# Memorandum

U.S. Department
Of Transportation

**Federal Highway Administration**

6300 Georgetown Pike
McLean, Virginia 22101

Subject: **ACTION**: LTPP Directive I-166
AIMS Data Storage Format Standards

Date: April 24, 2014

From: Jane Jiang
Long Term Pavement Performance Team

Reply to
Attn of: HRDI-30

To: Mr. Gabe Cimini, PM – LTPP North Atlantic Regional Contract
Mr. Gabe Cimini, PM - LTPP North Central Regional Contract
Mr. James Sassin, PM - LTPP Southern Regional Contract
Mr. Kevin Senn, PM - LTPP Western Regional Contract

Attached is the Long-Term Pavement Performance (LTPP) Program Directive I-166: AIMS Data Storage Format Standards. Please ensure that all personnel involved with the process 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 or jane.jiang@fhwa.dot.gov.

Attachments (1)

FHWA:HRDI-30:JJiang:mdeeney:493-3149: 4/24/2014
File: c:/mdeeney/directive/IMS/I-166.docx
cc:
Jonathan Groeger
Directive Binder
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Official file
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# LONG TERM PAVEMENT PERFORMANCE PROGRAM DIRECTIVE

***For the Technical Direction of the LTPP Program***

| | | | |
|---|---|---|---|
| Program Area: | Information Management System | Directive Number: | I-166 |
| Date: | April 23, 2014 | Supersedes: | GO-48, GO-57 |
| Subject: | AIMS Data Storage Format Standards | | |

All Ancillary Information Management System (AIMS) electronic files shall be stored on the AIMS Data Entry Portal (ADEP), currently operated under the LTPP Data Entry Portal (LDEP) https://portal.ltpp.org/. All AIMS electronic files shall be stored in the ADEP in accordance with the specifications contained in this document. FHWA may direct changes to the AIMS directory structure without issuance of a formal LTPP program directive.

## 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 US 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:

- PDF files shall be created following the PDF/A format as defined in http://www.iso.org/iso/catalogue_detail?csnumber=38920.
- Data forms shall be scanned at a minimum resolution of 600 pixels per inch.
- Bitonal (Black and white) scanning is preferred for black and white data forms not containing color coded information. Color scanning should be used for paper documents where information content is contained in color[1].
- Image compression in the PDF creation process shall use lossless compression methods (JBIG2 Lossless).
- All data forms in a defined category are scanned into PDF/A files.

The preferred practice is to match the orientation of scan paper data forms with the original paper format in the final PDF file. This means that paper data forms formatted in portrait orientation shall be contained in the final PDF file in an upright-portrait orientation. Likewise, paper data forms formatted in a landscape orientation shall be in a centered, upright-landscape orientation in the final PDF file.

**Specifications for Digitized Video**

At the time the original LTPP guidelines were prepared, NARA had 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. The following are the revised standards based on current NARA standards:

- **MPEG1**: This format is no longer appropriate. It was previously used for older video obtained from Super-VHS video recorders. Minimum frame size is 320 × 240 pixels. Video files previously stored in this format do not have to be converted unless otherwise instructed by FHWA.
- **MPEG4** : This is the preferred digital video storage format. A minimum pixel frame size of 720 x 480 or greater should be used. Format specifications contained in ISO/IEC 14496-10:2003, Information technology -- Coding of audio-visual objects -- Part 10: Advanced Video Coding (formal name) MPEG-4, Advanced Video Coding shall be followed: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37729
- **MPEG2**: This is an acceptable video compression standard. Format specifications contained in ISO/IEC 13818-2:2000 Information technology -- Generic coding of moving pictures and associated audio information: Video shall be followed: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=31539

[1] Distress maps from PADIAS interpretations are an example of a paper data forms where information content is color coded.

Other digitized video formats can be used if approved by FHWA. Approval requests and confirmations from FHWA shall be posted as an issue in the AIMS project on the LDEP.

**Still Digital Images**

Still digital images include photographs produced by digital cameras, and scanned images of photographic prints, slides, and negatives.

The general requirements for still digital image records include:

- Appropriate, professional quality, dedicated photographic equipment shall be used when capturing images.

- Digital conversion of analog photographic prints, slides, raw positives, etc. shall be performed to standards appropriate for the accurate preservation of the original image. Examples of appropriate methods can be found at http://www.archives.gov/preservation/products/definitions/photo-def.html.

