Australian Standard®

# Methods for sampling and analysis of ambient air

# Method 9.6: Determination of suspended particulate matter—$PM_{10}$ high volume sampler with size-selective inlet—Gravimetric method

PREFACE

This Standard was prepared by Standards Australia's Committee on Methods for Examination of Air under the direction of the Chemical Standards Board. This Standard method deals with the determination of suspended matter with an equivalent aerodynamic diameter (EAD) of less than approximately 10 μm. Other methods in the AS 3580 series of Standards on the determination of particulate matter are as follows:

Method

9.1 Determination of deposited matter—Gravimetric method

9.2 Determination of suspended matter expressed as equivalent black smoke by filter paper soiling

9.3 Determination of total suspended particulates (TSP)—High volume sampler gravimetric method

9.4 Determination of light scattering—Integrating nephelometer method

9.5 Determination of impinged matter expressed as directional dirtiness, background dirtiness and/or area dirtiness (directional dust gauge method)

9.7 Determination of suspended particulate matter—$PM_{10}$ dichotomous sampler—Gravimetric method

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## FOREWORD

Suspended particulate matter as measured by this method includes particles with an equivalent aerodynamic diameter generally less than 10 μm. Particles of this size range are respirable and hence may affect health. They also can have a major effect on visibility because of their light scattering properties. Such particulate matter is generated by industrial processes, combustion of fuels, burning of vegetation, and incineration. The particles are also present in motor vehicle emissions, wind blown dust and salt air.

The procedure described in this Standard involves batch sampling and the gravimetric determination of $PM_{10}$, and is based on the United States Code of Federal Regulations, Title 40.

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## METHOD

**1 SCOPE.** This Standard Sets out a gravimetric method for the determination of suspended particulate matter in ambient air. The method provides a measure of mean concentration of $PM_{10}$ over the sampling period employed. A procedure for assessing the performance of $PM_{10}$ samplers, so that they can comply with the sampling requirements of this method, is described in Appendix A.

NOTES:

1. Sampling is normally of 24 h duration to average out diurnal variations. Provided that the mass of the filter is determined under carefully controlled laboratory conditions, mean concentrations of 1 $\mu g/m^3$ and greater may be determined using a 24 h sampling period.
2. It is possible that some particulate matter, depending upon its hygroscopicity, may alter slightly in mass from its initial as-sampled state because of the filter equilibration procedure referred to in Clauses 7.1 and 7.4. Such slight and indeterminable changes, if they occur, are considered insignificant.

**2 REFERENCED DOCUMENTS.** The following documents are referred to in this Standard:

AS
2922 Ambient air—Guide for the siting of sampling units.

USEPA Code of Federal Regulations: Title 40, Parts 50 and 53

**3 DEFINITIONS.** For the purpose of this Standard, the definitions below apply.

**3.1 Equivalent aerodynamic diameter (EAD)**—the diameter of a spherical particle of density 1000 $kg/m^3$ which exhibits the same aerodynamic behaviour as the particle in question.

**3.2 $PM_{10}$**—atmospheric suspended particulate matter having an EAD of less than approximately 10 μm, which is passed by a size classifier having performance characteristics as defined in US Code of Federal Regulations: Title 40, Part 50, Appendix J.

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

**4 PRINCIPLE.** Ambient air is drawn at a constant flow rate into a size-selective inlet where the suspended particulate matter is inertially separated. The $PM_{10}$ fraction of suspended particulate matter is collected on a preweighed filter for gravimetric analysis.

**5 APPARATUS.**

**5.1 $PM_{10}$ sampler.** The sampler consists of a size-selective inlet fitted to a high volume sampler. The performance of the $PM_{10}$ sampler shall comply with USEPA requirements described in US Code of Federal Regulations, Title 40, Parts 53.40 to 53.43 inclusive, or the sampler shall demonstrate a performance equivalent to a USEPA-approved $PM_{10}$ sampler sited and tested under the conditions described in Appendix A. The $PM_{10}$ sampler shall consist of:

(a) *Size-selective inlet.* The size-selective inlet is a device designed to separate particles and permit only the $PM_{10}$ fraction to pass through to the filter. The size-selective inlet is designed to collect particles of EAD 10 ± 0.5 μm at a 50% efficiency, on a mass basis, at wind speeds of up to 24 km/h and at a flow rate of 1.13 $m^3/min$ ± 10%.