

Hydrogen sulfide—0.2 $\mu\text{g}/\text{m}^3$, 1-hour average;

(11)(i) At the discretion of the Administrator, the requirements for air quality monitoring of PM_{10} in paragraphs (m)(1)(i)–(iv) of this section may not apply to a particular source or modification when the owner or operator of the source or modification submits an application for a permit under this section on or before June 1, 1988 and the Administrator subsequently determines that the application as submitted before that date was complete, except with respect to the requirements for monitoring particulate matter in paragraphs (m)(1)(i)–(iv).

(ii) The requirements for air quality monitoring of PM_{10} in paragraphs (m)(1)(iii) and (iv) and (m)(3) of this section shall apply to a particular source or modification if the owner or operator of the source or modification submits an application for a permit under this section after June 1, 1988 and no later than December 1, 1988. The data shall have been gathered over at least the period from February 1, 1988 to the date the application becomes otherwise complete in accordance with the provisions set forth under paragraph (m)(1)(viii) of this section, except that if the Administrator determines that a complete and adequate analysis can be

accomplished with monitoring data over a shorter period (not to be less than 4 months), the data that paragraph (m)(1)(iii) requires shall have been gathered over that shorter period.

(m) *Air quality analysis.*

(1) ***

(vii) For any application that becomes complete, except as to the requirements of paragraph (m)(1)(iii) and (iv) pertaining to PM_{10} , after December 1, 1988 and no later than August 1, 1988 the data that paragraph (m)(1)(iii) requires shall have been gathered over at least the period from August 1, 1988 to the date the application becomes otherwise complete, except that if the Administrator determines that a complete and adequate analysis can be accomplished with monitoring data over a shorter period (not to be less than 4 months), the data that paragraph (m)(1)(iii) requires shall have been gathered over that shorter period.

(viii) With respect to any requirements for air quality monitoring of PM_{10} under paragraphs (i)(11)(i) and (ii) of this section, the owner or operator of the source or modification shall use a monitoring method approved by the Administrator and shall estimate the ambient concentrations of PM_{10} using the data collected by such approved monitoring method in accordance with

estimating procedures approved by the Administrator.

(p) ***

(5) ***

Pollutant	Maximum allowable increases (micrograms per cubic meter)
Particulate matter:	
TSP, annual geometric mean	19
TSP 24-hr maximum	37

(w) *Permit rescission.* ***

(2) Any owner or operator of a stationary source or modification who holds a permit for the source or modification which was issued under § 52.21 as in effect on July 30, 1987, or any earlier version of this section, may request that the Administrator rescind the permit or a particular portion of the permit.

§ 52.24 [Amended]

3. In § 52.24, paragraph (f)(10) is amended by removing the fourth entry, beginning "Particulate matter," from the list of significant emission rates.

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 50 and 52

[AD-FRL-314-9(d)]

Air Programs; Particulate Matter (PM₁₀) Fugitive Dust Policy

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed policy statement.

SUMMARY: Since 1977, EPA has allowed States with rural fugitive dust areas (RFDA's) to discount fugitive dust in developing and enforcing a State implementation plan (SIP) for attainment and maintenance of the national ambient air quality standards (NAAQS) for particulate matter (PM). Elsewhere in the *Federal Register* today, EPA is announcing final decisions concerning the indicator and levels of the NAAQS for PM and the requirements for implementing those new standards. By this notice, EPA is soliciting comments on alternative SIP requirements for RFDA's and on the adequacy of the definitions which are used in identifying RFDA's. The EPA will continue its existing fugitive dust policy and apply it to implementation of the revised PM standard until it has received and reviewed comments on these proposed alternative SIP requirements and has adopted a final policy.

DATES: All comments must be submitted on or before July 31, 1987.

ADDRESSES: Comments on these alternative fugitive dust policies should be submitted (in triplicate if possible) to the Central Docket Section (LE-132), U.S. Environmental Protection Agency, Attention: Docket Number A-87-01, 401 M Street, SW., Washington, DC 20460. The Docket is located in Room 4, South Conference Center and is available for public inspection between 8:00 a.m., and 3:00 p.m. on weekdays. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Kenneth Woodward, Standards Implementation Branch (MD-15), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Telephone: (919) 541-5351 (FTS 629-5351).

SUPPLEMENTARY INFORMATION:

I. Background

A. Clean Air Requirements

Section 110(a)(1) of the Clean Air Act (Act) requires that each State adopt, within 9 months after promulgation or revision of a primary NAAQS, a SIP that provides for implementation, maintenance, and enforcement of the NAAQS at all locations within 3 years

of approval of the plan by EPA. The Administrator may grant a 2-year extension to the attainment date under conditions given in section 110(e) of the Act. Because some areas may be heavily impacted by fugitive dust which can be difficult to control, EPA issued a fugitive dust policy in 1977 applicable to nonattainment areas for total suspended particulate (TSP).

B. History of the Fugitive Dust Policy

Fugitive dust was identified as a significant contributor to ambient concentrations of TSP in 1976. However, there was little experience in controlling fugitive dust sources such as agricultural activities, unpaved roads, and wind erosion. In rural areas especially, four factors mitigated EPA's desire to reduce fugitive emissions: (1) The PM was native soil which was believed to be less of a health hazard than urban particles, (2) the population affected was small, (3) the economic base to support control was small, and (4) the aggregate cost of controlling miles of unpaved roads and acres of open land could be unreasonable. For these reasons, EPA issued guidance on implementation of its SIP development and new source review policies in areas impacted by fugitive dust (Tuerk, 1977). The guidance (known as the fugitive dust policy) concluded that fugitive dust caused greater environmental impact in urban areas than in rural areas. The basis for this conclusion was the belief that although fugitive dust is typically native soil, in urban areas it is contaminated to a measurable degree by "a combination of industrial pollutants from a variety of sources making it potentially more harmful." Also, the fugitive dust problem was considered "more pronounced within urbanized areas and thus more conducive to development of an implementable control program." On this basis, EPA's policy for development of control strategies for fugitive dust emissions of TSP was that "urban areas should receive the highest priority for development of a comprehensive and reasonable program to control fugitive dust." Control programs in rural areas were to "center on the control of large existing manmade fugitive dust sources (i.e., tailing piles, mining operations, etc.) which in themselves are presently causing violations of the NAAQS or are sources of a known toxic or hazardous material (e.g., asbestos)."

Another aspect of the fugitive dust policy was that "new sources that wish to construct in rural fugitive dust areas should be allowed to do so without the need of an emission offset, as long as they comply with the applicable emission regulation and the impact of

their emissions plus the emissions from other stationary sources in the vicinity of the proposed location, along with normal background, is not projected to cause violations of the NAAQS."

The following criteria were used in defining a rural area under the fugitive dust policy: "(1) the lack of major industrial development or absence of significant industrial particulate emissions, and (2) low urbanized population (i.e., eastern states <100,000-200,000 or western states <25,000-50,000)."

The EPA felt justified in focusing efforts to control fugitive dust in urban areas not only because it was considered potentially more harmful, but also because (1) the population at risk was larger, and (2) resources to implement a control program (control agency manpower and control costs) could be spread over a broad base of support.

The EPA's guidance on State designation of attainment status under section 107 of the Act was issued by the Assistant Administrator for Air and Waste Management on October 7, 1977 (Hawkins, 1977). This guidance stated that an "area should be designated attainment when a TSP violation can be clearly attributed to rural fugitive dust (as defined in the EPA fugitive dust policy paper)."

These two guidance memorandums (Tuerk, 1977 and Hawkins, 1977) constitute what has become known as EPA's Rural Fugitive Dust Policy. Under this policy, 144 counties or portions of counties identified as RFDA's were eventually designated attainment for TSP.

C. Proposed Revision of the NAAQS for Particulate Matter

The EPA, on March 20, 1984 (49 FR 10408), proposed several revisions to the PM standards. One of the most significant proposals was to replace TSP as the indicator for PM with a new indicator that includes only particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM₁₀). The notice of final rulemaking on the revisions to 40 CFR Part 50 in today's *Federal Register* announces EPA's final decisions on the proposed revisions and the basis for the selection of PM₁₀ as the new indicator for both the primary and secondary NAAQS.

The EPA proposed revisions to its regulations governing SIP's on April 2, 1985 (50 FR 13130), to account for the proposed changes in the NAAQS for PM. At that time, EPA proposed to continue its existing fugitive dust policy

and solicited comments on that course of action.

D. Comments on Proposal to Continue Existing Policy

Several State agencies and environmental organizations favored narrowing or discontinuing the current policy. Comments were received from several industrial groups favoring continuation or expansion of the current fugitive dust policy. A summary of the comments and EPA's response follows.

Comments opposing continuation of the existing policy. Several commenters stated that EPA should discontinue use of the rural fugitive dust policy for PM_{10} until it has been subjected to full public review. It was alleged that control of PM_{10} must be based on the health impacts and not on economic consequences. It was argued that fine particles, fertilizers, pesticides, and herbicides in fugitive dust from agricultural processes and other processes that disturb the land may have as great an impact on rural communities as other sources do on urban communities.

Several commenters stated that EPA should narrow the scope of its policy because they believe over 50 percent of fugitive dust may be PM_{10} which can travel long distances and impact a larger population than just those in the rural area of origin. They alleged rural fugitive dust may also include fungal spores which cause diseases such as Valley Fever. Therefore, the commenters felt sources of fugitive dust need to be controlled whenever it is technically and economically possible.

EPA response to comments. The EPA has chosen not to discontinue the existing fugitive dust policy while it is soliciting comments on alternative policies. To do so before a decision on a final policy is made could cause limited State resources to be prematurely directed away from addressing higher priority urban area problems. However, EPA recognizes that some of the reasons for the existing policy may not apply to PM_{10} and consequently is seeking further comment on alternative policies.

Comments favoring continuing or expanding the existing policy. Several commenters (primarily representing mining interests) stated that EPA should continue its rural fugitive dust policy as proposed or expand it to include areas where industrial sources contribute only a minor portion of total PM_{10} emissions. The commenters alleged that fugitive dust from mines is essentially the same as, and poses no greater health risk than, naturally occurring uncontaminated dust. They felt that the current policy recognizes that large

particles (which predominate in rural fugitive dust) are of little concern to human health, control of fugitive dust is difficult, and the cost of control on a broad scale would be staggering.

EPA response to comments. The EPA's 1977 fugitive dust policy stated that a rural area would be identified by a lack of major industrial development or absence of significant industrial PM emissions and low urbanized population. The highest priority was to be given to developing control programs for fugitive dust in urban areas. Priority was also to be given to control of large manmade fugitive dust sources in rural areas that in themselves caused violations of the TSP NAAQS or were sources of known toxic or hazardous material.

Thus, the fugitive dust policy never defined a rural area as completely absent of industrial development. Also, one of the bases for the policy was that control of fugitive dust was difficult and the cost could be large, especially for a rural economy.

Fugitive dust includes PM_{10} in varying amounts. Since EPA has now concluded that long-term exposure to high concentrations of PM_{10} constitutes a health risk and has concluded that, at present, fugitive dust or other specific components of PM_{10} cannot be safely excluded from the primary standard, EPA must carefully consider application of the existing fugitive dust policy in rural areas. The options being

considered by EPA range from continuing the existing policy to requiring attainment of the PM_{10} NAAQS with 3 years.

E. Possible Rural Fugitive Dust Areas for PM_{10}

The number of counties likely to be considered RFDA's for PM_{10} under the existing policy are categorized in Table 1 by probabilities of violating PM_{10} NAAQS of 50 micrograms per cubic meter ($\mu g/m^3$), annual arithmetic mean, and 150 ($\mu g/m^3$, 24-hour average, together with the population of the counties. The probabilities are based on 1983-1985 TSP air quality data and calculated using EPA's probability guideline¹ and a national distribution of PM_{10} to TSP ratios (EPA 1986). The TSP has been monitored in many of these areas for several years, whereas PM_{10} is not yet monitored in many RFDA's.