Minimum standards for JPG files include:

- 256 color
- Lossless data compression
- 300 pixels per inch

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

Additional special requirements for digital photographs are described in 36 CFR 1237.28.

Specifications for acceptable file formats include:

- JPEG File Interchange Format (JFIF) with Joint Photographic Experts Group (JPEG) compression. Format version 1.02. Following ISO/IEC 10918-5 Information technology – Digital Compression and coding of continuous-tone still images: JPEG Interchange File Format: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=54989, and ISO/IEC 10918-1:1994 Information technology – Digital Compression and coding of continuous-tone still images: Requirements and guidelines: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=18902

- Jpeg2000 (JP2). Format version JP2-Part 1. Following ISO/IEC 15444-1:2004 Information technology – JPEG 2000 image coding system: Core coding system: http://www.iso.org/iso/catalogue_detail.htm?csnumber=37674.

## Overview of AIMS Data File Storage Structure

Table 1 presents a summary of the overall file directory storage structure that shall be used to store AIMS files on the internal LTPP file servers. In this table, folder name variables are presented in an italics font to indicate multiple levels beneath the preceding data storage tiers. These folder names variables are in addition to the folder names which use field names defined in the pavement performance database tables, which also imply multiple levels of data folders.

Table 2 presents a the file directory storage structure that shall be used to store AIMS files on the internal LTPP file server for data loaded by regional contractors. In this table the file directory storage structures are expanded to include all combinations.

Table 3 presents a summary of the file directory storage structure that shall be used to store AIMS files on the internal LTPP file server provided by central LTPP contractors and FHWA staff.

**Table 1. LTPP AIMS directory data storage structure.**

| Primary Directory | 2nd Tier | 3rd Tier | 4th Tier | 5th Tier | 6th Tier | 7th Tier | 8th Tier | 9th Tier |
|---|---|---|---|---|---|---|---|---|
| AWS | STATE_CODE | AWS_ID | | | | | | |
| DEF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | | |
| DEFCAL | DEFL_UNIT_ID | YEAR | *Cal_Type* | | | | | |
| DIS | *Dis_Type* | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | |
| GPR* | STATE_CODE+SPS_ID | | | | | | | |
| PRF | LPF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | |
| PRF | *LPF* | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | ERD | | | |
| PRF | LPF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | *Set#* | | | |
| PRF | WSP | STATE_CODE | STATE_CODE+Experiment_Number+Lane+Wheelpath | SURVEY_DATE | | | | |
| PRF | WSP | STATE_CODE | STATE_CODE+*EELW* | SURVEY_DATE | ERD | | | |
| SMP | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | | |
| TRF | LTAS | STATE_CODE | STATE_CODE+SHRP_ID | YEAR | *LTAS_Type* | | | |
| TRF | LTQC | STATE_CODE | STATE_CODE+SHRP_ID | LEV4 | DATA | YEAR | *LTQC_Type* | |
| TRF | MON | STATE_CODE | STATE_CODE+SHRP_ID | LEV4 | YEAR | | | |
| TRF | SHEET | STATE_CODE | STATE_CODE+SHRP_ID | | | | | |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP_ID | YEAR | BINARY | | | |
| TRF* | PVR | STATE_CODE | STATE_CODE+SHRP_ID | YEAR | ASCII | *Software_Version* | *Class_Scheme* | *Lane* |
| *Data_Type* | STATE_CODE | STATE_CODE+SHRP_ID | | | | | | |
| MAT* | TST | *TST_Type* | STATE_CODE | STATE_CODE+SHRP_ID | *Layer_No* | | | |
| DSV | STATE_CODE | STATE_CODE+SHRP_ID | *Video_Type* | VIDEO_DATE | | | | |
| DDV* | STATE_CODE | STATE_CODE+SHRP_ID | VIDEO_DATE | | | | | |

Note: *Cal_Type*: {REF, REL}, *Class_Scheme:* {LTPP_CLASS_SCHEME_2006, LTPP_CLASS_SCHEME_2013}, *Data_Type*: {INV, MAT\TST, MAT\SAMP, RHB, MNT, FRIC, SPS}, *Dis_Type*: {MDS, ADS, TPF}, *EELW*: {Experiment Number (EE), Lane designation (O)uter or (I)nner and Wheelpath (L)eft, (R)ight, (C)enter} *Lane:* {LTPP_LANE, NON_LTPP_LANE}, *LTAS_Type*: {AVC, WIM, VOL}, *LTQC_Type*: {AVC4, WIM7, VOL3, DATA}, *Set# :* {SET1, SET2, SET3, etc.}, *Software_Version:* {iANALYZE5_1, iANALYZE5_2Beta, iANALYZE5_3}, *TST_Type*: {P07, P46}, and *Video_Type*: {GEN, DIS, PROF}. *CSSC folder

