U.S. Department
of Transportation

**Federal Highway
Administration**

Memorandum

6300 Georgetown Pike
McLean, Virginia 22101

Subject: **ACTION**: LTPP DIRECTIVE AWS-21
Operation, Maintenance & Calibration of Automated Weather Stations and Termination of Data Collection

Date: February 19, 2008

From: Jack Springer
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 AWS-21, which supercedes AWS-1, 3, 9 and portions of 4 and 19. This directive should be transmitted to all appropriate personnel as soon as possible.

Should you have any questions, or would like to discuss this directive, please do not hesitate to contact me at 202-493-3144

Attachment (1)

FHWA:HRDI-13:JSpringer:mdeeney:493-3144:2/15/08
File: c:/mdeeney/directive/aws/AWS-21dir.doc
cc:
Dr. Gonzalo Rada
LTPP Staff
Directive File
Official File (160.20)
Chron

LONG TERM PAVEMENT PERFORMANCE PROGRAM DIRECTIVE

For the Technical Direction of the LTPP Program

Program Area:	Monitoring	Directive Number:	AWS-21
Date:	February 1, 2008	Supersedes:	AWS-1, AWS-3, AWS-9, portions of AWS-4, portions of AWS-19
Subject:	Operation, Maintenance & Calibration of Automated Weather Stations and Termination of Data Collection		

The Long-Term Pavement Performance (LTPP) Regional Support Contractors (RSCs) have four options for the retrieval of Automated Weather Station (AWS) data at the Specific Pavement Study (SPS) -1, 2 and 8 projects. Those options, in order of preference, are:

1. Access through direct phone line to the AWS site
2. Access through cellular phone installed at the AWS site
3. Upload of AWS data stored in the datalogger during site visits by RSC personnel
4. Upload of AWS data stored in the datalogger during site visits by highway agency personnel

Under options 1 and 2, the retrieval of AWS data is ideally performed at routine intervals not to exceed one (1) month. For options 3 and 4, the retrieval of AWS data is ideally performed at regular intervals such that no data is lost. Due to equipment or resource issues, meeting these timelines may not always be possible. In which case, the data should be collected as soon as practical to minimize the loss of data.

Regardless of the AWS data retrieval option used, the RSCs shall:

1. Review the data within two (2) weeks of receipt in the regional office for quality control using the latest version of AWSScan software.
2. Process these data within one (1) month of receipt in the regional office using the latest version of the AWSCheck program.
3. Append the resulting AWSCheck file to an existing EDT file for the AWS site or use it to start a new EDT file if one does not already exist.

4. Upload the AWS data to the LTPP Pavement Performance Database in accordance with instructions and dates specified by the FHWA LTPP Division.

Retrieval of AWS Data During Site Visits

Retrieval of the weather data shall be done in accordance with the procedures specified in Campbell Scientific's "UT-3 Tower-Based Weather Station Installation Manual", dated July, 1994. The RSC is responsible for coordinating with the highway agency all data retrieval and necessary maintenance activities around the area of the AWS.

When retrieving data from the storage module, select **Option A** to collect **ALL** data.

Notes: (1) Do not use Option U which collects Uncollected data file.
(2) Do not erase storage module after data collection.
(3) Do not clear the storage module's data area after completion of data retrieval.

When retrieving data from the storage module, select a descriptive name for the root collection filename – e.g. AZDOT.DAT (DAT extension is automatically appended to the filename). When data retrieval is completed, rename the file using the following convention:

4801W051.107

Where characters

1 to 2 =	state code e.g. "48" for Texas
3 to 4 =	experiment number; e.g. "01" for the first SPS-1 project in the state
5 =	always "W" for AWS data
6 to 7 =	day of the month on which the data was uploaded; e.g. "05" for the fifth day of the month
8 to 10 =	month on which the data was uploaded; e.g. "1.1" for November (the eleventh month)
11 to 12 =	last two digits of the year; e.g. "07" for 2007.

