



# Asbestos Analytical Equipment: Calibration Requirements

## Technical Paper

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## AUSTRALIAN INSTITUTE OF OCCUPATIONAL HYGIENISTS INC (AIOH)

The Australian Institute of Occupational Hygienists Inc. (AIOH) is the association that represents professional occupational hygienists in Australia. Occupational hygiene is the science and art of anticipation, recognition, evaluation and control of hazards in the workplace and the environment. Occupational hygienists specialise in the assessment and control of:

- Chemical hazards (including dusts such as silica, carcinogens such as arsenic, fibrous dusts such as asbestos, gases such as chlorine, irritants such as ammonia and organic vapours such as petroleum hydrocarbons);
- Physical hazards (heat and cold, noise, vibration, ionising radiation, lasers, microwave radiation, radiofrequency radiation, ultra-violet light, visible light); and
- Biological hazards (bacteria, endotoxins, fungi, viruses, zoonoses).

AIOH members are the professionals most likely to be asked to identify hazards associated with asbestos in various materials and airborne fibre contaminants to assess any exposure risks. Therefore, the AIOH has a keen interest in the integrity of asbestos identification and airborne fibre analysis.

The Institute was formed in 1979 and incorporated in 1988. An elected governing Council, comprising the President, President Elect, Secretary, Treasurer and three Councillors, manages the affairs of the Institute. The AIOH is a member of the International Occupational Hygiene Association (IOHA).

The overall objective of the Institute is to help ensure that workplace health hazards are eliminated or controlled. It seeks to achieve this by:

- Promoting the profession of occupational hygiene in industry, government and the general community.
- Improving the practice of occupational hygiene and the knowledge, competence and standing of its practitioners.
- Providing a forum for the exchange of occupational hygiene information and ideas.
- Promoting the application of occupational hygiene principles to improve and maintain a safe and healthy working environment for all.
- Representing the profession nationally and internationally.

More information is available at our website – <http://www.aioh.org.au>.

## EXPOSURE STANDARDS COMMITTEE MISSION STATEMENT

The AIOH established the Exposure Standards Committee to provide expert guidance and comment to the exposure standards setting process at a State and National level and internationally where appropriate, through development of AIOH Position Papers, AIOH guidance publications or comment on relevant Standards, Regulations and Codes of Practice. The Committee's remit is to confirm that the revision of exposure standards, and other relevant Standards and Codes of Practice, are valid and based on good occupational hygiene and scientific principles. The Committee is also concerned with the integrity of the exposure assessment process whereby sampling results for airborne contaminants are compared against exposure standards.

## STATEMENT OF POSITION REGARDING AIOH TECHNICAL PAPERS

The AIOH is not a standard or method setting body. Through its Technical Papers, the AIOH seeks to provide relevant technical information on equipment and methodologies with regard to ensuring the integrity of the process of evaluating workplace hazards. The information herein is supplementary to published and validated methods for sampling and is provided as a resource where the information is not available elsewhere, such as from Australian Standards (AS) or the National Association of Testing Authorities (NATA), or in methods published by Regulatory organisations (e.g. Safe Work Australia).

NATA is in the process of withdrawing technical documentation regarding procedures and frequency for calibration of field and laboratory equipment used for occupational hygiene assessments and analysis. These documents have been developed by experienced AIOH members as part of their role on the previous NATA Occupational Hygiene Technical Committee and have been subject to public review for more than 20 years. The technical content of the documents along with copyright is being handed over to the AIOH, to be published as Technical Papers.

The information included in this document attempts to provide practical and pertinent information to assist Occupational Hygienists or laboratory personnel to use correct sampling or analytical techniques and equipment for collecting valid samples, which can be used to compare against the relevant workplace exposure standards (WES) where personal sampling has been conducted. Data quality is an important aspect of the exposure assessment process, particularly when it is necessary to demonstrate compliance with a WES.

## Consultation with AIOH members

AIOH activities are managed through committees drawn from hygienists nationally. This Technical Paper has been prepared by the Exposure Standards Committee based on NATA documentation, with comments sought from AIOH members with interest and/or expertise in this area. The AIOH acknowledges the following contributors to this Paper: Neil Shepherd from NATA; and AIOH Members Linda Apthorpe, Philip Hibbs, Robert Golec and Ian Firth.

## Thirty-seventh AIOH Council

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## List of Abbreviations and Acronyms

AIOH	Australian Institute of Occupational Hygienists
AS	Australian Standard
NATA	National Association of Testing Authorities
NOHSC	National Occupational Health and Safety Commission
SWA	Safe Work Australia
WES	Workplace Exposure Standard

## Competent Person

AIOH recommends the following definition of a *Competent Person* for the purposes of this document:

- A person with the relevant experience (at least 5 years) and proven competence in workplace exposure assessment, particularly as related to workplace testing of airborne contaminants; and
- A Full member of the AIOH; and
- Has current professional indemnity insurance for occupational hygiene work (including asbestos if required).

