GOOD PRACTICE GUIDANCE FOR THE MANAGEMENT AND CONTROL OF ASBESTOS

PROTECTING WORKPLACES AND COMMUNITIES FROM ASBESTOS EXPOSURE RISKS

MARCH 2022

ASIAN DEVELOPMENT BANK

ADB

GOOD PRACTICE GUIDANCE FOR THE MANAGEMENT AND CONTROL OF ASBESTOS

PROTECTING WORKPLACES AND COMMUNITIES FROM ASBESTOS EXPOSURE RISKS

MARCH 2022

ASIAN DEVELOPMENT BANK

ADB

6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 8632 4444; Fax +63 2 8636 2444
www.adb.org

ISBN 978-92-9269-370-1 (print); 978-92-9269-371-8 (electronic); 978-92-9269-372-5 (ebook)
Publication Stock No. TIM220047-2
DOI: http://dx.doi.org/10.22617/TIM220047-2

The ADB Sustainable Development Working Paper Series presents data, information, and/or findings from ongoing research and studies to encourage exchange of ideas and elicit comment and feedback about development issues in Asia and the Pacific. Since papers in this series are intended for quick and easy dissemination, the content may or may not be fully edited and may later be modified for final publication.

Corrigenda to ADB publications may be found at http://www.adb.org/publications/corrigenda.

Notes:
This Good Practice Guide is intended to be used as a reference for ADB's borrowers, clients and project teams in managing exposure risks to asbestos and asbestos-containing materials. It is not intended to be a compliance guide to satisfying the requirements under ADB's Safeguard Policy Statement (2009) and does not modify such requirements.

On the cover: Bonded asbestos (photo from iStock.com).

CONTENTS

TABLES, FIGURES, AND IMAGES

TABLES

FIGURES

IMAGES

ABBREVIATIONS AND DEFINITIONS

ACM	Asbestos-containing material
ADB	Asian Development Bank
APLAC	Asia Pacific Laboratory Accreditation Cooperation
ARD	Asbestos-related diseases (four main types: asbestos-related benign plural disease, asbestosis, asbestos-related lung cancer and mesothelioma)
Asbestos contractor	A person who conducts asbestos-related work
Asbestos-related work	Work that has the potential to disturb asbestos, including asbestos removal, asbestos encapsulation, asbestos handling and disposal
ASTM	American Society for Testing and Materials
EBRD	European Bank for Reconstruction and Development
EPA	Environmental Protection Agency (the one referred to in this report is USEPA, which is United States EPA)
GPG	Good Practice Guidance
IARC	International Agency for Research on Cancer
ILAC	International Laboratory Accreditation Cooperation
ILO	International Labour Organization
kg	kilogram
m	meter
mg/m^3	milligram per cubic meter
mL	milliliter
µm	micrometer
mm	millimeter
NIOSH	National Institute for Occupational Safety and Health
OHS	occupational health and safety
PCM	phase contrast microscopy
PEL	permissible exposure limit
PLM	polarized light microscopy
SEM	scanning electron microscopy
t	tonne
TEM	transmission electron microscopy
TLV	threshold limit value
TWA	time-weighted average concentration
UN	United Nations
WHA	World Health Assembly
WHO	World Health Organization

ACKNOWLEDGMENTS

This Good Practice Guidance (GPG) on the Management and Control of Asbestos was produced by the Safeguards Division (SDSS) of the Asian Development Bank's Sustainable Development and Climate Change Department (SDCC). Its preparation was led and managed by Felix Oku, Senior Social Development Specialist (Safeguards) and led by Bruce Dunn, Director of SDSS, under the oversight of Bruno Carrasco, SDCC Director General, and concurrently Chief Compliance Officer.

Production was managed with core support from the following consultants: Geosyntec Consultants Pty Ltd. (Cheryl Halim, Kylie Lloyd, and Rachael Martin), Rocilyn Laccay, Rebecca Salvo, and Maria Cristina Velez.

ADB's Technical Working Group on Occupational and Community Health and Safety comprising members of ADB operations and other departments, provided inputs and conducted technical reviews on this GPG. We acknowledge contributions from the following staff: Zehra Abbas, Manjula Amerasinghe, Ricardo Barba, Haidy Ear-Dupuy, Beatrice Gomez, Glen Harris, Duncan Lang, Emma Marsden, Antoine Morel, Takako Morita Lalinka Padrinao, Ninette Pajarillaga, Noel Peters, Francesco Ricciardi, Susann Roth, Christopher Tabungar, Antoinette Virtucio, Jean Williams, and Jenny Chu.

We also acknowledge the review and guidance of Debbie Cousins and Derran Williams of the European Bank for Reconstruction Development (EBRD), and Bruce Gordon of the World Health Organization (WHO). Development of this GPG was funded by the Urban and Climate Change Resilient Trust Fund (UCCRTF) for the Regional Technical Assistance (TA 9901 – Strengthening Safeguards Implementation in ADB Projects).

1 INTRODUCTION

Asbestos is a fibrous silicate mineral that became widely used in the 20th century due to its tensile strength, thermal stability, thermal resistance and electrical resistance. The World Health Organization (WHO) considers all forms of asbestos to be carcinogenic to humans. While mining, manufacturing and use of asbestos-containing material (ACM) continues in many parts of the world, more than 60 countries globally have banned the use of asbestos due to its human health impact with respect to development of asbestosis, asbestos-related lung cancer, and mesothelioma.

1.1 The Purpose of This Good Practice Guidance

The purpose of this Good Practice Guidance (GPG) is to help increase awareness of the risks of occupational asbestos exposure and of how to address them. It provides high level guidance on:

- The duties of employers, workers/subcontractors, asbestos contractors and vendors;
- Training requirements for working with asbestos;
- Identification of asbestos;
- Managing long term risks of asbestos;
- Working safely with asbestos;
- Managing incidents where asbestos is found;
- Managing the risks of asbestos removal;
- Managing asbestos waste; and
- Managing asbestos waste generated through disasters

This Good Practice Guidance is not intended to provide a detailed methodology for performing work where asbestos is present. It is recommended that specialist advice be sought to provide a situation-specific detailed methodology and ensure compliance with relevant national legislation and other international best practice requirements.

The International Labour Organization (ILO) and the WHO provide guidance (ILO & WHO, 2007) that states that asbestos-containing material should be avoided in new construction. In existing projects, the presence of asbestos and associated asbestos risks should be assessed and a management plan be prepared that includes the end-of-life actions.

This document considers good practice guidance prepared by international organizations, including the ILO (1984) Safety in the Use of Asbestos and the World Bank (2009) Good Practice Note: Asbestos: Occupational and Community Health Issues (links provided in Section 13). Other international documents were used to supplement these guidance documents.

As an additional tool, Appendix B includes checklists to help implement this good practice guidance. These provide a useful summary of important items that may be addressed to:

- Minimize the use of asbestos in any new developments.
- Identify general duties of workers and project managers/employers.
- Confirm that workers involved in projects are appropriately trained to perform asbestos work.
- Ensure that asbestos has been identified and that asbestos management plans are in place.
- Manage the risk of asbestos.
- Manage asbestos-related work.
- Manage asbestos incidents.
- Ensure that asbestos removal work is being conducted in a safe manner.
- Check that asbestos waste has been appropriately handled and disposed of.
- Manage asbestos during disasters.

Appendix B also provides a list of suggested key performance indicators and associated documentary evidence which may be used to monitor the safety components of asbestos work.

2 ASBESTOS AWARENESS

2.1 What Is Asbestos?

Asbestos is a naturally occurring fibrous serpentine or amphibole mineral with current or historical commercial usefulness due to its extraordinary tensile strength, poor heat conduction and relative resistance to chemical attack (WHO, 2014; IARC, 2018).

Asbestos is often categorized in two main classes:

- Serpentine, which consists of a silicate with the hydroxyl layer on the outside and forms curly and snake-like fibers. This class includes the chrysotile form of asbestos.
- Amphibole, which consists of a silicate with a hydroxyl layer on the inside and can be recognized by the sharp needle-like fibers. This class includes the crocidolite, amosite, anthophyllite, tremolite, actinolite, riebeckite, and cummingtonite-grunerite forms of asbestos.

Three of the abovementioned asbestos minerals that are regularly encountered in commercial products include the following (shown in Image 1):

- Chrysotile (white asbestos);
- Amosite (brown asbestos); and
- Crocidolite (blue asbestos).

The most common forms of asbestos encountered are chrysotile and amosite asbestos. It is rare to find pure form asbestos as a commercial product.

Image 1: Most Common Forms of Asbestos

Chrysotile (white asbestos) | **amosite (brown asbestos)** | **crocidolite/riebeckite (blue asbestos)**

Source: iStock.com.

2.2 Asbestiform Habit

Asbestiform habit is a term that is used to describe the crystallization form of a mineral consisting of crystals that are thin, hairlike fibers that possess enhanced strength, flexibility and durability and lack of surface defects (National Research Council (US) Committee on Nonoccupational Health Risks of Asbestiform Fibers, 1984).

In addition to asbestos, there are other minerals used in industry (e.g., palygorskite), which may also crystallise with well-developed thin hairlike fibers (i.e., in the asbestiform habit) but are not called asbestos. These minerals may also have properties similar to asbestos and pose similar hazards.

2.3 Where Can Asbestos Be Found in the Workplace?

Because of its tensile strength, durability and fire and chemical resistance, asbestos has been used for thousands of years. Widespread use did not occur until major asbestos mines were opened in the 1880s. Historians estimate that asbestos has been used in more than 3000 types of products in consumer goods (insulation, thickeners and fillers) and in construction, maritime and automotive industries.

In recent years, the main asbestos products comprise corrugated fiber cement (roofing), flat fiber cement, pipes, insulation, friction materials, gaskets and joints and textile and sealants.

Due to its extensive use historically, asbestos may be present in many parts of the built environment, including walls, ceilings, roofs, floors, pipes, electrical switchboards, heaters, boilers, roof and wall cavities, pipe joints, etc. Examples of uses are provided in Section 6.1.

Asbestos can also be found in contaminated soils around buildings or structures containing asbestos due to deterioration of the asbestos-containing materials, or where poor demolition of buildings or structures with asbestos-containing materials has occurred.

As asbestos (and other asbestiform minerals) are naturally occurring, asbestos may be encountered as naturally occurring minerals at some project locations, such as in tunnel digging/boring, excavation for buildings or infrastructure, etc. Where a national register exists on potential locations of naturally occurring asbestos and other asbestiform minerals, it is prudent to assess whether proposed project related work is likely to expose these minerals.

