
Indoor air —

Part 27:

**Determination of settled fibrous dust
on surfaces by SEM (scanning electron
microscopy) (direct method)**

Air intérieur —

*Partie 27: Détermination de la poussière fibreuse déposée sur les
surfaces par MEB (microscopie électronique à balayage) (méthode
directe)*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 146, *Air quality*, Subcommittee SC 6, *Indoor air*.

ISO 16000 consists of the following parts, under the general title *Indoor air*:

- *Part 1: General aspects of sampling strategy*
- *Part 2: Sampling strategy for formaldehyde*
- *Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — Active sampling method*
- *Part 4: Determination of formaldehyde — Diffusive sampling method*
- *Part 5: Sampling strategy for volatile organic compounds (VOCs)*
- *Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID*
- *Part 7: Sampling strategy for determination of airborne asbestos fibre concentrations*
- *Part 8: Determination of local mean ages of air in buildings for characterizing ventilation conditions*
- *Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method*
- *Part 10: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test cell method*
- *Part 11: Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens*
- *Part 12: Sampling strategy for polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polycyclic aromatic hydrocarbons (PAHs)*

- Part 13: Determination of total (gas and particle-phase) polychlorinated dioxin-like biphenyls (PCBs) and polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDDs/PCDFs) — Collection on sorbent-backed filters
- Part 14: Determination of total (gas and particle-phase) polychlorinated dioxin-like biphenyls (PCBs) and polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDDs/PCDFs) — Extraction, clean-up and analysis by high-resolution gas chromatography and mass spectrometry
- Part 15: Sampling strategy for nitrogen dioxide (NO₂)
- Part 16: Detection and enumeration of moulds — Sampling by filtration
- Part 17: Detection and enumeration of moulds — Culture based method
- Part 18: Detection and enumeration of moulds — Sampling by impaction
- Part 19: Sampling strategy for moulds
- Part 20: Detection and enumeration of moulds — Determination of total spore count
- Part 21: Detection and enumeration of moulds — Sampling from materials
- Part 23: Performance test for evaluating the reduction of formaldehyde concentrations by sorptive building materials
- Part 24: Performance test for evaluating the reduction of volatile organic compound (except formaldehyde) concentrations by sorptive building materials
- Part 25: Determination of the emission of semi-volatile organic compounds by building products — Micro-chamber method
- Part 26: Sampling strategy for carbon dioxide (CO₂)
- Part 27: Determination of settled fibrous dust on surfaces by (SEM) scanning electron microscopy (direct method)
- Part 28: Determination of odour emissions from building products using test chambers
- Part 29: Test methods for VOC detectors
- Part 30: Sensory testing of indoor air
- Part 31: Measurement of flame retardants and plasticizers based on organophosphorus compounds — Phosphoric acid esters
- Part 32: Investigation of buildings for pollutants and other injurious factors — Inspection

The following parts are under preparation:

- Part 33: Determination of phthalates with gas chromatography/mass spectrometry (GC/MS)
- Part 34: Strategies for the measurement of airborne particles (PM 2,5 fraction)
- Part 35: Measurement of polybrominated diphenylether, hexabromocyclododecane and hexabromobenzene
- Part 36: Test method for the reduction rate of airborne bacteria by air purifiers using a test chamber

Introduction

Standardized ISO methods for measuring asbestos exposure levels using different analytical methods are available and widely used (ISO 10312, ISO 13794, ISO 14966). Standardized methods (ISO 22262-1) determining the asbestos content in bulk materials (products, etc.) are also established. This International Standard is based on the procedures described in VDI 3877 Part 1^[6] and closes the remaining gap in describing a method for measuring asbestos in settled dust on surfaces.

Governmental regulations in many countries exist for asbestos exposure levels and for the asbestos content in products. The asbestos content in settled dust has been the source of widespread discussions. Regulatory efforts based on measurement results are known in only very few cases. The reasons for this have been the lack in many countries of standardized and well accepted measurement methods and the difficult and disputed judgement of the risk potential. A general accepted correlation between the asbestos content and possibly resulting airborne asbestos fibre concentration by re-entrainment of the dust is not established.

A significant difference between direct transfer samples for determining surface contamination and filter samples for air measurement is in the more common appearance of fibrous structures whose dimensions are larger than those of alveolar fibres. The analysis of air samples is performed to determine the concentration of respirable fibres; the analysis of direct transfer dust samples, in contrast, is done more according to the risk (fibre potential) to generate respirable fibres. Surface dust samples are frequently taken in connection with asbestos abatement or other events, where spreading of asbestos containing dust is expected and has to be judged.

The method can also be used for the determination of surface contamination of other fibrous structures like man-made mineral vitreous fibres.

Indoor air —

Part 27:

Determination of settled fibrous dust on surfaces by SEM (scanning electron microscopy) (direct method)

1 Scope

This part of ISO 16000 specifies a method giving an index for the numerical concentration of fibrous structures with fibres equal or greater than 0,2 μm in diameter in settled dust on surfaces and their classification into specific substance groups (e.g. chrysotile, amphibole asbestos, other inorganic fibres). It is primarily applicable to indoor areas, but it is also suitable for certain outdoor situations. A sampling technique for collection of settled dust using adhesive tape is described. The method incorporates an analytical method for evaluation of the collected samples by scanning electron microscopy. The result can be specified in asbestos structures per unit area and/or classified into four different loading classes. The analytical sensitivity depends on the area examined and can be as low as 10 structures/cm².

For the purpose of this part of ISO 16000, an asbestos or fibrous structure is defined as an asbestos or (other inorganic/organic) fibre-containing particle regardless of its diameter.

The use of the sampling method described is limited, depending on the structure and type of the surface (minor roughness and curvature) and the thickness of dust layer. If the dust layer is too thick, the dust layer can be sampled by other means and eventually analysed as powder sample.^{[3] [4]}

It is assumed that the settled dust has particle diameters mostly below 1 mm.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22262-1, *Air quality — Bulk materials — Part 1: Sampling and qualitative determination of asbestos in commercial bulk materials*

3 Terms and definitions

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

3.1

abatement

activity undertaken to control the potential emission of asbestos fibres from an asbestos-containing building material by removing, enclosing, or encapsulating the material or by repairing damaged material

3.2

ambient sampling

air sampling to determine the airborne asbestos fibre concentration in the immediate vicinity of the building exterior