convention:

MDD+STATE_CODE+SHRP_ID+SURVEY_DATE (YYYYMMDD).pdf

For distress data sets where linked distress measurements in a data set were conducted on different days, the first measurement day in the data set shall be used in the file name.

[1] The MDM directory specified in directive GO-41 shall be renamed MDS.
[2] Linked distress measurements are defined as those measurements with a common SURVEY_ID for a test section as contained in the MON_DIS_LINK table in the pavement performance database.

Manual distress surveys scanned following the old TIFF protocol will be replaced by a combined electronic PDF file in the future.[3] If changes are made to the previously scanned manual distress data causing re-scanning of the data packet, the new data packet shall be submitted in PDF format.

Examples:

DIS\MDS\24\240504\20040609\MDP240504A200401.jpg - Manual distress photograph-1 on section 24_0504 taken on June 9, 2004.

DIS\MDS\24\240504\20040609\MDD24050420040609.pdf – File containing an image of all manual distress data forms from the manual distress survey performed on June 9, 2004 in PDF format.

Automated Photographic Distress Surveys (ADS)

This category includes distress maps interpreted from the automated distress survey images (ADS files) and digitized images from the 35-mm photographic distress film (ADP files).

The directory structure for each subcategory is as follows. The file names should be in accordance with the relevant LTPP distress directives (e.g. D-17, D-31, D-44 or their successors).

DIS\ADS\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD)

e.g.: DIS*ADS\24\241006\20010229*

DiVA and Distress Photo Database

The Distress Review Microsoft Access file from the DiVA output and the Distress Photo Survey MS Access metadata database table shall be stored in the DIS root directory.

Profile (PRF) – Longitudinal, Weigh-In-Motion (WIM) Site

Separate folders shall be used for each profile subcategory; longitudinal profile (LPF) and WIM site profile (WSP). Where applicable, data files created during the archival process using the ProQual software shall be placed in the corresponding directories in accordance with Directive P-44 or its successor. Specific directions and subdirectory structures for each subcategory follow.

Longitudinal Profile (LPF)

Longitudinal profile that has been collected with both high-speed road profilers and Dipsticks® shall be submitted for the AIMS upload. The following directory structures and subfolders shall be used.

PRF\LPF\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD),
e.g.:*LPF\01\012106\19921222*

[3] It is not necessary to remove previously scanned TIFF files.

PRF\LPF\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD)\ERD. When possible, RSCs shall convert raw profiles to the *.ERD format and place these files in the ERD directory subfolder.
e.g.:*LPF\01\012106\19921222\ERD*

File names for data from road profilers shall be in accordance with applicable directives at the time the data was collected.

The following directory structure and file name convention shall be used for longitudinal profile measurements with a Dipstick scanned from the paper data collection forms:

PRF\LPF\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD)*File_name*

Where:

File_name = PRF+STATE_CODE+SHRP_ID+"_"+SURVEY_DATE (YYYYMMDD).pdf

PRF\LPF\10\101450\20030308\PRF101450_20000308.pdf – longitudinal dipstick data for section 101450 from 03/08/2000

WIM Site Profile (WSP)

For the WIM site profile (WSP) subcategory, the following directory structures and subfolders shall be used for raw data and data in ERD format:

PRF\WSP\STATE_CODE\SSEELW\SURVEY_DATE (YYYYMMDD)\ *filename.ext* – for raw profile data files produced by the field measurement device and named in accordance with the LTPP file naming convention applicable at the time of data collection.

PRF\WSP\STATE_CODE\SSEELW\SURVEY_DATE (YYYYMMDD)\ERD*filename.erd* – for longitudinal profile data converted to ERD format.

