

§ 53.40 General provisions.

(a) The test procedures prescribed in this subpart shall be used to test the performance of candidate methods for PM₁₀ against the performance specifications given in table D-1. Except as provided in paragraph (b) of this section, a test sampler or samplers representative of the sampler described in the candidate method must exhibit performance better than, or equal to, the specified value for each performance parameter, to satisfy the requirements of this subpart.

(b) For a candidate method using a PM₁₀ sampler previously approved as part of a designated PM₁₀ method, only the test for precision need be conducted and passed to satisfy the requirements of this subpart. For a candidate method using a PM₁₀ sampler inlet previously approved as part of a designated PM₁₀ method, the tests for precision and flow rate stability must be conducted and passed to satisfy the requirements of this subpart; the tests for sampling effectiveness and 50 percent cutpoint need not be conducted if suitable rationale is provided to demonstrate that test results submitted for the previously approved method are applicable to the candidate method.

(c) The liquid particle sampling effectiveness and 50 percent cutpoint of a test sampler shall be determined in a wind tunnel using 10 particle sizes and three wind speeds as specified in table D-2. A minimum of 3 replicate measurements of sampling effectiveness shall be required for each of the 30 test conditions for a minimum of 90 test measurements.

(d) For the liquid particle sampling effectiveness parameter, a smooth curve plot shall be constructed of sampling effectiveness (percent) versus aerodynamic particle diameter (µm) for each of the three wind speeds. These plots shall be used to calculate the expected mass concentration for the test sampler, using the procedure in § 53.43(a). The candidate method passes the liquid particle sampling effectiveness test if the expected mass concentration calculated for the test sampler at each wind speed differs by no

more than ±10 percent from that predicted for the "ideal" sampler.*

(e) For the 50 percent cutpoint parameter, the test result for each wind speed shall be reported as the particle size at which the curve specified in § 53.40(d) crosses the 50 percent effectiveness line. The candidate method passes the 50 percent cutpoint test if the test result at each wind speed falls within 10±0.5 µm.

(f) The solid particle sampling effectiveness of a test sampler shall be determined in a wind tunnel using 25 µm particles at 2 wind speeds as specified in table D-2. A minimum of three replicate measurements of sampling effectiveness for the 25 µm solid particles shall be required at both wind speeds for a minimum of 6 test measurements.

(g) For the solid particle sampling effectiveness parameter, the test result for each wind speed shall be reported as the difference between the average of the replicate sampling effectiveness measurements obtained for the 25 µm solid particles and the average of the replicate measurements obtained for the 25 µm liquid particles. The candidate method passes the solid particle sampling effectiveness test if the test result for each wind speed is less than, or equal to, 5 percent.

(h) The precision and flow rate stability of three identical test samplers shall be determined at a suitable test site by simultaneously sampling the PM₁₀ concentration of the atmosphere for 10 periods of 24 hours.

(i) For the precision parameter, the test result for each of the 10 periods of 24 hours shall be calculated using the procedure in § 53.43(c). The candidate method passes the precision test if all of the test results meet the specifications in table D-1.

*The sampling effectiveness curve for this "ideal" sampler is described by column 5 of table D-3 and is based on a model that approximates the penetration of particles into the human respiratory tract. Additional information on this model may be found in a document entitled, "Particle Collection Criteria for 10 Micrometer Samplers," which is available from the Quality Assurance Division (MD-77), Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

(j) For the flow rate stability parameter, the test results for each of the three test samplers and for each of the 10 periods of 24 hours shall be calculated using the procedure in § 53.43(d). The candidate method passes the flow rate stability test if all of the

test results meet the specifications in table D-1.

(k) All test data and other documentation obtained from or pertinent to these tests shall be identified, dated, signed by the analyst performing the test, and submitted to EPA.

TABLE D-1—PERFORMANCE SPECIFICATIONS FOR PM₁₀ SAMPLERS

Performance parameter	Units	Specification
1. Sampling effectiveness:		
A. Liquid particles	Percent	Such that the expected mass concentration is within ±10 percent of that predicted for the ideal sampler. Sampling effectiveness is no more than 5 percent above that obtained for liquid particles of same size.
B. Solid particles	Percent	
2. 50 Percent cutpoint	µm	10±1.5 µm aerodynamic diameter.
3. Precision	µg/m ³ or percent	5 µg/m ³ or 7 percent for three collocated samplers.
4. Flow rate stability	Percent	Average flow rate over 24 hours within ±5 percent of initial flow rate; all measured flow rates over 24 hours within ±10 percent of initial flow rate.

§ 53.41 Test conditions.

(a) Set-up and start-up of all test samplers shall be in strict accordance with the operating instructions specified in the manual referred to in § 53.4(b)(3).

(b) If the internal surface or surfaces of the candidate method's sampler inlet on which the particles removed by the inlet are collected is a dry surface (i.e., not normally coated with oil or grease), those surfaces shall be cleaned prior to conducting wind tunnel tests with solid particles.

(c) Once the test sampler or samplers have been set up and the performance tests started, manual adjustment shall be permitted only between test points for the sampling effectiveness and 50 percent cutpoint tests or between test days for the precision and flow rate stability tests. The manual adjustments and any periodic maintenance shall be limited to only those procedures prescribed in the manual referred to in § 53.4(b)(3). The submitted records shall show clearly when any manual adjustment or periodic maintenance was made and shall describe the operations performed.

(d) If a test sampler malfunctions during any of the sampling effectiveness and 50 percent cutpoint tests, that test run shall be repeated. If a test sampler malfunctions during any of the precision and flow rate stability tests, that day's test shall be repeated. A detailed explanation of all malfunctions

and the remedial actions taken shall be submitted to EPA with the application.

§ 53.42 Generation of test atmospheres for wind tunnel tests.

(a) A vibrating orifice aerosol generator shall be used to produce monodispersed liquid particles of oleic acid tagged with uranine dye and monodispersed solid particles of ammonium fluorescein with equivalent aerodynamic diameters as specified in table D-2. The geometric standard deviation for each particle size and type generated shall not exceed 1.1 (for primary particles) and the proportion of multiplets (doublets and triplets) in a test particle atmosphere shall not exceed 10 percent. The particle delivery system shall consist of a blower system and a wind tunnel having a test section of sufficiently large cross-sectional area such that the test sampler, or portion thereof, as installed in the test section for testing, blocks no more than 15 percent of that area. To be acceptable, the blower system must be capable of achieving uniform wind speeds at the speeds specified in table D-2.

TABLE D-2—PARTICLE SIZES AND WIND SPEEDS FOR SAMPLING EFFECTIVENESS TESTS

Particle size (µm) ^a	Wind speed (km/hr)		
	2	8	24
3±0.5	/	/	/
5±0.5	/	/	/
7±0.5	/	/	/