Table 1 indicates that 14 RFDA's with a total population of about 1.3 million have a 95 percent or greater probability of violating a 24-hour PM_{10} NAAQS of 150 $\mu g/m^3$. Two of those same RFDA's have 95 percent or greater probability of violating an annual PM_{10} NAAQS of 50 $\mu g/m^3$. About 35 RFDA's with a total population of about 1.1 million have between 20 and 95 percent probability of violating the 24-hour NAAQS. Twelve of these 35 RFDA's have greater than 20 percent probability of violating the annual NAAQS.

TABLE 1. ESTIMATED NUMBER OF PM_{10} RFDA'S AND THEIR POPULATION FOR VARIOUS PROBABILITIES OF VIOLATING THE ANNUAL OR 24-HOUR PM_{10} NAAQS

Probability of violating standards	50 $\mu g/m^3$ annual arithmetic mean	Popula- tion at risk (1000's)	150 $\mu g/m^3$ 24- hour average	Popula- tion at risk (1000's)
>0.95.....	2	110	¹ 14	1,293
>0.20, <0.95.....	22	1,219	² 35	1,131
Totals.....	24	1,329	³ 49	2,424

¹ Of the 14 RFDA's with 95 percent or greater probability of violating the 24-hour NAAQS, 2 have 95 percent or greater, 10 have from 20 to 95 percent, and 2 have less than 20 percent probability of violating the annual NAAQS. Thus, this number includes 12 RFDA's from column 2.

² Of the 35 RFDA's with 20 to 95 percent probability of violating the 24-hour NAAQS, 12 have from 20 to 95 percent and 23 have less than 20 percent probability of violating the annual NAAQS. Thus, this number includes 12 RFDA's from column 2.

³ Includes all 24 areas which have greater than 20 percent probability of violating the annual NAAQS.

II. Definition of Rural Fugitive Dust Areas

The 1977 policy defined an RFDA as having a:

¹ The "probability guideline," an EPA report entitled "Procedures for Estimating Probability of Nonattainment of a PM_{10} NAAQS Using Total

(1) Lack of major industrial development or absence of significant industrial particulate emissions, and

Suspended Particulate or PM_{10} Data," was prepared to facilitate classifying areas in the absence of adequate PM_{10} air quality data.

(2) Low urbanized population (i.e., eastern states <100,000–200,000 or western states <25,000–50,000). The terms "lack of major industrial development" and "absence of significant industrial particulate emissions" were not defined in the 1977 policy. In the past, potential RFDA's have been evaluated for compliance with these terms on a case-by-case basis. The Administrator seeks comment on whether the terms should be specifically defined and, if so, how they should be defined.

In addition, a multitude of small nonfugitive dust sources (i.e., wood stoves) could also significantly impact small communities. Therefore, the Administrator seeks comment on the need to define and include in the definition of an RFDA the term "lack of significant, nonfugitive dust, area source emissions."

In the past, the 1977 definition of low urbanized population has been applied to the total population of the RFDA without respect to the size of the area involved. The RFDA's for TSP generally conformed to county boundaries which often included very large areas in western States. Since the sizes of the RFDA's varied greatly, the total population of the area was not indicative of the population density. Air monitoring sites in RFDA's are generally located in small towns which are often the only population center in the RFDA. Therefore, the most dense population is often within a few kilometers of the monitoring site. The Administrator seeks comments on whether the 1977 definition of low urbanized population for rural areas is adequate for implementing any fugitive dust policy adopted by EPA, or whether EPA should define low urbanized population based upon the population density of an area in proximity to a monitor.

III. Alternative Fugitive Dust Policies

The EPA believes that it may be appropriate to continue to give a lower priority to full SIP development in rural fugitive dust areas. A PM₁₀ fugitive dust policy may be desirable given the potentially high cost of controlling rural fugitive dust in relation to the low populations at risk in such areas. Further, it may be more productive to require prompt attainment of the annual PM₁₀ NAAQS in rural areas while giving a lower priority to the 24-hour PM₁₀ NAAQS. The Administrator wishes to gather more technical information from the public in order to evaluate the relative importance of promptly attaining annual versus 24-hour PM₁₀ standards in RFDA's and the costs of

attaining each standard. The EPA is soliciting public comment on these issues to provide a basis for determining if the existing fugitive dust policy should be revised. If EPA concludes that the fugitive dust policy should be changed for PM₁₀, it will adopt a policy appropriate to meet the concerns identified.

The EPA is currently considering three alternatives to the existing fugitive dust policy, which are discussed below. They range from requiring attainment of both the 24-hour and annual PM₁₀ NAAQS within 3 years [or 5 years with a section 110(e) extension] to requiring attainment of only the annual standard over an extended period of time.

The notice of final rulemaking revising 40 CFR Parts 51 and 52, published elsewhere in today's *Federal Register*, sets forth EPA's policies for implementing the PM₁₀ NAAQS. The notice explains that air quality areas are being divided into three groups. Group I areas will be those with a high probability of not attaining the PM₁₀ NAAQS, Group II areas will be those where existing air quality data are not sufficient to determine if they are attainment, and Group III areas will be those with a high probability of attaining the NAAQS without revisions to their existing control strategy.

A. Alternative I

The first alternative fugitive dust policy is the most stringent. The RFDA's with greater than 95 percent probability of violating the annual PM₁₀ NAAQS would be required to meet Group I SIP requirements as explained in the notice of final rulemaking of Parts 51 and 52. Table 1 indicates that two RFDA's would be put into Group I under the alternative. The SIP must demonstrate attainment of the annual NAAQS within 3 years.

The RFDA's with greater than 20 percent but less than 95 percent probability of violating the annual PM₁₀ NAAQS, or greater than 20 percent probability of violating the 24-hour NAAQS, would be required to meet Group II SIP requirements. Table 1 indicates that 47 RFDA's² would be put into group II. Major new sources and major modifications would be required to meet the same provisions for PM₁₀ offsets under the PSD program as those in other areas not attaining the NAAQS and lacking an approved PM₁₀ plan, i.e., emission offsets sufficient to provide a

net air quality benefit. Consequently, a source might have to find reductions from nonindustrial sources, such as unpaved roads.

B. Alternative II

The second alternative policy would be to require RFDA's with greater than 20 percent probability of violating either the annual or 24-hour NAAQS to meet the Group II SIP requirements. If attainment of the annual or 24-hour NAAQS cannot be demonstrated within 5 years [including a 2-year extension under section 110(e)], all reasonable control measures must be taken toward attainment. Rationale would be required as to why enactment of certain measures would be unreasonable and States would be required to show sustained progress toward attainment of both the annual and 24-hour NAAQS in RFDA's. The EPA solicits comments on this approach of allowing States to submit SIP's showing sustained progress toward attainment but not demonstrating attainment by any set attainment date. Specifically, EPA solicits comment on potential legal constraints on such an approach in light of the apparent statutory requirements for attainment by fixed dates [Cf. 51 FR 34428, 34434 (September 26, 1986)] ("reasonable extra efforts program" proposed for California ozone nonattainment area)].

Major new sources and major modifications would be required to offset emissions under this alternative also. Table 1 indicates that 49 RFDA's would be put into Group II under this alternative.

C. Alternative III

The third alternative policy would be to require RFDA's with greater than 20 percent probability of violating the annual PM₁₀ NAAQS only to meet Group II SIP requirements. Table 1 indicates there are about 24 such RFDA's.

As in Alternative II, if a control strategy is required but attainment cannot be demonstrated, all reasonable control measures must be taken toward attainment. Rationale would be required as to why enactment of certain measures would be unreasonable and States would be required to show sustained progress toward attainment of the annual PM₁₀ NAAQS. Preparation of SIP's for RFDA's experiencing violations of the 24-hour NAAQS will be second priority.

As with the 1977 policy, major new sources and major modifications would not be required to offset emissions. They would be required to demonstrate that

² This figure is derived from the 49 RFDA's with greater than 20 percent probability of violating the 24-hour NAAQS minus the 2 RFDA's which have a probability of 95 percent or greater of violating the annual NAAQS, and thus are categorized as Group I areas.

the impact of their emissions plus the emissions of other stationary sources in the vicinity plus normal background would not cause violations of the PM₁₀ NAAQS.

D. Continuing the Existing Policy

Under the 1977 policy, all RFDA's including those exceeding the 24-hour or annual PM₁₀ NAAQS would be put into Group III and would not be required to develop a control strategy to attain the NAAQS. Major new and modified sources would not be required to offset emissions, but would have to demonstrate that the impact of their emissions plus the emissions of other stationary sources in the vicinity plus normal background would not cause violations of the PM₁₀ NAAQS.

IV. Analysis of Five RFDA's

The EPA, in cooperation with the States concerned, examined the impact of the existing fugitive dust policy and the three alternatives on five areas designated RFDA's for TSP. The five RFDA's were selected as representative of areas impacted by a variety of fugitive dust sources. (Characteristics of the five RFDA's are contained in study reports referenced at the end of this notice and are available in Docket Number A-87-01). The study areas generally have the following characteristics typical of RFDA's:

1. The population is small with generally less than 25,000 persons within 20 km of the monitoring site;
2. A large portion of the land area is natural or used for agriculture (e.g., growing crops or grazing);
3. Emissions from industrial sources are a small portion of the total inventory for the area; and
4. A significant portion of emissions in the area are from unpaved roads, agricultural activities, or wind erosion.

Three of the five study areas have high probabilities of violating a 24-hour PM₁₀ NAAQS of 150 µg/m³ based on 1983-1985 TSP data. The probabilities of violating an annual PM₁₀ NAAQS of 50 µg/m³ vary from as low as 5 percent up to 70 percent. These studies were conducted over an 8-week period; therefore, the quantity of emissions from each source category and the impacts of the various source categories on the population could not be determined precisely. A description of each RFDA and the characteristics of the PM monitoring sites are presented along with a discussion of PM sources in the area and possible control strategies. The area selected are Umatilla County, Oregon, and Sherman County, Kansas, both dry land agricultural areas; San Miguel County, Colorado, a ski resort

area with unpaved roads and a mine tailings pile; Grant County, New Mexico, an arid region with rangeland, copper mines, and smelting operations; and the Southeast Desert Air Basin (SEDAB) in California, a large desert area that encompasses 63 communities. Tables 2 through 6 present detailed characteristics of the study areas such as population, urban centers, land use, climate, location of PM monitors, significant sources of PM₁₀ and the reduction in emissions necessary to attain the PM₁₀ NAAQS.

Umatilla County, Oregon was selected because it was an RFDA for TSP. It is a rural agricultural area with a very fine soil (>50 percent silt). Windblown dust is a problem but the area is also impacted by smoke from wood stoves and field burning.

Sherman County, Kansas was selected because it is a typical Plains-State agricultural area Annual TSP values equaled or exceeded the former primary TSP NAAQS (75 µg/m³) in 1979, 1981, 1982 and 1984. The former 24-hour TSP NAAQS has not been exceeded since 1979. The TSP concentrations have decreased in the last 10 years possibly because the acres of irrigated cropland near the air quality monitor have greatly increased. The area is not impacted significantly by smoke and is projected to attain the PM₁₀ NAAQS.

San Miguel County, Colorado, was selected because it is a recreational area rather than an agricultural area. The area has a very small permanent population, but it is a ski area in winter and hosts a bluegrass festival (7000 people) in the summer. It is impacted by PM₁₀ from an old mine tailings pile, unpaved roads, and campfires during the summer months. During the winter, smoke from wood stoves is a problem.

Grant County, New Mexico, was selected because it is an arid agricultural area with some open pit mines and a copper smelter. The land is used for grazing cattle; very little is used to grow crops. The area is impacted by fugitive dust from unpaved roads and tailings piles.

The SEDAB in California was selected because it is a large, sparsely populated desert area. The EPA estimates that over 80 percent of PM₁₀ emissions in the area may be due to windblown dust from agricultural fields and disturbed desert areas.