2.4 What Is the Difference between Bonded and Unbonded Asbestos?

Asbestos is commonly encountered as a commercial product in two forms (Image 2) based on the potential for releasing fibers, and the associated risks to human health:

- **Bonded** (or non-friable) asbestos refers to materials containing asbestos that are solid and cannot be crumbled by hand or reduced to powder by hand. In this form, the asbestos fibers have been mixed with a bonding compound such as cement. This type of asbestos is commonly referred to as asbestos-containing material (ACM). Some ACM can contain very high (up to 70% asbestos fibers by volume).

- **Unbonded** (or friable) asbestos refers to materials containing asbestos that, when dry, are in powder form or may be crushed or pulverised into powder form by using your hand (Safe Work Australia, 2020)/crumbly asbestos (WHO, 2020). The fibers in these materials can readily become airborne and then settle as dust on surfaces.

Note: Bonded asbestos (non-friable), if in good condition and left undisturbed, generally represents a lower risk to human health as the fibers are less likely to be released and to become airborne. However, asbestos fibers within bonded ACM may become friable through weathering, damage, normal wear and tear, and/or through mechanical/construction activities (such as drilling or sawing). Friable asbestos can become airborne when disturbed and represents a greater risk to workers and surrounding communities due to the increased risk of inhalation of asbestos fibers.

Image 2: Example of Bonded and Unbonded Asbestos

Bonded asbestos **Unbonded asbestos**

Source: iStock.com.

Some examples of potentially asbestos-containing materials include:

- Flat and corrugated sheeting (commonly known as fibro cement sheeting)
- Cement pipes
- Insulation (buildings, electrical wiring, etc.)
- Floor tiles
- Adhesives
- Roofing
- Textiles
- Textured paints
- Automotive parts such as brake pads

For a comprehensive series of images showing ACM features that correspond to the common ACM uses, please refer to Figure 3 in Section 6.

2.5 What Are the Risks of Asbestos Exposure?

The World Health Organization (WHO, 2006) recognises that all types of asbestos cause disease and that evidence for increased cancer risks have been observed in populations exposed to very low levels of asbestos. Similarly, the International Agency for Research on Cancer (IARC, 2018) considers that all forms of asbestos (i.e., chrysotile, amosite, crocidolite, anthophyllite, tremolite and actinolite) are carcinogenic to humans, meaning that exposure to all forms of

asbestos can cause cancer, including mesothelioma (cancer of the lining of the lung), and cancers of the lung, larynx, and ovary.

Asbestos-related diseases (ARDs) typically arise when asbestos fibers are inhaled into the lung and penetrate the respiratory tissue. Although most fibers will be removed from the lungs through coughing and/or swallowing, fibers deposited in the deepest regions of the lung are removed more slowly than those deposited in the upper regions of the lungs (Hoffman & Asgharian, 2003). Some fibers may persist in the lung and remain embedded for many years. Over time an inflammation response is triggered, and this inflammation can lead to pathologies such as scarring, or other changes leading to cancer (Brody, 2018).

The four most common types of ARD include asbestos-related benign plural disease, asbestosis, asbestos-related lung cancer, and mesothelioma (Safe Work Australia, 2012). The latter two diseases can produce first symptoms up to 40 years following first exposure to asbestos (WHO, 2014; Safe Work Australia, 2012).

Asbestos-related cancer and mesothelioma may occur after occupational exposure to asbestos, as well as after exposure by the general population living in the neighborhood of asbestos factories and mines, or in people living with asbestos workers (Loomis, Dement, Wolf, & Richardson, 2009; WHO, 2014).

Additionally, asbestos can also present a risk to the general population when ACM is disturbed. The vast majority of those exposed to asbestos remain in the general population without any ongoing health screening (Takahashi, Landrigan, & Ramazzini, 2016), and therefore may not be aware of any changes in the lung until symptoms occur, often decades after exposure.

The occurrence of ARDs is affected by fiber type, size, dose and how the asbestos is processed. Currently there is no safe threshold identified for the carcinogenic risk of any form of asbestos. Cigarette smoking has been found to increase the risk of lung cancer from asbestos exposure (WHO, 2014).

WHO (2003) considers that although asbestos may be introduced to drinking water through the erosion of anthropogenic asbestos products (such as asbestos-containing water pipes), there is no conclusive evidence that ingested asbestos causes cancer. For this reason, WHO does not consider it appropriate or necessary to establish a guideline value for asbestos in drinking water. However, WHO (2020a) recognises that there is a need to minimize the degradation and release of asbestos fibers from all manufactured asbestos products (including water pipes) because of the risks associated with the inhalation of these fibers, such as during pipe maintenance or replacement. Therefore, it would be prudent not to install new sources of asbestos fibers in drinking water supplies, such as in reticulated water supply infrastructure and storage containers.

2.6 Asbestos as a Global Health Issue

Exposure to asbestos fibers may occur in the workplace; in the vicinity of asbestos sources (such as asbestos mines or asbestos manufacturing facilities); because of domestic asbestos use in housing and buildings; and via nonoccupational exposures.

Globally, an estimated 125 million people are exposed to asbestos in the workplace. Recent estimates indicate that occupational exposures to asbestos are responsible for 233,000 deaths annually, and at least an additional 20,000 deaths were attributed to nonoccupational asbestos exposures (Furuya, Chimed-Ochir, Takahashi, David, & Takala, 2018). These deaths are largely the result of exposure to asbestos through the inhalation of airborne asbestos fibers.

WHO (2014) set out the following approach to the elimination of asbestos-related disease:

- Recognizing that the most efficient way to eliminate ARDs is to stop the use of all types of asbestos.
- Providing information about solutions for replacing asbestos with safer substitutes and developing economic and technological mechanisms to stimulate its replacement.
- Taking measures to prevent exposure to asbestos in place and during asbestos removal (abatement).
- Improving early diagnosis, treatment and rehabilitation services for asbestos-related diseases and establishing registries of people with past and/or current exposure to asbestos.

3 LAWS AND OBLIGATIONS

3.1 The Scale of Global Asbestos Use

Asbestos and ACM have been used globally for a wide range of applications. The popularity of ACM in developing countries is high, particularly in those where affordable, mass-produced building materials are in high demand. In the Asia and Pacific region, for example, asbestos cement sheeting has been widely used for new housing developments and building construction (Li, Dong, Yu, & Liu, 2014).

While asbestos has been banned in 67 nations globally (Kazan-Allen, 2019), asbestos continues to be used in various countries. The International Asbestos Ban Secretariat provides updated information and Maps showing Global Asbestos Usage and Bans based on USGS (United States Geological Survey) data.

Note on asbestos bans: Countries with a ban on asbestos use do not necessarily have no asbestos risks. Asbestos can be hidden in many buildings, infrastructure, waste streams, and other environmental media in those countries.

3.2 International Agreements and Obligations

WHO (2006) states that as there is no evidence of a safe threshold for carcinogenic effect for asbestos, the most efficient way to eliminate ARDs is "to stop using all types of asbestos".

In an effort to eliminate ARDs, the International Labour Organization (ILO) and the World Health Organization (WHO) prepared a document that provides high level guidance for countries to establish national programs for elimination of asbestos-related diseases, including strategic policy, awareness raising, capacity building, an institutional framework and a national plan of action for ARDs (ILO & WHO, 2007).

The above collaboration was formed based on various international conventions and forums aimed at minimizing or eliminating asbestos and ARDs.

The following international conventions, sessions, and resolutions are applicable to the management of asbestos:

- The Occupational Cancer Convention, 1974 (No. 139), sets out measures to be taken for the control and prevention of occupational hazards caused by carcinogenic substances and agents, with key measures including:
  - periodically determining the carcinogenic substances and agents to which occupational exposure shall be prohibited or made subject to authorization or control;
  - making every effort to have carcinogenic substances and agents to which workers may be exposed in the course of their work replaced by non-carcinogenic substances or agents or by less harmful substances or agents;
  - reducing the number of workers exposed to carcinogenic substances or agents and keeping the duration and degree of such exposure to the minimum.
- The ILO Convention on Safety in the Use of Asbestos, in 1986 (No. 162). This convention sets out measures to be taken for the prevention and control of, and protection of workers against, health hazards due to occupational exposure to asbestos through prohibiting the use of crocidolite and products containing the crocidolite form of asbestos and spraying of all forms of asbestos. Key provisions of Convention No. 162 include:
  - replacement of asbestos or of certain types of asbestos or products containing asbestos with other materials or products evaluated as less harmful,

- total or partial prohibition of the use of asbestos or of certain types of asbestos or products containing asbestos in certain work processes,
- measures to prevent or control the release of asbestos dust into the air, and to ensure that the exposure limits or other exposure criteria are complied with, and also to reduce exposure to as low a level as is reasonably practicable.

- The Chemicals Convention, 1990 (No. 170) requires that 'when in an exporting member State all or some uses of hazardous chemicals are prohibited for reasons of safety and health at work, this fact and the reasons for it shall be communicated by the exporting member State to any importing country'.
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992), to which 181 countries are parties, aims to protect human health and the environment against the adverse effects of hazardous wastes. It lists asbestos (dust and fibers) as a category of controlled waste and requires parties to prohibit or not permit the export of such waste to parties that have prohibited its import under the convention.
- The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (2004), saw the majority of its 154 Parties indicate a wish to see chrysotile listed under Annex 3 of the Convention. Listing chrysotile in Annex 3 means there will be specific requirements for import of material containing chrysotile. Several countries, which continue to trade and use asbestos, have blocked inclusion of chrysotile in the list, as this would impact on their import activities.
- Waigani Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region 2001.
- The Convention for the Protection of Natural Resources and Environment of the South Pacific Region (the Noumea Convention).
- Various World Health Assemblies and other regional conventions.

The links in Table 1 provide the list of countries that have either ratified, accepted, approved, or acceded to the corresponding convention responsibilities. Links to each convention can be found within Section 13 of the GPG.

National legislation on asbestos should be met if present. Some ADB member countries also have responsibilities under the key international conventions concerning the regulation and control of asbestos and ACM.

3.3 Are 'Asbestos-free' Products Free from Asbestos?

Local standards in some supplier countries allow for the classification of goods as 'asbestos-free' where they meet a nominated low level of asbestos content. However, for those countries that have banned the importation of all asbestos, products labelled 'asbestos-free' are sometimes found not to comply with the regulations of those countries.

International best practice is for users of 'asbestos-free' products to request the supplier, importer, or manufacturer to supply the analytical test results of a sample of the product prior to purchase to confirm the absence of asbestos in that product. Procurement of project related materials and equipment should follow this recommended approach to ensure asbestos-free products are indeed free of ACMs.

