Australian/New Zealand Standard™

Methods for sampling and analysis of ambient air

Method 9.11: Determination of suspended particulate matter—PM_{10} beta attenuation monitors

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EV-007, Methods for Examination of Air as a Joint Australian/New Zealand Standard.

This Standard incorporates Amendment No. 1 (May 2009). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The objective of this Standard is to provide regulatory and testing bodies with a method for continuously monitoring suspended particulate matter changes of particles less than 10 micrometres in ambient air, providing near real time measurement of mean particle concentration.

In the preparation of this Standard, reference was made to ISO 10473:2000, *Ambient air—Measurement of the mass of particulate matter on a filter medium—Beta-ray absorption method*, but this was not adopted as some commonly used instruments fall outside its scope.

The requirements for instruments specified in this Standard were derived from those given in the United States Environmental Protection Agency (US EPA) Title 40, Part 53 of the *Code of Federal Regulations (40 CFR Part 53)—Ambient air monitoring reference and equivalent methods,* Subpart B: *Procedures for testing performance characteristics of automated methods*. Acknowledgment is made of the assistance obtained therefrom.

Instruments bearing the US EPA equivalency designation predominate in Australia and New Zealand. Accordingly it was deemed appropriate to accept the US EPA designation of instruments with minor modifications for local requirements where necessary. The US EPA definitions for performance characteristics vary considerably in presentation (if not in substance) from those currently prescribed in ISO 9169:2006, *Air quality—Definition and determination of performance characteristics of an automatic measuring system*, but have nevertheless been retained, virtually intact, for the sake of preserving consistency with US EPA.

The term ‘normative’ has been used in this Standard to define the application of the appendix to which it applies. A ‘normative’ appendix is an integral part of a Standard.

METHOD

1 SCOPE

This Standard sets out the method for the determination of suspended particulate matter in ambient air using a beta attenuation monitor (BAM). This method can provide a measure of

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the time-integrated mean particle concentrations for periods ranging from 10 min to 24 h. Measurements made in accordance with this method, when averaged over a 24-hour period, are considered to be equivalent to those determined in accordance with US EPA *Code of Federal Regulations—Protection of Environment 40 CFR* Part 53 Subpart D.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS ISO/IEC
17025 General requirements for competence of testing and calibration laboratories

AS/NZS
3580 Methods for sampling and analysis of ambient air
3580.1.1 Method 1.1: Guide to siting air monitoring equipment

ISO Guide to the expression of uncertainty in measurement (ISO GUM)

EN
12341 Air quality—Determination of the PM_{10} fraction of suspended particulate matter—Reference method and field test procedure to demonstrate reference equivalence of measurement methods

US EPA
Code of Federal Regulations—Protection of Environment 40 CFR Part 53 Subpart D

3 DEFINITIONS

For the purposes of this Standard the definitions below apply:

3.1 Areic

Modifier used to denote an attribute divided by area.

3.2 Beta ray

Radiation emitted by electrons during the nuclear decay of radioactive elements. Monitors used in compliance with this method typically use an element such as ^{14}C.

3.3 Equivalent aerodynamic diameter (EAD)

The diameter of a spherical particle of unit density 1 g/cm^3 which exhibits the same aerodynamic behaviour as the particle in question.

3.4 PM_{10}

Suspended particulate matter consisting of particles having an EAD of less than 10 μm, which is passed by a size classifier having performance characteristics as defined in US EPA *Code of Federal Regulations—Protection of Environment 40 CFR* Part 53 Subpart D.

NOTE: One of the performance characteristics referred to is that there is a 50% collection efficiency of particles of 10 ±0.5 μm EAD.

3.5 Range

Nominal minimum and maximum concentrations which a method is capable of measuring. The nominal range is specified by the lower and upper range limits in concentration units, e.g. 0 to 10 000 μg/m^3. The upper range (full scale) shall be defined as 1.25 times the upper span calibration foil reading.

3.6 Uncertainty

A variable associated with the result of a measurement that characterizes the dispersion of the values that could be reasonably attributed to the measurand.