Table 2.—Umatilla County, Oregon

County Population (1980): 59,000
Urban areas and population: Pendleton
14,500 in 1985
Land Use:
2,068,000 acres total

66 percent used for grazing and crops
58,000 acres are irrigated

Climate:

Mild and dry

Average annual rainfall 13 inches

Average wind speed 9 mph

Particulate matter monitoring site:

location:

Roof of State Office Building in
Pendleton

PM₁₀/TSP ratio: 0.3-0.5/1

Probability of not attaining: annual
NAAQS—0.31

24-hour NAAQS—0.32

Significant sources of PM₁₀

Source category	Tons per year
Point.....	140
Area:	
Wood stoves.....	260
Motor vehicles.....	3
Paved roads.....	88
Unpaved roads.....	200
Field burning.....	6,700
Agricultural tilling.....	3,200
Total.....	10,600

Estimate of required emission reduction:

A 21 percent reduction in emission may be required to attain the 24-hour NAAQS. This reduction may occur through the implementation of recently approved regulations for wood stoves and open burning permits.

Table 3.—Sherman County, Kansas

County Population (1980): 7,800
Urban Areas and population (1980):
Goodland 5,700

Land Use:

675,000 acres total

120,000 acres irrigated crop land

Most of remaining land is used for growing dry land crops (e.g. wheat and alfalfa). There are very few trees in the county.

Climate:

Semi arid

Average annual rainfall 17 inches

Moderate to strong surface wind speeds

Particulate matter monitoring site:

Location: roof of Goodland fire station
PM₁₀/TSP ratio: 0.4/1

Probability of not attaining:

Annual NAAQS—0.05

24-hour NAAQS—0.15

Significant sources of PM₁₀:

Agricultural tilling

Wind erosion from cleared areas such as fields, unpaved parking areas and lots, and cattle feed lots.

Estimate of required emission reduction:

Reductions may not be required; the area is likely to attain both NAAQS.

Table 4.—San Miguel County, Colorado

County Population (1980): 3,000
 Urban areas and population (1980):
 Telluride 1,200
 Land Use:
 Box canyon surrounded on three sides
 by mountains
 Area is used for recreational purposes
 in winter (skiing) and summer
 (bluegrass festival)
 Climate:
 Average annual precipitation 16–20
 inches
 Strong inversion layers frequently trap
 pollutants in the canyon between
 7:00 p.m. and 11:00 a.m.
 Particulate matter monitoring sites:
 Location:
 Roof of two story building in
 Telluride.
 Two sites in the canyon but outside
 of town
 Probability of not attaining:
 Annual NAAQS—0.28
 24-hour NAAQS—0.90
 Significant sources of PM₁₀:
 Summer: Old mine tailings pile,
 unpaved roads, and campfires.
 Winter: Wood stoves
 Estimate of required emission reduction:
 A 28-percent reduction may be
 required to attain the 24-hour NAAQS.

Table 5.—Grant County, New Mexico

County Population (1980) 26,200
 Urban areas and population (1980):
 Silver City—9,900
 Bayard—3,000
 Land use:
 2,540,000 acres total
 1,445,000 acres rangeland
 350,000 acres woodland
 9,600 acres cropland
 Climate:
 Semiarid to arid
 Average annual rainfall 8 inches in
 plains, 20 inches in mountains
 Average wind speed in spring (March–
 June) 9 mph with gusts to 38 mph
 Particulate matter monitoring site:
 monitors are located in three cities.

Location	Site	Probability of not attaining	
		Annual (per- cent)	24- hour
Hurley	Roof of public building	0.32	0.46
Silver City	Roof of public safety building	.18	.35
Bayard	Platform in parking area	.69	.81

PM₁₀/TSP ratio is about 0.3/1 based on
 PM₁₀ data for April–June, 1986
 Significant sources of PM₁₀:

Source category	Tons per year
Point Area:	230
Wood stoves	250
Motor vehicles	840
Unpaved roads	23,000
Total	24,320

Estimate of required reduction: Based on
 ambient TSP values, it is not clear
 what emission reduction may be
 necessary to attain the NAAQS at
 Bayard.

**Table 6.—Southeast Desert Air Basin,
California****Population**

The RFDA in SEDAB consists of
 portions of three counties in
 California—Imperial Riverside, and San
 Bernardino. The total population of the
 area in 1980 was 590,000. There are 63
 communities in the area and most are
 smaller than 25,000 persons. Two larger
 communities are Lancaster with 48,000
 and Palm Springs with 85,000.

Land use:

21.5 million acres total
 3.2 million acres are irrigated for
 growing crops
 17.8 million acres are covered only
 with desert vegetation

Climate:

Annual rainfall 2 to 5 inches
 Monthly mean windspeed is about 7
 to 10 mph
 Peak windspeeds 60 to 80 mph

Particulate matter monitoring sites:

Site	Probability not attaining NAAQS	
	Annual (per- cent)	24-hour
Imperial County:		
Brawley	0.63	0.61
El Centro	.30	.67
Riverside County:		
Banning	.05	.45
Indio	.55	.97
San Bernardino County:		
Barstow	.70	.99
Victorville	.09	.22

Significant sources of PM₁₀:

Source category	Imperial County tons/yr PM ₁₀	River- side County tons/yr PM ₁₀	San Bernar- dino County tons/yr PM ₁₀
Industrial sources	420	60	2,300
Motor vehicles	640	1,360	1,300
Tilling	7,410	3,500	170
Feed lots	12,700	90	0
Paved roads	2,600	5,100	1,900
Unpaved roads	3,180	7,700	1,800
Wind Erosion:			
Agricultural	59,400	31,100	4,100
Desert	92,000	96,500	74,500
Miscellaneous	650	3,100	1,430
Total	179,000	148,500	88,500

Estimate of required emission reduction:
 The following emission reductions
 may be required for each planning
 area:

Imperial County—21 percent
 Riverside County—22 percent
 San Bernardino County—38 percent

**V. Effect of Alternative Policies on
Study Areas**

A summary of the PM₁₀ nonattainment
 probabilities and possible nontraditional
 control measures available for the five
 study areas is presented in Table 7. The
 effect of the alternative rural fugitive
 dust policies on the ability of each study
 area to attain the PM₁₀ NAAQS is
 presented in Table 8.

The main sources of PM₁₀ in Sherman
 County, Kansas, are agricultural fields.
 Ambient PM levels appear to be
 decreasing as the areas of irrigated
 farmland near Goodland have
 increased. The probabilities of attaining
 the annual and 24-hour PM₁₀ NAAQS
 are 95 and 85 percent, respectively.
 Therefore, Sherman County will be put
 into Group III and will not be affected
 by the alternate policies.

Nearly 70 percent of PM₁₀ emissions in
 Umatilla County, Oregon, are estimated
 to come from wood stoves and field
 burning. The State of Oregon has
 adopted regulations which require
 permits for open burning and
 certification of new wood stoves. The
 EPA anticipates that implementation of
 these regulations will bring about
 attainment and maintenance of the
 annual and 24-hour PM₁₀ NAAQS in
 Umatilla County within 5 years;
 therefore, this area should attain under
 all the alternative policies.

A. Alternative I

Under policy Alternative I, RFDA's
 with 95 percent or greater probability of
 violating an annual NAAQS of 50µg/m³
 would be put into Group I. Other areas
 with 20 percent or greater probability of
 violating the annual NAAQS or a 24-
 hour NAAQS of 150µg/m³ would be put
 into Group II. Therefore, all of the
 RFDA's studied would be put into Group
 II and be required to attain both
 NAAQS within 3 to 5 years except for
 Sherman County. Although Umatilla
 County, Oregon, will be placed in Group
 II, no additional control measure should
 be necessary for the area to attain the
 PM₁₀ NAAQS.

The possibility of attaining the annual
 NAAQS in San Miguel County appears
 good. However, the possibility of
 attaining the 24-hour NAAQS within 3 to
 5 years is poor. The EPA estimates that
 emissions must be reduced 28 percent.
 There are fugitive dust emissions from

unpaved roads and an old mine tailings pile. However, PM_{10} concentrations above $150\mu g/m^3$ are measured in the winter when snow cover should reduce dust significantly. The State has already identified emissions from wood stoves and campfires, especially during atmospheric inversions, as significantly impacting air quality. Therefore, measures are being taken to limit emissions from these sources.

The possibility of attaining the annual NAAQS in Grant County is good at Silver City and Hurley. It is poor at Bayard, however. Fugitive dust from unpaved streets in Bayard and the unpaved lots around the monitoring site are believed to impact the area significantly. The possibility of attaining the 24-hour NAAQS within 3 to 5 years is poor at all three sites. The most significant sources impacting the county are unpaved roads and motor vehicles. There are also emissions from open pit mines, tailings piles, and a copper smelter. More than 5 years would probably be required to control these sources.

The possibility of attaining the annual NAAQS within 5 years is poor in each of the three planning areas of the SEDAB. The possibility of attaining the 24-hour NAAQS is very poor. The EPA estimates that 50 to 80 percent of daily emissions in each area could be from disturbed desert lands.

B. Alternative II

Under Alternative II, RFDA's with 20 percent or greater probability of violating either the annual or the 24-hour NAAQS would be put into Group II. All reasonable control measures would be required in an effort to attain both the

annual and 24-hour NAAQS over an extended period of time, if necessary.

As discussed above, Sherman County, Kansas, would be placed in Group III, and Umatilla County, Oregon, is expected to attain the PM_{10} NAAQS in 5 years without the application of additional control measures.

In San Miguel County, the possibilities of attaining the annual and 24-hour NAAQS over an extended period are good. About a 28 percent reduction of emissions may be required to attain 24-hour NAAQS. The State is taking steps to limit emissions from wood stoves; however it may take more than 5 years to achieve the necessary reductions from these actions. Unpaved roads could be stabilized during the summer months if necessary.

In Grant County, the possibility of attaining the annual NAAQS at Hurley and Silver City is good and is fair at Bayard over an extended period. The possibility of attaining the 24-hour NAAQS over extended time is poor because of the miles of unpaved roads that must be stabilized with the expense borne by the State and local governments.

The possibility of attaining the annual NAAQS in the SEDAB over extended time is fair. Attainment depends on reducing windblown dust from agricultural fields, disturbed desert lands, and perhaps controlling some traditional sources in the towns. The possibility of attaining the 24-hour NAAQS is poor because of the large open areas and arid conditions.

C. Alternative III

Under Alternative III, RFDA's with 20 percent or greater probability of

violating the annual NAAQS would be put into Group II. All reasonable control measures would be required in an effort to attain the annual NAAQS over an extended period of time.

As discussed above, Sherman County would be placed into Group III and Umatilla County would be placed in Group II, but it is expected to attain without the adoption of additional control measures. San Miguel County would be placed in Group II and has a good possibility of attaining the annual NAAQS over extended time. The possibilities of attaining the annual NAAQS at the Silver City and Hurley sites in Grant County are good. Emissions from unpaved areas will need to be reduced to a greater extent in Bayard to attain the annual NAAQS, however.

In the SEDAB, the possibility of attaining the annual NAAQS is only fair because of the large open areas and arid conditions that prevail.

D. Continuing the Existing Policy

Under the existing fugitive dust policy, RFDA's would be put into Group III and fugitive dust would not be considered in determining whether the area was attained the PM_{10} NAAQS. Sherman County and Umatilla County are expected to attain the PM_{10} NAAQS without the adoption of additional control measures. However, it is not clear whether San Miguel County could attain the NAAQS even if fugitive dust was not considered since it is heavily impacted by smoke. Therefore, this area may no longer qualify as an RFDA.

TABLE 7.—SUMMARY OF NONATTAINMENT PROBABILITIES AND CONTROL MEASURES FOR STUDY AREAS

RFDA	SIP category	Probability of not attaining annual/24-hour in percent		Percent emission reduction required	Possible control measures
Umatilla, OR	Group II	31	32	21	Conservation tilling, better smoke management, certify new wood stoves, incentives to control existing stoves.
Sherman, KS	Group III	5	15	0	None required.
San Miguel, CO	Group II	28	90	28	Certify new wood stoves, limit number of wood burning units, stabilize tailings pile, stabilize unpaved roads in summer months.
Grant, NM:					
Bayard	Group II	69	81	¹ N/A	Stabilize unpaved streets in and near towns, control dust from open pit mine, stabilize tailings pile at copper smelters.
Silver City	Group II ²	18	35	N/A	
Hurley	Group II	32	46	N/A	
SEDAB, CA:					
Imperial	Group II	63	67	21	Restrict the use of off-road vehicles in the desert, plant wind-breaks to protect fields from wind erosion.
Riverside	Group II	55	97	34	
San Bernardino	Group II	70	99	38	

¹ Not available.

