

ASBESTOS AND ITS POTENTIAL FOR OCCUPATIONAL HEALTH ISSUES

Position Paper



PREPARED BY
AIOH Exposure Standards Committee
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AUTHORISATION
This Position Paper has been prepared by the AIOH Exposure Standards Committee and authorised by AIOH Council.

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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).

Therefore the AIOH has a keen interest in the potential for workplace exposures to asbestos fibre, as its members are the professionals most likely to be asked to identify associated hazards and assess any exposure risks.

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 exposure standards numbers, and Standards and Codes of Practice, are changed for valid occupational hygiene and scientific reasons.

STATEMENT OF POSITION REGARDING AIOH POSITION PAPERS

The AIOH is not a standards setting body. Through its Position Papers, the AIOH seeks to provide relevant information on substances of interest where there is uncertainty about existing Australian exposure standards. This is done primarily through a review of the existing published, peer-reviewed scientific literature but may include anecdotal evidence based on the practical experience of certified AIOH members. The Position Papers attempt to recommend a health-based exposure value that can be measured; that is, it is technically feasible to assess workplace exposures against the derived OEL. It does not consider economic or engineering feasibility. As far as reasonably possible, the AIOH formulates a recommendation on the level of exposure that the typical worker can experience without adverse health effects.

Any recommended exposure value should **not** be viewed as a fine line between safe and unsafe exposures. They also do not represent quantitative estimates of risk at different exposure levels or by different routes of exposure. Any recommended exposure value should be used as a guideline by professionals trained in the practice of occupational hygiene to assist in the control of health hazards.

Consultation with AIOH members

AIOH activities are managed through committees drawn from hygienists nationally. This Position Paper has been prepared by the Exposure Standards Committee, with comments sought from AIOH members generally and active consultation with particular members selected for their known interest and/or expertise in this area. Various AIOH members were contributors in the development of this Position Paper. Key contributors included: Linda Apthorpe, Alan Rogers, Michael Shepherd, Michael Fisher, Carl Strautins, Ron Capil and Ian Firth.

Thirty-fifth AIOH Council

President:	Caroline Langley (TAS)
President Elect:	Phillip Hibbs (NSW)
Secretary:	Brian Eva (Vic)
Treasurer:	Di Allen (WA)
Councillors:	Linda Apthorpe (NSW), Kate Cole (NSW), Dr Raelene Young (VIC)

List of Abbreviations and Acronyms

ACM	Asbestos containing material
AIOH	Australian Institute of Occupational Hygienists
ALARP	As low as reasonably practicable
AS	Australian Standard
FMMP	Fibrous minerals management plan
f/mL	Fibres per millilitre of air
LDB	Low density asbestos fibre board
MMVF	Man-made vitreous fibres
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NOA	Naturally occurring asbestos
NOHSC	National Occupational Health and Safety Commission
OEL	Occupational Exposure Limit
PPE	Personal Protective Equipment
RPE	Respiratory protection equipment
SMF	Synthetic mineral fibres
SWA	Safe Work Australia
TWA	Time Weighted Average
WES	Workplace Exposure Standard

Competent Person

AIOH recommends the following definition of a *Competent Person*:

- A person with the relevant asbestos experience and proven competence in the required specific areas of investigation, analysis and/or interpretation of the findings used for asbestos related enquiries. This includes health effects of asbestos, asbestos inspection surveys, risk assessments, preparation of Asbestos Registers, sampling (i.e. airborne analysis and asbestos identification analysis), removal methodologies, disposal requirements, clearances and project management of asbestos removal work; and
- A licensed asbestos assessor (e.g. where friable asbestos is present); and
- A Full member of the AIOH; and
- Has current professional indemnity insurance for asbestos.

