

CLARK COUNTY DEPARTMENT OF AIR QUALITY

Monitoring Division


PROCEDURE NUMBER 405

**STANDARD OPERATING PROCEDURE FOR
PM GRAVIMETRIC LABORATORY OPERATIONS**

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ACRONYMS AND ABBREVIATIONS

Acronyms

DAQ	Clark County Department of Air Quality
FDS	Field Data Sheet
FRM	Federal Reference Method
HEPA	High efficiency particulate air filter
NAAQS	National Ambient Air Quality Standard
NIST	National Institute of Standards and Technology
PM	Particulate Matter
PTFE	Polytetrafluoroethylene or Teflon
QC	Quality Control
QA	Quality Assurance
U.S. EPA	United States Environmental Protection Agency

Abbreviations

gr	grams
µg	micrograms
µg/m ³	micrograms per cubic meter

1.0 PURPOSE

The purpose of this procedure is to establish uniform process for the Gravimetric Laboratory within the Monitoring Division of the Clark County Department of Air (DAQ).

This SOP deals with the operation and maintenance of the Federal Reference Method (FRM) Particulate Matter at 2.5 microns (PM 2.5) Gravimetric Laboratory. The Laboratory is not in compliance with the Americans with Disabilities Act (ADA) and should remain that way due to the type of work that Technicians are required to perform.

2.0 SCOPE/APPLICABILITY

This procedure provides general guidance on accepting, conditioning, weighing, supplying, recording, and archiving filters for use in ambient air monitoring of airborne particles with an aerodynamic size less than or equal to 2.5 microns using the Federal Reference Method.

3.0 DEFINITIONS

Field Data Sheets are the chains-of-custody forms for field operators, and where the sample volume is recorded.

Lab: The FRM PM 2.5 Gravimetric Laboratory is also referred to as the filter lab or the FRM lab.

Microbalance: a laboratory balance with a weighing precision of plus or minus one microgram.

4.0 ROLES AND RESPONSIBILITIES

It is the responsibility of the Monitoring Technician to conduct these operations to prepare and provide Monitoring Technicians in the field with the filters required for sampling PM 2.5 for NAAQS sampling and for special events sampling. The Laboratory Technician also records and manages data, chain-of-custody forms, and laboratory logs. The Monitoring Technician also maintains and services the microbalance and the laboratory environmental control unit.

The Monitoring Technician should be aware of the equipment required to conduct these activities as outlined as well as the general knowledge of how the system works in its entirety.

It is the responsibility of the Supervisor to inspect and verify that the work performed followed all acceptable procedures.

It is the responsibility of the Quality Assurance (QA) Officer to verify laboratory operation through the QA Audit Procedures.

5.0 PROCEDURE

This procedure and associated guides covers the operations that are to be conducted in order to support filter-based PM 2.5 sampling by providing the filters used in the field, and performing the required gravimetric analysis.

5.1 Summary of Method

Filters are accepted, conditioned, and weighed in a temperature and humidity-controlled environment. Gravimetric analysis is performed with a microbalance with a readability of plus or minus 1 microgram and a repeatability of 1 microgram. The microbalance must be located in the same controlled environment in which the filters are conditioned. To reduce dust contamination, positive pressure, HEPA filters, tacky mats, and gloves are used. To reduce static charge contamination, a static reducing pad, static wipes, and de-ionizing strips are used. Certified, NIST-traceable mass standards are used to verify microbalance performance.

Filters are conditioned and weighed prior to sampling, packaged in the appropriate cassettes along with the Field Data Sheet, and provided to the operators for field use. After sampling, the filters are conditioned and weighed again, and the recorded weights are used to determine the mass and concentration values. Filters are then archived and stored in freezers for the specified duration. An Excel spreadsheet is for data recording and calculating, and results are reported.

QA conducts an independent review and assessment of lab operations during audit procedures.

5.2 Health and Safety Warnings

To prevent personal injury, all employees must heed any warnings that are associated with the operation of the microbalance, the PM 2.5 sampler, and any supporting equipment and supplies. Anti-static strips use Polonium 210, an alpha particle emitter, for de-ionization, which can be fatal, if ingested.