² The probability of not attaining the 24-hour NAAQS is 35 percent; thus, Silver City would be placed in Group II under Alternatives I and II. However, the probability of not attaining the annual NAAQS is only 18 percent; thus Silver City would be placed in Group III under Alternative III.

TABLE 8. SUMMARY OF THE ENVIRONMENTAL EFFECTS OF ALTERNATIVE POLICIES

RFDA	Alternative I	Alternative II	Alternative III	Existing Policy
Umatilla, OR....	Implementation of recently adopted control measures will likely result in attainment of the PM ₁₀ NAAQS in 5 years ¹ .	See Alternative I.....	See Alternative I.....	See Alternative I.
Sherman, KS....	Recent monitoring data indicates this area is probably attaining both NAAQS and thus will not be affected by the policy.	do.....	do.....	Do.
San Miguel, CO.	The annual NAAQS may be attained within 5 years by using a combination of measures. Control of existing wood stoves probably cannot be implemented rapidly enough to achieve attainment of the 24-hour NAAQS within 5 years.	Control of existing wood stoves or replacement with new stoves and limiting the total number of wood burning units may allow attainment of the 24-hour NAAQS over extended time.	The annual NAAQS may be attained with 5 years.	Little improvement in air quality is expected, except as may result from control of new wood stoves (see 52 FR 4994).
Grant, NM.....	The air quality would be improved by stabilizing unpaved streets in the county and other control measures. However, the county may not be able to expand stabilization fast enough to attain the annual or 24-hour NAAQS within 5 years.	Attainment of the annual NAAQS may eventually be achieved by expansion of a program to stabilize unpaved roads. Additional control measures may lead to attainment of the 24-hour NAAQS at some time in the future.	Attainment of the annual NAAQS may eventually be achieved by expansion of a program to stabilize unpaved roads.	Little improvement in air quality is expected.
Sedab, CA.....	Air quality may be improved some by restricting the use of off-road vehicles in the desert. However, emission reductions probably would not be adequate to attain the annual or 24-hour NAAQS within 5 years.	Restricting the use of off-road vehicles and planting windbreaks may reduce PM ₁₀ concentrations enough to attain the annual NAAQS. Reduction of peak concentrations below the 24-hour NAAQS is questionable.	Restricting the use of off-road vehicles and planting windbreaks may reduce PM ₁₀ concentrations enough to attain the annual NAAQS.	Do.

¹ Includes possible 2-year extension under section 110(e).

VI. Conclusions

An overview of the study results shows that air quality in most of the study areas is adversely affected by emissions from source categories other than those for which the rural fugitive dust policy was developed. This does not necessarily mean that these areas could not continue to be designated as RFDA's if the Administrator decides to adopt one of the alternatives described herein. It does mean, however, that emissions from such source categories should be targeted for control in the SIP.

As discussed above, Alternative I would require areas to be placed in Group I, II, or III based upon their probability of violating the PM₁₀ standard. Initial analysis of existing RFDA's indicate that two areas would fall into Group I and 47 areas would fall in Group II. Areas in Group I and areas in Group II which monitor violations of the PM₁₀ standard will be required to demonstrate attainment of both the

annual and 24-hour NAAQS within 3 years of the date the SIP is approved. (A 2-year extension is always available under section 110(e) if the State can make the proper showings regarding the adequacy of control technology.) This means States must adopt some combination of possible control measures (e.g., those listed in Table 7: conservation tilling, better smoke management, certification of wood stoves, stabilizing unpaved roads, controlling dust from open pit mines, stabilizing tailing piles, restricting use of off-road vehicles, and planting windbreaks to protect fields from erosion). However, Group I areas or any of the Group II areas which monitor violations of the PM₁₀ standards may still have a great deal of difficulty demonstrating attainment within the 3 to 5 year time frame. Since this alternative could require use of all the control measures listed above, it should bring about attainment of the NAAQS quicker

than the other alternatives even if compliance extends beyond 5 years.

Since Alternative II would not require any area to be immediately placed in Group I, all RFDA's with greater than 20 percent probability of violating either the 24-hour or annual PM₁₀ would be required to conduct additional monitoring. If violations of the NAAQS are monitored, then the State would be required to develop attainment plans. The State must consider essentially the same controls as would be called for under Alternative I. If the State cannot demonstrate that the standards will be attained within 5 years, [including the section 110(e) 2-year extension] then the State must adopt all reasonably available control measures and show why other measures would be unreasonable. In addition, the State must show sustained progress toward attainment. It is anticipated that the town of Bayard in Grant County and the SEDAB will have a fair chance of

attaining the annual NAAQS by applying controls only over an extended period of time. Attainment of the 24-hour standard will continue to pose a problem except for Umatilla County and Sherman County where it is anticipated that implementation of existing control measures will result in attainment within the 5 years.

Since Alternative III requires grouping and initial attainment plan development based only on the annual average PM_{10} concentrations, fewer areas would be in Group II and fewer areas would be required to develop attainment plans in the near future. If attainment plans are necessary, States would be required to adopt reasonable control measures to attain the annual NAAQS only. These control measures are essentially the same as those required under Alternative II to attain the annual NAAQS. While implementation of these control measures may also provide a measure of progress toward attainment of the 24-hour NAAQS by reducing peak concentrations, Alternative III does not require controls specific for attainment and maintenance of the short-term standard.

Continuation of the existing policy will give lower priority to attaining the NAAQS in rural rather than in urban areas, thus the annual and 24-hour standards may not be attained. This policy would save resources otherwise expended toward the difficult problems of controlling fugitive sources. This would allow the resources not expended

in rural areas to be expended to improve air quality in urban areas.

VII. Public Comments

The Administrator seeks comment on (1) the necessity for adopting some form of a rural fugitive dust policy; (2) technical support for such a policy, specifically information on the costs of controlling rural fugitive dust and the relative importance of protecting annual versus 24-hour NAAQS; (3) potential legal constraints on alternatives that contemplate SIP's providing for sustained progress toward attainment but not demonstrating attainment by a fixed date; (4) what should be the definition of a rural fugitive dust area; and (5) the preferred policy of the three alternatives presented.

Until such time as the Administrator decides which course of action to follow, he will allow States, in effect, to continue implementing the fugitive dust policy by placing qualified RFDA's in Group III, as defined in the notice of final rulemaking revision 40 CFR Parts 51 and 52 published elsewhere in today's Federal Register.

Authority: Sections 110 and 301 of the Act give the Administrator authority to adopt policies necessary to implement national ambient air quality standards.

Dated: June 2, 1987.

Lee M. Thomas,
Administrator.

References

Hawkins, David G. (Assistant Administrator for Air and Waste Management), Model

Letter Regarding State Designation of Attainment Status. Memorandum to Regional Administrators. October 7, 1977.

Tuerk, Edward F. (Acting Assistant Administrator for Air and Waste Management), Guidance on SIP Development and New Source Review in Areas Impacted by Fugitive Dust. Memorandum to Regional Administrators. August 16, 1977.

U.S. Environmental Protection Agency (EPA), "Procedures for Estimating Probability of Nonattainment of a PM_{10} NAAQS Using Total Suspended Particulate Matter or PM_{10} Data." Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. EPA 450/4-86-017, December 1986.

EPA Region VI, "Rural Fugitive Dust Area Study Grant County, New Mexico." Air Programs Branch, Dallas, Texas, September 1986.

EPA Region VII, "Evaluation of Goodland, Kansas As a PM_{10} Fugitive Dust Area." Air Branch, Kansas City, Kansas, September 1986.

EPA Region VIII, "PM₁₀ Rural Fugitive Dust Study of Telluride, Colorado." Air Branch, Denver, Colorado, September 1986.

EPA Region IX, "Effects of a PM_{10} Rural Fugitive Dust Policy on California's Southeast Desert Air Basin." Air Management Branch, San Francisco, California, November 1986.

EPA Region X, "Rural Fugitive Dust Area Study Pendleton, Oregon." Air Programs Branch, Seattle, Washington, October 1986.

[FR Doc. 87-13710 Filed 6-30-87; 8:45 am]

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 53

[FRL-3141-9(e)]

Ambient Air Monitoring Reference and Equivalent Methods

AGENCY: Environmental Protection Agency.

ACTION: Final rulemaking.

SUMMARY: Today's action promulgates amendments to Part 53 of Chapter 1 of Title 40 of the Code of Federal Regulations to incorporate performance specifications, test procedures, and other requirements applicable to reference and equivalent methods for measuring the atmospheric concentration of particles less than 10 micrometers in aerodynamic diameter (PM_{10}). This action is taken in conjunction with the promulgation of revised national ambient air quality standards for particulate matter (40 CFR Part 50) and a new reference method for the determination of PM_{10} in the atmosphere (40 CFR Part 50—Appendix J). The revisions to 40 CFR Part 53 were proposed on March 20, 1984 and include provisions for the determination and designation of reference and equivalent methods for PM_{10} , performance specifications and explicit test procedures by which the performance of candidate reference and equivalent methods for PM_{10} is to be tested, and some minor changes and clarifications to existing provisions of Part 53 pertaining to other pollutants for which ambient air quality standards exist.

DATE: This regulation takes effect on July 31, 1987.

ADDRESS: Docket No. A-82-43 containing material relevant to this action is located in the Central Docket Section of the U.S. Environmental Protection Agency, South Conference Center, Room 4, 401 M Street, SW., Washington, DC. The docket may be inspected between the hours of 8:00 a.m. and 3:00 p.m. on weekdays, and a reasonable fee may be charged for copying services.

FOR FURTHER INFORMATION CONTACT: Larry J. Purdue, Quality Assurance Division, (MD-77), Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711 (Telephone: (919) 541-2665 or (FTS) 629-2665).

SUPPLEMENTARY INFORMATION:

Background

Section 110(a)(2)(C) of the Clean Air Act requires the development of State

Implementation Plans that include provisions for monitoring ambient air quality for the pollutants for which national ambient air quality standards (NAAQS) have been established. The ambient air monitoring reference and equivalent method regulations in 40 CFR Part 53, promulgated under the authority of section 301(a)(1) of the Clean Air Act, contain performance specifications, test procedures, and other requirements applicable to ambient air monitoring methods for most of the pollutants for which NAAQS have been established. Subpart A of Part 53 contains general requirements. Subpart B contains performance specifications and test procedures for candidate automated methods for the gaseous criteria pollutants. Subpart C contains test procedures and specifications for demonstrating the comparability of candidate equivalent methods to reference methods.

Elsewhere in this issue of the *Federal Register*, EPA is promulgating revisions to the NAAQS for particulate matter and a new reference method for the determination of ambient concentrations of particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}). Amendments to 40 CFR Part 53 to incorporate provisions for reference and equivalent methods for PM_{10} were proposed on March 20, 1984 (49 FR 10454). The proposed principal change to Part 53 was the addition of a new Subpart D, which prescribes performance specifications and test procedures specifically applicable to candidate methods for PM_{10} . Specifications and associated test procedures for PM_{10} candidate methods were proposed for sampling effectiveness (for both liquid and solid particles), 50 percent cutpoint, reproducibility, and flow rate stability. In addition, Subpart C was proposed to be revised to allow for the designation of equivalent methods for PM_{10} by adding test procedures and specifications to compare candidate equivalent methods to a PM_{10} reference method. The amendments being promulgated today are, with the exception of changes made in response to public comment, the same as those proposed on March 20, 1984.

Summary of Comments

EPA received comments from a total of 35 respondents on the proposed amendments to Part 53. The respondents are categorized as follows: industrial concerns or industry groups (26), State and local governmental agencies (7), and institutions (2). One commentator provided numerous detailed comments and recommendations concerning the

proposed performance specifications and test procedures; those comments formed the basis for the majority of the comments submitted by many of the industry respondents.

The commentators generally agreed with the performance-based approach for approving reference and equivalent methods for PM_{10} , an approach that would allow the use of currently available PM_{10} samplers and encourage improvements and innovations in future sampler designs. However, there was a general consensus that the proposed performance requirements were too lenient and would result in the approval of PM_{10} methods that could produce substantially different PM_{10} measurements in the field.