Where
SS - State Code
EE - Experiment #
L - Lane designation, 'O' is outer, and 'I' is inner.
W - wheelpath, 'L', 'R', 'C' for left, right and center respectively.

e.g. PRF\WSP\36\3608OL \20020913\ERD

Seasonal Monitoring Program (SMP)

For each SMP site the following directory structure shall be created:

SMP\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE(YYYYMMDD)

This directory shall contain all raw data files downloaded from the SMP instrumentation and scanned paper data forms collected on the survey date. File names for the scanned paper data forms shall use the following convention:

File_name=SMP+STATE_CODE+SHRP_ID+"_"+SURVEY_DATE.pdf

EDT files created by the SMPCheck software and PPDB upload files created by the SMPCheck software shall be stored in the following upper tier directory structure using the file naming conventions specified in SMP related directives.

SMP\STATE_CODE\ STATE_CODE+SHRP_ID\

Traffic Data

Traffic data includes electronic traffic data files and scanned paper data forms.

Electronic Traffic Data Files

This category includes all ASCII data files output by the LTPP Traffic QC (LTQC), the LTPP Traffic Analysis (LTAS) or IRD Analyze software. A site may require use of multiple sub-directory structures. The sub-directory structure created by the LTPP traffic software below the regional level will be retained. IRD Analyze monitored data files in either binary or vendor specific record format will be added using additional folders for data types defined in the LTAS subdirectory structure.

The name of the main folder and sub folder for monitored traffic data electronic is TRF\MON. The State abbreviation at the next folder level in the current LTPP traffic database structures shall be replaced by State Code. Files other than the flat files (binary files in Levels 1, 2, 3, or 5 from processing in SAS or LTQC or *.pst files) shall be included in the submission. Summary.dat files (LTQC output) shall be excluded to limit the amount of space used.

The following are examples from the LTAS, SAS, and LTQC directory structures.

LTAS directory structure – TRF\MON\STATE_CODE\STATE_CODE+SHRP_ID\YEAR\data folders by type (AVC, WIM, IRD, ASCII)

e.g.: TRF\MON\22\220100\2008\ASCII

SAS directory structure - TRF\MON\STATE_CODE\STATE_CODE+SHRP_ID\LEV4\YEAR

e.g.: TRF\MON\32\321021\LEV4\1990

LTQC directory structure –
TRF\MON\STATE_CODE\STATE_CODE+SHRP_ID\LEV4\DATA\YEAR\data folders by type (AVC4, WIM7, VOL3, DATA)

e.g.: TRF\MON\36\364018\LEV4\DATA\1998\AVC4

Scanned Paper Data Forms

For traffic data sheets 1-9, 11, 14 and 15, one PDF file shall be created containing all of these data sheets with the following name:

File_name = TRF+STATE_CODE+SHRP_ID.pdf

For traffic data sheets 10, 12, 13 and 16, one PDF file shall be created containing all of these sheets by the year using the following name:

File_name = TRF+STATE_CODE+SHRP_ID+"_"YEAR (YYYY).pdf

The scanned paper data forms shall be stored in the following directory structure:

TRF\STATE_CODE\STATE_CODE+SHRP_ID\ *File_name.pdf*

Other Scanned Paper Data Forms

This data type includes images of digitally scanned paper data forms for non-rejected LTPP test sections. All scanned images of data forms for a particular Data Type (DT) for a section or project shall be combined into PDF files following the specifications in this directive. Files with unique file names containing similar data types with other electronic data can be stored in the same low level directory. The following file directory and file naming conventions shall be used for inventory, material, rehabilitation, maintenance, friction, and Specific Pavement Studies (SPS). The files shall be stored in the electronic structure as other corresponding electronic data with matching DT as specified below.

DT\STATE_CODE\STATE_CODE+SHRP_ID*File_name.pdf*

Where

DT = INV for inventory data (including global positioning measurements)
MAT\TST for material test data (one MAT directory with two subdirectories)
MAT\SAMP for material sampling data (one MAT directory with two subdirectories)
RHB for rehabilitation data
MNT for maintenance data
FRIC for friction monitoring data
SPS for general SPS project data, SHRP_ID=PROJECT_ID

For INV, RHB, and MNT data the following file naming convention shall be used:

File_name = *DT*+STATE_CODE+SHRP_ID.pdf

For SPS data the following file name convention shall be used:

File_name = SPS+ "#"+STATE_CODE+SHRP_ID.pdf – for test section specific data
File_name = SPS+ "#"+STATE_CODE+PROJECT_ID.pdf – for general project data

Where # is the SPS experiment number assigned to the project site.

