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Methods for sampling and analysis of ambient air

Method 9.18: Determination of suspended particulate matter — PM_{10} and $PM_{2.5}$ continuous method using optical light scattering instrumentation



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ACT Health and Community Services Directorate
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Australian Institute of Refrigeration Air Conditioning and Heating
Clean Air Society of Australia & New Zealand
Department of Climate Change, Energy, the Environment and Water, NSW
Department of the Environment, Tourism, Science and Innovation, Qld
Department of Water and Environmental Regulation, WA
Environment Protection Authority, Vic.
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This page explains the meaning of the language and structure of this Standard.

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Australian and Australian/New Zealand Standards are voluntary unless they are referenced in legislation or called up in contracts.

Requirements

To conform to a Standard, all requirements in the Standard need to be met.

A requirement is any statement in the Standard which uses the word "shall".

Recommendations, permissions and possibilities

The following words are commonly used in Standards, but statements using them do not have to be followed to conform to the Standard:

(a) "should" means that something is recommended.

(b) "may" means that something is permitted.

(c) "can" means that something is possible.

Structure of Standards

A Standard always has the following parts:

(i) The Preface states who developed the Standard, what the Standard is aiming to do, and how it relates to other documents.

(ii) The Scope states what the Standard is about, what it covers and what it does not cover.

(iii) The Normative references clause lists other documents that are referenced in the Standard as part of requirements.

(iv) The Terms and definitions clause defines important terms to help with understanding the Standard.

A Standard may also include other parts, such as the following:

(1) A normative appendix sets additional requirements that need to be conformed to.

(2) An informative appendix provides additional information or guidance. They usually do not contain requirements. If an informative appendix does contain requirements, the Standard will explain when those requirements apply.

(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

Preface

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

NOTE While this document is an Australian Standard rather than an Australian/New Zealand Standard, New Zealand members of EV-007 participated in its development.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this document as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this document is to provide regulatory and testing bodies with a standard method for simultaneous continuous monitoring of suspended particulate matter with an equivalent aerodynamic diameter (EAD) of less than 10 μm (PM_{10}) and less than 2.5 μm ($PM_{2.5}$) in ambient air, providing near real-time measurement of mean particle concentrations, using an optical light scattering technique. Instruments can also provide simultaneous measurement of suspended particulate matter with diameters between 2.5 μm and 10 μm ($PM_{10-2.5}$), as well as other size fractions.

Optical instruments do not measure particle mass directly but instead derive particle mass from a combination of light-scattering direction, intensity and wavelength. Agreement with gravimetric reference methods is highly dependent on aerosol size, shape, composition and number concentration. For this reason, this document requires conforming instruments to have demonstrated performance equivalence to reference gravimetric PM_{10} and $PM_{2.5}$ methods through one of the following testing protocols:

(a) Australian/New Zealand Standard AS/NZS 3580.9.17.

(b) European Standard EN 16450.

(c) United States Environmental Protection Agency (US EPA) Code of Federal Regulations, Title 40 Protection of Environment, Part 53 Ambient Air Monitoring Reference and Equivalent Methods (40 CFR 53) Subparts D and E.

A list of all parts in the AS/NZS 3580 series can be found in the Standards Australia online catalogue.

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Introduction

Particulate matter emission sources include industrial processes, fuel combustion, burning of vegetation, incineration and natural causes such as windblown dust and salt laden air. Combustion processes tend to contribute more $PM_{2.5}$ than non-combustion sources. Important anthropogenic combustion sources include domestic wood heaters and motor vehicles (especially diesel-fuelled vehicles).

PM_{10} and $PM_{2.5}$ have been statistically associated with certain human health end points, including daily mortality, hospital admissions and exacerbation of asthma. While health research on short-term exposure effects of particulate matter has typically used 24-h averages as the exposure metric, more recent studies have demonstrated that health effects can be triggered for exposure periods of 3 h or less. In response, monitoring instrumentation capable of resolving changes in particulate matter concentrations over averaging periods of 1 h or less are required.

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Methods for sampling and analysis of ambient air

Method 9.18: Determination of suspended particulate matter — PM_{10} and $PM_{2.5}$ continuous method using optical light scattering instrumentation

1 Scope

This document sets out a method for the continuous determination of PM_{10} and $PM_{2.5}$ in ambient air using optical light scattering instrumentation that has demonstrated equivalence to reference gravimetric methods.

The method can provide a measure of mean particle concentration over periods of 5 min or less. Results are normally reported as 1-h or 24-h time-integrated mean values.

Instruments can also simultaneously report concentrations of $PM_{10-2.5}$ and other particle size fractions, but these size fractions are not covered within the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 3580.19, *Methods for sampling and analysis of ambient air, Method 19: Ambient air quality data validation and reporting*

AS/NZS 3580.1.1, *Methods for sampling and analysis of ambient air, Part 1.1: Guide to siting air monitoring equipment*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
calibration
verification of instrument response against a known standard or reference that includes adjustment of instrument settings

3.2
certified reference material
CRM
reference material, accompanied by an endorsed document issued by a calibration laboratory accredited against the requirements of AS ISO/IEC 17034, one or more of whose property values are certified by a procedure which establishes traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at amla stated level of confidence

Note 1 to entry: Accreditation bodies who are signatories to the Global Accreditation Cooperation Incorporated Multilateral Recognition Arrangement for testing laboratories can offer accreditation against the requirements of AS ISO/IEC 17034.

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