# AIOH Technical Paper: Asbestos Analytical Equipment: Calibration Requirements

## 1. Introduction

This Technical Paper was prepared to give guidance on the various requirements for calibration checks and equipment used by laboratories who undertake asbestos identification, airborne asbestos fibre and airborne synthetic mineral fibre analysis. These analysis techniques incorporate the use of specialised microscopes and related equipment in order to conduct the work.

It is important that all equipment used by laboratories for these analyses is regularly checked to ensure it meets the necessary requirements provided herein to ensure it is fit for purpose and provides consistent analytical results. The results of the analysis may be used for risk assessment purposes and determining compliance against the workplace exposure standards (WES).

The information provided herein is related to the following analytical testing procedures:

- Asbestos identification analysis
- Airborne asbestos fibre analysis
- Airborne synthetic mineral fibre analysis

## 2. Background

Previously, requirements (including calibration information) for microscopes and other equipment was provided by NATA for facilities accredited against ISO/IEC 17025 *General requirements for the competence of testing and calibration laboratories*. However, in accordance with recent changes NATA can no longer provide guidance for how laboratory equipment such as microscopes and other equipment is to be checked, calibrated and maintained. Instead, the focus will be on the facility to provide information on how to calibrate and check their equipment to ensure it is fit for purpose for the specific analytical technique.

Therefore, the AIOH will provide the relevant information for Occupational Hygienists and laboratories in the form of this Technical Paper. The information contained herein may be used to assist Occupational Hygienists and Laboratory Facilities to ensure their analytical equipment is suitable for the specific testing carried out and to obtain consistent results.

## 3. Asbestos identification Analysis

The purpose of the asbestos identification analysis technique is to determine the presence of chrysotile, amosite or crocidolite asbestos. The method may also be used to identify the presence of unknown mineral fibres, organic fibres or synthetic mineral fibres (now known as man-made vitreous fibres) in samples.

The method for asbestos identification analysis in Australia is Australian Standard 4964: 2004 *Method for the qualitative identification of asbestos in bulk samples*. The technique involves the use of a stereo-binocular microscope, polarised light microscope (PLM), refractive index oils and a furnace in order to carry out the analysis.

The results of the analysis may be used for purposes such as preparation of an Asbestos Register, Risk Assessments or when confirmation of asbestos presence is required for removal or importation into Australia. Results of the analysis may indicate that a sample (e.g. manufactured materials, dust, soil, aggregate or ore) contains asbestos therefore, certain precautions are required to prevent exposure. The results may also indicate a sample does not contain asbestos, therefore no precautions are required.

Due to the importance of the analytical results, AIOH recommends that the analysis is conducted by suitably qualified and experienced persons to ensure the quality and consistency of results. In addition, the analytical work should always be carried out by a laboratory facility accredited by NATA for the specific test of asbestos identification.

For the recommended equipment checks and calibration requirements, please refer to Section 5 below.

## 4. Airborne fibre analysis

The purpose of airborne fibre sampling is to determine the airborne concentration of respirable asbestos or respirable synthetic mineral fibres. The fibre sampling may be carried out in a worker's breathing zone (i.e. personal sample) or in an area (i.e. fixed location or static sample). The results of personal sampling can be used to determine compliance to the relevant WES. As the results of personal sampling directly relate to exposure and potential health effects, it is important

that the sampling is carried out by persons suitably qualified and experienced, i.e. competent persons. In addition, air sampling for determination of compliance against the WES is a requirement of Work, Health and Safety/Occupational Health and Safety Legislation across all jurisdictions in Australia (Safe Work Australia, 2013; Grantham & Firth, 2014)).

Airborne asbestos fibre area or static sampling is normally conducted to ensure that an asbestos removal process is under control, i.e. no fugitive airborne asbestos fibres are generated during the removal process. This is known as control monitoring. Airborne fibre sampling may also be undertaken for background or clearance purposes. This type of sampling must also be carried out by competent persons to ensure the quality and integrity of the results<sup>1</sup>.

Depending on the fibre type to be sampled and analysed, the Australian methods<sup>2</sup> are listed below:

- NOHSC:3003 *Guidance note on the membrane filter method for estimating airborne asbestos fibres* (2<sup>nd</sup> Edition, 2005)
- NOHSC:3006 *Guidance Note on the membrane filter method for the estimation of Airborne Synthetic Mineral Fibres* (1989)

The analysis for both types of fibres requires the use of a phase contrast microscope (PCM) and various other equipment. For the recommended equipment checks and calibration requirements, please refer to Section 5 below.

For recommended equipment checks and calibration requirements for other equipment required for carrying out the air sampling, please refer to the following AIOH Technical Papers:

- Air Sampling Pumps: Equipment Calibration Requirements
- Flow Measuring Equipment: Equipment Calibration Requirements

The AIOH recommends that all airborne fibre analysis is conducted by suitably qualified and experienced persons to ensure the quality and consistency of results. In addition, the analytical work should always be carried out by a laboratory facility accredited by NATA for the specific test of either airborne asbestos fibre analysis or airborne synthetic mineral fibre analysis.