This section of the GPG is largely based on the guidance presented in ILO (1984) and comprises typical duties of employers/project managers, workers/subcontractors, asbestos contractors and vendors. Some countries may have specific obligations and requirements within occupational health and safety legislation and guidance on the roles and responsibilities of employers, project managers, workers, and subcontractors. Compliance is essential to ensure the protection of workers and communities.

Table 1: International Conventions Applicable to Asbestos and Links to the Participating Countries

Author	Convention Title	Link to List of Participating Countries
International Labor Organization (ILO)	ILO Asbestos Convention 1986 (No. 162) and Recommendation 1985 (No. 172)	https://www.ilo.org/dyn/normlex/en/f?p=1000:11300:0::NO:11300:P11300_INSTRUMENT_ID:312307
ILO	Occupational Cancer Convention, 1974 (No. 139)	https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11300:0::NO:11300:P11300_INSTRUMENT_ID:312284:NO
ILO	The Chemicals Convention, 1990 (No.170)	https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11300:0::NO:11300:P11300_INSTRUMENT_ID:312315:NO
United Nations Environment Programme (UNEP)	Basel Convention (1992) on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	http://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx
United Nations Environment Programme (UNEP) and Food and Agriculture Organization (FAO) of the United Nations	Rotterdam Convention (2004) on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-14&chapter=27
Secretariat of the Pacific Regional Environment Programme (SPREP)	Waigani Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region 2001	https://www.sprep.org/convention-secretariat/waigani-convention
Secretariat of the Pacific Regional Environment Programme (SPREP)	The Convention for the Protection of Natural Resources and Environment of the South Pacific Region (the Noumea Convention)	https://www.sprep.org/convention-secretariat/noumea-convention

4 GENERAL DUTIES/RESPONSIBILITIES

4.1 General Duties/Responsibilities of Employers and Project Managers

General duties/responsibilities of employers and project managers are as follows:

- **General**
  - Employers/project managers shall ensure any work in the workplace and surrounding communities, including asbestos-related work, meets the national legislation and obligations and follows requirements for international best practice.
- **Before and/or during construction**
  - Employers/project managers shall assess whether material supplied for their workplace contains asbestos.
  - Where possible, asbestos and ACM should be avoided in new materials and alternative materials should be used.
  - Where ACM is used in construction, employers/project managers should ensure that it does not present unacceptable risk to construction workers or future users and its location should be fully documented in an asbestos register to guide scheduled maintenance works.
- **During operation/maintenance**
  - Employers/project managers shall provide reasonable measures to identify and assess the potential asbestos hazards currently present at the workplace and surrounding communities, within the materials and equipment / plant used by workers. An asbestos register shall be prepared by the manager prior to commencement of routine and ad hoc maintenance works.
  - Employers/project managers are responsible for the control and prevention of exposures to airborne asbestos within a workplace and surrounding communities, including (but not limited to):
    - » Asbestos risk is mitigated through the various control measures provided in this document.
    - » Provision of monitoring equipment (where necessary), which should be adequately maintained and calibrated.
    - » Provision of health surveillance to workers (where necessary).
    - » Provision of appropriate (type specific) personal protective equipment (PPE).
  - Employers/project managers must conduct regular inspections of sites where asbestos work takes place to ensure asbestos controls are adequate.
  - Employers/project managers shall make the following information available for workers and subcontractors, noting that they should engage a competent person to provide this information:
    - » Relevant legislation, regulations and safety precautions for work with potential asbestos exposure;
    - » Locations of identified or suspected ACM within the workplace;
    - » Potential hazards and risks of asbestos in the workplace;
    - » Appropriate mitigation measures for working in or around the presence of identified or suspected ACM; and
  - Employer/projects managers shall liaise with relevant project development stakeholders to ensure the safety and wellbeing of surrounding communities against exposure from ACM from their workplace.
  - Employers/project managers shall ensure that workers and other subcontractors are adequately trained in conducting their work, recognizing potential ACM in the workplace and any work with potential asbestos exposure.

- Employers/project managers shall engage suitably qualified and experienced asbestos contractors for all asbestos-related work, including assessments of areas where ACM may be present, before the start of work that could release asbestos fibers.

- **During asbestos removal/demolition of structures/buildings**
  - Employers/project managers shall engage suitably qualified, experienced and licensed (if required) asbestos contractors for asbestos removal work.
  - Employers/project managers shall ensure the asbestos removal work does not result in unacceptable risk to other workers and communities.
  - Employers/project managers shall ensure that the area of asbestos removal is appropriately validated following asbestos removal work by a suitably qualified, experienced and licensed (if required) competent person prior to allowing access to the area.

4.2 General Duties/Responsibilities of Workers and Subcontractors

General duties/responsibilities of workers/subcontractors are as follows:

- Workers/subcontractors shall follow instructions provided to them by their employers/project managers to prevent airborne asbestos in the workplace/surrounding communities and shall work within the national legislation and requirements and follow requirements of international best practice.
- Within the limits of their responsibilities, workers/subcontractors shall prevent, to the extent practicable, the release of airborne asbestos fibers in the working environment by ensuring safe asbestos work practices are followed and ensuring that any damaged asbestos or unexpected asbestos found in the workplace is managed in accordance with international best practice.
- Workers/subcontractors shall participate in health surveillance for asbestos where required by the employers/project managers.
- Workers/subcontractors shall inform the managers of observations of unidentified potential hazards in the workplace which may give rise to asbestos dust exposure.
- Workers/subcontractors shall wear appropriate PPE provided and take other asbestos control measures as instructed by employers/project managers.

4.3 General Duties/Responsibilities of Asbestos Contractors

General duties/responsibilities of asbestos contractors are as follows:

- Asbestos contractors shall conduct work where asbestos may be present in accordance with national legislation and requirements and follow requirements of international best practice.
- Obtain and maintain asbestos-related licence/permits/accreditations in accordance with national legislation and requirements, and project requirements/international best practice.
- Asbestos contractors shall employ controls during work where asbestos may be present to prevent airborne asbestos, including but not limited to:
  - Isolating the area and limiting access to the area of work and providing adequate signage.
  - Decontaminating equipment and cleaning up of the area
  - Handling waste to mitigate spread of asbestos within the area, in soils, air or within waste locations.
  - Disposal of asbestos waste at a lawful location required to reduce spread of asbestos.
  - Conducting air monitoring.
- Asbestos contractors shall ensure that the workplace is cleaned to an appropriate standard to minimize asbestos exposure at the completion of the work.
- Asbestos contractors should provide validation/clearance following completion of the work, which states that asbestos has been adequately removed/encapsulated/stabilized and that the workplace is safe for work.

4.4 General Duties/Responsibilities of Vendors

General duties/responsibilities of vendors are as follows:

- Vendors shall provide goods in accordance with national legislation and requirements.
- Vendors shall provide purchasers with information on asbestos content within the goods they supply and instructions on how to safely use the product.

4.5 Consultation with Stakeholders

To ensure successful implementation of this Good Practice Guidance, it is important to obtain cooperation from all stakeholders involved in a project, such as representatives, government authorities, employers, project managers, workers, subcontractors, and occupational health and safety representatives.

General guidance for effective consultation includes (but is not limited to):

- Consultation between stakeholders shall be conducted early in the project development cycle (e.g., at project design and early procurement planning stages). This should consider appropriate national legislation and requirements and international best practice guidance requirements for the project.
- Regular consultation shall occur throughout the project duration between stakeholders with a focus on prevention of health hazards due to asbestos, including (but not limited to):
  - National legislation/requirements
  - Requirements for use of items or equipment where asbestos presence has been confirmed or is suspected
  - The nature of asbestos present at the workplace (within the buildings, structures or equipment used)
  - The results of any monitoring completed
  - Preventative or mitigation measures required to minimize asbestos exposure, including requirements of PPE and other controls
  - The outcomes of inspections
  - Any identification of new asbestos in the workplace

5 ASBESTOS TRAINING

5.1 Definition of Competent Person

Asbestos work must always be conducted by a **competent person**. Each country may have its own definition of a **'competent person'** who is able to conduct work where asbestos may be present.

In this document, a **competent person** as it applies to asbestos work, is defined as someone who has the relevant knowledge, skills, experience, and attitude to perform asbestos work while applying the current state of knowledge on work, health and safety for controlling asbestos risks in the workplace.

It should be noted that asbestos work competency is often task specific. For example, a person who is competent to identify asbestos in the workplace may not be competent to conduct asbestos removal work. The person (or company) should therefore be assessed based on the proposed asbestos task.

Some countries may require a licence, permit or specific accreditation for certain activities/tasks (e.g., asbestos removal work, issuing clearance certificate, etc.) which may assess the competency of the specialists completing the tasks. In countries where such regulatory and permitting requirements are absent and/or inadequate, international best practices should be followed.

A guide to assess competency is provided in Section 3 of the Tool Kit in Appendix B

5.2 Training Requirements

Employers/project managers have the responsibility to ensure that workers/subcontractors are provided with training for items within this Good Practice Guidance related to their work, in accordance with national legislation/requirements and requirements of international best practice.

Specialized training and certification may be required for (but not limited to) the following asbestos-related work:

- Asbestos identification during workplace asbestos surveys
- Laboratory testing for asbestos
- Air monitoring
- Disturbance of asbestos-containing material
- Asbestos removal work
- Other asbestos remediation work (e.g., isolation)
- Issuing clearance certificate following asbestos removal work
- Handling and transport of asbestos waste
- Receiving asbestos waste

5.3 E-Learning Modules

Asbestos Awareness E-learning modules are available for building managers, and any other workers who need to understand the basic hazards and risks associated with asbestos. The course modules can be found at the following link:

https://elearn.adb.org/course/view.php?id=425.

6 ASBESTOS IDENTIFICATION

6.1 Asbestos Survey

Identification of asbestos in the workplace is the first step in managing the risk of exposure and planning how to conduct work safely.

Asbestos and asbestiform minerals may be encountered:

- Within a building, structure, plant or equipment.
- Within contaminated soil under or around buildings/structures (from poor demolition practices, from impacted fill brought onto the site, or from waste burial).
- As naturally occurring mineral.
- Within infrastructure trenches (e.g., telecommunication, electrical or water conduits) as a result of weathering of existing asbestos conduits or being associated with historical asbestos conduits.

Listing all locations where ACM could be encountered is beyond the scope of this document. The UK Health and Safety Executive website provides an overview of where asbestos might be encountered in typical residential and industrial buildings.[1] There may of course be big differences between countries in where asbestos may be present.

