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Measuring method for airborne fibrous particles — Part 3: Indirect-transfer transmission electron microscopy method

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Descriptors : air, quality, exhaust gases, asbestos, determination of content, particle size measurement, coarse-grain material, permeability measurement, electron microscopes

Reference number : **JIS K 3850-3 : 2000 (E)**

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law.

JIS K 3850 series consist of the following four parts with the title of *Measuring method for airborne fibrous particles.*

Part 1: *Optical microscopy method and scanning electron microscopy method*
Part 2: *Direct-transfer transmission electron microscopy method*
Part 3: *Indirect-transfer transmission electron microscopy method*
Part 4: *Stationary source emissions — Determination of asbestos plant emissions — Method by fibre count measurement*

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In the event of any doubts arising as to the contents, the original JIS is to be the final authority.

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Measuring method for airborne fibrous particles — Part 3: Indirect-transfer transmission electron microscopy method

Introduction This Japanese Industrial Standard has been prepared based on **ISO/ DIS 13794** *Ambient air—Determination of asbestos fibres—Indirect-transfer transmission electron microscopy method* published in 1996 without modifying the technical contents.

The portions underlined with dots are the matters not stated in the original International Standard.

This Standard is applicable to the measurement of airborne asbestos in a wide range of ambient air situations, including the interior atmospheres of buildings, and for detailed evaluation of any atmosphere in which asbestos fibres are likely to be present. Because the best available medical evidence indicates that the numerical fibre concentration and the fibre size and type are the relevant parameters for evaluation of the inhalation hazards, a fibre counting and measuring technique is the only logical approach. Most fibres in ambient atmospheres are not asbestos, and therefore there is a requirement for fibres to be identified. Many airborne asbestos fibres in ambient atmospheres have diameters below the resolution limit of the optical microscope. This Standard is based on transmission electron microscopy, which has adequate resolution to allow detection of small fibres and is currently the only technique capable of unequivocal identification of the majority of individual fibres of asbestos. The fibres found suspended in an ambient atmosphere can often be identified unequivocally, if sufficient measurement effort is expended. However, if each fibre were to be identified in this way, the analysis becomes prohibitively expensive. Because of instrumental deficiencies or because of the nature of the particulate, some fibres cannot be positively identified as asbestos, even though the measurements all indicate that they could be asbestos. Subjective and instrumental factors therefore contribute to this measurement, and consequently a very precise definition of the procedure for identification and enumeration of asbestos fibres is required.

In addition to single fibres and bundles, asbestos is often found in air samples as very complex, aggregated structures which may or may not be also aggregated with other particles. The number of asbestos fibres and bundles incorporated in these complex structures often exceeds the number of isolated fibres and bundles observed, and many of them may be completely obscured in direct-transfer TEM preparations. The method defined in this Standard incorporates specimen preparation procedures that result in selective concentration of asbestos fibres, and removal of organic and water-soluble materials. These procedures have the effect of dispersing the majority of the complex clusters and aggregates of fibres into their component fibres and bundles so that the asbestos in the air sample can be more accurately quantified. All of the feasible specimen preparation techniques result in some modification of the airborne particulate. Even the collection of particles from a three-dimensional airborne dispersion on to a two-dimensional filter surface can be considered a modification of the particulate, and some of the particles in most samples are modified by the specimen preparation procedures. Although this method results in dispersal of complex clusters and aggregates, it minimizes other effects on the size distribution of fibres and fibre bundles.