Three (3) complete backup copies of the AWS data file on electronic media shall be made prior to leaving the site. Two backup copies shall be transmitted to the RSC office along with written comments or observations concerning the data. The remaining copy shall stay with the data collection team and serve as a backup should the copies sent to the RSC be lost or damaged.

Retrieval of AWS Data Using Direct Telephone Line or Cellular Telephone

The AWS datalogger shall be programmed to turn on and off a maximum of two times per 24 hour period. The first turn on/off time shall be between midnight and three a.m. for data upload purposes only. The second turn on/off time shall be scheduled to coincide with regular office hours so that the RSC can review and check the data collected during the previous night and ensure that there are no problems at the AWS site. For information and instructions for

performing these datalogger programming tasks, refer to "AWS Remote Access – Direct Line Hook-Up", by Brandt Henderson and Dilan Singaraja, October 6, 1997 and "Automated Weather Station Telemetry Pilot", by Hank Usher, June 23, 1997.

Installation of remote data collection capabilities at AWS eliminates the need for site visits by either RSC or highway agency personnel for retrieving data from the AWS datalogger. To the extent possible, the regions will continue to perform maintenance and calibration activities as described below. Implementation of remote data collection capabilities could lead to more frequent site visits since data for any given site can be viewed daily and problems can be identified more quickly.

AWS Maintenance, Calibration and Sensor Replacement

The RSC shall coordinate AWS maintenance activities with the highway agency. Routine maintenance such as mowing, debris removal, cleaning of the access road and checking for vandalism shall be the responsibility of the highway agency.

The RSC is required to perform the following maintenance activities each time the AWS site is visited:

1. Visual Station Inspection
    a) Sensor cables cut or broken?
    b) Sensors showing physical damage?
2. Inspection of Solar Sensor
    a) Is the sensor clean and debris free?
        i. Clean the sensor with water and a soft bristle brush or dry air
        ii. Be careful not to scratch the surface of the solar sensor
        iii. Check the drain hole next to the surface of the sensor to ensure that it is clear of debris
3. Rain Gauge
    a) Remove any debris from inside the rain gauge funnel and then make sure the screen inside is clean.
    b) To remove the funnel, first remove the screws at the base of the rain gauge. Make sure the funnel hole is not clogged.
    c) Observe the tipping mechanism inside. Tip the mechanism from side to side to ensure that it moves freely. Record these tips so they may be removed from the AWS data.
    d) Clean any webs or bugs that might cause it to freeze in one position. Clean the tipping buckets of any accumulated dirt or dust.
    e) Reassemble the funnel and be sure that the rain gauge is level.
4. Wind Monitor
    a) Check for free horizontal movement of the wind sensor
    b) Check for free movement of the propeller. Do not use WD-40 or any lubricants other than the oil specified by the manufacturer.
    c) Verify that the propeller nut is secured to the shaft.

5. Temperature/Relative Humidity Probe
    a) Check that the radiation shield and the sensor end cap are free from debris.
    b) Check the sensor end cap by removing the sensor from the radiation shield. It is fastened by a plastic compression screw which screws into the shield.
    c) Check the screen for debris and clean it of dirt and dust with a soft brush.
    d) Replace the end cap if it is still dirty.
6. Datalogger Enclosure
    a) Open the enclosure and inspect it for bugs, webs and moisture.
    b) Replace the desiccant packs with new, dry ones.
    c) Verify that the conduit putty is firmly sealed around the sensor leads and that there is no light showing through the conduit hole. If there is, firmly press the putty around the conduit until it is sealed.
    d) Remove the PS12LA cover and check if the red LED is lit. If not, it may indicate a problem with the solar panel or charging circuit.
    e) Check sensor leads going to the CR10 wiring panel. Firmly secure the screw terminals of any loose sensor leads.
    f) Connect the SC32A to the CR10. Start **Graph Term** and enter the **Monitor Mode.** Check the current sensor readings. Take note of any readings of -99999. This indicates a faulty sensor or loose connection. Verify that the CR10 clock is correct.
7. SPS AWS LOG
    a) On completion of the AWS installation, the RSC affixed a copy of data sheet SPS_AWS_LOG to the inside of the enclosure door.
    b) An entry to this sheet must be made each time the station is visited. Include visits for data download, routine maintenance, sensor calibration and/or replacement.