AIOH Position on asbestos and its potential for occupational health Issues

Key messages

- Asbestos is a risk to health when the fibres are breathed in, with the potential to cause cancer.
- When asbestos containing material (ACM) is left in situ, undisturbed and in good condition, it poses no measureable risk to health.
- Risk assessments for ACM and naturally occurring asbestos (NOA) must be conducted by a *Competent Person*.
- The AIOH believes that exposure can be adequately controlled by means of a range of best practices, including Asbestos Management Plans, Asbestos Registers (detailing location and condition of ACM), labelling ACM, and following strict guidelines set by workplace health and safety jurisdictions for management and removal of ACM.
- The AIOH believes that current exposure standards used in Australia are adequate, and as with any carcinogen, exposures should be maintained as low as reasonably practicable (ALARP).

Summary

This paper was compiled to give guidance on the assessment of occupational exposure to asbestos fibre. It is an update of a previous AIOH Position Paper (2008) on this subject. This Paper covers technical aspects and issues associated with asbestos exposure during work activities (i.e. occupational exposures). Issues relating to household and community exposures and how they are approached and handled are beyond the scope of this Paper.

Asbestos is a hazardous material and as such, has the potential to cause harm to human health. Even though asbestos is banned in Australia (and some other countries), there is still a large industry involved in its assessment and removal. In addition, there is a considerable number of workplaces that face occupational exposures in areas such as maintenance work associated with in-situ asbestos products, waste management, non-asbestos mining, road building and other earthmoving activities due to the presence of contaminant asbestiform minerals and naturally occurring asbestos (NOA).

Risk to health is via inhalation of 'respirable' asbestos fibres only. When asbestos-containing materials are in good condition and remain undisturbed, they pose no measurable risk to health.

If NOA or asbestos contamination in soil is suspected it is important that asbestos identification analysis and a risk assessment is conducted. The identification and assessment of asbestos containing material (ACM), soils contaminated with asbestos material and NOA should be carried out by a competent person (refer to *Competent Person* definition above).

Removal of ACM should always be conducted by licensed asbestos removal contractors to ensure minimal disturbance and negligible risk to health for workers or nearby persons. Removal must be conducted using approved methods and supervised by a competent person.

The potential for exposure to soils contaminated with asbestos material and NOA needs to be identified and controls implemented in accordance with legislative requirements, incorporating a management plan.

NATA accredited laboratories should always be used for analysis of airborne fibre samples and asbestos identification samples with NATA endorsed reports issued for all results.

The AIOH believe that current exposure standards used in Australia are adequate, and as with any carcinogen, exposures should be maintained as low as reasonably practicable (ALARP).

1. What is asbestos?

Asbestos is a commercial generic term for naturally occurring elongated silicate mineral bundles. Asbestos fibres exist in parallel bundles that tend to split longitudinally when subjected to mechanical action, forming finer and finer fibres that maintain a high length-to-width aspect ratio. These fibres have physical properties such as:

- low electrical conductivity,
- high tensile strength,
- sufficient flexibility to be spun,
- non-combustible,
- low thermal conductivity, and
- resistance to heat.

The various types of asbestos have been used in a broad variety of products to enhance strength, heat, chemical and friction resistance, and various insulation properties.

There are six types of the fibrous asbestos minerals, in two mineralogical groups as described below:

- The serpentine asbestos is chrysotile (or white asbestos). Chrysotile has been the most commonly used form of asbestos amounting to 90-95% of overall commercial asbestos tonnage.
- Amphibole asbestiforms, amosite (brown or cummingtonite/grunerite asbestos) and crocidolite (blue or riebeckite asbestos), were the most commonly commercially used amphibole types in Australia. Tremolite, actinolite and anthophyllite were not commercially used in Australia but can be commonly encountered at low levels in the geological environment.

Crocidolite and amosite fibres tend to be straighter and stiffer than chrysotile fibres (Pickford *et al*, 2013).

The serpentine and amphibole group of minerals is widely found throughout the earth's crust, however only a few varieties have an asbestiform habit and the latter occur in relatively low quantities. The genesis of asbestos fibres as distinct mineral deposits requires certain conditions with regard to chemical composition, nucleation and fibre growth. Such conditions must have prevailed over a period sufficiently long and perturbation-free to allow a continuous growth of the silicate sheets or chains into fibrous structures.

