CALIBRATION OF AIR SAMPLING STATIONS

Purpose

This Meteorology and Air Quality Group (MAQ) procedure describes the process for replacement of AIRNET sampling pumps and the calibration of airflow after installation.

Scope

This procedure applies to the individual assigned to maintain the air pumps used as part of the Meteorology and Air Quality Group ambient air sampling network (AIRNET) system.

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Signatures

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12/16/04

General information about this procedure

Attachments

This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Hazard Review	2

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description of Changes
0	4/4/95	New document.
1	10/9/96	Safety considerations added, documentation requirements added and clarified, calibration tolerance corrected to ±0.4 from ±0.2 CFM, removed steps for tygon exhaust tubing.
2	7/16/97	Added references to new model of Buck calibrator.
3	8/26/98	Changed criteria and steps for adjusting flow, added Mid-Sampling Period Change of Flow Form.
4	2/2/99	Added requirements for wearing safety shoes when moving pumps; separated steps for calibrating filter and gel flows.
5	2/22/00	Made minor changes to HCP, added HCP as attachment 1, removed attachment "Mid-Sampling Period Change of Flow Form," and added reminders to use lifting equipment and gloves.
6	11/1/00	Changed weight of pumps, changed steps to measure flow after pump replacement.
7	12/10/02	Quick-change revision to change "breaker" to "GFCI" and instructions when calibrator does not agree with silica gel flow meter.
8	12/14/04	Describe use of in-house calibrators.

Who requires training to this procedure?

The following personnel require training before implementing this procedure:

- employees assigned to calibrate air sampling equipment

Employees previously trained to revision 6 of this procedure do not require retraining to this revision.

General information about this procedure, continued

Training method

The training method for this procedure is **on-the-job training** by a previously trained individual and is documented in accordance with the procedure for training (MAQ-024).

Prerequisites

In addition to training to this procedure, the following training is also required prior to performing this procedure:

- RRES-ES-Field, "Field Safety For All Employees"
- RRES-ES-Driving, "Driving and Towing Safety For All Employees"
- MAQ-011, "Logbook Use and Control"
- MAQ-202, "Environmental Sampling of Airborne Particulate Radionuclides"
- MAQ-204, "Sampling of Airborne Tritium"
- Rad Worker training
- CPR and First Aid
- TA-54 site-specific training
- TA-15 site-specific training
- PS-13 training "Electrical Safe Work Practices for Nonelectrical Crafts Workers" (course #12175)

Periodically review the field safety information in the Employee Notebook (see MAQ-032).

References

The following documents are referenced in this procedure:

- RRES-ES-Field, "Field Safety For All Employees"
- RRES-ES-Driving, "Driving and Towing Safety For All Employees"
- MAQ-024, "Personnel Training"
- MAQ-032, "Orienting New Employees"
- MAQ-011, "Logbook Use and Control"
- MAQ-202, "Environmental Sampling of Airborne Particulate Radionuclides"
- MAQ-204, "Sampling of Airborne Tritium"
- MAQ-254 "Using The Roots Meter To Calibrate Flow Calibrators"
- MAQ-255, "Using the Bell Prover to Calibrate Flow Calibrators"

Note

Actions specified within this procedure, unless preceded with "should" or "may", are to be considered mandatory guidance (i.e., "shall").

Replacement of pumps

Caution at damaged stations

When approaching a station, if the AIRNET station housing appears damaged in such a way that electrical wires are exposed or could be shorted to the housing or conduit, **do not touch the station!** Immediately report the damage and request that an electrician repair the electrical damage.

Required safety equipment

Wear steel-toed shoes anytime you are carrying or lifting pumps. Use the lift table and tailgate of the truck to assist with lifting pumps. Avoid "dead lifts" from ground level; get help to lift pumps on the ground or floor.

Safety in the field

Review the field safety concerns in the document RRES-ES-Field. This reminds you about hazards of thunderstorms, working alone, falling, electricity, and other requirements for going into the field.