If employers/project managers have reasonable grounds to believe that asbestos is not present in the workplace (such as where previous remediation and clearance occurred, or a building was constructed a considerable period after legislation prohibited asbestos use in the country), an asbestos survey may not be needed.

However, if the presence of asbestos has not been ruled out, an asbestos survey should be conducted to assess the hazards and risk of asbestos to workers and surrounding communities.

Given the many potential uses of asbestos, a competent person should be engaged to conduct the asbestos survey. Each country may have its own requirements on the definition of a competent person. Reference to international best practice is recommended to ensure competent persons have the relevant qualifications and experience to complete the assigned tasks.

As a baseline, people competent to carry out asbestos surveys could be:

- Occupational hygienists experienced in asbestos identification; or
- Individuals who have had adequate training and experience on asbestos identification; or
- Asbestos contractors who have experience with demolition of buildings/structures containing asbestos, managing asbestos movement or asbestos demolition and waste disposal.

The following should be considered when conducting asbestos surveys:

- Date of asbestos prohibition in the country (if applicable)
- The age of the workplace
- Establishment of the history of definite or potential use of asbestos. It is noted that discussion with workers who have worked at the workplace for a long time can establish potential or actual presence of asbestos
- Materials used for construction
- Discussion with designers, manufacturers, suppliers to confirm specifications and as built construction
- Design plans which may provide details on construction materials
- Thorough inspection of all areas of the workplace, including potentially hidden spaces such as ceiling spaces, cellars, shafts, storage areas, wall cavities, fire door, security saves, air-conditioning ducts.

[1] See https://www.hse.gov.uk/asbestos/building.htm. There may of course be big differences between countries in where asbestos may be present.

Material should be considered as potentially containing asbestos unless proven otherwise if there is uncertainty as to whether it contains asbestos, or if it is inaccessible during a survey.

National requirements should be consulted regarding inclusions for an asbestos survey.

In the absence of national requirements, as a guide, the information recorded in an asbestos survey should include:

- Products type
- Location
- Asbestos type
- Extent/quality
- Amount of damage/deterioration
- Accessibility
- Surface treatment
- Laboratory analysis of representative samples (see further in Section 6.2)

ACM may be hidden from sight behind non-asbestos material, (e.g., non-asbestos wall panels or flooring), or beneath non-asbestos flooring material beneath asbestos encapsulation.

Image 3: Examples of Asbestos-Containing Materials

Corrugated roof

Flat roof

Under the roof

Wall sheet

Asbestos wall panels

Asbestos wall panels

Below or around window panels

Fence

Walls and sink area of bathroom (wet area)

continued on next page

Image 3 *continued*

Walls and sink area of laundry (wet area)

Garage

Flat panels

Within chimneys

Eaves

Ceiling

Backing board of fire extinguisher box

Gutter and downpipe

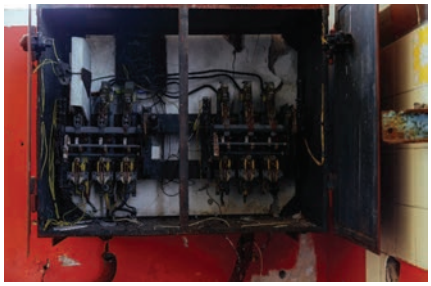
Pipe

Pipe insulation

Pipe insulation (sprayed-on type)

Pipe insulation

Sprayed insulation under the roof



Asbestos ropes and backing board in circuit board

Tiles

Image 3 *continued*

Brake pads

Gaskets

Gaskets on pipe joints

Adhesives below vinyl flooring

Asbestos cloth

Asbestos rope

Textured paint / coating

Inside telecommunication pits or other service pits

Building rubble

Building rubble

In soil, e.g., as a result of poor demolition

Ships

Source: iStock.com and from the Geosyntec collection.

6.2 Asbestos Testing

Many asbestos alternatives (such as alternative fiber cement materials) look similar to ACM and it is often difficult to distinguish them. The most reliable method to confirm the presence of asbestos in a material is through laboratory analysis.

There are various available laboratory-based analytical methods, based on the type of samples and limit of reporting. Examples of these are listed below (ALS Global, Undated):

- Solid samples
  - **Polarized light microscopy (PLM) (method EPA/600/R-93/116)**, which is used to determine percentage of asbestos in bulk building materials.
  - **Point counts by PM (method EPA/600/R-93/116)**, which is used to characterize bulk materials with close to or exceeds 1% asbestos. This method is applicable to friable bulk material, but not to material with organic binder, such as roofing tar.
  - **Transmission electron microscopy (TEM) (method EPA/600/R-93/116)**, which can detect smaller fibers which may be too small to detect with the PLM.
  - **Scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS)** has been used to examine fiber morphology to identify asbestiform fibers and x-ray analysis to characterize the asbestos type (similar to TEM).
  - **Gravimetry prep of bulk samples**, which is used to provide a more accurate estimate when the asbestos content is close to or exceeds 1%.
  - **American Society for Testing and Materials ASTM D7521-16**, which provides a standard test method for asbestos in soil.
- Air samples
  - **Phase Contrast Microscopy (PCM) (method NIOSH 7400)**, which is used to analyze filter samples for airborne fibers.
  - **TEM (method NIOSH 7402)**, which is the TEM equivalent of the NIOSH 7400 and can detect smaller fibers than PCM.
  - **American Society for Testing and Materials (ASTM)** methods provide counting field only to asbestos whose appearance meets certain characteristics. ASTM Methods use PCM and TEM (ASTM D7200-06) or TEM (ASTM D6281-15).
  - **The AHERA method** is intended to test an area for clearance.
- Dust samples (e.g., on surfaces in the vicinity of asbestos removal work)
  - **Method ASTM D5755-03** is used to analyze microvac dust samples for asbestos.
  - **Method ASTM D 6480-05** is used to analyze asbestos of settled dust collected using wipes.
- Water samples
  - **EPA/600/4-83-043, methods 100.1 and 100.2**, are used to analyze water samples for asbestos.

The PLM technique is more commonly used for solid samples and the PCM technique is more commonly used for air samples, as the TEM (which is generally more accurate) is more expensive.

The selection of analytical methods may be dependent on national requirements and the availability of certain tests.

It is prudent to conduct the analysis in laboratories that have appropriate and applicable accreditation (e.g., International Laboratory Accreditation Cooperation (ILAC), the Asia Pacific Laboratory Accreditation Cooperation (APLAC) or accreditation by individual countries). Some countries may also have mutual recognition arrangements (MRA) with international accreditation bodies, generally using the international standard ISO/IEC 17011. Specialist advice may need to be sought to determine the appropriate analytical technique for the project.

At the time of the preparation of this document, a number of portable asbestos analyzers were commercially available, however their reliability and accuracy have not yet been demonstrated.

6.3 Asbestos Risk Assessment

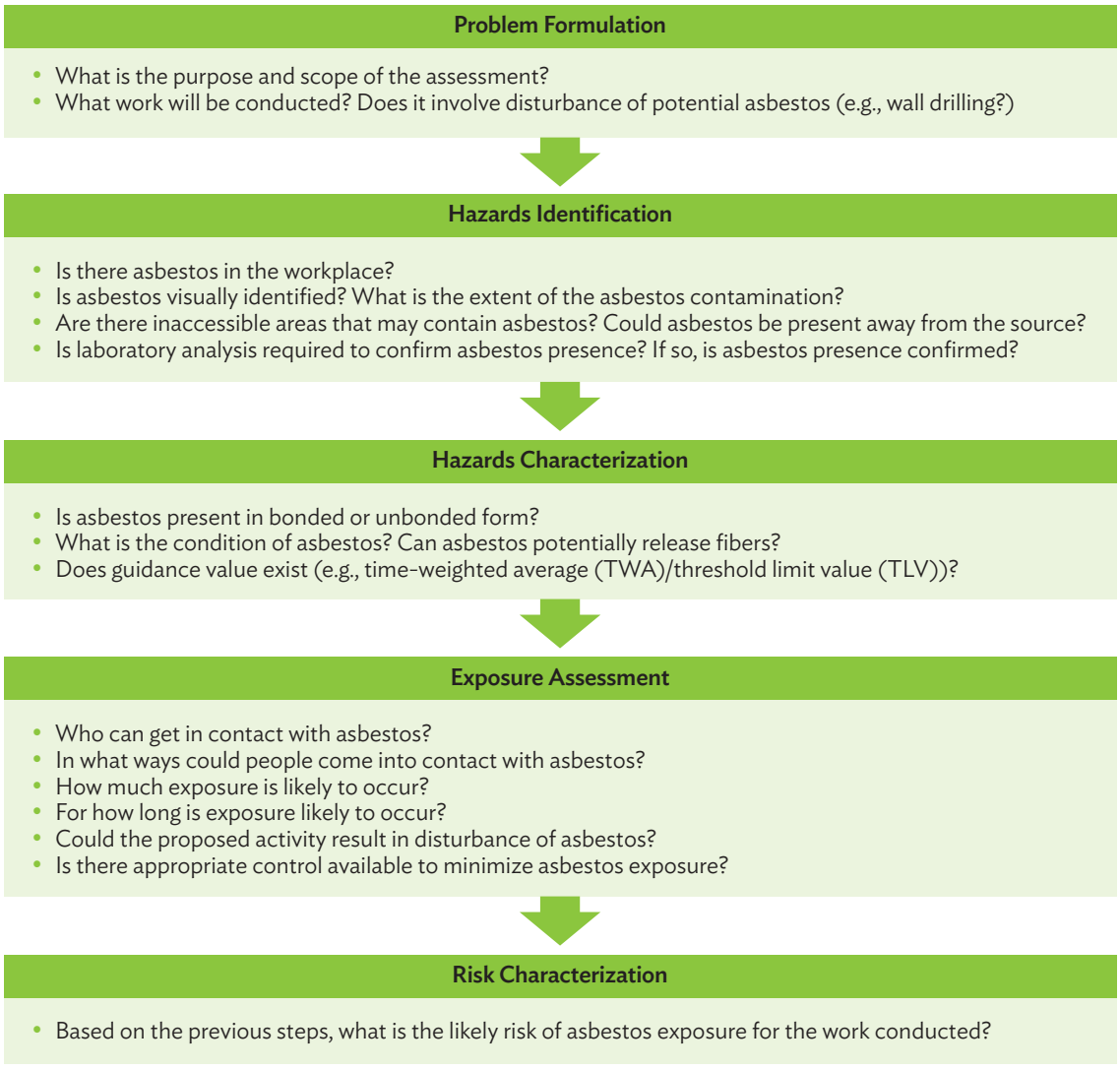
While undisturbed, adequately encapsulated ACM is unlikely to present a risk. It is important to conduct asbestos risk assessment when conducting work that may potentially disturb ACM.

