

FILTER CONDITIONING AND WEIGHING FACILITIES AND PROCEDURES FOR PM_{2.5} REFERENCE AND CLASS I EQUIVALENT METHODS

A. Microbalance Requirements and Recommendations

1. Must have a readability and repeatability of $\pm 1\mu\text{g}$.
2. Must be calibrated according to the manufacturer's instructions, prior to each weighing session.
3. Must be located in a controlled environment, as described in #B below.
4. Should be located on a clean, vibration-free surface.
5. Should be located in an environment free of air pulses or turbulence which might prolong or disrupt efforts to achieve stable weights.
6. Should be electrically grounded to reduce static.
7. Should be left on at all times.
8. Should be maintained and operated strictly according to the manufacturer's instructions.
9. Should have service agreement with a local balance company for routine independent calibrations (recommended every 6 months; or minimally every 1 year) and service calls.

B. Controlled Environment Requirements

1. Mean temperature: 20-23°C
2. Temperature control: $\pm 2^\circ\text{C}$ over 24 hours
3. Mean humidity: 30-40% RH, unless field sampling is done at less than 30%; then conditioning can be done within $\pm 5\%$ of that ambient humidity, but not below 20% RH. However, some laboratories operating balance rooms at 25-29% RH have reported increased problems with electrostatic charges while operating at these lower humidities.
4. Humidity control: $\pm 5\%$ RH over 24 hours.

C. Filter Conditioning and Weighing Requirements

1. Must be conditioned in the controlled environment for a minimum of 24 hours prior to weighing.
2. Must be conditioned in the same controlled environment in which the balance is kept.
3. Both pre- and post-sampling weighing should be carried out on the same balance, preferably by the same analyst.
4. An effective technique must be utilized to neutralize static charges on the filter. For further guidance see: *Cahn Technical Note: Static Control for Balances*, 6/90. This document is available within the U.S. EPA's Ambient Monitoring Technology Information Center (AMTIC) PM_{2.5} monitoring information web page.
5. The pre-sampling weighing must be carried out within 30 days of the sampling period.
6. The post-sampling weighing must be carried out within 10 days after the end of the sampling period, unless the filter is maintained at 4°C or less during the time between retrieval from the sampler and the start of the conditioning, in which case the period shall not exceed 30 days.
7. Field blanks must be utilized as QC checks.
8. Weighing room blanks must be utilized as QC checks.
9. In order to remove static electricity from filters, direct exposure to Polonium 210 strips is recommended. These strips should be replaced according to the manufacturer's instructions, usually within 1 year from date of manufacture.

D. Balance Room Recommendations

1. Collect temperature, pressure, and relative humidity data to evaluate candidate balance room locations before deciding which room or area to use or to modify and use. Determine static and vibration control by operating a micro-balance with known stability in the candidate room or area and determine any changes in performance. For detailed guidance, see:
 - a. *NIST/NVLAP Handbooks 150: Procedures and General Requirements*, and *150-2: Calibration Laboratories Technical Guide*, June 1996. These documents can be obtained by contacting: (301) 975-4016.
 - b. *Recommended Practice for Laboratory Design, RP-7, National Conference of Standards Laboratories*, July 25, 1993. This document can be obtained by contacting the National Conference of Standards Laboratories, 1800 30th St., Suite 305B, Boulder, CO 80301. Phone: (303) 440-3339.

2. Although referred to here as a "balance room," this can be any suitable area which meets requirements and recommendations for filter handling, conditioning and weighing.
3. The balance room should be large enough to comfortably house one or more microbalances, one or at most two microbalance operators/analysts at a time, a filter conditioning area, furniture, and all necessary support equipment such as shelves or surfaces to handle, condition, and store filters.
4. The balance room should be small enough to allow proper and economical control of temperature and humidity, and so that it is easy to maintain cleanliness.
5. The balance room should be a room within a building (or within another room) in order to facilitate stabilization of temperature and humidity control, while minimizing dust intrusion. Establishing a balance room in an outdoor shelter or trailer is discouraged.
6. The balance room should have its own independent temperature and humidity control systems, and therefore its own air circulation system. These systems may consist of heating, air conditioning, humidification, de-humidification, and dust control.
7. Continuous measurements of temperature and relative humidity should be recorded in the balance room. These measurements should be visible to the operator and retained. This can be accomplished by means of thermograph and hydrothermograph charts, or by means of temperature and relative humidity sensors interfaced with a data logger. These temperature and humidity sensors should be located as close as practical to the filter conditioning area so that their measurements are representative of this area. In addition, it should be verified that there are no significant temperature or humidity gradients in the balance room. Many experienced microbalance operators recommend temperature monitoring of the microbalance itself, in addition to the balance room area.
8. Temperature measurements in the balance room should be accurate to $\pm 1^{\circ}\text{C}$, and relative humidity measurements should be accurate to $\pm 2\%$ RH. These measurement systems should be calibrated at least monthly.
9. The balance room should have sufficient ventilation to properly condition the filters. However, air flow rates in the area of the microbalance should be very low. Therefore it is recommended that incoming air be baffled.
10. If the balance room contains a computer, it should be placed as far from the microbalance as possible. Computer printers should not be located in the balance room.
11. Laboratory blanks should not experience a weight change of more than $10\mu\text{g}$ over a period of 24 hours. In order to minimize dust intrusion, the air delivery/circulation system for the balance room should contain a HEPA filter. In addition, the door to the balance room should always be closed, except for entering and exiting the room. Further, it may be prudent to place a sticky floor mat near the door to the balance room.

Ideally, the entrance to and/or exit from the weighing room should be through a vestibule or anti-room to isolate from and therefore minimize changes caused by entry to or exit from the weighing room during weighing. The air pressure (and flow) gradient of differential from the weighing room to any adjacent rooms or corridors should be positive. In other words, the pressure should be slightly higher in the balance room than in the adjacent rooms or corridors.

12. The balance room should not contain the following: refrigerators, water sources (such as sinks), telephones, coffee makers, or anything not directly required for the balance room operation. Use of the balance room by more than two people at a time should be discouraged.
13. The balance room should be cleaned only by the operator and not by facilities janitorial staff. The use of cleaning solvents or any other chemicals in the balance room should be discouraged.
14. The balance room should be a restricted access area which should not be used for anything but conditioning and weighing filters, and loading filters into cassettes. All such operations should be performed on a clean laboratory mat.
15. In order to minimize vibration the balance should be located on a heavy table, preferably marble. Ideally, the balance room should be located on the bottom floor, on a concrete slab that is isolated by a shock-absorbing material from the rest of the foundation/ground floor slab of the building. In addition, if the balance and table are not on a slab, it may be necessary to reinforce the floor upon which the table is placed.
16. Should have a service agreement with local heating and air conditioning (HVAC) company for routine maintenance and service calls if control limits are exceeded.