For Mat\TST and Mat\SAMP,

File_name =DT+STATE_CODE+SHRP_ID+"_" + Field Set

For FRIC data, the following file name convention shall be used:

File_name = FRIC+STATE_CODE+SHRP_ID+"_"SURVEY_DATE (YYYYMMDD).pdf

Examples:

INV\10\101450\INV101450.pdf – Inventory data for section 10_1450. One PDF file is made for each test section or SPS project.
SPS\10\100100\SPS1100102.pdf – SPS1 construction data for section 10_0102
FRIC\48\483855\FRIC483855_19951207.pdf – All friction data for section 48_3855 from 12/7/1995
MAT\TST\10\101450\TST101450_1.pdf – a set of testing data for section 101450, field set No.1.
MAT\SAMP\34\340801\SAMP340801_1.pdf – sampling on section 340801, field set No. 1.

Digitized Test Section Videos (DSV)

This data type includes digitized video of test sections. All digitized video shall conform to the guidelines contained in this document. The digitized video shall be stored in the following directory structure.

DSV\STATE_CODE\STATE_CODE+SHRP_ID*VT*\VIDEO_DATE (YYYYMMDD)*file_name*

Where
VT = GEN for initial video of test section or other at other dates not included below
DIS for video taken during a manual distress survey
PROF for video taken through the windshield of a profiler

e.g. DSV\48\481077\GEN\19891202\

File_Name = *VT*+STATE_CODE_SHRP_ID+"_" +VIDEO_DATE.*fe*

Where
VT = Video type defined above
Fe = File extension type appropriate to the type of file, i.e. mpg

e.g. DSV\GEN\48\481077\GEN481077_19891202.mpg

Required Data Change Updates

When changes are made to distress maps or distress forms that were already scanned, the changes need to be reflected in the corresponding scanned-in distress maps or distress forms in the next AIMS submittal.

When changes are made to data in the database contained on scanned paper data forms, preferred practice is to annotate the changes on the paper data form and update the electronic scanned records contained in the AIMS submittals.

Submittal Format

Two copies of each submittal shall be submitted; one to the LTPP CSSC and one to the FHWA LTPP database manager.

Submittals shall be made using external hard disk-based media using a format specified by the FHWA. The current standard is USB drives. Multiple drives may be submitted depending on the amount of storage space required. Data groups should not be divided across different data storage media. Data shall be grouped into the categories defined in this directive.

Electronic files shall be submitted with the read only and hidden file attributes turned off. Submittals shall only include the files specified in this directive and be free of extraneous auto generated files generated by the operating system such as Thumds.bd files.

The following naming convention shall be used when submitting a USB drive. This name shall appear when viewing the drive through the Microsoft Windows operating system. The name electronically burned into the disk media on each disk shall include

Region_SubmittalDate, where:

Region: A two-letter abbreviation used to specify the regional contractor; North Atlantic Region (NA), North Central Region (NC), Southern Region (SR), and Western Region (WR).

Submittal Date: Use a YYYYMMDD" format

Example: NA_20080630

The following information, at a minimum, shall be included on the physical label of the USB drive:

- FHWA/LTPP
- Descriptive Title. (e.g. 2008 RSC AIMS Data Submittal)
- Region – 2-letter (e.g. SR)
- Submittal date, in text using YYYYMMDD format; e.g. 20080630

Questions concerning this directive should be addressed to the FHWA LTPP Team member responsible for IMS operations, with a copy to the LTPP TSSC.

Prepared by: TSSC/FHWA

Approved by:

Aramis López, Jr.
LTPP Team Leader