There are many available international resources which provide methodologies to assess the risk of asbestos exposure. The International Program on Chemical Safety (IPCS, 2010) provides a WHO human health risk assessment tool kit for chemical hazards, such as asbestos.

National requirements may specify what information an asbestos risk assessment should consider. It is recommended that any requirements for asbestos risk assessment and management planning are referenced against international best practice that seeks to protect health. As a guide, a risk assessment process may comprise the steps provided in Figure 1 and may include details of the work conducted and information on:

- Type(s) and quantity of asbestos
- Expected level of exposure
- Controls to reduce exposure (e.g., ventilation, wetting, PPE, enclosures, etc.)

Figure 1: Generic Road Map forAsbestos Risk Assessment



(modified from IPCS [2010])

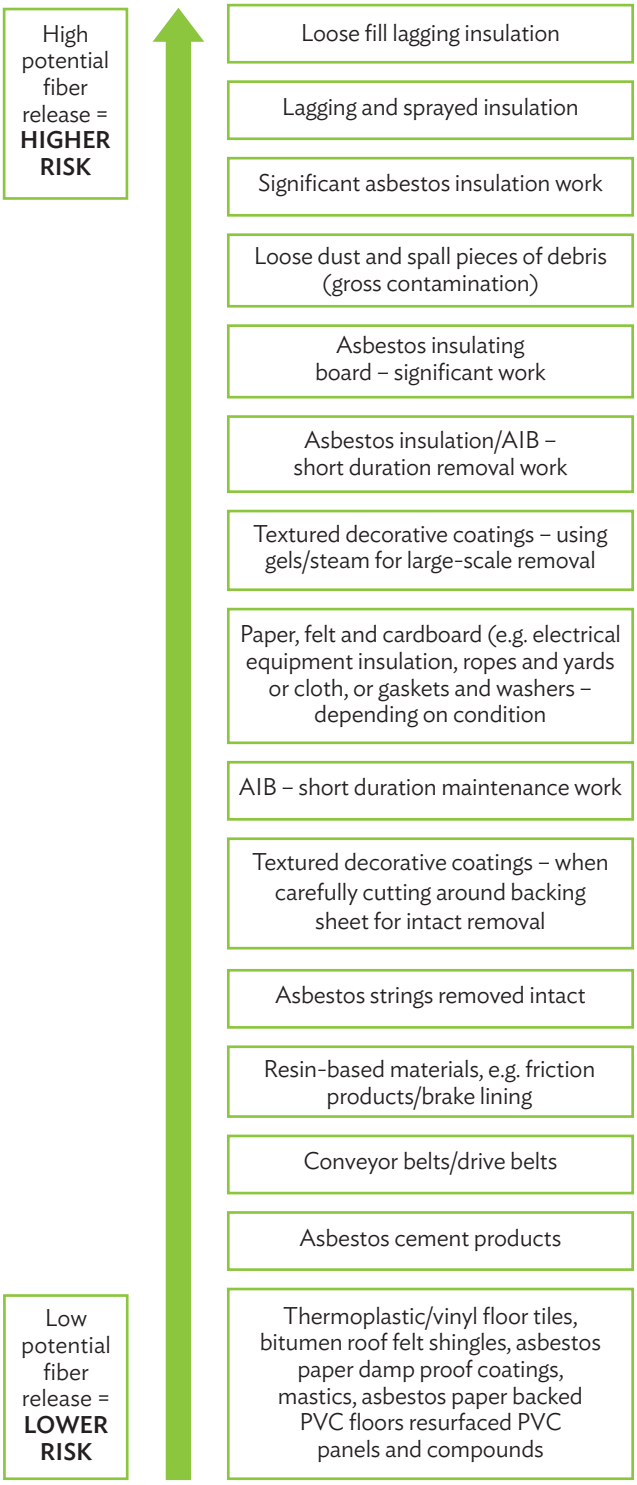
- Decontamination procedures
- How asbestos waste will be managed
- Emergency procedures

In general, unbonded asbestos generally presents higher risk than bonded asbestos. Figure 5 provides examples of the likelihood of fiber release for different ACM. The risk for certain materials may be different in each country depending on how the material is produced and applied. A competent person should be engaged to assess the risk.

Important considerations include:

- Asbestos could be present away from the source, e.g., on the ground beneath the roof drip line due to roof weathering.
- Plumbers working on a long pipe that does not have asbestos insulation where the work is being done may cause disturbance to asbestos insulation some meters away.
- Historical asbestos may be present (e.g., around new pipes, as a result of previous incomplete removal).

Figure 2: Illustration on Likely Asbestos Risk Based on Work Types



Source: UK Health and Safety Executive. Control of Asbestos Regulations 2012. https://www.hse.gov.uk/asbestos/regulations.htm.

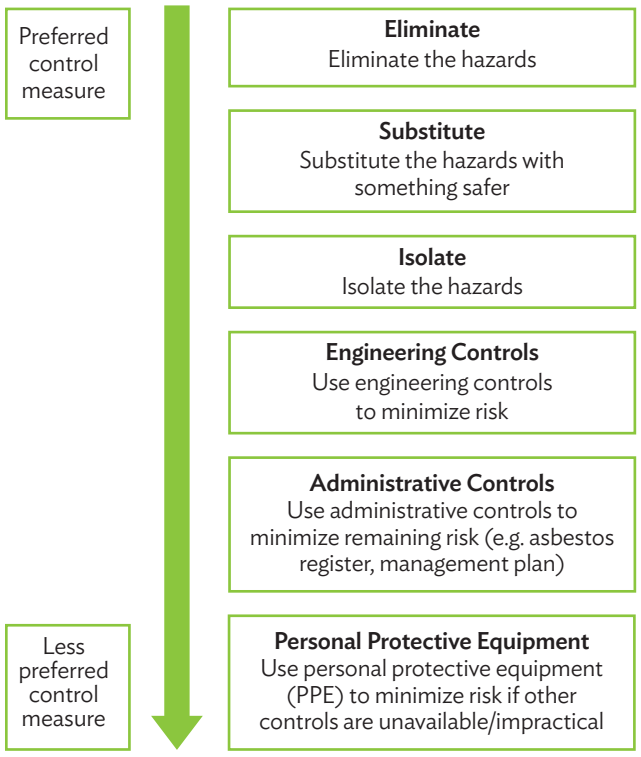
7 MANAGING ASBESTOS RISK

7.1 What Is Involved in Managing Asbestos Exposure Risks?

The risk of exposure to asbestos can be managed using a systematic process as follows:

- Identify hazard
- Assess risk, as outlined in Section 6.3
- Control risk
- Review control measures
- When choosing the control measures, the following hierarchy should be considered:

Figure 3: Hierarchy of Control Measures



The above control measures are explained in the sections below.

Administrative control and PPE alone do not control the hazards at the source as they rely on human behavior and supervision, so the use of these is the least effective in minimizing the risk. As a control measure, PPE should be the last control measure after all other control measures have been exhausted as part of the hierarchy of control measures.

A combination of control measures may be required for controlling the risk of an activity. There may be national requirements to adopt certain control measures for asbestos work. The adequacy of any national measures required to be employed to control risk of asbestos exposure should be assessed against international best practice that protects health.

7.2 Elimination/Removal

Elimination involves removal of asbestos or ACM.

This is often the preferred control measure as it requires removal of the source (i.e., asbestos) and is consistent with the WHO and ILO advice.

For new materials installed in the workplace, this involves the use of non-asbestos alternative material. Guidance for removal of asbestos is further discussed in Section 10.

7.3 Substitution

Substitution involves changing work methods and/or designs to alternatives to reduce the exposure to the hazard.

For example, instead of drilling holes through asbestos-containing wall to install screws for hanging pictures, consideration could be given to attaching a hook on the wall with double tape.

Any use of substitution method should ensure the substitution activity does not result in the release of asbestos fibers.

7.4 Isolation

Isolation involves removing the exposure to the asbestos by isolating asbestos from the air or the receptor. Isolation can be conducted through enclosing, encapsulation or sealing of ACM.

Enclosing ACM is the preferred alternative control measure when asbestos removal is not practicable. The choice to use this method may depend on the condition of asbestos or ACM and the likely risk and cost.

An example is the installation of a non-asbestos false wall in front of an asbestos wall. Note that conducting this activity may present additional hazard when not appropriately conducted or recorded. For example, future workers may conduct drilling through the non-asbestos wall, not knowing there is a second asbestos wall behind, which may result in the asbestos wall being disturbed.

When asbestos is isolated in an enclosure it is important to register the presence of asbestos and the method of isolation in an asbestos register together with an asbestos management plan and ensure this asbestos management plan is available and documents procedures to conduct work in the area (see below in Section 7.6).

Encapsulation of asbestos involves sealing asbestos product in a resilient matrix, such as in reinforced plastics, vinyl, resins, mastics, bitumen, flexible plasters and cement, which have low likelihood to release fibers unless damaged.

Any asbestos controlled by encapsulation should also be recorded in an asbestos register with asbestos management plan documenting long term management of the material, which includes maintenance and potential intrusive work.

Sealing of asbestos involves covering the surface of the ACM with a protective coating to prevent fiber release. This method is the least effective isolation method particularly where coating may degrade due to temperature, weather, etc.

Any asbestos controlled by sealing should also be recorded in an asbestos register with asbestos management plan documenting long term management of the material, which includes maintenance and potential intrusive work.

Any isolation work should be conducted by a competent person experienced with conducting such work and may need to consider:

- The condition and extent of asbestos
- Potential airborne asbestos release during the work and any controls required
- Any other aspects to control asbestos release provided in this guidance
- Potential future asbestos disturbance in the area
- Maintenance requirements
- Strength and durability of the isolation method (e.g., chemical resistance in area requiring chemical resistance, weather resistance for outdoor items, etc.)
- Requirement of labelling
- PPE requirement

7.5 Engineering Control

Engineering control involves the use of tools/equipment to reduce the potential asbestos risk. This includes the use of hand tools instead of a power tool and the use of other alternatives to high-pressure water and compressed air for cleaning asbestos roof, to minimize potential asbestos fiber release.

Where possible, the use of local exhaust ventilation fitted into tools and/or vacuuming technique should be used to extract any released fibers. There may be national requirement of the vacuum cleaner required for asbestos work. Generally, a household vacuum cleaner is not adequate.