Asbestos minerals are formed in solid solution with varying degrees of sequential cation substitution within the crystalline structure taking place. This leads to minor defects that effect the cleavage planes resulting in a range of particle habits, but mainly as elongated cleavage fragments. These show subtle and near virtually identical identification properties to asbestiform fibres in morphology, crystal structure, refractive index and chemical composition.

As a result of mechanical crushing, a range of particle habits can be created. Crystal aggregates are described as being fibrous, asbestiform, or columnar, whereas single crystal shape can be classified as fibre, fibril, filiform, prismatic, acicular, or bladed. These morphological definitions are often misused. Non-asbestiform particles can be classified as asbestos fibres by regulatory agencies, even though their toxicological properties are different to that of asbestos fibres.

Local geo-chemical conditions existing at the time of formation contribute to the relative ease of cleavage, the chemical ratio and mineral habit varies throughout the deposit and from deposit to deposit. In the beneficiation of specific commercial asbestos deposits, several fibre parameters are considered critically important and are used as standard evaluation criteria such as; fibre length (or length distribution), degree of fibre bundle opening and surface area, performance in cement reinforcement, and dust and granule content.

Serpentine and amphibole asbestiforms that are found as geological contaminants in certain types of rock formations can have fibrous and non-fibrous structures. The fibrous form is called asbestos. It is important to note that non-fibrous forms can have similar chemical composition and internal elemental structures, however do not have the same health effects as the fibrous forms. There are other minerals that are similar to asbestos in their particle shape, but do not possess the characteristics required to classify them as asbestos.

Amphiboles, and to a lesser extent serpentine minerals, are widely distributed in the earth's crust, hence asbestos may occur as an accessory mineral. For example, tremolite and actinolite are a matter of significance for any skarn deposits, in fact, for any igneous deposit that has limestone as a host, and, at some level, for almost all porphyry coppers. Fibrous minerals may be associated with carbonate-facies iron formations.

Similarly, chrysotile and other elongated non-asbestos serpentine minerals (i.e. picrolite and antigorite) and fibrous amphiboles are common occurrences in deposits of lateritic and magmatic sulphide nickel. Chrysotile can occur in serpentine rocks, especially if they are associated with metamorphism of ultramafic rocks. Asbestos can also occur as an accessory mineral with other industrial minerals (e.g. amphibole asbestos with vermiculite and talc).

2. Asbestos in materials

Asbestos was used extensively in some construction material in Australia up until about the mid 1980's. Asbestos continued to be used in a small number of Australian manufactured products (such as gaskets, friction linings) until the end of 2003. Imported products also have the potential to contain asbestos.

The three main types of asbestos commercially used in Australia are chrysotile, amosite and crocidolite. Asbestos was used in a wide range of industrial applications, building materials and some domestic products because of the fibrous structure which added various properties; e.g. strength or heat insulation properties to the material in which it was used.

Risk to health is via inhalation of respirable fibres. When considering the potential for an ACM to release respirable asbestos fibres, it is important to understand the terms 'friable' and 'non-friable'.

Friable ACM may be crumbled or pulverised or reduced to powder by hand pressure when dry (e.g. pipe insulation, sprayed insulation, millboard). Disturbance of these materials has the potential to generate large quantities of 'respirable' fibres. The concentration of respirable asbestos fibres released will be dependent on the level of mechanical disturbance and the amount of asbestos present in the material.

The term non-friable, covers all other ACM (including bonded ACM, i.e. asbestos-cement, friction products, vinyl tiles etc.). For bonded ACM, the fibres are contained within the matrix by use of such materials as resins and cement etc. Even with significant mechanical disturbance of non-friable or bonded ACM, including removal activities, generation of measurable quantities of 'respirable' fibres is unlikely; therefore this type of ACM poses a lower risk.

There may also be different levels of friability for some products, e.g. low density asbestos fibre board (LDB). LDB is much softer than bonded asbestos cement sheeting and will crumble easily if disturbed.

If ACM is in good condition and left in situ, it presents a low risk to building occupants.

The Safe Work Australia (SWA, 2008) publication [Literature review of asbestos fibre release from building materials following weathering and/or corrosion](#) provides more detail on the potential for 'respirable' fibre exposure from these sources.