Regular replacement of pumps

Replace vacuum pumps in the AIRNET sampling stations every six months according to the rotation schedule in the AIRNET Field Log (kept inside the front cover of the field logbook).

Replacement pumps are kept at the Cave at TA-54-1001.

CAUTION: The pumps will be hot after running continuously – use gloves to handle hot pumps.

CAUTION: Pumps weigh 40 to 60 pounds -- use proper lifting techniques or get assistance when moving them.

Checking tubing

Whenever a pump is replaced, reattach exhaust and intake hoses, and check all fittings and airflow passages for leaks or obstructions. Pay particular attention to the joints between airflow tubing and brass fittings, located on the rear of the sampling head. Replace any tubing that appears brittle or torn.

After a new pump has been installed in the station, calibrate the sampling heads according to the instructions in the following chapter.

Replacement of pumps, continued

Recording pump replacement

Enter the following information in the field log book (make all logbook entries according to MAQ-011):

- station number and location
- date and time
- name or initials of installer
- end filter flow (as-found flow)
- end silica gel flow (as-found flow)
- replaced pump number
- installed pump number

Calibration of pump flow

Calibration

Recalibrate vacuum pumps in the AIRNET sampling stations every six months according to the rotation schedule in the AIRNET Field Log (kept in the Cave TA-54-1001).

Replace a pump after six months of service. When a pump is replaced, perform the following steps to calibrate the airflow through the filter assembly. Collect the equipment listed below before leaving for the sampling sites.

Equipment needed

The following equipment and tools are needed to perform pump calibrations at the sampler sites:

- Model C-828 Air Flow Calibrator (kept in TA-54-1001)
- Mini-Buck Model M-30 or M-5 Calibrator (kept in TA-54-1001)
- soap solution (kept in Calibrator carrying case)
- new filter and filter holder (for checking calibrated air flow)

Steps to calibrate the filter air flow

To calibrate the air flow through the filter, perform the following steps:

Step	Action
1	Record the date, station number, filter flow rate, silica gel flow rate, and timer reading.
2	Disconnect the air filter cartridge from the sampling head, and set aside temporarily. Replace with a cartridge containing a clean filter.
3	Slip the Model C-828 Air Flow Calibrator over the clean cartridge.
4	Using the large black knob on the front of the sampling head, adjust air flow to 4.0 ±0.4 CFM, indicated on the calibrator.
5	Remove the Air Flow Calibrator from the sampling head, remove the clean cartridge, and reconnect the air filter cartridge.
6	Slip the calibrator over the cartridge with the current filter and record the indicated flow.

Calibration of pump flow, continued

Steps to calibrate the silica gel air flow

To calibrate the air flow through the silica gel, perform the following steps:

Step	Action
1	Place the Mini-Buck Model M-30 or M-5 Calibrator in the air station enclosure, in the shade if possible. Turn on the Calibrator.
2	If additional soap solution is needed, add approximately 1 teaspoon of soap solution to the inlet tube at the bottom of the Calibrator.
3	Pull the tritium cartridge out of its holder on the bottom of the air sampling enclosure. Connect the quick-disconnect fitting to the bottom of the cartridge. Connect the outlet fitting of the calibrator to the cartridge. (The outlet fitting is at the end of a piece of flexible tubing connected to the Model M-30 or M-5.)
4	Depress the calibrate button on the M-30 or M-5, and hold until a bubble forms in the base of the unit (normally about 1 second). Release button.
5	Within 1 minute the flow, in cc/min or L/min, should be displayed on the calibrator. Note in the logbook the flow indicated by **both** the calibrator and the flow meter.
6	Turn off and disconnect the calibrator. Remove the quick-disconnect fitting from the cartridge and return the cartridge to its holder.

Test GFCI

Press the "TEST" button on the GFCI. Verify that the breaker stops the pump and that it resumes when power is restored. Record the test actions in field logbook.

Record calibration data

Once calibration has been completed, enter the following information into the AIRNET Field Log:

- date and time
- name or initials of calibrator
- pump number
- identifier (e.g., serial number) of the calibrators used
- calibrated flow of silica gel (as indicated by calibrator)
- silica gel flow meter reading
- calibrated flow of filter (as indicated by calibrator)
- filter flow meter reading
- test of GFCI breaker

Calibration of air flow calibrators

Annual calibration of Model C-828 calibrators

Every year, recalibrate the C-828 calibrators according to MAQ-254 or MAQ-255.

If needed, return the calibrators to the factory at the addresses below.

Annual calibration of Model C-30 and M-5 calibrators

Every year, recalibrate the Model C-30 and M-5 calibrators by returning to the manufacturer factory at the addresses below.

Manufacturer addresses

Model C-828 calibrators:

SAIC Radeco
4161 Campus Point Rd.
San Diego, CA 92121
Phone 619-458-3831

OR

Hi-Q
7386 Trade Street
San Diego CA 92121
Phone 858-549-2820

Model C-30 and M-5 calibrators:

A. P. Buck Inc.
3139 S. Orange Ave.
Orlando, Fl 32806
Phone 407-851-8602

Maintain records

Maintain all records of the calibration and maintenance performed on the calibrators, including the certificates of calibration.

Records resulting from this procedure

Records

The following records generated as a result of this procedure are to be submitted as records to the Records Coordinator:

- entries in the AIRNET field log (made according to MAQ-011)
  -- date and time
  -- name of installer
  -- numbers of pumps removed and installed
  -- flow rates before and after pump replacement
  -- identifier of calibrators used

- certificates of annual calibration of the calibrators

HAZARD REVIEW

Work tasks/Steps	**Hazards, Concerns, and Potential accidents; Likelihood/ Severity**	**Controls, Preventive Measures** *(e.g., safety equipment, administrative controls, etc.)*	**Hazard Level** *from IMP 300-00-00 Hazard Grading Matrix*
Load pumps into vehicle and carry pumps to and from AIRNET station.	Dropping pumps onto feet. Lifting injuries. Improbable / Critical = Low	Steel-toed shoes/boots must be worn whenever carrying pumps. Use proper lifing techniques when carrying pumps.	Low
Change and calibrate pumps according to steps in chapter "Replacement of Pumps" in this procedure.	Thermal burns--skin burns from pumps Occasional/Negligible = Minimal	Use care to avoid these injuries. Wear long protective gloves when reaching around hot pump exhaust line and when carrying hot pumps. Exhaust line has been wrapped at all stations.	Low
As part of work, enter radiation areas and explosives testing areas.	Site-specific hazards such as high explosives testing (TA-15, TA-16, TA-49) or radiation Areas (TA-54- Area-G, TA-16) Remote / Negligible = Minimal	Comply with all site-specific access requirements. Existing facility access controls include site specific training, sign-in/sign-out, and scheduling procedures. Area-G and TA-15 require entry through manned access control gates.	Low
As part of work at AIRNET stations, work around electrical equipment.	Electrical shock in wet conditions Remote / Catastrophic = Low Electrical shock from electrical conduit damaged by vehicle or large animal Improbable / Catastrophic = Medium	For wet conditions, all stations were retrofitted with GFCI (ground fault interrupts). If damaged station is found with potential for electrical contact in damaged conduit, contact electrician to shut off power prior to any further work.	Low

Wastes or residual materials resulting from process	None.
Emergency actions to take in event of control failure	For all injuries, provide first aid and see that injured person is taken to Occupational Medicine (only if immediate medical attention is not required) or the hospital. Notify supervisor and group office as soon as possible. For any exposed, energized electrical wires, contact an electrican or the appropriate authority to turn off the power. Follow all site-specific emergency plans for any radiation or explosives emergencies.