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Measuring method for airborne fibrous particles — Part 2: Direct-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 3850-2 : 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.

Measuring method for airborne fibrous particles — Part 2: Direct-transfer transmission electron microscopy method

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 10312** *Ambient air — Determination of asbestos fibres — Direct-transfer transmission electron microscopy method* published in 1995 without modifying the technical contents.

This Standard is applicable to the determination 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 structures are likely to be present. Because the best available medical evidence indicates that the numerical fibre concentration and the fibre sizes are the relevant parameters for evaluation of the inhalation hazards, a fibre counting 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. Asbestos is often found, not as single fibres, but as very complex, aggregated structures which may or may not be also aggregated with other particles. The fibres found suspended in an ambient atmosphere can often be identified unequivocally, if a sufficient measurement effort is expended. However, if each fibre were to be identified in this way, the analysis would become 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 factors therefore contribute to this measurement, and consequently a very precise definition of the procedure for identification and enumeration of asbestos fibres is required. The method specified in this Standard is designed to provide the best description possible of the nature, numerical concentration, and sizes of asbestos-containing particles found in an air sample.

This Standard is necessarily complex, because the instrumental techniques used are complex, and also because a very detailed and logical procedure must be specified to reduce the subjective aspects of the measurement. The method of data recording specified in this Standard is designed to allow re-evaluation of the structure counting data as new medical evidence becomes available. 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 onto 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. However, the procedures specified in this Standard are designed to minimize the disturbance of the collected particulate material, and the effect of those disturbances which do occur can be evaluated.

This Standard describes the method of analysis for a single air filter. However, one of the largest potential errors in characterizing asbestos in ambient atmospheres is associated with the variability between filter samples. For this reason, it is necessary to design a replicate sampling scheme in order to determine this Standard's accuracy and precision.