Most of the commentators believed that the typical urban particle size distribution used in the calculation of expected mass concentrations in the liquid particle sampling effectiveness test was inadequate. The commentators favored the use of a coarse particle-dominated distribution. Some commentators felt that five particle sizes were not sufficient to accurately define a candidate sampler's sampling effectiveness curve, and additional tests at higher wind speeds were suggested by others. Solid particle sampling effectiveness tests over a full range of particle sizes and wind speeds, with calculation of expected mass concentrations in the same manner as required in the liquid particle sampling effectiveness tests, were also recommended. Many of the commentators felt that the additional solid particle tests would be justified because of recently published reports indicating that significant PM_{10} measurement errors can result from solid particle bounce in sampler inlets with uncoiled internal collection surfaces.

Many of the industry commentators favored a specification and test procedure for D_{50} , the smallest particle size for which a candidate sampler's sampling effectiveness is zero. Although there was no consensus on what the D_{50} particle size specification should be, the commentators tended to favor a value between 15 and 25 μm . The industry groups recommended that all candidate methods be compared to an absolute reference sampler under field test conditions to validate sampler performance as determined in the wind tunnel tests. They further recommended that photomicrographs and scanning electron microscopy analysis be required as part of the field test to verify that candidate samplers do not collect large particles to an extent greater than allowed. A need for periodic retesting of approved samplers in a wind tunnel

following field use to check for degradation in performance due to exposure to ambient particulate matter was suggested by some commentators. Tighter specifications for sampler reproducibility and flow rate stability were also generally favored.

All of the comments were given careful consideration, and many of the suggestions and recommendations were taken. Those suggestions that resulted in revisions to the proposed requirements are discussed in more detail in the next section. Those suggestions that were rejected are discussed below.

The suggestions for a specification and test for D_0 are directed at the need to minimize the overcollection of coarse particles by approved PM_{10} methods. This issue can be adequately addressed by changing the particle size distribution used for the expected mass calculations in the liquid particle sampling effectiveness test. The use of a more appropriate size distribution dominated by coarse particles for this calculation will provide a test that is much more sensitive to sampler effectiveness curves that have a gradual tail on the large particle end of the curve (i.e., significant particle collection in the range from 15 to 25 μm). Samplers with a high coarse particle collection efficiency, relative to the ideal sampler, will have a higher probability of failing the sampling effectiveness test with the modified particle size distribution.

A need for additional wind tunnel tests at higher wind speeds has not been conclusively demonstrated. Current researchers are in disagreement concerning the effects of elevated wind speed on sampler performance. One researcher has observed an oversampling effect during wind tunnel tests of a current PM_{10} sampler at 48 km/hr (1). However, the developer of this sampler has conducted similar tests at 48 km/hr and found no such effect (2). Considering the uncertainty in the current information base and the impracticality and cost of an additional testing requirement, no additional tests at elevated wind speeds have been included in the final regulation.

The suggestion to require additional solid particle tests was given careful consideration but was rejected. Recent wind tunnel tests on a current PM_{10} sampler with an uncoiled inlet, using both solid and liquid particles in the range of 3 to 20 μm , indicate very little difference in measured sampling effectiveness for the two particle types (3). Thus, solid particle tests in this size range do not appear to be justified. Solid particle tests in a range of particle sizes above 20 μm might be appropriate to identify solid particle bounce problems with

candidate sampler inlets, but the technical problems associated with the generation and transport of large particles through the wind tunnel limit the maximum size of test particles to about 25 to 30 μm .

A field test to compare candidate methods to an absolute reference sampler to validate wind tunnel performance is a reasonable recommendation. However, such a test is not feasible due to the unavailability of any such well-characterized, unequivocal, and accepted sampling device, and the unlikelihood of any device becoming available in the near future. Furthermore, any absolute reference sampler that could be used for this purpose would most likely be characterized using wind tunnel tests. The ability of wind tunnel tests to accurately predict the reference sampler's performance under all ambient sampling conditions would be subject to the same reservations as is the wind tunnel testing of candidate method samplers.

Retesting of approved PM_{10} methods following some period of field use might be desirable. However, it would be difficult to design a practical performance test that would identify samplers vulnerable to performance degradation after a period of field use. The effect of field exposure would be dependent on sampler design and the concentration, size distribution, and types of particles sampled, among other factors, and could vary considerably from site to site. EPA has chosen to address this potential problem by requiring manufacturers to incorporate appropriate maintenance procedures into their sampler instruction manuals, and by implementing a post-designation testing program for approved PM_{10} methods. Current provisions of Part 53 require manufacturers to include maintenance procedures in their sampler instruction manuals, which would be reviewed and approved as part of the method designation process. EPA currently conducts post-designation testing of approved reference and equivalent methods for the other criteria pollutants, including both laboratory tests and field comparisons. Similar post-designation testing of approved PM_{10} methods should identify potential problems related to field use. In the event that a sampler problem is uncovered by post-designation testing by EPA, or during tests by other parties, the sampler manufacturer would be given the opportunity, under the existing provisions of Subpart A of Part 53, to take corrective actions or make other necessary adjustments to bring the method into compliance.

Specific Changes in Final Regulation

The following paragraphs discuss specific changes to the proposed amendments that resulted from review of the public comments. Other minor changes have also been made throughout Part 53 to clarify the proposed requirements and language.

Subpart D—Procedures for Testing Performance Characteristics of Methods for PM_{10}

The 50 percent cutpoint specification is changed from 10 ± 1 to $10 \pm .05 \mu m$. This change is necessary to minimize the potential for PM_{10} measurement bias among designated methods due to differences in cutpoint. The change is justified by improvements in the state-of-the-art technology for the wind tunnel characterization of particle sampling devices. Improved particle generation and sizing techniques, an increase in the number of particle sizes used in the liquid particle sampling effectiveness tests, and standardization of the wind tunnel test procedures should lead to increased confidence in the wind tunnel test results.

The typical urban particle size distribution used in the calculation of expected PM_{10} mass concentration for the test sampler and for the ideal sampler in the test for sampling effectiveness with liquid particles was strongly criticized as being much too lenient. The use of a particle size distribution characterized by a much larger coarse particle fraction and higher total mass concentration than the typical urban distribution proposed results in a more stringent sampling effectiveness test, alleviates the need for a D_0 test, and minimizes the potential for PM_{10} measurement bias among approved methods. Several alternative size distributions, both real and simulated, were considered, and a simulated size distribution representing rather extreme coarse particle concentration conditions was selected. The new distribution is characterized by a coarse mode mass median diameter of 14.0 μm , a fine mode mass median diameter of 0.5 μm , coarse and fine mode geometric standard deviations of 2.0, a coarse to fine ratio of 3.0, and a total mass concentration of 300 $\mu g/m^3$. This change in the particle size distribution will require that a candidate sampler's effectiveness curve more closely match that of the ideal sampler.

The number of particle sizes used in the tests for liquid particle sampling effectiveness and 50 percent cutpoint is increased from 5 to 10, increasing the minimum number of test measurements

with liquid particles from 45 to 90. Sampling effectiveness measurements for the increased number of particle sizes will result in a more precise determination of the test sampler's sampling effectiveness curve and 50 percent cutpoint.

The particle size used in the test for solid particle sampling effectiveness is changed from 20 to 25 μm . The larger particle size is believed to represent a more stringent test of particle bounce than the smaller size proposed, and yet is not too large to make generation and transport through the wind tunnel impractical or impossible.

The wind tunnel test procedure is changed to explicitly require the use of a vibrating orifice aerosol generator for the generation of all test particles. In addition, the solid test particles must be ammonium fluorescein. These requirements provide a more uniform and standardized approach for test particle generation, and should result in improved comparability of test results from different wind tunnel facilities, particularly results for solid particle bounce.

A requirement to correct liquid particle sampling effectiveness test results for the presence of multiplets (doublets and triplets) is added. Correction for multiplets is clearly necessary to ensure accurate determination of both sampling effectiveness and 50 percent cutpoint. More explicit procedures for the microscopic verification of particle size and the determination of the multiplet population in test particle atmospheres are also incorporated.

The sampling zone in the wind tunnel test section is redefined. The horizontal dimension is changed from not less than 1.5 times the width of the test sampler at its inlet opening to not less than 1.2 times that width. The vertical dimension is changed from not less than the height of the sampler inlet to 25 cm. This reduces the area in the wind tunnel test section in which test particle concentration uniformity must be established. The proposed definition of the sampling zone would have required concentration uniformity over a much larger area than is necessary. To ensure accurate test results, concentration uniformity is required only in close proximity to the test sampler's inlet opening.

A new provision is added to require that the internal collection surface or surfaces of a candidate sampler's inlet be cleaned prior to conducting wind tunnel tests with solid particles if the surface is normally dry (i.e., not coated with oil or grease). If the solid particle bounce test is conducted following tests

with liquid particles, it is possible that any coating of liquid particles on the inlet's internal collection surface could suppress the extent of solid particle bounce during the subsequent test.

The specification for reproducibility, now referred to as precision, is changed from 15 percent to 5 $\mu\text{g}/\text{m}^3$ for PM_{10} concentrations below 80 $\mu\text{g}/\text{m}^3$ and 7 percent for PM_{10} concentrations above 80 $\mu\text{g}/\text{m}^3$. The specification for flow rate stability is changed from a single specification for the maximum difference between initial and final flow rates over a 24-hour sampling period to two specifications. The new specifications require that (1) the average flow rate over a 24-hour sampling period be within ± 5 percent of the initial flow rate, and (2) all measured flow rates during the 24-hour sampling period be within ± 10 percent of the initial flow rate. The number of sampling periods (test days) for the precision and flow rate stability tests is increased from 5 to 10. The flow rate stability test procedure is changed to require flow rate measurements at 6-hour intervals during three of the 10 test days. These changes are based on a general consensus that current commercial PM_{10} samplers are capable of meeting more stringent requirements than were initially proposed.

The accuracy specification for all flow measurements obtained during the tests is changed from 5 to 2 percent. The proposed specification was unnecessarily loose, since higher accuracy is easily attainable with most flow measurement techniques.

Subpart C—Procedures for Determining Comparability Between Candidate Methods and Reference Methods

The test requirements and specifications for candidate equivalent methods for PM_{10} are changed to provide an improved and more stringent test of comparability. The proposed test required the collection of five sets of simultaneous 24-hour PM_{10} samples with one reference method sampler and three candidate method samplers at three different test sites. If the difference between the candidate method and reference method PM_{10} measurements exceeded 20 percent more than once per test site, the candidate method would fail the comparability test. This requirement was considered to be inadequate and much too lenient by most of the commentators, because it could theoretically result in the approval of methods that produce PM_{10} measurements as much as 40 percent apart.

The revised procedure requires the comparison of three candidate method

samplers and three reference method samplers over 10 to 15 test days at each of two test sites. The precision of the reference method PM_{10} measurements on each test day is required to be 5 $\mu\text{g}/\text{m}^3$ or 7 percent. The linear regression relationship between the candidate method and reference method PM_{10} measurements is determined for each test site. If the linear regression slope and intercept fall within 1.00 ± 0.1 and $0 \pm 5 \mu\text{g}/\text{m}^3$, respectively, and the correlation coefficient is 0.97 or better at each test site, the candidate method passes the test for comparability.

Designation of Approved Methods for PM_{10}

There will be a period of perhaps several months before the first PM_{10} reference method is designated. To expedite the availability of approved PM_{10} samplers, manufacturers are encouraged to conduct the required testing and to submit an application for a reference method determination as soon as possible. Manufacturers are also encouraged to consider appropriate sampler design changes to minimize potential performance degradation due to field exposure and to incorporate more definitive maintenance guidance in their instruction manuals. In the unlikely event that no manufacturer-tested PM_{10} sampler is designated as a reference method in a reasonable time, provisions in Part 53 would allow EPA to conduct the tests itself, if necessary. Since candidate equivalent methods for PM_{10} must be compared to a designated PM_{10} reference method as part of the testing requirements, some additional time will be necessary before any equivalent methods can be designated.

Whenever an application for a reference or equivalent method determination is received by EPA, a notice of receipt of application will be published in the *Federal Register* in accordance with Part 53. Likewise, whenever a method is designated, notice of the designation and other information pertinent to the method designation will be published in the *Federal Register*.