**Table 2. Expanded LTPP AIMS directory data storage structure for regionally loaded data.**

| Primary Directory | 2nd Tier | 3rd Tier | 4th Tier | 5th Tier | 6th Tier | 7th Tier | 8th Tier | 9th Tier |
|---|---|---|---|---|---|---|---|---|
| AWS | STATE_CODE | AWS_ID | | | | | | |
| DEF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | | |
| DEFCAL | DEFL_UNIT_ID | YEAR | REF | | | | | |
| DEFCAL | DEFL_UNIT_ID | YEAR | REL | | | | | |
| DIS | ADS | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | |
| DIS | MDS | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | |
| DIS | TPF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | |
| DSV | STATE_CODE | STATE_CODE+SHRP_ID | DIS | VIDEO_DATE | | | | |
| DSV | STATE_CODE | STATE_CODE+SHRP_ID | GEN | VIDEO_DATE | | | | |
| DSV | STATE_CODE | STATE_CODE+SHRP_ID | PROF | VIDEO_DATE | | | | |
| FRIC | STATE_CODE | STATE_CODE+SHRP_ID | | | | | | |
| INV | STATE_CODE | STATE_CODE+SHRP_ID | | | | | | |
| MAT | SAMP | STATE_CODE | STATE_CODE+SHRP_ID | | | | | |
| MAT | TST | STATE_CODE | STATE_CODE+SHRP_ID | | | | | |
| MNT | STATE_CODE | STATE_CODE+SHRP_ID | | | | | | |
| PRF | LPF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | |
| PRF | LPF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | ERD | | | |
| PRF | LPF | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | *Set#* | | | |
| PRF | WSP | STATE_CODE | STATE_CODE+*EELW* | SURVEY_DATE | | | | |
| PRF | WSP | STATE_CODE | STATE_CODE+*EELW* | SURVEY_DATE | ERD | | | |
| RHB | STATE_CODE | STATE_CODE+SHRP_ID | | | | | | |
| SMP | STATE_CODE | STATE_CODE+SHRP_ID | SURVEY_DATE | | | | | |
| SPS | STATE_CODE | STATE_CODE+SHRP_ID | | | | | | |
| TRF | LTAS | STATE_CODE | STATE_CODE+SHRP_ID | YEAR | AVC | | | |
| TRF | LTAS | STATE_CODE | STATE_CODE+SHRP_ID | YEAR | WIM | | | |
| TRF | LTAS | STATE_CODE | STATE_CODE+SHRP_ID | YEAR | VOL | | | |
| TRF | LTQC | STATE_CODE | STATE_CODE+SHRP_ID | LEV4 | DATA | YEAR | AVC4 | |
| TRF | LTQC | STATE_CODE | STATE_CODE+SHRP_ID | LEV4 | DATA | YEAR | DATA | |
| TRF | LTQC | STATE_CODE | STATE_CODE+SHRP_ID | LEV4 | DATA | YEAR | VOL3 | |
| TRF | LTQC | STATE_CODE | STATE_CODE+SHRP_ID | LEV4 | DATA | YEAR | WIM7 | |
| TRF | MON | STATE_CODE | STATE_CODE+SHRP_ID | LEV4 | YEAR | | | |
| TRF | SHEET | STATE_CODE | STATE_CODE+SHRP_ID | | | | | |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP_ID | YEAR | BINARY | | | |

Note: *Set# :* {SET1, SET2, SET3, etc.} and *EELW*: {EE - Experiment Number , L - Lane (O) outer or (I) inner, W - Wheelpath (L) left, (R) right, (C) center}

