Memorandum

U.S. Department
of Transportation

**Federal Highway
Administration**

6300 Georgetown Pike
McLean, Virginia 22101

Subject: **ACTION**: LTPP Directive AWS-18
Replacement of AWS Parts

Date: November 27, 2002

From: Jack Springer
Long Term Pavement Performance Team

Reply to
Attn of: HRDI-13

To: Dr. Frank Meyer, PM - LTPP North Atlantic Regional Contract
Mr. Tom Wilson, PM - LTPP North Central Regional Contract
Mr. Mark Gardner, PM - LTPP Southern Regional Contract
Dr. Sirous Alavi, PM - LTPP Western Regional Contract

Attached is the Long Term Pavement Performance (LTPP) Directive AWS-18. LTPP Directive AWS-4: Check-Out Procedures and Calibration of AWS Sensors details the procedures to be followed by the regional contractors to check-out the condition of active AWS and, as appropriate, to calibrate and/or replace them. However, that directive does not explicitly address equipment parts. Accordingly, this directive supplements the procedures detailed in LTPP Directive AWS-4 to minimize the potential for loss of AWS data by replacing time or wear sensitive parts. This directive should be transmitted to all appropriate personnel as soon as possible.

If you have any questions concerning this transmittal, please do not hesitate to call me at (202) 493-3144.

Attachment

FHWA:HRDI-13:JSpringer:mad:493-3144:11/27/02
File: c:\mdeeney\directives\aws_18.doc
cc:
Mactec/Law PCS
Robin Belt
Brandt Henderson
Nadarajah Suthahar
Haiming Huang
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-18
Date:	November 27, 2002	Supersedes:	N/A
Subject:	Replacement of AWS Parts		

A number of LTPP automated weather stations (AWS) have been in operation for more than five years, and some of them are beginning to experience equipment related problems that have resulted in the loss of data. LTPP Directive AWS-4: Check-Out Procedures and Calibration of AWS Sensors details the procedures to be followed by the regional contractors to check-out the condition of active AWS and, as appropriate, to calibrate and/or replace them. However, that directive does not explicitly address equipment parts. Accordingly, this directive supplements the procedures detailed in LTPP Directive AWS-4 to minimize the potential for loss of AWS data by replacing time or wear sensitive parts.

Effective immediately, the following list of parts shall be considered for replacement on a two-year cycle, in conjunction with the LTPP Directive AWS-4 activities.

Precipitation Gauge

The following AWS precipitation gauge (tipping-bucket) parts should be replaced as part of the checkout and calibration procedures required by LTPP Directive AWS-4:

- 27 VDC Surge Suppressor part # 46311502. The surge suppressor is placed between the +/- leads on the 2-pin terminal block for the signal output to the datalogger. Burn marks at the terminals or between the suppressor and terminal base is an indication the surge suppressor should be replaced. In addition, because surge suppressors are relatively inexpensive, the regional contractors may consider replacing them during each maintenance visit.
- Allen head screws to retain tipping bucket paddles (loctite in place); replacement SS hex socket set screw with cup point part # SS2003.
- Precision bearing for rotation of pendulum shaft; bearing dimension .250X.375X.125. If an examination of the bearing indicates loss of lubricant or signs of rust, the bearings should be replaced.

- Barrel Switch activated by magnet as the tipping buckets are tipped. Part # 51001802. This part should not require replacement if the tipping bucket calibration is repeatable.
- Magnet to trip proximity sensor; Radio Shack part # 64-1883. Since these magnets weaken over time, it is recommended that the regional contractors replace them during each maintenance visit.
- Fire rod (large Capacitor) for heating the tipping bucket funnel; replacement part # 9407-J2N45 (100 W). Examine for corrosion or inability to heat rain gage funnel. Replace as required.
- Thermostat. A thermostat mounted to the bottom of the funnel controls the rain gage heater. Placing a bag of ice in the funnel should cause the thermostat to activate the heater (fire rod) causing the ice to melt in the rain gage funnel. Vendor should be contacted for replacement thermostat, if needed.
- Heater fuse; 4 amp 120 VAC.

Wind Speed and Wind Direction Sensors

The wind speed and wind direction sensor bearings are checked as part of the LTPP Directive AWS-4 checkout and calibration process. They should be replaced if either of the bearings offer resistance or a noticeable 'wobble' is observed when the wind propeller is rotated. Replacement bearings can be purchased from the vendor.

- 05124VG Vertical shaft bearing – 2 required.
- 05163PG Flange bearing – 2 required.

The wind gauge degree of movement is checked with the vane angle bench stand. If the measurements exceed the 3-degree tolerance establish for calibration check, the problem may exist as a result of corrosion at the circuit board or failure of the potentiometer. If the problem exists after cleaning the circuit board and stripping back the wire insulator to expose clean wire, it is highly likely that the potentiometer needs to be replaced. As this is a precision instrument, only skilled technicians should attempt replacement of the potentiometer.

- 05133B Potentiometer – 10K ¼% Lin Cond Plastic.

Relative Humidity Sensor

Careful consideration should be given to replacement of the relative humidity sensor based on the results of the calibration required by LTPP Directive AWS-4. If the calibration check conducted in the regional office shows that the sensor in question is acceptable, then it may be returned to service in the field. However, prior to putting back in service, the filter should be replaced to reduce the possibility for erroneous readings as a result of moisture getting trapped in the dirt accumulated on the filter. The filter should be cleaned in distilled water, dried in a microwave oven and returned to service, providing there is no deterioration of the filter. The replacement HMP45 RH/ATP has a "removal-head," which make the field removal process for much easier and reduces the potential for wiring problems

Batteries

The 12V 7-amp battery should be replaced on a 4-year cycle to minimize the risk of data loss as a result of a failed battery.

Regional contractors may also consider replacement of the SM-192 Storage Module batteries, and especially those that have been in service for more than five years. However, only skilled technicians should attempt to replace these batteries, as it requires working with live voltage. If a regional contractor does not feel comfortable doing this, it may go directly to the vendor for replacement of the battery.

Cables and Wires

Frayed or damaged cable casing or wires should be replaced as part of the LTPP Directive AWS-4 procedures. Minor nicks may be repaired and protected with rubberized tape. If an instrument is disassembled, then regional contractor personnel should replace its cables.

Equipment	Wire colors	# Wires	Length of Wire	Wire location
Wind Gage	Black of Red	6	11 ft.	G
	Black of Green			AG
	Green			2L
	Black			E2
	Red			P1
	Clear			G
Pyranometer	Red	4	10 ft.	3H
	Black			3L
	White			AG
	Clear			G
Tipping Bucket	Red	2	24 ft.	P2
	Black			G

Note: Replacement cable can be purchased from electronic supply centers or from vendor. The pyranometer has a Campbell Scientific interface attached to the cable that needs to be purchased from Campbell Scientific.

In addition to the equipment parts listed above, regional contractors may also consider the use of tools to diagnose problems with the AWS sensors, and therefore to reduce the potential for loss of data. For example, Campbell Scientific has a tool called the keyboard display (Part No. CR10KD) used to access the datalogger to check the eprom, to check and make changes to the program, or to determine if there is a communication problem with the computer/SC32A interface. However, the regional contractors must obtain COTR approval before purchasing any diagnostic tools.

Prepared by: NARSC and TSSC

Approved by:

Aramis López, Jr.
LTPP Team Leader