It is the responsibility of the employee to be aware of high voltage electricity, moving mechanical parts, chemical hazards, pressurized water and refrigerant lines, and equipment placement and stability hazards in the laboratory and field environments, and to take the necessary precautions to prevent injury.

5.3 Cautions

Improper handling or over taxing the microbalance can severely damage sensitive parts. Improper handling of filters, dust or particulate contamination, heat, and reactive chemicals can degrade or void the integrity of the sample.

5.4 Interferences

Volatilization of certain volatile organic compounds collected can reduce mass of the sample. Particulate contamination and static charge can cause large interferences of the sample, and should be avoided during handling in the lab and the field.

5.5 Equipment and Supplies

A temperature and humidity controlled laboratory environment for conditioning and weighing filters.

A supply of filter 46.2 mm PTFE Teflon filters

A microbalance with 1 microgram resolution

100 and 200 mg NIST-traceable mass reference standards and mass working standards

NIST-traceable hygrometer

Clean room, powder-free gloves

Static wipes and de-ionizing strips

Forceps (Metal and Plastic)

Filter cassettes, handling and shipping containers, and Petri dishes

Lab logbook and appropriate lab forms and Field Data Sheets

5.6 Procedure

5.6.1 Procedural Steps for accepting, conditioning, weighing, assigning, and archiving filters are detailed in the “Gravimetric Laboratory Filter Handling Guide.”

5.6.2 Periodic maintenance, Quality Control verifications, and Quality Assurance audit schedules for the samplers and the Gravimetric Laboratory are found in the “Maintenance, Calibration, Certification, Firmware Schedules Guide.”

5.6.3 Computer Hardware and Software

The analyst should have a copy or access to the correct associated spreadsheet or word documents for the work involved.

5.6.4 Data Acquisition, Data Reduction, and Calculations

Mass concentration calculations are performed in the Excel spreadsheet using data generated from the lab filter weighing sessions, and from data from the field provided by the sampler operators. All mass concentration and meta-data is reviewed with QA Data Specialist quarterly prior to submittal into the AQS database. Laboratory environmental data is recorded on a circular chart.

5.6.5 Troubleshooting

Most problems with environmental controller can be solved by verifying the set points and cycling the power (e.g. if unable to read the screen). Issues with the microbalance should be addressed by repeating the internal calibration sequence or cycling the power, and making sure the microbalance is properly cleaned and de-ionized. When required, consult with other Monitoring Technicians, Senior Monitoring Technicians, Monitoring Supervisors, instrument manual or vendor for additional assistance with troubleshooting.

Refer to the manufacturer's manual for assistance in trouble shooting issues. Most manuals have direct phone numbers to technical personnel at the manufacturer's location that can also assist in troubleshooting.

If problems arise consult:

The proper equipment manual,
Other Monitoring Technicians,
Senior Monitoring Technicians,
Monitoring Supervisor
Equipment Vendor

6.0 RECORDS MANAGEMENT

Filters, Laboratory Data Forms, Filter Assignments Logs, and Gravimetric Laboratory logbooks are records that are generated and stored in the lab, which is secure from unauthorized access. Spreadsheets and meta-data records are saved at the proper location on the divisions centralized designated storage area under the proper naming convention.

All electronic records stored in the divisions centralized designated storage area are considered to be the official record of the activity.

Field data sheets are records that accompany each filter to the field, and these records are completed by Monitoring Technicians in the field. When the filters are returned to the lab, they are retained in a secure location for the specified time period.

Filters are archived in frost-free freezers to preserve any volatile compounds, and may be analyzed for specific species after sampling.

These locations allows for review by Monitoring Seniors, Supervisors, QA Technician, and Management.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

Lot blanks and lab blanks are used to detect contamination from laboratory procedures.

Detailed laboratory and sampler specifications can be found in *U.S. EPA Quality Assurance Guidance Document 2.12, Monitoring PM 2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods (November 1998)*.

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

8.0 REFERENCES

MQO Guide

Gravimetric Laboratory Filter Handling Guide

Maintenance, Calibration, Certification, Firmware Schedules Guide

PGC Environmental Controller System Manual, located in the Gravimetric Laboratory.

Sartorius MSE6.6 Microbalance Manual, located in the Gravimetric Laboratory.

U.S. EPA Quality Assurance Guidance Document 2.12, Monitoring PM 2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods (November 1998).

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>