A combination of several engineering controls and also a wet method involving wetting ACM may be required. Where engineering control is used, air monitoring may need to be conducted to ensure the effectiveness of the system.

7.6 Administrative Controls

Administrative controls include the use of documentation to control the risk, such as through preparation of an asbestos management plan or asbestos register. Guidance on asbestos registers is provided in Section 7.6.1. Asbestos registers are typically attached to an asbestos management plan of a workplace.

7.6.1 Asbestos Register

Where asbestos is identified in the workplace and will remain, the information should be documented in an asbestos register. There may be different national requirements for asbestos registers, which may need to be followed. As a guide, an asbestos register should include at a minimum the following information:

- Date asbestos was identified
- Location (sample reference, material description, building floor, room area)
- Normal occupant activity (main type of activity in the area)
- Likelihood of disturbance (consideration of location, accessibility, extent/amount)
- Human exposure potential (e.g., no. of occupants, frequency of use, average time in the area)
- Maintenance activity (type of work, frequency)
- Material (product type, extent of damage, surface treatment (e.g., painting, behind other material), asbestos type (if known))
- Management plan

An example of an asbestos register is provided in Appendix A.

An asbestos register should be regularly maintained and be made accessible to everyone working in the workplace.

7.6.2 Asbestos Management Plan

An asbestos management plan is a plan that states how asbestos in the workplace will be managed. There may be national requirements for information which needs to be included in an asbestos management plan. As a guide, the information recorded in an asbestos management plan should include at a minimum the following information:

- Asbestos identification in the workplace, including a link to the asbestos register
- An outline on how the risks for each ACM are controlled, e.g., some ACM may require labelling, others may require prohibition in drilling, etc.
- Control measures on the management of asbestos and ACM in the workplace, such as safe work method statements (details provided in Section 7.6.3)
- Procedures for accidents, incidents and emergencies involving asbestos in the workplace
- Responsibilities in implementation of the plan
- Worker requirements for conducting asbestos work, e.g., licences/permit requirement, training, responsibilities, supervision, health surveillance, etc.
- Air monitoring requirement during each type of asbestos work
- Requirement of communication of the plan to workers and other relevant stakeholders

An asbestos management plan should be prepared and reviewed by competent people experienced in assessing asbestos risk and control measures, and in carrying out activities in the workplace that may risk ACM exposure.

The plan should be regularly reviewed and revised (including after an incident) to ensure it is up to date international best practice.

The employer/managers responsible for the workplace should ensure the asbestos management plan be adequately resourced and communicated to all workers who may conduct work that may disturb or have the potential to be exposed to asbestos.

7.6.3 Safe Work Method Statements

When conducting work that potentially disturbs asbestos or ACM (including work that is conducted to control asbestos risk), it is important to prepare a safe work method statement (SWMS). A SWMS documents the hazards identified in a work activity, assesses the risk of each hazard and details the measures to be put in place to control the risk.

There may be national requirements on information which needs to be considered in a SWMS. As a guide, SWMS should include at a minimum the following information:

- Details of work activity
- Person responsible for ensuring compliance with the SWMS and contact details
- Tasks involved
- The hazards identified for each task and assessment of risk for each hazard
- The control measures to control the risk
- Records of workers who have been inducted to the SWMS

The SWMS should be prepared by a person familiar with the proposed work who has prior experience with

the activity to be conducted. Workers conducting the proposed work should be inducted to the SWMS to understand the risk of the work and the control measures required to minimize the risk.

7.7 Hygiene

Consumption of food, drinks or smoking should be avoided within the asbestos work zone until a person is appropriately decontaminated.

7.8 Personal Protective Equipment

The use of personal protective equipment (PPE) should be considered as the last method to control the risk of exposure to ACM in line with the hierarchy of control measures. There may be national requirements on PPE for asbestos work. As a guide, the following PPE comprises minimum requirements which should be considered:

- Face mask/respirators with appropriate filters (generally P1, P2 or P3 are used for asbestos work, with P1 being the least efficient and P3 being the most efficient in providing protection)
- Disposable overalls
- Gloves and rubber boots, preferably covered with disposable glove or boot covers to minimize exposure to clothing.

The type of face mask/respirators depend on the type of asbestos work and should be recommended by a competent person who is familiar with the activity. The choice of a respirator should also consider how much airborne asbestos is likely to be present during the work.

Some countries may have standards on the appropriate respirators for certain type of asbestos work, noting disposable face masks may not be appropriate for certain types of work.

Examples include:

- Negative pressure air-purifying respirator (half-face mask)
- Positive pressure respiratory equipment
- Direct air-line breathing apparatus

The following may need to be considered:

- All persons entering work zone may have minimum PPE requirements as listed in the SWMS.
- All workers who require PPE should be provided adequate training to appropriately use them.
- To achieve good seal on the face, respirators may need to be properly fitted and facial hair may need to be removed.
- PPEs should be appropriately maintained (e.g., some respirator filters may have expiry date) and appropriately stored (e.g., in areas that would not cause contamination).
- Used disposable PPE should be appropriately disposed of as potentially asbestos contaminated.
- Used non-disposable PPE should be placed in separate container labelled as potentially asbestos contaminated, until appropriately decontaminated.

Guidance for laundering of clothing is provided in Section 8.6.

8 WORKING SAFELY WITH ASBESTOS

8.1 Asbestos Work Zone and Warning Signs

For work that may potentially disturb ACM, it is important to isolate the work area in an asbestos work zone to limit access to the area and potential asbestos exposure. The area should be appropriately barricaded with warning signs placed to indicate asbestos work is being conducted. The signs should remain until the asbestos work is complete and the area is adequately cleaned up.

Where dust can escape the work area (i.e., through windows, pipes, air-conditioning ducts, etc.), the work area should be adequately sealed with adhesive tape or isolated by sealed plastic sheeting. Floors, tools and equipment may also need to be sealed in plastic sheeting to minimize contamination.

8.2 Asbestos Monitoring

Asbestos monitoring should be measured in areas or places where workers and surrounding communities may be exposed to the risk of airborne asbestos. Asbestos monitoring may include:

- Air/static monitoring, which comprises measurement of airborne asbestos in air samples at the work place.
- Personal monitoring, which comprises air samples in the worker's breathing zone.

The type, frequency, method and the locations of monitoring may depend on the type of work, the likely airborne asbestos concentration generated with the activity and national requirements and should be recommended by a competent person. The air samples should be submitted to a laboratory (see Section 6.2 for analytical methods).

Asbestos monitoring results (generally provided as fiber/mL, fiber/cc or fiber/m3) should be compared with established action levels listed in the SWMS prior to the work. Action levels may consider national and international threshold limit value (TLV), permissible exposure limit (PEL) or time weighted average (TWA).

The action levels may also consider:

- What happens if action level is exceeded? Does work need to be stopped?
- Who needs to be notified?
- What other control measures need to be put in place?

The following should also be considered when conducting air monitoring.

- To provide meaningful information, air monitoring results should be obtained as soon as practicable (i.e., results obtained weeks after work had been completed would be too late to respond to).
- The air monitoring results should be made available to workers. If action levels are exceeded, workers should be informed of the likely risk and additional control measures required.

8.3 Use of Enclosure

During large- scale asbestos removal work or asbestos work that may cause a significant airborne asbestos, an enclosure may be required. The design of the enclosure should be completed by a competent person and may be dependent on national requirements. At a minimum, the design should include the following information:

- The activity conducted
- Method used to contain asbestos release
- The strength of the enclosure material, to prevent tearing during work. Typically, enclosure may be constructed with heavy-duty polyethylene sheeting.
- Location of decontamination area and changing facility
- Requirement of negative pressure exhaust units

- Air quality and temperature within the enclosure
- Lighting types
- Potential for dust to escape
- Any other hazards, including emergency/evacuation

Other factors which will assist in an appropriate design include:

- Minimization of moveable items (e.g., desk, chairs, etc.). Any moveable objects should be placed outside the enclosure.
- Tools should remain within the enclosure until appropriately cleaned and decontaminated.
- Adequate coverage of any non-moveable items, including floors.
- Any potential pathway for dust to escape (e.g., air-conditioning fan, pipes, ducts, windows, doors) should be appropriately sealed.
- Requirement of negative pressure exhaust units to prevent the escape of airborne asbestos fibers from an enclosed asbestos zone should be assessed.
- The effectiveness of the enclosure should be monitored prior to asbestos work commencing, such as through smoke test, visual inspection and/or negative pressure testing, and during asbestos work, such as by air monitoring outside the enclosure. Where any defects are identified, work should cease until the defects are rectified.
- It may be prudent to have a person standby outside the enclosure to provide communication to workers inside the enclosure in case of emergency.
- Air extraction equipment should remain in operation for at least 15 minutes after asbestos work has ceased (ILO 1984)
- Upon completion of works, a person working within the enclosure should appropriately decontaminate himself/herself and any clothing in a decontamination area (see further in Section 8.4).
- Following completion of the work, all disposable material (including plastic used for the enclosure) should be disposed of asbestos waste. The person conducting cleanup should wear appropriate PPE.

8.4 Decontamination

A dedicated area should be provided to conduct decontamination of clothing, PPE and tools and equipment. The requirements of decontamination area depend on the national requirements, activity conducted, the number of workers involved, the number if tools and equipment, etc. and should be designed by a competent person. The minimum design should include:

- Decontamination area should be constructed adjacent to or as close as possible to the asbestos work zone.
- Where the decontamination unit is not located adjacent to the asbestos work zone, other control measures (e.g., additional overalls, etc.) may be required.
- Decontamination area should consist of contaminated area and clean area. A shower can be provided if considered necessary.
- Ventilation under positive pressure may also be considered.
- The contaminated area should have provision of storage of contaminated clothing and footwear in a labelled container.
- A vacuum dusting or hose to clean clothing and footwear can be provided.
- Exhaust ventilation creating negative pressure may also be considered.
- The clean area should have provision for storage of clean clothing.

8.5 Cleaning Up

Workplace (within and outside asbestos work zone) should be maintained in a clean state and free of asbestos waste at all times. Cleaning methodology depends on the activities conducted, the area asbestos is likely to be present, the extent of control during asbestos work, and should be prepared by a competent person. The following items should be included at a minimum:

- Cleaning should be carried out using vacuum cleaning equipment with special filters (e.g., high-efficiency particulate air (HEPA) filters) where practicable, or by some other means in such a way that asbestos dust neither escape nor

is discharged into the air, such as washing/wetting method. Where mechanical equipment is used for cleaning, they should not result in secondary generation of airborne asbestos. Generally, a household vacuum cleaner (even with HEPA filter) is not considered adequate. There may be national requirements of the vacuum cleaner required for asbestos work.