**Table 3. Expanded LTPP AIMS directory data storage structure for centrally loaded data.**

| Primary Directory | 2nd Tier | 3rd Tier | 4th Tier | 5th Tier | 6th Tier | 7th Tier | 8th Tier | 9th Tier |
|---|---|---|---|---|---|---|---|---|
| DDV | STATE_CODE | STATE_CODE+SHRP_ID | VIDEO_DATE | | | | | |
| DLR | RAW_TRACES | NC | SPS-2 | TRACE_ NUMBER | | | | |
| DLR | RAW_TRACES | OH | SPS-1 | TRACE_ NUMBER | | | | |
| DLR | RAW_TRACES | OH | SPS-2 | TRACE_ NUMBER | | | | |
| GPR | STATE_CODE+SPS_ID | | | | | | | |
| MAT | TST | P07 | STATE_CODE | STATE_CODE +SHRP_ID | LAYER_NO | | | |
| MAT | TST | P46 | STATE_CODE | STATE_CODE +SHRP_ID | LAYER_NO | | | |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | BINARY | | | |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_1 | LTPP_CLASS_ SCHEME_2006 | LTPP_LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_1 | LTPP_CLASS_ SCHEME_2006 | NON_LTPP_ LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_1 | LTPP_CLASS_ SCHEME_2013 | LTPP_LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_1 | LTPP_CLASS_ SCHEME_2013 | NON_LTPP_ LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_2 Beta | LTPP_CLASS_ SCHEME_2006 | LTPP_LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_2 Beta | LTPP_CLASS_ SCHEME_2006 | NON_LTPP_ LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_2 Beta | LTPP_CLASS_ SCHEME_2013 | LTPP_LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_2 Beta | LTPP_CLASS_ SCHEME_2013 | NON_LTPP_ LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_3 | LTPP_CLASS_ SCHEME_2006 | LTPP_LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_3 | LTPP_CLASS_ SCHEME_2006 | NON_LTPP_ LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_3 | LTPP_CLASS_ SCHEME_2013 | LTPP_LANE |
| TRF | PVR | STATE_CODE | STATE_CODE+SHRP _ID | YEAR | ASCII | iANALYZE5_3 | LTPP_CLASS_ SCHEME_2013 | NON_LTPP_ LANE |

## Details by Data/Format Type

### 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. In those cases where multiple EDT files were created by RSCs for an AWS site, a number is appended to the file name extension to make the file name unique. Preferred practice is to assign the appended number starting with 1 for the earliest file and increasing sequentially with time. For example:

- 04AAWSDAT.EDT1 - first EDT file for AWS site A in Arizona
- 04AAWSDAT.EDT2 – second EDT file for AWS site A in Arizona

For other files, the 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. The file naming convention shall be in accordance with directives existing at the time of data acquisition and/or file creation as follows:

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

In addition, the pavement temperature gradient measurements recorded on paper data forms and 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

For pavement temperature gradient measurements recorded using the automated temperature data loggers, the electronic data files from these measurements shall be stored in ASCII format using the following file naming convention:

TMPT+STATE_CODE+SHRP_ID+SURVEY_DATE(YYYYMMDD)+"_"+Loc .DAT

Where,

Loc = A for approach and L for leave end of the section where the measurements were performed.

Example name of files containing data from the automated temperature data loggers include:

- TMPT31302420131002_A.DAT for temperatures measurements from section 31_3024, performed on October 2, 2013 on the approach end of the test section.
- TMPT31302420131002_L.DAT for temperatures measurements from section 31_3024, performed on October 2, 2013 on the leave end of the test section.

The following directory/subdirectory structure is used to store both the FWD measurement data, scanned paper pavement temperature gradient data, and data files from the automated temperature data loggers:

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

An example of a directory/subdirectory structure is \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 by the RelCal software containing the results of the relative calibration test results.

- Electronic data files produced by the WinFWDCal software in pavement deflection data exchange format used for calibrations following the *AASHTO Recommended Standard of Practice R32-09*. This includes FWDCalibrationRecord (DD-MM-YYYY).DDX and FWDCalibrationOutput (DD-MM-YYYY).DDX. Other electronic files used in this process, such as those produced by the FWD, should also be stored.

- Scanned output showing gain factors from results of a reference calibration test, (certificate of calibration), available Temperature Sensor Check (TSC) 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 is used:

- DEFCAL\DEFL_UNIT_ID\4-digit Year\REF – for files associated with reference (annual) calibration. This includes both reference and relative calibration tests.

- DEFCAL\DEFL_UNIT_ID\4-digit Year\REL – for files associated with relative (monthly) calibration.

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

Some examples include:

- DEFCAL\8002-131\1994\REL\13020394.RC1
- DEFCAL\8002-131\1994\REL\13020394.CS1

Note that these are examples 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\SDX1926.GO1
- DEFCAL\8002-131\1994\REF\ Load188.LO1
- DEFCAL\8002-131\1994\REF\ Dyna131A.GO1

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

**Ground Penetrating Radar (GPR)**

GPR measurements include the raw data files containing readings every 6 inches (152 mm), a graph of the data contained in the raw data file, a graph of the interpreted dielectric constant versus position, a graph of the interpreted layer thicknesses versus position in the right wheel path and center of the lane, and the upload files used to populate the table in the PPDB that contains the interpreted results

GPR data are stored using the following directory structure:

GPR\STATE_CODE+SPS_ID*filename.ext.*

**Pavement Distress Data (DIS)**

This data type includes manual distress, transverse profile, automated distress, distress viewer and analyzer (DiVA), and manual distress photo database categories

***Manual Distress Surveys (MDS)***

This category includes the manual distress maps , 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 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, and 9), rut depth measurements (sheet 3), faulting measurements (sheet 6), lane shoulder drop-off separation (sheets 7 and 10), hand drawn distress maps, and transverse profile measurements with the dipstick (sheets DS-7 and DS-8). The file directory storage structure for these data is as follows:

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

The appropriate file naming convention for manual distress maps scanned before issuance of directive is assigned in accordance with the relevant LTPP distress directives (e.g., D-17, D-31, D-44, or their successors). Manual distress survey data from sets digitized after issuance of LTPP Directive GO-48 "AIMS Electronic Data Format, Submission Standards, and Dates" 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

File names for digitized manual distress photographs are assigned in accordance with the relevant LTPP distress directives (e.g. D-17, D-31, D-44, D-54 or their successors) at the time photograph image was obtained. Directive D-54 requires the following file naming convention:

MDP+STATE_CODE+SHRP_ID+SEQUENCE_LETTER+SURVEY_YEAR(YYYY)+##.JPG

Where

| | | |
|---|---|---|
| SEQUENCE_ LETTER= | | multiple visits to the same test section within a year starting at A |
| ## | = | photograph sequence number on the survey day starting at 01 |

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 is used in the file name.

Manual distress surveys scanned following the old tagged image file format (TIFF) protocol have been replaced by a single PDF file following these guidelines. [1] If changes are made to previously scanned manual distress data causing re-scanning of the data packet, the new data packets are 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.

[1] The TIFF files can be combined into a single PDF using Adobe Acrobat. It is not necessary to remove previously scanned TIFF files.

### *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 assigned 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).

An example of a directory structure file name is 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 Microsoft Access® metadata database table is stored in the DIS root directory. Storage of updated DIVA output files is no longer required.

### *ProQual Transverse Profile (TPF) Data Files*

The transverse profile (TPF) archival data file produced by the ProQual software shall be stored using the following directory structure:

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

The file name convention produced by ProQual is used for these files.

An example data storage directory is DIS\TPF\01\012106\19921222.

Note that scanned paper data forms containing transverse profile measurements using the dipstick are included in the MDD files defined under manual distress data.

## Profile (PRF)—Longitudinal and Weigh-In-Motion (WIM) Sites

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 are placed in the corresponding directories in accordance with Directive P-37 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 Dipstick shall be stored in the central AIMS file archive. File names for data from road profilers are assigned in accordance with applicable directives at the time the data was collected.

The following directory structure and subfolders are used for data files from high-speed profilers where the data storage directory does not have to be split due to repeat files names produced by the ProQual software for multiple measurement data sets created on the same day.

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

An example data storage directory is: PRF\LPF\01\012106\19921222

The following directory structure and subfolders are used for data files from high-speed profilers where the data storage directory have to be split due to repeat files names produced by the ProQual software for multiple sets of measurement data created on the same day. In this situation, an additional folder is being added to the directory structure using the name SET. A set is a group of multiple profile measurements collected on a measurement day where all of the required data files produced from ProQual can logically be stored in the same file folder.

PRF\LPF\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD)\SET#,

An example data storage directory is: PRF\LPF\04\040210\20131225\SET1

Where SET#, starts at SET1 and is incremented by one for each set of profile measurements performed on the same day. For example, if in response to LTPP directive P-46, 3 sets of profile measurements are performed at different times on the same day then the resulting data would be stored as follows:

- SET1 – first data set collected on the test day.
- SET2 – second data set collected on the test day.
- SET3 – third data set collected on the test day.

When possible, RSCs shall convert raw profiles to the *.ERD format and place these files in the ERD directory subfolder. This structure is used for *.ERD files regardless of if the other profile data files need to be split into sets.

PRF\LPF\STATE_CODE\STATE_CODE+SHRP_ID\SURVEY_DATE (YYYYMMDD)\ERD.

An example data storage structure is PRF\LPF\01\012106\19921222\ERD.

The following directory structure and file name convention is 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

An example data directory storage structure and file name format for longitudinal Dipstick measurements performed on section 10_1450 on 03/08/2000 is:

PRF\LPF\10\101450\20030308\PRF101450_20000308.pdf

### *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* is used for raw profile data files produced by the field measurement device and named in accordance with the LTPP file naming convention in force at the time of data collection.

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

Where:

SS = State code.
EE = Experiment number.
L = Lane designation, “O” is outer and “I” is inner.
W = Wheel path, ”L,” “R,” and “C” for left, right, and center, respectively.

An example data storage structure is PRF\WSP\36\3608OL\20020913\ERD.

This folder should contain the electronic data files produced by the field measurement device, other associated electronic data files, and ERD files if they were previously created. The files shall be named in accordance with LTPP file naming conventions at the time of their creation.

### Resilient Modulus Material Tests

This includes electronic test from the P07 test protocol Test Method for Determining the Creep Compliance, Resilient Modulus, and Strength of Asphalt Materials Using the Indirect Tensile Test Device and P46 test protocol Resilient Modulus of Unbound Materials.

File names are assigned in accordance with the material test protocol existing at the time. For LTPP P07 data, the file names included in AIMS should match the files names contained in the database records for these test results.

The LTPP P07 data shall be stored using the following directory structure:

MAT\TST\P07\STATE_CODE\STATE_CODE+SHRP_ID\LAYER_NO\ *filename.ext*.

The LTPP P46 data shall be stored using the following directory structure:

MAT\TST\P46\STATE_CODE\STATE_CODE+SHRP_ID\LAYER_NO\ *filename.ext.*

### Seasonal Monitoring Program (SMP)

For each SMP site, the following directory structure shall be created for data collected at a site on the specified survey day:

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

This directory shall contain the raw onsite (*.ONS) and mobile (*.MOB) data files downloaded onsite in the field 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, PPDB upload files created by the SMPCheck software, and *.PLS[1] files created by the OnsPlus software or *.ONS/*.MOB files created from *.PLS files shall be stored in the following directory structure.

SMP\STATE_CODE\ STATE_CODE+SHRP_ID\

In those cases where multiple EDT files were created by regional contractors for a SMP site, a number shall be appended to the file name extension to make the file name unique following the practice for similar AWS EDT files. Upload file names shall be in accordance with the file naming convention produced by the SMPCheck software. *.PLS, *.ONS and *.MOB file names shall be in accordance with the file naming convention in-place at the time of file creation.

**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 LTQC software, LTAS, IRD iANALYZE, or SAS-based traffic analysis software. A site may require use of multiple subdirectory structures.

The largest repository of electronic traffic monitoring data contained in AIMS is associated with LTAS data since this is the current software used by the LTPP program to check and process all traffic monitoring data. Traffic monitoring data collected before implementation of the LTAS software may have been processed by this program.

**LTAS directory structure:** The directory structure used to store LTAS data is as follows:

TRF\LTAS\STATE_CODE\STATE_CODE+SHRP_ID\YEAR\data folders by type {AVC, WIM, VOL}.

Examples include the following:

- TRF\LTAS\22\220100\2008\AVC.
- TRF\LTAS\22\220100\2008\WIM.

**LTQC directory structure**: TRF\LTQC\STATE_CODE\STATE_CODE+SHRP_ID\LEV4\ DATA\YEAR\data folders by type {AVC4, WIM7, VOL3, DATA}.

[1] *.PLS files were instrumentation measurements downloaded remotely from some SMP sites. These files contained a combination of *.ONS and *.MOB files similar to those collected during field visits to sites with no remote telemetry installed. The *.PLS files were renamed to *.ONS and *.MOB for input into the SMPCheck program.

An example directory file name path structure is TRF\LTQC\36\364018\LEV4\DATA\1998\AVC4.