## 5. Equipment checks and calibration information

The recommended calibrations and checks are detailed in the following Table for equipment used for asbestos identification analysis, airborne asbestos fibre analysis and airborne synthetic mineral fibre analysis.

Item of Equipment	Maximum period between successive calibrations (years)	Maximum period between checks (months)	Procedures and comments
Effective Filter Area	Initial	On commissioning and whenever filter, filter holder or any aspect of the filter clearing is changed	As per NOHSC Guidance note: 3003 and 3006
Furnaces	Initial		
		12	Check variation within working zone at the working temperature - AS2853
		On use	Monitor temperature with an appropriate sensor
Microscope (PCM)	Yearly service		Refer details below table
		Regular cleaning	Microscope lenses and objectives must be kept clean

<sup>1</sup> It should be noted in some Australian jurisdictions asbestos fibre monitoring carried out for friable asbestos removals must be conducted by a Licensed Asbestos Assessor.

<sup>2</sup> Both methods are available from [www.safeworkaustralia.gov.au](http://www.safeworkaustralia.gov.au)

Item of Equipment	Maximum period between successive calibrations (years)	Maximum period between checks (months)	Procedures and comments
		On use	The HSE/NPL test slide is used when setting up the microscope prior to counting each batch of slides. Only test slides with the 5 <sup>th</sup> set of lines fully visible and the 6 <sup>th</sup> set partially visible are suitable. Use of slide to be recorded.
Microscope (stereo, PLM)	Yearly service		Refer details below table
		Regular cleaning	Microscope lenses and objectives must be kept clean
Refractive Index Oils	Initial		Oils must be checked prior to use to ensure they are fit for purpose
		12	If high grade proprietary oils to be used
		3	If chemical blends are mixed by facility
Walton-Beckett Graticule		Measured on installation in PCM and then every 12 months and whenever interpupillary distance, objective, intermediate magnification, or, on some microscopes, the eyepieces are changed. Note: for microscopes embodying a magnification change, the graticule must be measured prior to counting each batch of slides.	Walton-Beckett graticule as per NOHSC Guidance note: 3003 and 3006

## 6. Servicing of microscopes

The correct functioning and operation of microscopes must be assured. This may be achieved through annual servicing and by undertaking the activities below for each microscope type.

### 6.1 Stereo microscopes

- Check, lubricate (as necessary) and adjust all mechanical moving parts, such as focusing rack and zoom controls.
- Check all optical alignments such as oculars, binocular tube, objective and illumination system for surface and mount defects.
- Clean all optical components as necessary.
- Check and adjust for parfocal operation throughout zoom range.

### 6.2 Polarised light microscopes

- Check, lubricate (as necessary) and adjust all mechanical moving parts, such as condenser rack, stage controls and field diaphragm.

- Check all optical alignments such as oculars, objectives, binocular tube, condenser and illumination system for surface and mount defects.
- Clean all optical components as necessary.
- Check for vertical, horizontal and rotational displacement of images in binocular tube.
- Check directions of polariser, analyser and accessory plate.
- Check correct operation of iris diaphragm in relation to dispersion staining.

### 6.3 Phase contrast microscopes

- Check, lubricate (as necessary) and adjust all mechanical moving parts, such as condenser rack, stage controls and field diaphragm.
- Check all optical alignments such as oculars, objectives, binocular tube, condenser and illumination system for surface and mount defects.
- Clean all optical components as necessary.
- Check for vertical, horizontal and rotational displacement of images in binocular tube. If any observable vertical displacement of the image is detected, the microscope must be removed from use and corrected before being placed back into service.

## 7. References and sources of additional information

- AIOH Position Paper (2016): *Asbestos and its potential for occupational health issues*. Australian Institute of Occupational Hygienists (AIOH). Available from [www.aioh.org.au](http://www.aioh.org.au)
- AIOH Position Paper (2016): *Synthetic mineral fibres (SMF) and occupational health issues*. Australian Institute of Occupational Hygienists (AIOH). Available from [www.aioh.org.au](http://www.aioh.org.au)
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- NOHSC (1989). *Guidance Note on the Membrane Filter Method for the Estimation Airborne Synthetic Mineral Fibres* [NOHSC: 3006]. Available from [www.safeworkaustralia.gov.au](http://www.safeworkaustralia.gov.au)
- Safe Work Australia (2013). *Guidance on the interpretation of workplace exposure standards*. Canberra. April 2013. Available from <https://www.safeworkaustralia.gov.au/doc/guidance-interpretation-workplace-exposure-standards-airborne-contaminants>

### SEARCH

- The NATA website ([www.nata.com.au](http://www.nata.com.au)) for accredited laboratory facilities who can undertake testing and analysis of workplace airborne contaminants.
- The AIOH website for Occupational Hygiene consultants ([www.aioh.org.au](http://www.aioh.org.au)).