3. Hazards associated with asbestos

A hazardous material has the potential to cause adverse effects, whilst risk is the likelihood of a substance causing adverse effects.

The presence of asbestos may constitute a health hazard, however the degree of risk to health is based on the likelihood that 'respirable' fibres are released and inhaled, and then deposited in the lung.

Respirable fibres are very small fibres (i.e. smaller than 3 micrometres in diameter, with aspect ratios of at least 3:1) that can be inhaled and deposited into the lower regions of the lung. For regulatory purposes, 'respirable fibres'¹ are usually also required to be longer than 5 micrometres, which fits with the understanding of their major toxicological properties.

Friable products have a greater potential to liberate respirable fibres as even slight disturbances can allow the fibres to be released into the air. For non-friable products, particularly bonded ACM where fibres are contained within a matrix, it is more difficult to release measurable concentrations of respirable fibres into the air. There is much less risk of airborne respirable fibres being liberated from bonded ACM unless it is significantly damaged (e.g. by using power tools such as drills or saws).

The greater the inhaled dose of respirable asbestos fibre, the greater the risk of developing asbestos associated disease. Dose is represented by both the amount of respirable asbestos in the air and the duration of exposure. Therefore, inhalation of large amounts of respirable fibres over long periods of time may lead to asbestos-related diseases (Doll & Peto, 1985; Hodgson & Darnton, 2000).

There is no scientific or epidemiological evidence to suggest that small or single exposures to asbestos will cause asbestos related diseases. All humans have continuous very low level background environmental exposure to asbestos fibres (HEI, 1991).

The three major occupational lung diseases caused by asbestos are:

- asbestosis
- lung cancer
- mesothelioma

Although asbestos is the major aetiological agent, a 'background' rate of these diseases exists in the normal unexposed Australian population. For persons exposed to asbestos, other factors such as smoking can increase the risk of developing lung cancer.

Applying linear 'no threshold linear exposure-response models' to estimate the risk applicable to current asbestos exposed groups such as maintenance workers that apply suitable control measures, indicates a very low risk from lung cancer or mesothelioma. The predicted level is within the range of 'negligible' risk (1/1,000,000/year) and the upper level of 'tolerability' of risk of death to any worker (1/1,000/year), as used by occupational health authorities (HSE, 1994; Topping, 2001). Such low level risk would not be statistically detectable in prospective cohort epidemiological or large scale toxicological studies.

¹ Note: under the WA mines legislation, there is a slight difference in the definition of respirable fibres

4. How do we measure and identify asbestos?

Airborne asbestos fibre sampling

Airborne asbestos fibre testing measures the number of respirable fibres that may be present in an atmosphere. This method is used primarily to test compliance with an exposure standard or an engineering control standard in circumstances such as:

- Monitoring of work situations where the process or product is exempt from the prohibition on asbestos usage (e.g. contaminant asbestiform minerals in mining and road building earthmoving activities);
- Monitoring of adjacent areas during asbestos removal or related work (e.g. testing integrity of removal enclosures); and
- Testing of an area prior to re-occupancy after asbestos removal work (i.e. clearance air testing).

Air monitoring must be carried out in accordance with the National Occupational Health and Safety Commission (NOHSC, 2005) [Guidance Note on the Membrane Filter Method \(MFM\) for Estimating Airborne Asbestos Fibres](#).

Results for airborne asbestos fibre monitoring are reported as number of fibres per 100 fields (raw result) and a calculated concentration of fibres per millilitre of air (f/mL). The detection limit for the method is 10 fibres per 100 fields which under normal circumstances (including sampling of sufficient volume) results in a reported concentration of less than 0.01 f/mL. Therefore, any result where the total number of fibres per 100 fields is less than 10, and the final reported concentration is less than 0.01 f/mL, is satisfactory.

Depending on the situation the results obtained from the airborne asbestos fibre monitoring are compared against either the workplace exposure standard or an engineering control standard.