Automated or Continuous Methods for PM_{10}

Manufacturers of particulate sampling equipment are strongly encouraged to pursue the development of automated or continuous methods for PM_{10} . In many areas, PM_{10} compliance monitoring is required on a daily basis. Everyday monitoring using conventional manual reference or equivalent methods requires multiple samplers at many monitoring sites, resulting in increased costs for equipment procurement,

operation, and maintenance. The development and formal designation of automated PM₁₀ samplers, or preferably continuous PM₁₀ monitors, could substantially reduce the cost and manpower burden that a daily sampling schedule imposes on State and local air monitoring agencies. Continuous PM₁₀ monitors would also be extremely useful for episode monitoring where PM₁₀ measurements for periods shorter than 24 hours are needed.

Regulatory Impact Analysis

Under Executive Order 12291, EPA must judge whether a regulation is "major" and therefore subject to the requirement of a Regulatory Impact Analysis. This rule is not a major regulation, because it principally revises the existing provisions in 40 CFR Part 53 to incorporate requirements for the designation of reference and equivalent methods for PM₁₀, in conjunction with the revisions to the NAAQS for particulate matter. Moreover, the total national expenditures for PM₁₀ samplers will be much less than \$100 million. In fact, EPA estimates that it will be less than \$10 million. The Regulatory Impact of the revisions to the NAAQS is addressed in that rulemaking, which is published elsewhere in today's Federal Register.

Impact on Small Entities

The Regulatory Flexibility Act, 5 U.S.C. 601 et seq., requires that all federal agencies consider the impacts of final regulations on small entities, which are defined to be small businesses, small organizations, and small governmental jurisdictions. EPA's consideration pursuant to this Act indicates that no small entity group would be significantly affected in an adverse way by this rulemaking. Therefore, pursuant to 5 U.S.C. 605(b) the Administrator certifies that this regulation will not have a significant economic impact on a substantial number of small entities.

Other Reviews

This regulation was submitted to the Office of Management and Budget (OMB) for review. Comments from OMB and EPA responses to these comments are available for public inspection at EPA's Central Docket Section (Docket No. A-82-43), West Tower Lobby, Gallery I, Waterside Mall, 401 M Street, SW., Washington, DC.

List of Subjects in 40 CFR Part 53

Administrative practice and procedure, Air pollution control.

Dated: June 2, 1987.

Lee M. Thomas,
Administrator.

References

1. Wedding, J.B., M.A. Weigand, and Y.J. Kim, Evaluation of the Sierra-Andersen 10- μ m Inlet for the High-Volume Sampler, *Atmos. Environ.*, Vol. 19, No. 3, pp. 539-542 (1985).
2. McFarland, A.R., and C.A. Ortiz, Response to Comment on "A Field Comparison of PM₁₀ Inlets at Four Locations", *JAPCA*, Vol. 35, No. 9, pp. 950-953 (1985).
3. Woods, M., F. Chen, and M.B. Ranade, The PM₁₀ Sampler Evaluation Program: January 1985 to July 1986, EPA-600/4-87/004, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, January 1987.

PART 53—AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS

For the reasons set forth in the preamble, Part 53 of Chapter I of Title 40 of the Code of Federal Regulations is amended as follows:

1. The authority citation for Part 53 continues to read as follows:

Authority: Sec. 301(a) of the Clean Air Act (42 U.S.C. sec. 1857g(a)), as amended by sec. 15(c)(2) of Pub. L. 91-604, 84 Stat. 1713, unless otherwise noted.

1a. Section 53.1 is amended by revising paragraph (j) and adding paragraphs (m) and (n) to read as follows:

§ 53.1 Definitions.

(j) "Test analyzer" means an analyzer subjected to testing as a candidate method in accordance with Subparts B, C, and/or D of this part, as applicable.

(m) "PM₁₀ sampler" means a device, associated with a manual method for measuring PM₁₀, designed to collect PM₁₀ from an ambient air sample, but lacking the ability to automatically analyze or measure the collected sample to determine the mass concentration of PM₁₀ in the sampled air.

(n) "Test sampler" means a sampler subjected to testing as part of a candidate method in accordance with Subpart C or D of this part.

2. Section 53.2 is revised to read as follows:

§ 53.2 General requirements for a reference method determination.

(a) *Manual methods.* (1) For measuring SO₂ and lead, Appendices A and G, respectively, of Part 50 of this chapter specify unique manual reference methods for those pollutants. Except as provided in § 53.16, other manual

methods for SO₂ and lead will not be considered for reference method determinations under this part.

(2) For measuring PM₁₀, a candidate method must be a manual method that meets the requirements specified in Appendix J of Part 50 of this chapter and must include a PM₁₀ sampler that meets the requirements specified in Subpart D of this part.

(b) *Automated methods.* For measuring CO, O₃, and NO₂, a candidate automated method must utilize the measurement principle and calibration procedure specified in the appropriate appendix to Part 50 of this chapter and must meet the requirements specified in Subpart B of this part.

3. Section 53.3 is revised to read as follows:

§ 53.3 General requirements for an equivalent method determination.

(a) *Manual methods.* Candidate manual methods must satisfy the requirements specified in Subpart C of this part. In addition, samplers associated with manual methods for PM₁₀ must satisfy the requirements of Subpart D of this part.

(b) *Automated methods.* Candidate automated methods for pollutants other than PM₁₀ must satisfy the requirements specified in Subparts B and C of this part. Candidate automated methods for PM₁₀ must satisfy the requirements of Subparts C and D of this part.

§ 53.4 [Amended]

4. Section 53.4 is amended as follows:

a. In paragraph (a), the address for submission of applications for reference or equivalent method determinations is revised to read as follows:

(a) * * * Director, Environmental Monitoring Systems Laboratory, Department E, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

b. In paragraph (b)(3), the phrase "For automated methods," is revised to read "For samplers and automated methods," and footnote 1 is removed.

c. Paragraphs (b)(4) through (b)(6) and (c) are revised to read as follows:

(b) * * *

(4) A statement that the candidate method has been tested in accordance with the procedures described in Subparts B, C, and/or D of this part, as applicable.

(5) Test data, records, calculations, and test results as specified in Subparts B, C, and/or D of this part, as applicable.

(6) A statement that the method, analyzer, or sampler tested in accordance with this part is representative of the candidate method described in the application.

(c) For candidate automated methods and candidate manual methods for PM_{10} , the application shall also contain the following:

(1) A detailed description of the quality control program that will be utilized, if the candidate method is designated as a reference or equivalent method, to ensure that all analyzers or samplers offered for sale under that designation will have essentially the same performance characteristics as the analyzer or sampler tested in accordance with this part.

(2) A description of the durability characteristics of such analyzers or samplers (see § 53.9(c)).

§ 53.9 [Amended]

5. Section 53.9 is amended as follows:

a. Paragraph (c) is revised to read as follows:

(c) Any analyzer or PM_{10} sampler offered for sale as a reference or equivalent method shall function within the limits of the performance specifications referred to in § 53.20(a) or § 53.40(a), as applicable, for at least one year after delivery and acceptance when maintained and operated in accordance with the manual referred to in § 53.4(b)(3).

b. In paragraphs (d), (f), and (g), the words "analyzer" or "analyzers" are removed each time they occur and replaced with the phrases "analyzer or PM_{10} sampler" or "analyzers or PM_{10} samplers", respectively.

6. The title of Subpart B is revised to read as follows:

Subpart B—Procedures for Testing Performance Characteristics of Automated Methods for SO_2 , CO , O_3 , and NO_2

7. The title of Subpart C is revised to read as follows:

Subpart C—Procedures for Determining Comparability Between Candidate Methods and Reference Methods

8. Section 53.30 is amended as follows:

a. Paragraph (a) is revised to read as follows:

§ 53.30 General provisions.

(a) *Determination of comparability.* The test procedures prescribed in this subpart shall be used to determine if a candidate method is comparable to a

reference method when both methods measure pollutant concentrations in ambient air.

(1) Comparability is shown for SO_2 , CO , O_3 , and NO_2 methods when the differences between:

(i) Measurements made by a candidate manual method or by a test analyzer representative of a candidate automated method, and

(ii) Measurements made simultaneously by a reference method, are less than or equal to the values specified in the last column of Table C-1.

(2) Comparability is shown for lead methods when the differences between:

(i) Measurements made by a candidate method, and (ii) measurements made by the reference method on simultaneously collected lead samples (or the same sample, if applicable), are less than or equal to the value specified in Table C-3.

(3) Comparability is shown for PM_{10} methods when the relationship between: (i) Measurements made by a candidate method, and (ii) measurements made by a reference method on simultaneously collected PM_{10} samples (or the same sample, if applicable) at each of two test sites, is such that the linear regression parameters (slope, intercept, and correlation coefficient) describing the relationship meet the values specified in Table C-4.

b. The heading of paragraph (b)(2) is revised and paragraph (b)(4) is added to read as follows:

(b) * * *

(2) Methods for SO_2 , CO , O_3 , and NO_2 .

(4) *Methods for PM_{10} .* Test measurements must be made at, or derived from particulate samples collected at, not less than two test sites, each of which must be located in a geographical area characterized by ambient particulate matter that is significantly different in nature and composition from that at the other test site(s). Augmentation of pollutant concentrations is not permitted, hence appropriate test sites must be selected to provide PM_{10} concentrations in the specified range.

c. Paragraph (c) is revised to read as follows:

(c) *Test atmosphere.* Ambient air sampled at an appropriate test site or sites shall be used for these tests. Simultaneous concentration measurements shall be made in each of

the concentration ranges specified in Table C-1, C-3, or C-4, as appropriate.

d. The heading of paragraph (d)(2) and paragraphs (d)(3) and (d)(4) are revised to read as follows:

(d) * * *

(2) *Methods for SO_2 , CO , O_3 , and NO_2 .*

(3) *Methods for lead and PM_{10} .* The ambient air intake points of the candidate and reference method samplers for lead or PM_{10} shall be located at the same height, and between 2 and 4 meters apart. The samplers shall be oriented in a manner that will minimize spatial and wind directional effects on sample collection.

(4) *Methods employing a common sampling procedure.* Candidate methods which employ a sampler and sample collection procedure that are identical to the sampler and sample collection procedure specified in the reference method may be tested by analyzing common samples. The common samples shall be collected according to the sample collection procedure specified by the reference method and shall be analyzed in accordance with the analytical procedures of both the candidate method and the reference method.

§ 53.31 [Amended]

9. Section 53.31 is amended by revising the heading and first sentence of paragraph (b) to read as follows:

(b) *Samplers and automated methods.* Set-up and start-up of the test analyzer, test sampler(s), and reference method (if applicable) shall be in strict accordance with the applicable operation manual(s).

10. Section 53.32 is amended by removing the phrase "consistent relationship" each time it appears in paragraphs (c)(1), (c)(2), (c)(3)(i), (c)(3)(ii), and (c)(4) and replacing it with the word "comparability", and by revising the title to read as follows:

§ 53.32 Test procedures for methods for SO_2 , CO , O_3 , and NO_2 .

11. Section 53.33 is amended as follows:

a. The title is revised to read as follows:

§ 53.33 Test procedure for methods for lead.

b. In paragraph (b), the address is revised to read:

*** Director, Quality Assurance Division (MD-77), Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. ***

c. In paragraphs (e), (h) heading, and (i), the phrase "consistent relationship" is removed each time it appears and replaced by the word "comparability."

d. Paragraphs (h)(2) and (h)(3) are revised to read as follows:

(2) If none of the percent differences (D) exceed ± 20 percent, the candidate method passes the test for comparability.

(3) If one or more of the percent differences (D) exceed ± 20 percent, the candidate method fails the test for comparability.

12. Section 53.34 is added to read as follows:

§ 53.34 Test procedure for methods for PM_{10} .

(a) *Sample collection.* Using three reference method samplers collocated with three candidate method samplers, collect a minimum of 15 sets of simultaneous 24-hour PM_{10} samples at each of two test sites (i.e., a minimum of 30 sets of samples, each consisting of three reference method and three candidate method samples collected simultaneously, 180 samples total). If the conditions of § 53.30(d)(4) apply, collect sample sets only with the three reference method samplers.