**SAS directory structure:** The electronic data files from the SAS based traffic analysis software are stored in the following directory structure:

TRF\MON\STATE_CODE\STATE_CODE+SHRP_ID\LEV4\YEAR

An example directory file name path structure is TRF\MON\32\321021\LEV4\1990.

**PVR directory structure:** IRD monitored traffic data files are stored in a separate directory data structure since they were collected as part of the LTPP SPS Traffic Data Collection pooled fund study. Both an ASCII version and binary versions which is the input into the IRD proprietary software which provides additional data review capabilities are stored. This data type is called “per vehicle record” (PVR) and is stored using the following directory structure:

TRF\PVR\STATE_CODE\STATE_CODE+SHRP_ID\YEAR\data folders by type {BINARY, ASCII}.

The BINARY data files are stored in the following directory structure:

TRF\PVR\STATE_CODE\STATE_CODE+SHRP_ID\YEAR\BINARY

The ASCII data files are stored in the following directory structure:

TRF\PVR\STATE_CODE\STATE_CODE+SHRP_ID\YEAR\ASCII\Software_Version\ Class Scheme \ Lane

Where:

- Software_Version = is the version of the software used to convert the binary file to the ASCII format and currently includes iANALYZE5_1, iANALYZE5_2Beta, or iANALYZE5_3,
- Class Scheme = LTPP_CLASS_SCHEME_2006 or LTPP_CLASS_SCHEME_2013, and
- Lane = LTPP_LANE or NON_LTPP_LANE.

***Scanned Paper Data Forms***

The scanned traffic related paper data forms are stored in PDF format based on the frequency of updates and addition and new additions. Both types of the following scanned paper data forms are stored within the same directory/file folder; the only difference is the file name assigned to each group of files.

For traffic data sheets 1–9, one PDF file shall be created. Changes, updates, or new data contained on these data sheets shall be appended to a single file with the following name:

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

For traffic data sheets 10 through 24, when available, one PDF file shall be created using a file naming format which includes data sheets submitted by calendar year, using the following file name format:

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

These files shall be stored in the following directory structure:

TRF\SHEET\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 are combined into PDF files. 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 are used for inventory, material, rehabilitation, maintenance, friction, and SPS. The files are stored in the same structure as other corresponding electronic data with matching DT as specified below.

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

Where DT equals the following:

- 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 naming conventions 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, the following file naming conventions shall be used:

- *File_name* = TST+"_"+L05+"_"+STATE_CODE+SHRP_ID.pdf—For lab data sheets L05, L05A, and L05B. All data sheets for a test section are included in one file.

- *File_name* = TST+STATE_CODE+SHRP_ID+"_" + Field Set.pdf—For all other lab data sheets. All data sheets for the same field set are stored in the same file.

For MAT\SAMP data forms the following file naming convention shall be used:

- *File_name* = SAMP+STATE_CODE+SHRP_ID+"_" + Field Set.pdf—All data sheets for the same field set are stored in the same file.

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

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

Examples include the following:

- INV\10\101450\INV101450.pdf—Inventory data for section 10_1450.

- 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\TST_L05_101450.pdf—All lab data sheets L05, L05A, and L05B for section 101450.

- MAT\TST\10\101450\TST101450_1.pdf—Lab data sheets for section 101450, for 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. The digitized videos shall be stored in the following directory structure

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

Where VT equals the following:

- 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.

An example For example, DSV\48\481077\GEN\19891202\.

*File_Name* = VT+STATE_CODE_SHRP_ID+"_"+VIDEO_DATE(YYYYMMDD).fe

Where:

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

An example directory file name path structure and valid file name is DSV\48\481077\GEN\GEN481077_19891202.mpg.

**Digitized Drain Inspection Video (DDV)**

This data type contains digitized video from photographic inspections of the subsurface drainage features on SPS-1 and SPS-2 projects. These videos are from cameras inserted into the lateral drains and extended as far up the drain as possible. The digitized videos shall be stored in the following directory structure

- DDV\ STATE_CODE \ STATE_CODE + SHRP_ID\SURVEY_DATE (YYYYMMDD)\ *file_name*.

  Where:

- *file_name* = STATE_CODE +SHRP_ID_VideoID.avi
- VideoID = a sequential number assigned to video of each lateral drain

An example directory file name path structure and valid file name is DDV\06\060204\20011005\060204_08.avi.

## Required Data Change Updates

When changes are made to distress maps or distress forms that were previously 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. The update process includes replacement of the previous files with those containing the updated information content.

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