- The Safe Work Australia time weighted average (TWA) Workplace Exposure Standard (WES) of 0.1 f/mL has been set for all forms of asbestos including the commercial types; chrysotile, amosite and crocidolite. The exposure standard is in part based on quantitative risk assessment of asbestosis, lung cancer and mesothelioma derived from epidemiological studies conducted on past asbestos workers. It is to be applied to results of personal monitoring in situations where workers are handling, disturbing or where bystander exposure to asbestos materials can occur, bearing in mind that it is important in these situations to keep exposures as low as reasonably practicable (ALARP).
- An Engineering Control Standard of 0.01 f/mL is a value set at the analytical detection limit of the membrane filter method. It is to be applied in situations where static, or area sampling is carried out to test for leakage at the perimeter of asbestos removal enclosures, and for testing the removal area prior to re-entry of unprotected persons (i.e. clearance monitoring). Air monitoring in this instance should not be used as a substitute for critical visual inspection of the area or process ([Code of Practice: How to Safely Remove Asbestos](#) (2011), [Code of Practice for the Safe Removal of Asbestos](#) (2005) and relevant State-based Codes).

National Association of Testing Authorities (NATA) accredited laboratories should always be used for airborne asbestos sampling and analysis, and results reported on a NATA endorsed test report.

Asbestos inspection survey

Materials containing asbestos, particularly those used in the construction of a building or structure, should be identified by carrying out an *Asbestos Inspection Survey*. The survey should be undertaken by a competent person (refer to *Competent Person* section above) who has a good understanding of the historical usage of ACM and experience in conducting such surveys.

Samples of material suspected of containing asbestos should be collected and analysed as described below.

Results from the *Inspection Survey* form the basis of the site *Asbestos Register*. The model Code of Practice - [How to Manage and Control Asbestos in the Workplace](#) (2011) provides a template and an example of an asbestos register.

Asbestos identification analysis

Asbestos identification analysis is used to identify if a sample contains asbestos fibres. This must be carried out in accordance with Australian Standard (AS) 4964: *Method for the qualitative identification of asbestos in bulk samples* (note, this method is qualitative only). The sample could be a manufactured building material, dust or soil.

Asbestos identification analysis must be conducted prior to disturbance of any suspected ACM (e.g. ACM removal work). If asbestos is detected then certain procedures must be followed during any disturbance activities.

Site-based analysis is not recommended and samples should always be sent to a NATA accredited laboratory for asbestos identification analysis, with results reported on a NATA endorsed test report.

5. Major uses / potential for exposure (in Australia)

The new use and re-use of all forms of asbestos and ACM is now prohibited in Australia. ACM in situ may remain in buildings and equipment providing it remains in good condition. In addition, asbestos or ACM is a prohibited import cannot be imported into Australia. For additional information regarding managing importation of asbestos into Australia, refer to the Australian Government [Asbestos Safety and Eradication Agency](#).

It is important for any material suspected of containing asbestos to be tested by asbestos identification analysis prior to any disturbance activities occurring (e.g. removal, refurbishment or demolition). Exposure sources are largely non-existent provided that:

- Removal techniques following the relevant Code of Practice for asbestos removal are used;²
- No unauthorised removal, disturbances or refurbishments are conducted; and
- Any suspected ACM is tested prior to disturbance activities.

All Australian jurisdictions have licensing requirements for removal and disposal of asbestos.

6. How do we control it and prevent asbestos exposure?

Risk of health effects

Asbestos is a risk to health via inhalation only and the likelihood of asbestos becoming airborne and posing a risk to health is based upon the following factors:

- Condition and type of ACM
- Friability of ACM
- Potential for disturbance of the ACM
- Nature of disturbance
- Accessibility and location of ACM
- Extent of ACM

Therefore, if ACM is left in situ, undisturbed and it remains in good condition then there is no measurable risk to health above that posed by ambient background levels of asbestos (HEI, 1991). A risk assessment can be conducted by a suitably experienced occupational hygienist (refer to *Competent Person* section above) regarding risk to health from ACMs.

Available controls

Risk can be minimised so far as is reasonably practicable by using a risk assessment approach and following the hierarchy of controls. When ACM is left in situ the controls are mainly administrative and include preparing an *Asbestos Register*, informing occupants, trades / maintenance personnel and visitors of the presence of ACM, labelling ACM locations, and conducting regular checks (i.e. inspections) on the condition of any ACM (refer to the [Code of Practice: How to Manage and Control Asbestos in the Workplace](#) for additional information). These controls help prevent unwanted release of respirable asbestos fibres due to inadvertent disturbance of ACM.

For any work involving the disturbance or removal of any ACM there are strict guidelines in regard to the isolation of work areas, personal protective equipment, removal procedures and ventilation requirements.

Substitution of ACM with a non-asbestos-containing alternative may be suitable for some applications. Substitution materials generally include man-made vitreous fibres (MMVF), previously called synthetic mineral fibres (SMF). For more information regarding SMF, please refer to the AIOH Position Paper on SMF.

Asbestos management plan

As part of control for ACM, it is important an *Asbestos Management Plan* (AMP) is prepared. The AMP is a comprehensive document outlining the management strategies in place to prevent exposure to asbestos fibres. For further information regarding the AMP, please refer to the [Code of Practice: How to Manage and Control Asbestos in the Workplace](#).

7. Asbestos contamination in soils

Soil can be contaminated with asbestos material arising from inappropriate removal activities carried out in the past or from inappropriate burial (e.g. illegal dumping). As a result, the asbestos may be present in the form of bonded asbestos material and debris (e.g. asbestos cement), visible fibrous asbestos and asbestos fines (e.g. small fibrous bundles).

There may also be free asbestos (i.e. respirable fibres) distributed throughout the soil in rare circumstances, however these fibres will not be visible to the naked eye.

It is important a risk assessment is conducted by a suitably experienced occupational hygienist (refer to *Competent Person* section above) whenever asbestos contamination is present in soil. The risk assessment will cover degree of contamination and type of ACM present (i.e. either friable or non-friable) and provide remediation strategies.

Whenever asbestos contaminated soil is present, it is important an AMP for the site is prepared.

Potential for human exposure as a result of asbestos contamination in soil is typically limited; however specialised removal techniques (e.g. dust control) may be required in some circumstances or jurisdictions (Swartjes & Tromp, 2008).

² Refer to *Current Applicable Legislation* section below for additional details on Codes of Practice.

During contaminated soil disturbance and / or removal work, exposures should be maintained in accordance with the ALARP principle. In addition, it is a community expectation that no measureable airborne asbestos fibres are generated during soil remediation work.

Information for site assessment of ACM-contaminated soils can be found in the [National Environment Protection \(Assessment of Site Contamination\) Measure](#) (NEPM, 2013). The document specifies techniques for field observations and assessments of *visible* ACM at sites where ACM contamination (i.e. asbestos-cement or small fibrous asbestos bundles) is present. Note that the NEPM document outlines additional requirements for competent persons to undertake the assessment of ACM-contaminated soils as per the NEPM guidelines, and it does not cover free (or respirable) asbestos (greater than 10% of the overall ACM content), which may be present in the soil.

AS 4964 must be used whenever soil testing is required. As part of the analysis procedure, trace analysis must be undertaken to determine presence of free (or respirable) asbestos. Reporting of concentration of asbestos in soil cannot be undertaken using this method as the AS method is qualitative only.

Reports from laboratories must be clear and unambiguous, and results reported in accordance with AS 4964 where positive ACM (either asbestos-cement, asbestos bundles and/or free asbestos) is present to allow satisfactory interpretation for purposes of site risk assessments, and subsequent remediation strategies.

8. Naturally occurring asbestos (NOA)

Naturally occurring asbestiform minerals are widespread throughout certain geological areas hence can be present as a contaminant in workplaces where mining, road works and construction activities are conducted. The NOA may be found in veins of rock formations and ore bodies which are disturbed during site activities.

Areas with geological characteristics favourable for the formation of asbestiform minerals should be studied in detail to confirm their presence or absence by competent geologists or occupational hygienists trained in the specifics of dealing with NOA. If NOA is suspected, it is important asbestos identification analysis is conducted. However, there may be practical difficulties in analysis using AS 4964 as the characteristics of NOA can be only slightly different to that of commercial grade asbestos used in manufacture of asbestos-containing products. It is important to only use laboratories that have extensive experience in analysing NOA in order to minimise the potential for mis-identification.

In addition, often it is technically difficult, if not impossible, to determine the degree of exposure to contaminant asbestiform minerals using regulatory air monitoring techniques due to visible occlusion of the small amounts of fibres with non-fibrous particulate. In such circumstances, it is only possible to report that the airborne level is less than the monitoring detection limit, as it is in part determined by the ratio of fibres to host rock dust particles in the dust cloud sampled. The contaminant level in the ore body whilst visible in some veins and inclusions, in reality makes up only a very minor fraction of the mass of bulk material.

Operational practices at sites where NOA is present should be conducted in accordance with legislative requirements (e.g. the Western Australian Department of Mines and Petroleum MIAC (2015) Guideline - [Management of fibrous minerals in Western Australian mining operations](#)).

The potential for exposure to NOA needs to be identified and it is important for controls to be implemented in accordance with jurisdictional legislative requirements in order to keep exposures as low as reasonably practicable. An AMP or fibrous minerals management plan (FMMP) must also be prepared where NOA is present.

9. Current applicable legislation

All workplace health and safety jurisdictions have legislation which covers asbestos and publish documents that specify management, control and removal requirements.

Safe Work Australia documents are as follows:

- Code of Practice: [How to Manage and Control Asbestos in the Workplace](#) (December 2011).
- Code of Practice: [How to Safely Remove Asbestos](#) (December 2011).
- Code of Practice: [Safe Removal of Asbestos](#) 2nd Edition [NOHSC: 2002 (2005)].³
- Code of Practice: [Management and Control of Asbestos in the Workplace](#) [NOHSC: 2018 (2005)].³

These documents are available from www.safeworkaustralia.gov.au.

10. AIOH recommendation

The information for health aspects of asbestos and the degree of risk associated with compliance with the Workplace Exposure Standard is now well documented, and there are comprehensive legislative requirements and associated work practices to control the potential for asbestos exposure.

The AIOH recommends:

³ Still used in some jurisdictions.

- Professional grade AIOH members with relevant asbestos experience and proven competence in the required specific areas of investigation, analysis and/or interpretation of the findings are used for asbestos related enquiries (refer to *Competent Person* section above). Based on local legislative requirements, the occupational hygienist may also be required to be a licensed asbestos assessor to undertake these activities.
- Asbestos identification testing is conducted on materials suspected of containing asbestos *prior* to any disturbance activities.
- In accordance with local legislative requirements, suitably qualified and/or licensed asbestos removal contractors and assessors are used.
- NATA accredited laboratories are used for analysis of airborne fibre samples and asbestos identification samples with results reported on NATA endorsed reports.
- Inspection surveys are conducted with *Asbestos Registers* and *Asbestos Management Plans* prepared to assist building owners / administrators to manage ACM appropriately for buildings and structures constructed prior to December 31 2003.
- ACM present in buildings or structures is suitably labelled and managed with the aid of a site specific asbestos management plan.
- Any exposure to asbestos is kept as low as reasonably practicable (ALARP).
- During asbestos-contaminated soil disturbance and / or removal work, exposures should be maintained in accordance with the ALARP principle based on risk assessment conducted by a suitably experienced occupational hygienist (with additional competencies as defined in the NEPM (2013) where environmental site assessment is performed).
- The presence of naturally occurring asbestiform minerals as a contaminant in workplaces where mining, road works and construction activities take place should be risk assessed by a suitably experienced occupational hygienist (refer to *Competent Person* section above) and controlled using a site specific asbestos management plan.

11. References and sources of additional information

Australian Standard 4964 (2004). *Method for the qualitative identification of asbestos in bulk samples*. Available from <http://infostore.saiglobal.com/store/default.aspx>.

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The NATA website (www.nata.asn.au) for accredited laboratory contacts for asbestos-related tests (namely airborne fibre testing and asbestos identification analysis).

The AIOH website for Occupational Hygiene consultants (www.aioh.org.au).