(b) *Sample analysis.* Analyze each sample (or the same sample if § 53.30(d)(4) applies) according to the reference method or candidate method, as appropriate, and determine the PM_{10} concentration in $\mu g/m^3$.

(c) *Test for comparability.* (1) For each of the sample sets, calculate the average PM_{10} concentration obtained with the reference method samplers:

$$\bar{R}_j = \frac{\sum_{i=1}^3 R_{ij}}{3}$$

where R denotes results from the reference method, i is the sampler number, and j is the set.

(2) For each of the sample sets, calculate the precision of the reference method PM_{10} measurements:

$$P_j = \sqrt{\frac{\sum_{i=1}^3 R_{ij}^2 - (\sum_{i=1}^3 R_{ij})^2/3}{2}}$$

if $\bar{R}_j$ is below $80 \mu g/m^3$, or

$$RP_j = 100\% \times \sqrt{\frac{\sum_{i=1}^3 R_{ij}^2 - (\sum_{i=1}^3 R_{ij})^2/3}{2}} / \bar{R}_j$$

if $\bar{R}_j$ is above $80 \mu g/m^3$.

(3) If R_j falls outside the acceptable concentration range specified in Table C-4 for any set, or if P_j or RP_j , as applicable, exceeds the value specified in Table C-4 for any set, that set of samples shall be discarded. For each site, at least three of the sample sets shall have R_j values below $80 \mu g/m^3$ and at least three of the sample sets shall have R_j values above $80 \mu g/m^3$. Additional sample sets shall be collected and analyzed, as necessary, to provide a minimum of 10 acceptable sample sets for each site. If more than 10 sample sets meet the above criteria, all such sample sets shall be used to demonstrate comparability.

(4) For each of the acceptable sample sets, calculate the average PM_{10} concentration obtained with the candidate method samplers:

$$\bar{C}_j = \frac{\sum_{i=1}^3 C_{ij}}{3}$$

where C denotes results from the candidate method, i is the sampler number, and j is the set.

(5) For each site, plot the average PM_{10} measurements obtained with the candidate method ($\bar{C}_j$) against the corresponding average PM_{10} measurements obtained with the reference method ($\bar{R}_j$). For each site, calculate and record the linear

regression slope and intercept, and the correlation coefficient.

(6) If the linear regression parameters calculated above meet the values specified in Table C-4 for each test site, the candidate method passes the test for comparability.

TABLE C-4.—TEST SPECIFICATIONS FOR PM_{10} METHODS

Acceptable concentration range, $\mu g/m^3$.	30 to 500.
Minimum number of test sites...	2.
Number of candidate method samplers per site.	3.
Number of reference method samplers per site.	3.
Minimum number of 24-hour samples per sampler per site.	15.
Minimum number of acceptable sample sets per site.	10.
Precision of replicate reference method measurements.	$5 \mu g/m^3$ or 7 percent.
Slope of regression relationship.	1 ± 0.1 .
Intercept of regression relationship, $\mu g/m^3$.	0 ± 5 .
Correlation of reference method and candidate method measurements.	> 0.97 .

13. A new Subpart D is added to read as follows:

Subpart D—Procedures for Testing Performance Characteristics of Methods for PM_{10}

Sec.	
53.40	General provisions.
53.41	Test conditions.

Sec.

53.42 Generation of test atmospheres for wind tunnel tests.

53.43 Test procedures.

Subpart D—Procedures for Testing Performance Characteristics of Methods for PM₁₀

§ 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 $10 \pm 0.5 \mu\text{m}$.

(f) The solid particle sampling effectiveness of a test sampler shall be determined in a wind tunnel using $25 \mu\text{m}$ particles at 2 wind speeds as specified in Table D-2. A minimum of three replicate measurements of sampling effectiveness for the $25 \mu\text{m}$ 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 $25 \mu\text{m}$ solid particles and the average of the replicate measurements obtained for the $25 \mu\text{m}$ 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.

(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.
B. Solid particles	Percent	Sampling effectiveness is no more than 5 percent above that obtained for liquid particles of same size.
2. 50 Percent cutpoint	μm	$10 \pm 0.5 \mu\text{m}$ aerodynamic diameter.
3. Precision	$\mu\text{g}/\text{m}^3$ or percent	$5 \mu\text{g}/\text{m}^3$ 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

* 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, North Carolina 27711.

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) *	Wind speed (km/hr)		
	2	8	24
3±0.5	/	/	/
5±0.5	/	/	/
7±0.5	/	/	/
9±0.5	/	/	/
10±0.5	/	/	/
11±0.5	/	/	/
13±1.0	/	/	/
15±1.0	/	/	/
20±1.0	/	/	/
25±1.0	/	//s	//s

* Mass median aerodynamic diameter.

/ = liquid particle.

s = solid particle.

Number of liquid particle test points (minimum of 3 replicates for each combination of particle size and wind speed): 90.

Number of solid particle test points (minimum of 3 replicates for each combination of particle size and wind speed): 6.

Total number of test points: 96.

(b) The size of the test particles delivered to the test section of the wind tunnel shall be established using the operating parameters of the vibrating orifice aerosol generator and shall be verified during the tests by microscopic examination of samples of the particles collected on glass slides or other suitable substrates. When sizing liquid particles on glass slides, the slides should be pretreated with an oleophobic surfactant and an appropriate flattening factor shall be used in the calculation of aerodynamic diameter. The particle size, as established by the operating parameters of the vibrating orifice aerosol generator, shall be within the tolerance specified in Table D-2. The precision of the particle size verification technique shall be 0.5 μm or better, and particle size determined by the verification technique shall not differ by more than 0.5 μm or 10 percent, whichever is higher, from that established by the operating parameters of the vibrating orifice aerosol generator.

(c) The population of multiplets in a test particle atmosphere shall be determined during the tests and shall not exceed 10 percent. Solid particles shall be checked for dryness and evidence of breakage or agglomeration during the microscopic examination. If the solid particles in a test atmosphere are wet or show evidence of significant breakage or agglomeration (> 5 percent), the solid particle test atmosphere is unacceptable for purposes of these tests.

(d) The concentration of particles in the wind tunnel is not critical. However, the cross-sectional uniformity of the particle concentration in the sampling zone of the test section shall be established during the tests using isokinetic samplers. An array of not less than five evenly spaced isokinetic samplers shall be used to determine the particle concentration uniformity in the sampling zone. If the particle concentration measured by any single isokinetic sampler in the sampling zone differs by more than 10 percent from the mean concentration, the particle delivery system is unacceptable in terms of uniformity of particle concentration. The sampling zone shall be a rectangular area having a horizontal dimension not less than 1.2 times the width of the test sampler at its inlet opening and a vertical dimension not less than 25 centimeters. The sampling

zone is an area in the test section of the wind tunnel that is horizontally and vertically symmetrical with respect to the test sampler inlet opening.

(e) The wind speed in the wind tunnel shall be determined during the tests using an appropriate technique capable of a precision of 5 percent or better (e.g., hot-wire anemometry). The mean wind speed in the test section of the wind tunnel during the tests shall be within 10 percent of the value specified in Table D-2. The wind speed measured at any test point in the test section shall not differ by more than 10 percent from the mean wind speed in the test section. The turbulence intensity (longitudinal component and macroscale) in the test section shall be determined during the tests using an appropriate technique (e.g., hot-wire anemometry).

(f) The accuracy of all flow measurements used to calculate the test atmosphere concentrations and the test results shall be documented to be within ±2 percent, referenced to a primary standard. Any flow measurement corrections shall be clearly shown. All flow measurements shall be given in actual volumetric units.

(g) Schematic drawings of the particle delivery system (wind tunnel and blower system) and other information showing complete procedural details of the test atmosphere generation, verification, and delivery techniques shall be submitted to EPA. All pertinent calculations shall be clearly presented.

§ 53.43 Test procedures.

(a) *Sampling Effectiveness*—(1) *Technical Definition.* The ratio (expressed as a percentage) of the mass concentration of particles of a given size reaching the sampler filter or filters to the mass concentration of particles of the same size approaching the sampler.

(2) *Test Procedure.* (i) Establish a wind speed specified in Table D-2 and measure the wind speed and turbulence intensity (longitudinal component and macroscale) at a minimum of 12 test points in a cross-sectional area of the test section of the wind tunnel. The mean wind speed in the test section must be within ±10 percent of the value specified in Table D-2 and the variation at any test point in the test section may not exceed 10 percent of the mean.

(ii) Generate particles of a size and type specified in Table D-2 using a vibrating orifice aerosol generator. Check for the presence of satellites and adjust the generator as necessary. Calculate the aerodynamic particle size using the operating parameters of the vibrating orifice aerosol generator and record. The calculated aerodynamic

diameter must be within the tolerance specified in Table D-2.

(iii) Collect a sample of the particles on a glass slide or other suitable substrate at the particle injection point. If a glass slide is used, it should be pretreated with an appropriate oleophobic surfactant when collecting liquid particles. Use a microscopic technique to size a minimum of 25 primary particles in three viewing fields (do not include multiplets). Determine the geometric mean aerodynamic diameter and geometric standard deviation using the bulk density of the particle type (and an appropriate flattening factor for liquid particles if collected on a glass slide). The measured geometric mean aerodynamic

diameter must be within 0.5 μm or 10 percent of the aerodynamic diameter calculated from the operating parameters of the vibrating orifice aerosol generator. The geometric standard deviation must not exceed 1.1.

(iv) Determine the population of multiplets (doublets and triplets) in the collected sample by counting a minimum of 100 particles in three viewing fields. The multiplet population of the particle test atmosphere must not exceed 10 percent.

(v) Introduce the particles into the wind tunnel and allow the particle concentration to stabilize.

(vi) Install an array of five or more evenly spaced isokinetic samplers in the sampling zone (see § 53.42(d)) of the

wind tunnel. Collect particles on appropriate filters (e.g., glass fiber) over a time period such that the relative error of the measured particle concentration is less than 5 percent. Relative error is defined as $(p \times 100\%) / (X)$, where p is the precision of the fluorometer on the appropriate range, X is the measured concentration, and the units of p and X are the same.

(vii) Determine the quantity of material collected with each isokinetic sampler in the array using a calibrated fluorometer. Calculate and record the mass concentration for each isokinetic sampler as:

$$C_{\text{iso}(i)} = \frac{\text{mass of material collected with isokinetic sampler}}{\text{sample flow rate} \times \text{sampling time}}$$

where i = replicate number and j = isokinetic sampler number.

(viii) Calculate and record the mean mass concentration as:

$$\bar{C}_{\text{iso}(i)} = \frac{\sum_{j=1}^n C_{\text{iso}(ij)}}{n}$$

where n = total number of isokinetic samplers.

(ix) Calculate and record the coefficient of variation of the mass concentration measurements as:

$$CV_{\text{iso}(i)} = \sqrt{\frac{\sum_{j=1}^n C_{\text{iso}(ij)}^2 - (\sum_{j=1}^n C_{\text{iso}(ij)})^2 / n}{n-1}} / \bar{C}_{\text{iso}(i)}$$

If the value of $CV_{\text{iso}(i)}$ exceeds 0.10, the particle concentration uniformity is unacceptable and steps vi through ix must be repeated. If adjustment of the vibrating orifice aerosol generator or changes in the particle delivery system are necessary to achieve uniformity, steps ii through ix must be repeated. Remove the array of isokinetic samplers from the wind tunnel. NOTE: A single isokinetic sampler, operated at the same nominal flow rate as the test sampler, may be used in place of the array of isokinetic samplers for the

determination of particle mass concentration used in the calculation of sampling effectiveness of the test sampler in step xiii. In this case, the array of isokinetic samplers must be used to demonstrate particle concentration uniformity prior to the replicate measurements of sampling effectiveness.

(x) If a single isokinetic sampler is used, install the sampler in the wind tunnel with the sampler nozzle centered in the sampling zone (see § 53.42(d)). Collect particles on an appropriate filter

(e.g., glass fiber) for a time period such that the relative error of the measured concentration (as defined in step vi) is less than 5 percent. Determine the quantity of material collected with the isokinetic sampler using a calibrated fluorometer. Calculate and record the mass concentration as $C_{\text{iso}(i)}$ as in step vii. Remove the isokinetic sampler from the wind tunnel.