- Where washing is conducted, the asbestos-containing wastewater should be contained and appropriately disposed of and should not result in asbestos being dried out (e.g., on the floor) or migration to the area outside the asbestos work zone.
- Workers conducting cleaning should wear appropriate PPE.
- Where practicable, cleaning should be carried out where no other person is present. Where other person(s) are present, they should also wear appropriate PPE.
- Floors should be regularly cleared of accumulated dust and waste.
- Equipment and tools should be cleaned after use in the asbestos work zone. Cleaning can be done by vacuum cleaner or other methods. Parts of equipment inaccessible to the vacuum cleaner can be cleaned by other methods, such as oiled brushes.
- Cleaning should also include cleaning of overhead structures, which can be done by vacuum cleaning equipment or by some other means does not result in secondary generation of airborne asbestos.
- The collection bag within the vacuum cleaning filter should be disposable and be disposed of as asbestos waste after cleaning is complete.
- Contingencies - If the collection bag bursts open during use, the following approach should be employed:
  - The bag and its content should be removed and placed into an impermeable bag and disposed of as asbestos waste.
  - The vacuum cleaning equipment should then be cleaned using other equipment (e.g., another vacuum cleaner).
  - This activity should be conducted in an area identified as safe by a competent zone and should not result in contamination of a clean area.
- Prior to dismantling an enclosure, the following should be considered:
  - The internal layer needs to be cleaned and any asbestos fibers stabilized (e.g., by sealing, etc.).
  - Where disposable plastic enclosure is used, the plastic can be sprayed with tinted polyvinyl alcohol (PVA) of a similar acrylic emulsion using airless spray equipment to ensure any loose asbestos fibers are adhered to the plastic.
  - Enclosure should not be dismantled until a competent person is satisfied that the dismantling process would not result in the release of asbestos fibers outside the enclosure.
  - Monitoring should be completed outside the enclosure to ensure that airborne asbestos is not present, prior to dismantling.

Following cleanup, the area should be validated by a competent person to assess the completion of the asbestos removal and cleanup (see further in Section 10.6). Depending on the national requirements, there may be requirements of licence/permit of such competent person.

8.6 Laundering

There is evidence that secondary exposure to asbestos fibers in asbestos workers' clothes may be experienced by their families (WHO, 2011). Therefore, the employer/project manager should have provision for workers for the laundering of PPE and potentially contaminated works clothing.

There may be national requirements on laundering for asbestos work. As a guide, the laundering of asbestos contamination clothing should include at a minimum the following:

- Potentially contaminated clothing should be packed in secured dust proof containers, such as plastic bags which are appropriately sealed.
- Laundering should be conducted under controlled conditions (e.g., by a contractor that understands the precautions for handling asbestos-contaminated clothing) to prevent the emission of airborne asbestos during handling, transport and laundering.
- The laundering of potentially asbestos contaminated clothing in workers' homes should be avoided.

8.7 Selecting and Managing Contractors

Selection and management of contractors is important to ensure the asbestos risk is controlled. The following factors should be considered:

- Nature and scope of work
  - The type of contractor required (licensed, non-licensed, size, capability, etc.)
  - Type of work (removal, cleanup, validation, monitoring, etc.)
  - What reporting is required (validation of quality of work, validation of waste disposal, etc.)
- Company accreditation/permits/licence
  - Dependent on national requirements
  - Insurance requirements
- Individual competency
  - Asbestos knowledge
  - Task specific
- Ongoing onsite monitoring and revalidation

The selection of contractors will be dependent on the type of work and the national requirements for certain activities. Specialist advice may be required to determine the type of contractors required for certain activities.

Management of contractors should be conducted by a competent person.

Audits of the work may be required throughout to ensure it is conducted in accordance with the agreed scope, meets international best practice and national requirements, and does not result in unacceptable health risk.

8.8 Health Surveillance

Health surveillance may be required for workers to exposure with asbestos dust. There may be national requirements for information which needs to be considered in a health surveillance program. As a guide, the following should be considered:

- Workers subject to health surveillance should have the following rights:
  - Confidentiality of personal and medical information;
  - Full explanations of the purposes and results of the surveillance and copies of their own medical records;
  - The right to refuse invasive medical procedures; and
  - Results should not be used to unfairly discriminate against workers.
- Health surveillance relevant for asbestos-related work generally involves a physical examination of the worker with emphasis on the respiratory system, including standardized respiratory function tests. Other forms of surveillance may be recommended by a registered medical practitioner.
- Where deemed necessary, health surveillance should be conducted prior to conducting asbestos dust work (pre-assignment surveillance), at regular intervals as deemed necessary (periodic surveillance), and following cessation of employment.
- The pre-employment health surveillance should aim to:
  - Determine condition which would be a contraindication to occupational exposure to asbestos dust.
  - Establish baseline records for future health surveillance of workers.
  - Educate and advise workers about the risks associated with exposure to asbestos dust.
- The periodic health surveillance should aim to:
  - Detect the earliest signs of asbestos-related disease.
  - Detect any significant change in health status relative to the baseline examination.
  - Continue to educate and advise workers about health risks and to check that appropriate preventative measures are being taken to minimize riskk.
- Health surveillance should be provided at no expense to the workers.

9 MANAGING INCIDENTS

9.1 Overview

In this guidance document, an incident includes discovery of previously unknown ACM, damage of known or unknown ACM, which can result in potential asbestos fiber release.

9.2 Identification of Actual or Suspected Asbestos

The following steps are recommended when an asbestos incident occurs:

- Stop work immediately.
- Restrict access to the area.
- Make the area safe, where practicable.
- Decontaminate prior to leaving the area to minimize transferring asbestos fibers to clean area (see further in Section 9.3).

9.3 Decontamination

It is important to conduct personal decontamination prior to leaving the work area to minimise the release of asbestos fibres to other areas. Decontamination should include:

- Wearing respirator if possible and seeking help if required.
- Where possible, damp wiping visible dust.
- Replacing all clothes with clean clothes.
- Where there is potential asbestos fiber release, workers should shower to remove asbestos fibers potentially left on the body and hair
- Disposing all disposable clothing and rags as asbestos waste.
- Placing non-disposable clothing in a plastic bag and laundering them as potentially asbestos contaminated, when disposal is not possible (see Section 8.6 for laundering requirements).
- Decontaminating non disposable tools as potentially asbestos contaminated (see Section 8.5 for cleaning up potentially contaminated tools).

9.4 Inform

Once decontamination has been completed, other staff should be informed of the incident to minimize unauthorized entry and to begin incident assessment process. This should include:

- Sealing the area.
- Labelling access points to indicate potential asbestos hazards.
- Informing critical staff about the incident to ensure the area is kept safe and begin incident investigation/management process.

9.5 Assessment of Hazards and Mitigation Measures

The next step in incident management is conducting the investigation process, which should include:

- Assessment of the hazards by a competent person. This may include engaging an asbestos contractor to assess material to confirm the presence of asbestos, the extent of the asbestos and/or damage and any mitigation measures required.
- The competent person will make the area safe upon leaving the area. Samples of the suspected ACM may need to be submitted to laboratory for confirmation.
- Upon confirmation of asbestos presence, the competent person may make recommendations on potential mitigation measures, which may include:
  - Leave and manage;
  - Leave, manage and label;
  - Encapsulate;
  - Remove;
  - Or a combination of the above.

The potential mitigation measures are further discussed in Sections 7 and 10.

There may also be national requirements for reporting of incident to authority, which needs to be checked.

9.6 Implementation of Mitigation Measures

Following recommendation by the competent person, the mitigation measures should be immediately implemented.

The warning signs to the work area can be removed and the area can be opened again after a competent person provides clearance/validation that asbestos in the area has been made safe and the area can be used.

9.7 Post Event

Following completion of implementation of the mitigation measures, the information may be added into asbestos register if the ACM remains. Employers/managers may also decide entering negative asbestos result into the register to inform future workers/users. An asbestos management plan may need to be prepared (if not yet available for the site), or updated.

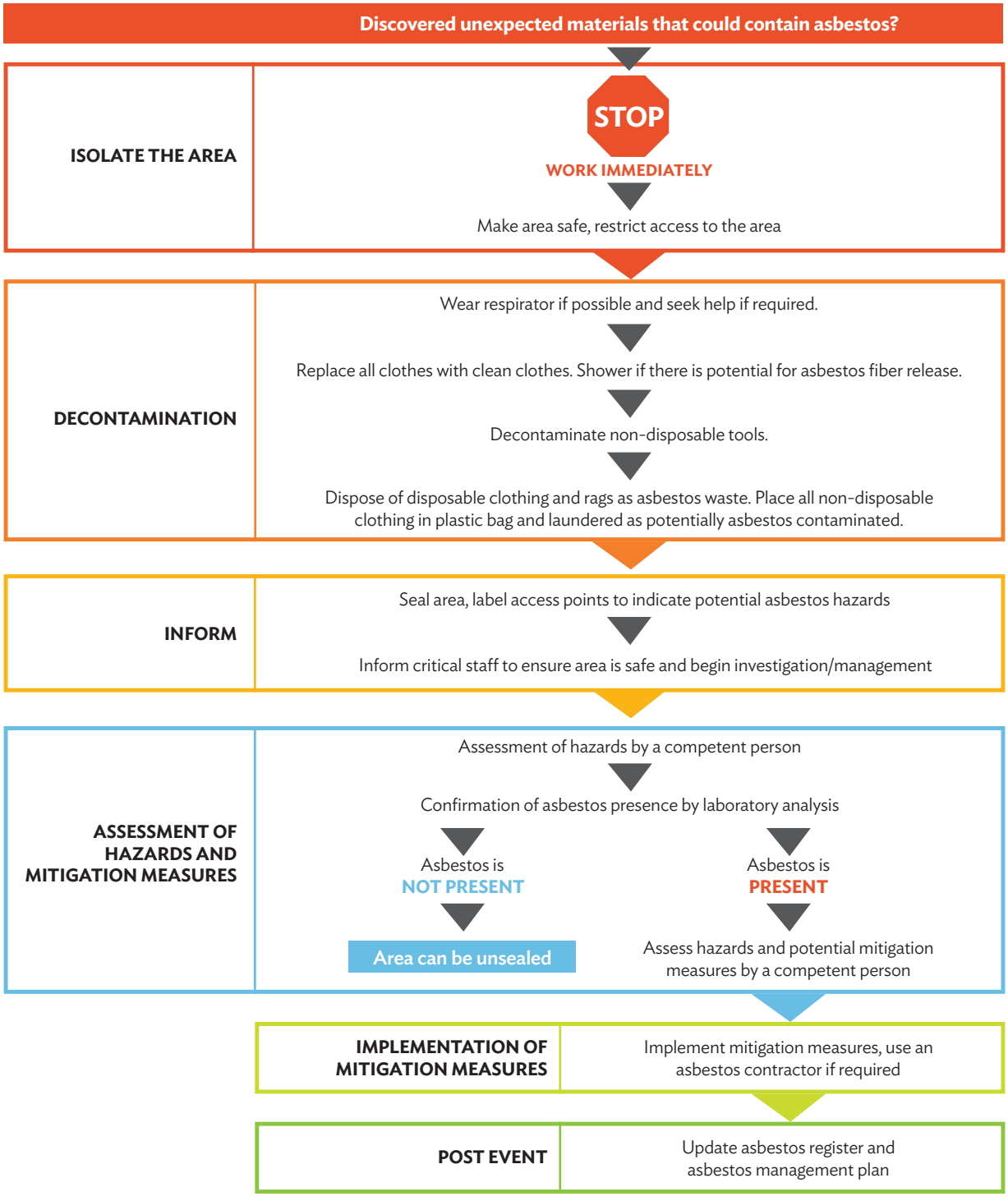
Additionally, the asbestos management plan should be reviewed to assess if the procedures included in the plan is still appropriate. The following items may need to be considered in the review and within the incident investigation:

- Was the asbestos register checked prior to work being conducted?
- Was the reporting adequate, accurate and accessible?
- Is there a nominated asbestos specialist – were they consulted?
- Is the emergency containment kit present? Was it used or is necessary to purchase additional items?
- Is health surveillance/assessment or counselling necessary?
- Do the information, instruction and training need revision?
- If the incident involves external contractor:
  - Are the contractor selection criteria sufficient?
  - Are the inductions adequate and fit for purpose?
  - Was safe work method statement provided?
  - Did contractors work in accordance with the safe work method statement?

9.8 Incident Management Flowchart

The incident management flowchart is provided below.

Figure 4: Incident Management Flowchart



10 MANAGING THE RISKS OF ASBESTOS REMOVAL

This section provides high-level guidance for management of asbestos exposure risks during asbestos removal work. For removal work, relevant guidance covered under other sections of this document should also be considered in particular Sections 7 Managing Asbestos Risk, 8 Working Safely with Asbestos, 9 Managing Incidents and 11 Asbestos Waste.

It is also important that asbestos removal work is conducted by a competent person who has adequate qualification, training and experience conducting the relevant removal work, as outlined in Section 5.2 Training Requirements and 8.7 Selecting and Managing Contractors, noting that asbestos removal work may require licence / permit / accreditation in some countries.

A safe work method statement should be prepared prior to removal work, which identifies the hazards, risk and any potential mitigation measures required and considers all the steps of the removal, including cleaning up and management of waste.

10.1 Demolition

Demolition of buildings/structures should be conducted in accordance with national requirements and in line with international best practice.

Prior to conducting demolition of buildings/structures, risk assessment should be completed to assess whether asbestos is present in the buildings/structures to be demolished/decommissioned in accordance with the guidance in Section 4 of the GPG. Any suspected ACM (e.g., sprayed insulation, lagging, textured coating, etc.) should be treated as asbestos-containing, unless otherwise confirmed through testing.

Any asbestos or suspected ACM should be removed prior to demolition of buildings/structures, to minimize asbestos contamination to the rest of the demolished material, as typically the cost of disposal of asbestos waste is higher than the cost of disposal of non-asbestos waste. Contamination of asbestos to non-asbestos material may require disposal of all the waste as asbestos waste.

10.2 Removal using Wet or Dry Methods

The selection of removal method should be based on the technique that eliminates or minimizes the potential release of asbestos fibers. The following is summarized from guidance in Australia (Safe Work Australia, 2020):

Asbestos removal work can include dry and wet methods. These methods are summarized as:

- Wet spray method, requires the use of a constant low-pressure water supply for wetting down ACM and associated items to suppress asbestos fibers.
  - The water spray is in the form of fine spray or mist and should not result in release of fiber.
  - The spray should be maintained so that the ACM is saturated throughout the removal work, while at the same time run-off is minimized.
  - A wetting agent (such as detergent) can be added to the water to facilitate more rapid wetting.
  - Saturation and water injection method, which requires injection of water or a water-based solution into friable asbestos using a special applicator. This is typically conducted on a thick asbestos, where wet spray method is unlikely to achieve full saturation. Specific training may be required to use this process and equipment.
- Dry method which involves removal of ACM without initial wetting of the ACM
  - This method has the highest likelihood to release airborne asbestos fibers and should only be used if the wet method is not practicable.

The selection of the method may be dependent on the type of the ACM and will need to be determined by a competent person. Where possible, ACM should be removed whole (e.g., by removal of nails), rather than by breaking the material, to remove potential release of asbestos fibers. Unbonded asbestos may need to be pre-treated (e.g., sealed) prior to removal to minimize the release of fibers.

10.3 Removal Tools and Equipment

The removal tools should be chosen as to minimize the potential release of asbestos fibers. As such, high pressure water sprays or compressed air are not recommended, unless for firefighting or fire protection purposes.

Other tools that may potentially release high amount of airborne asbestos fibers include high-speed abrasive power and pneumatic tools (such as angle grinders, sanders, saws, high speed drills), brooms or brushes, unless the use of equipment is controlled (e.g., through the use of enclosure and/or with attachments that capture airborne asbestos fibers) (Safe Work Australia, 2020).

The tools and equipment should be assessed by a competent person and meet national requirements. All tools and equipment should be adequately maintained and inspected prior to use to ensure they are fit for purpose and can be decontaminated after every use. At minimum the tools would include:

- Manually operated hand tools and equipment that have been designed to capture or suppress respirable dust
- Equipment to capture asbestos fibers (e.g., vacuum cleaner with appropriate filters)
- Engineering controls (e.g., extraction ventilation, negative pressure units)
- Enclosure
- Disposable cleaning rags
- Buckets of water or low-pressure misting spray bottle
- Sealant to seal potential unbonded asbestos
- Suitable asbestos waste container
- Warning signs and/or barrier tape
- Polyethylene plastic and tape for cover or wrap asbestos waste

10.4 Large Scale Asbestos Removal Work

There may be national requirement identifying the quantity that would be classified as large-scale removal. As a guide, large-scale removal work usually involves asbestos removal that may include a large amount of asbestos, is of a longer duration or high frequency and can result in significant amount of airborne asbestos fibers.

It is important that a large-scale asbestos removal work be conducted by a competent person experienced in such removal work. The following items should be included as a minimum for large-scale asbestos removal work:

- National legislation/requirements and international best practice.
- The permit/licence/accreditation required for asbestos removalist.
- Requirement of an enclosure. Should an enclosure be required, methodology for decontamination and removal strategy should be developed.
- Requirements of negative pressure exhaust units.
- PPE requirements.
- Validation requirements.

10.5 Small Scale Asbestos Removal Work

Small-scale removal work has the potential of generating a smaller quantity of asbestos fibers compared with large scale removal work. It is still important that small scale asbestos removal work is conducted by a competent person experienced in such removal work.

The following items should be included at a minimum for small scale asbestos removal work:

- National legislation/requirements.
- The permit/licence/accreditation required for asbestos removal specialists.
- Requirement of an enclosure, which may include a mini-enclosure or glove bag enclosure. A mini enclosure generally fits a person or more while a glove bag enclosure generally only fits parts of the body (e.g., arms). Should an enclosure be required, methodology for decontamination and removal strategy should be developed.
- A wrap and cut asbestos removal method can also be used. This method includes removal of whole undamaged ACM (without breaking the ACM), wrapping it in two layers of plastic sheeting, and disposal of the material. Some countries may have requirements for the plastic type and thickness. As a guide, heavy duty polyethylene sheeting (minimum 200µm thickness) can be used.
- PPE requirements.
- Validation requirements.

10.6 Validation / Clearance of Asbestos Removal

Following completion of asbestos removal, a validation of the removal should be conducted by a competent person to ensure that the removal has been adequately conducted. There may be national requirements for a competent person to issue a clearance certificate following completion of the validation.

The following validation should be considered:

- Stage 1 – Clearance of site and assessment of job completeness to ensure all ACM has been adequately removed.
- Stage 2 – Visual inspection by a competent person, followed by issue of clearance certificate. This inspection should also include inspection of surrounding area, to ensure the removal process did not result in contamination of the surrounding area (e.g., the ground beneath).
- Stage 3 – Air monitoring, to validate that the removal process does not result in airborne asbestos fibers.
- Stage 4 – Clearance of work area after dismantling, which includes clearance of enclosures, decontamination area, equipment, and any other areas that may be affected by asbestos (e.g., transfer area where vehicles containing asbestos may travel, stockpile footprint, etc.).

As a guide, validation/clearance may include:

- Visual inspection by a competent person.
- Sampling (e.g., dust sampling, soil sampling, air monitoring, confirmatory solid sampling, etc.).

Where possible, creation of asbestos waste should be avoided, noting that in most countries asbestos waste disposal cost is higher than non-asbestos waste.

Asbestos waste should be segregated from non-asbestos waste to minimize asbestos contamination in the non-asbestos waste and to minimize disposal cost for asbestos waste.

Waste disposal should be conducted in accordance with national legislation and requirements. This chapter provides good practice guidance, which should be considered, and is based on ILO (1984).

Handling asbestos waste, including collection, storage, transport and disposal should be captured within the safe work method statement prepared for the work, which should identify the potential hazards, risk and mitigation measures throughout the process, including management of emergency (e.g., accidental spillage).

The strategy for waste disposal should be thoroughly documented prior to asbestos removal process as this may determine the appropriate asbestos removal method.

11 ASBESTOS WASTE

11.1 Waste Collection

In the addition to national requirements, as a guide the following measures should be included at a minimum:

- Where possible waste material should be wetted during collection to minimize potential fiber release.
- Collection method will be dependent on the type of ACM and should be determined by a competent person. Some collection methods may require vacuuming or dust extraction.
- Waste handling should be conducted by a competent person who is experienced in such activity. There may be national requirements for permit, licence or accreditation for waste collection.
- Appropriate PPEs should be worn when handling waste.
- Where possible, ACM should be removed and disposed of whole, without breaking the material, to minimize fiber release. