CLARK COUNTY DEPARTMENT OF AIR QUALITY

Monitoring Division

PROCEDURE NUMBER 400

STANDARD OPERATING PROCEDURE FOR

Particulate Matter Instruments

Revision number 1

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APPROVALS:

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Revision History

No.	Date	Author	Description of Change	Affected Pages
0	12/04/13	M. Nelson	Original issuance	All
1	08/05/15	K. Simonian, M. Nelson, D. Dickens	Combined all Particulate Matter SOPs into one SOP	All

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ACRONYMS AND ABBREVIATIONS

Acronyms

DAQ	Clark County Department of Air Quality
QC	Quality Control
QA	Quality Assurance
NIST	National Institute of Standards and Technology
U.S. EPA	United States Environmental Protection Agency
TTN	Technology Transfer Network

Abbreviations

Thermo 5014i	Thermo Fisher Scientific 5014i Continuous Air Sampler
FEM	Federal Equivalent Method
Pb	Lead
PM	Particulate Matter
PM 10	Particulate Matter at 10 microns and less
PM 2.5	Particulate Matter at 2.5 microns and less
µq	microns
DC	Direct Current
AC	Alternating Current
RS232	Serial Port Cable
CAT5	unshielded twisted pair type cable
VSCC	Very Sharp Cut Cyclone

1.0 PURPOSE

The purpose of this procedure is to establish a uniform process for field operation and verification of particulate samplers within the Monitoring Division of the Clark County Department of Air Quality (DAQ).

2.0 SCOPE/APPLICABILITY

This procedure provides instructions on conducting QC field operations of particulate samplers. Further details on these operations are found in the associated references.

3.0 DEFINITIONS

DAS - Data Acquisition System includes the central servers and web page generation programs used by the Monitoring Division of DAQ to collect, control, record and display of data from continuous particulate monitors. Filter-based sampler data is stored on the DAQ Network Drive and entered manually into the AQS database.

4.0 ROLES AND RESPONSIBILITIES

It is the responsibility of the Quality Control (QC) Technician to conduct these operations anytime a sampler is placed into operation, repair work is conducted on the sampler, or the instrument is operating outside its normal operating parameters.

The QC Technician will be familiar with the equipment required to conduct these activities.

The QC Supervisor is responsible for inspecting and verifying that the work performed follows acceptable procedures.

It is the responsibility of the Quality Assurance (QA) Technician to verify operation of monitoring instrumentation through the QA Audit Procedures.

5.0 PROCEDURE

This procedure and associated guides cover acceptance testing, setup, calibrations, QC checks, and maintenance of particulate instruments. Additional information can be obtained from the product manufacturer and additional reference material listed in this document.

5.1 Summary of Method

This procedure requires an operational monitor (refer to the Instrument Acceptance Testing-Setup-Operating Guide), properly operating station test equipment (refer to the Equipment and Supplies Section of this SOP), and a trained operator. Monitor calibration is performed for detector response, flow, temperature, pressure, and relative humidity parameters. Operation requires routinely verifying flow, temperature, and pressure sensors. Preventive maintenance

(refer to the Maintenance, Calibration, Certification, Firmware Schedules) is performed to minimize unanticipated failures.

5.2 Health and Safety Warnings

Hazards from physical activities involved in this procedure (lifting, carrying, climbing ladders, etc.) can be minimized by using proper procedures for these types of activities.

Personnel must observe standard safety precautions whenever electrical equipment is operated, and use normal precautions when working on the inside of the analyzer with the power connected. Multiple monitoring instruments are powered by 120 volts alternating current (AC), and the analyzers are supplied with a 3-wire, grounding line cord. Under no circumstances should the analyzer be operated without an electrical ground.

Certain operations, such as replacing filter tape, are required when the monitor is in operation. Caution must be taken when working on an instrument when energized. Some components may have minimal electrical hazards due to the low voltage direct current (DC) of some of the internal parts, but 120 volts AC is active inside the unit. As with all electrical work, precautions should be taken to avoid unnecessary exposure to electrical shocks.

Continuous particulate monitors use a weak, radioactive source for measurement. Only qualified and trained personnel may access or handle a radioactive source. Neither the source nor the beta particle detector is serviceable in the field.

Refer to the manufacturer's equipment manual for additional safety precautions.

This list is not all inclusive of the risk involved in this procedure. Common sense, safety training, and supervisory communication are advised for any questions about safety concerns.

5.3 Cautions

Degrading of wiring both internal and external to the sampler can affect the sampler's operating system. A damaged sampler component can also cause erratic readings within the system. Care should be taken in the handling and installation of equipment. If the sampler is mounted on a stand, it could fall or tip over in high wind conditions if the stand is not properly anchored.

5.4 Interferences

Damaged equipment and compromised data logger wiring (refer to the Data Logger Guide) can cause poor equipment performance. Inspection and replacement of any suspect equipment is recommended. Faulty equipment connections, loose or crimped data logger wiring, improper handling of filters, torn or contaminated filter tape, and dirty inlet heads can alter particulate monitoring data. Local events such as structure fires, brush or forest fires, fireworks, roadwork, and chemical spraying can affect ambient particulate data. Progeny nuclides of Radon gas can interfere with continuous particulate monitor ambient data.

5.5 Equipment and Supplies

A particulate sampler that is properly installed and configured (refer to the Instrument Acceptance Testing-Setup-Operating Guide)

Certified, NIST-traceable standards such as:
Flow standard
Temperature standard
Relative humidity standard
Barometric pressure standard
Digital manometer
Foil set

Computer to access spreadsheets, SOP, logs, etc.
Hand tools and voltmeter
Leak test adaptor and disks

Spare filter tape
Cleaning swabs and supplies

5.6 Procedures

5.6.1 Calibration and Verification

This procedure assumes that continuous instruments are set up to transmit data to the DAS (refer to the Communications Setup Guide). It also assumes that all data logger wiring is complete for continuous instruments (refer to the Data Logger Guide), and calibration equipment is available for continuous and manual instruments.

This procedure prepares the instrument for field operation (refer to the Instrument Acceptance Testing-Setup-Operating Guide & the Maintenance, Calibration, Certification, Firmware Schedules)

Use the appropriate spreadsheet to document the instrument indicated parameters and the standard's readings. Adjust the instrument as necessary. Parameters may include one or more of the following: Relative Humidity, Ambient Temperature, Flow Temperature, Filter Temperature, Filter Compartment Temperature, Flow Rate, Barometric pressure, Filter Pressure, Vacuum Pressure, Mass, Leaks, and Date and Time.

5.6.2 Computer Hardware and Software requirements

Laptop or Desktop computer connected to the instrument or data logger and web pages. Software required for communicating (refer to the Communications Setup Guide) to the

instrument or data logger (refer to the Data Logger Guide). Copy or access to the correct associated spreadsheet or word documents for the work involved.

5.6.3 Data Acquisition, Data Reduction, and Calculations

Data acquisition and reduction is automated for continuous monitors, but requires QC and QA review before being submitted to the national database. For the filter-based monitors, data are entered manually into spreadsheets where the concentrations are calculated, before being reviewed and entered into the national database.

For speciation samples, the contracted lab performs its analysis for DAQ and posts the data directly to the AQS database. For Pb samples, the contracted lab performs its analysis and returns the data to DAQ, which posts the results to the AQS database.

5.6.4 Troubleshooting

Many instrument faults are due loose wiring or parts malfunction (flow controller). Double checking connections of all types will save time in hunting down potential system errors.

When required, consult with other Monitoring Technicians, Senior Monitoring Technicians, or Monitoring Supervisors for additional assistance with troubleshooting.

Refer to the manufacturer's manual for assistance in trouble shooting issues. Most manuals have the manufacturer's direct phone number or email address for technical support.

If problems arise consult:

The proper equipment manual,
Other Monitoring Technicians,
Senior Monitoring Technicians,
Monitoring Supervisors,
Equipment Manufacturers

6.0 RECORDS MANAGEMENT

All work conducted must be documented as noted in the appropriate instrument and station electronic logs (refer to SOP 100 Monitoring Stations Operations and Logbook Entries).

Any documentation of work conducted on the instrument should be saved to the DAQ Network Drive using the proper naming convention. All electronic records stored on the DAQ Network Drive are considered to be the official record of activity. This location allows for review by Monitoring Seniors, Supervisors, the QA Technician, and Management.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

QC activities are designed to allow verification of the quality and consistency of work. The appropriate QC procedures (flow verifications, leak tests, sensor checks) and QA material (such as collocated samples, and performance evaluation samples) (refer to SOP 800 QA Audits and CARS) are required to demonstrate successful performance of the method. Adherence to QC and QA schedules/frequencies (refer to Maintenance Calibration Certification Operations and Firmware Schedule) are also required.

Management and Supervision have determined that following the proper procedures for instrument calibration and operation falls within the United States Environmental Protection Agency (U.S. EPA) guidelines and rules for these instruments.

The QA Technician has the ability to review all procedures and equipment operations set forth in this SOP and associated guides.

8.0 REFERENCES

U.S. EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume II: Ambient Air Quality Monitoring Program (December 2008), located at http://www.epa.gov/ttnamti1/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf

40 CFR 50, Appendix L & N. The Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere

Additional Documents:

Guides
Manufacturers Equipment Manual, located on the DAQ Network Drive
Monitoring Equipment Wiring Guide, located on the DAQ Network Drive
Vendor Specific Software, located on the DAQ Network Drive or Vendor Website
Communications Setup Guide
Instrument Acceptance Testing, Setup & Operating Parameters, and Designations Guide
MQO Guide
Station Temperature Calibration Guide
Data Logger Guide
Sutron Guide *(under development)*
Volt Meter Verification Guide
Zero Air Generator Verification Guide

Schedules
Maintenance Calibration Certification Operations and Firmware Schedule
Operational QC Checks Schedule

SOPs
100 Monitoring Stations Operations and Logbook Entries

800 QA Audits and CARS
700 Data Validation Operations
405 Gravimetric Laboratory Operations

Training Material
Advanced Cal Span Interpretation
Calibration Limits
Is The Data Good
Manual Validation Presentations