(xi) Install the test sampler (or portion thereof) in the wind tunnel with the sampler inlet opening centered in the sampling zone (see § 53.42(d)). To meet

the maximum blockage limit of § 53.42(a) or for convenience, part of the test sampler may be positioned external to the wind tunnel provided that neither the geometry of the sampler nor the length of any connecting tube or pipe is altered. Collect particles on an appropriate filter or filters (e.g., glass

fiber) for a time period such that the relative error of the measured concentration (as defined in step vi) is less than 5 percent.

(xii) Determine the quantity of material collected with the test sampler using a calibrated fluorometer. Calculate and record the mass concentration as:

$$C_{sam(i)} = \frac{\text{mass of material collected with test sampler}}{\text{sample flow rate} \times \text{sampling time}}$$

where i = replicate number.

(xiii) Calculate and record the sampling effectiveness of the test sampler as:

$$E_{(i)} = \frac{C_{sam(i)}}{C_{iso(i)}} \times 100\%$$

where i = replicate number.

Note.—If a single isokinetic sampler is used for the determination of particle mass concentration, replace $C_{iso(i)}$ with $C_{iso(i)}$.

(xiv) Remove the test sampler from the wind tunnel. Repeat steps vi through xiii, as appropriate, to obtain a minimum of three replicate measurements of sampling effectiveness.

(xv) Calculate and record the average sampling effectiveness of the test sampler as:

$$\bar{E} = \frac{\sum_{i=1}^n E(i)}{n}$$

where n = number of replicates.

(xvi) Calculate and record the coefficient of variation for the replicate sampling effectiveness measurements of the test sampler as:

$$CV_E = \sqrt{\frac{\sum_{i=1}^n E(i)^2 - (\sum_{i=1}^n E(i))^2/n}{n-1}} / \bar{E}$$

If the value of CV_E exceeds 0.10, the test run (steps ii through xvi) must be repeated.

(xvii) Repeat steps i through xvi for each wind speed, particle size, and particle type specified in Table D-2.

(xviii) For each of the three wind speeds (nominally 2, 8, and 24 km/hr), correct the liquid particle sampling effectiveness data for the presence of multiplets (doublets and triplets) in the test particle atmospheres.

(xix) For each wind speed, plot the corrected liquid particle sampling effectiveness of the test sampler (E_{corr}) as a function of particle size (d_p) on semi-logarithmic graph paper where d_p is the particle size established by the operating parameters of the vibrating orifice aerosol generator. Construct a smooth curve through the data.

(xx) For each wind speed, calculate the expected mass concentration for the test sampler under the assumed particle size distribution and compare it to the mass concentration predicted for the ideal sampler, as follows:

(A) Extrapolate the upper and lower ends of the corrected liquid particle sampling effectiveness curve to 100 percent and 0 percent, respectively, using smooth curves. Assume that $E_{corr} = 100$ percent at a particle size of 1.0 μm and $E_{corr} = 0$ percent at a particle size of 50 μm .

(B) Determine the value of E_{corr} at each of the particle sizes specified in the first column of Table D-3. Record each E_{corr} value as a decimal between 0 and 1 in the second column of Table D-3.

(C) Multiply the values of E_{corr} in column 2 by the interval mass concentration values in column 3 and enter the products in column 4 of Table D-3.

(D) Sum the values in column 4 and enter the total as the expected mass concentration for the test sampler at the bottom of column 4 of Table D-3.

(E) Calculate and record the percent difference in expected mass concentration between the test sampler and the ideal sampler as:

$$\Delta C = \frac{C_{sam(exp)} - C_{ideal(exp)}}{C_{ideal(exp)}} \times 100\%$$

where:

$C_{sam(exp)}$ = expected mass concentration for the test sampler, $\mu\text{g}/\text{m}^3$

$C_{ideal(exp)}$ = expected mass concentration for the ideal sampler, $\mu\text{g}/\text{m}^3$ (calculated for the ideal sampler and given at the bottom of column 7 of Table D-3.)

(F) The candidate method passes the liquid particle sampling effectiveness test if the ΔC value for each wind speed meets the specification in Table D-1.

(xxi) For each of the two wind speeds (nominally 8 and 24 km/hr), calculate the difference between the average sampling effectiveness value for the 25 μm solid particles and the average sampling effectiveness value for the 25 μm liquid particles (uncorrected for multiplets).

(xxii) The candidate method passes the solid particle sampling effectiveness test if each such difference meets the specification in Table D-1.

TABLE D-3—EXPECTED MASS CONCENTRATION FOR PM_{10} SAMPLERS

Particle size (μm)	Test sampler			Ideal Sampler		
	Sampling effectiveness	Interval mass concentration ($\mu\text{g}/\text{m}^3$)	Expected mass concentration ($\mu\text{g}/\text{m}^3$)	Sampling effectiveness	Interval mass concentration ($\mu\text{g}/\text{m}^3$)	Expected mass concentration ($\mu\text{g}/\text{m}^3$)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<1.0	1.000	62.813	62.813	1.000	62.813	62.813
1.5		9.554		0.949	9.554	9.067
02.0		2.164		0.942	2.164	2.038
02.5		1.785		0.933	1.785	1.665
03.0		2.084		0.922	2.084	1.921
03.5		2.618		0.909	2.618	2.380
04.0		3.211		0.893	3.211	2.867
04.5		3.784		0.876	3.784	3.315
05.0		4.300		0.857	4.300	3.685
05.5		4.742		0.835	4.742	3.960
06.0		5.105		0.812	5.105	4.145
06.5		5.389		0.786	5.389	4.236
07.0		5.601		0.759	5.601	4.251

TABLE D-3—EXPECTED MASS CONCENTRATION FOR PM₁₀ SAMPLERS—Continued

Particle size (µm)	Test sampler			Ideal Sampler		
	Sampling effectiveness	Interval mass concentration (µg/m ³)	Expected mass concentration (µg/m ³)	Sampling effectiveness	Interval mass concentration (µg/m ³)	Expected mass concentration (µg/m ³)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
07.5		5.746		0.729	5.746	4.189
08.0		5.834		0.697	5.834	4.066
08.5		5.871		0.664	5.871	3.898
09.0		5.864		0.628	5.864	3.683
09.5		5.822		0.590	5.822	3.435
10.0		5.750		0.551	5.750	3.168
10.5		5.653		0.509	5.653	2.877
11.0		5.257		0.465	5.257	2.640
12.0		10.521		0.371	10.521	3.903
13.0		9.902		0.269	9.902	2.664
14.0		9.250		0.159	9.250	1.471
15.0		8.593		0.041	8.593	0.352
16.0		7.948		0.000	7.948	0.000
17.0		7.329		0.000	7.329	0.000
18.0		6.904		0.000	6.904	0.000
20.0		11.366		0.000	11.366	0.000
22.0		9.540		0.000	9.540	0.000
24.0		7.997		0.000	7.997	0.000
26.0		6.704		0.000	6.704	0.000
28.0		5.627		0.000	5.627	0.000
30.0		7.785		0.000	7.785	0.000
35.0		7.800		0.000	7.800	0.000
40.0		5.192		0.000	5.192	0.000
45.0		4.959		0.000	4.959	0.000
		$C_{\text{ideal(exp)}} =$			$C_{\text{ideal(exp)}} =$	143.889

(b) *50 Percent Cutpoint*—(1) *Technical Definition*. The particle size for which the sampling effectiveness of the sampler is 50 percent.

(2) *Test Procedure*. (i) From the corrected liquid particle sampling effectiveness curves for each of the three wind speeds, determine the particle size at which the curve crosses the 50 percent effectiveness line and record as D_{50} on the corresponding sampling effectiveness plot.

(ii) The candidate method passes the 50 percent cutpoint test if the D_{50} value at each wind speed meets the specification in Table D-1.

(c) *Precision*—(1) *Technical Definition*. The variation in the measured particle concentration among identical samplers under typical sampling conditions.

(2) *Test Procedure*. (i) Set up three identical test samplers at the test site in strict accordance with the instructions in the manual referred to in § 53.4(b)(3). Locate the test sampler inlet openings at the same height and between 2 and 4 meters apart. The samplers shall be oriented in a manner that will minimize spatial and wind directional effects on sample collection. Perform a flow calibration for each test sampler in accordance with the instructions given in the instruction manual and/or Appendix J to Part 50 of this chapter. Set the operating flow rate to the value prescribed in the sampler instruction

manual. NOTE: For candidate equivalent methods, this test may be used to satisfy part of the requirements of Subpart C of this chapter. In that case, three reference method samplers are also used at the test site, measurements with the candidate and

reference methods are compared as specified in § 53.34, and the test site must meet the requirements of § 53.30(b).

(ii) Measure the PM₁₀ concentration of the atmosphere using the three test samplers for 10 periods (test days) of 24 hours each. On each of the 10 test days, measure the initial and final flow rates of each test sampler. On three of the test days, measure the flow rate of each test sampler after 6, 12, and 18 hours of operation. All measurements of flow rate and mass collected must be made in accordance with the procedures prescribed in the sampler instruction manual and/or Appendix J to Part 50 of this chapter. All measurements of flow rate must be in actual volumetric units. Record the PM₁₀ concentration for each sampler and each test day as $C_{(ij)}$ where i is the sampler number and j is the test day.

(iii) For each test day, calculate and record the average of the three measured PM₁₀ concentrations as $C_{(j)}$ where j is the test day. If $C_{(j)} < 30 \mu\text{g}/\text{m}^3$ for any test day, data from that test day are unacceptable and the tests for that day must be repeated.

(iv) Calculate and record the precision for each of the 10 test days as:

$$P_j = \frac{\sqrt{\frac{3}{2} \left(\sum_{i=1}^3 C_{(i)}^2(j) - \left(\sum_{i=1}^3 C_{(i)}(j) \right)^2 / 3 \right)}}{2}$$

if $\bar{C}_j$ is below $80 \mu\text{g}/\text{m}^3$, or

$$RP_j = 100\% \times \frac{\sqrt{\frac{3}{2} \left(\sum_{i=1}^3 C_{(i)}^2(j) - \left(\sum_{i=1}^3 C_{(i)}(j) \right)^2 / 3 \right)}}{\bar{C}_j(j)}$$

if $\bar{C}_j$ is above $80 \mu\text{g}/\text{m}^3$.

(v) The candidate method passes the precision test if all 10 P_j or RP_j values meet the specifications in Table D-1.

(d) *Flow Rate Stability*—(1) *Technical Definition*. Freedom from variation in the operating flow rate of the sampler under typical sampling conditions.

(2) *Test Procedure*. (i) For each of the three test samplers and each of the 10

test days of the precision test, record each measured flow rate as $F_{(ij)}(t)$, where i is the sampler number, j is the test day, and t is the time of flow rate measurement ($t=0, 6, 12, 18$, or 24 hours).

(ii) For each sampler and for each test day, calculate and record the average flow rate as:

$$\bar{F}(i)(j) = \frac{\sum_{t=0}^{24} F(i)(j)(t)}{n}$$

where n=number of flow rate measurements during the 24-hour test day.

(iii) For each sampler and for each test day, calculate and record the percent difference between the average flow rate and the initial flow rate as:

$$\Delta F(i)(j) = \frac{\bar{F}(i)(j) - F(i)(j)(0)}{F(i)(j)(0)} \times 100\%$$

where $F(i)(j)(0)$ is the initial flow rate ($t=0$).

(iv) For each sampler and for each of the 3 test days on which flow measurements were obtained at 6-hour intervals throughout the 24-hour sampling period, calculate and record the percent differences between each measured flow rate and the initial flow rate as:

$$\Delta F(i)(j)(t) = \frac{F(i)(j)(t) - F(i)(j)(0)}{F(i)(j)(0)} \times 100\%$$

where $t=6, 12, 18$, or 24 hours.

(v) The candidate method passes the flow rate stability test if all of the $\Delta F(i)(j)$ and $\Delta F(i)(j)(t)$ values meet the specifications in Table D-1.

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