AWS sensors should be calibrated and replaced in accordance with LTPP Directives AWS-4: Check-Out Procedure and Calibration of AWS Sensors and AWS-19: Replacement of AWS Parts (or current versions), except that the two-year cycle required by these directives is waived. In those cases where maintenance and calibration of the AWS is no longer possible due to resource constraints or other reasons, consideration should be given by the RSC to the termination of AWS data collection at the site.

Termination of AWS Data Collection

For active AWS locations, data collection efforts by the RSC shall be terminated effective midnight on December 31, 2008.

AWS data collection may also be terminated prior to December 31, 2008 if either of the following conditions occurs:

- SPS project is no longer active (out-of-study) and project is not a Traffic Pooled Fund Study site.
- Quantity and/or quality of data being generated by the AWS, as judged by the RSC, no longer warrant further expenditure of resources.

Note: If one or more of the AWS components go out of calibration but data collection is continued at the site, the data for those components should be edited out before entry into the database.

Once AWS data collection is terminated at a site and the highway agency is not going to be taking responsibility for the equipment, the RSC will remove the AWS equipment during a visit to the site. In addition, the RSCs should put a comment in the AWS_COMMENT table on the date the AWS equipment was removed or taken out of LTPP service.

AWS Problem Reporting

In case AWS-related problems are encountered, an AWS problem report (AWSPR) forms shall be completed and submitted to the FHWA LTPP staff member responsible for AWS operations, with copies to the LTPP Technical Support Services Contractor (TSSC) and to the AWS coordinator at each RSC office.

An updated version of the AWSPR form is attached to this directive. The AWSPR form is self explanatory and it uses the same convention as the previous version of the AWSPR form, which is repeated below for completeness. The number consists of two parts as follows:

- A letter code representing the agency submitting the problem -- "F" for FHWA LTPP Division, "NA" for North Atlantic RSC, "NC" for North Central RSC, "S" for Southern RSC, "W" for Western RSC, "TSSC" for Technical Support Services Contractor, and "O" for others.

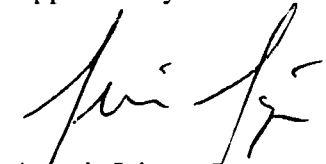
- A number code representing the AWSPR number for the submitting agency, in sequential fashion starting from 1. New AWSPR shall follow the numbering sequence already in place for the agency; i.e., do not re-start with 1.

For example, F-07: represents the seventh problem reported by the FHWA LTPP Division; and NA-23: represents the 23rd problem reported by the North Atlantic RSC.

A complete set of AWSPR submittals will be maintained by the TSSC, who will generate periodic reports summarizing the status of the AWSPR and post them on the TSSC web page.

Prepared by: TSSC

Approved by:



Aramis López, Jr.
LTPP Team Leader

Agency:_____
AWSPR #:_____

LONG-TERM PAVEMENT PERFORMANCE (LTPP)
LTPP SPS AUTOMATED WEATHER STATIONS
AWS PROBLEM REPORT (AWSPR)

Attention:	Aramis Lopez	FAX: (202) 493-3161
	Gonzalo R. Rada	FAX: (301) 210-5032

Type of Problem: Guidelines ___ Equipment ___ Software ___ Name: _____ Version: _____ Other _____	Reported by: _____ Agency: _____ Date: _____ Urgent? (Y/N) Page ___ of ___
Description:	

THIS SECTION RESERVED FOR USE BY FHWA AND TSSC	
Received by: _____	Date Received: _____
Referred to: _____	Agency: _____
Date Referred: _____	Date Approved: _____
Resolution:	
Notes:	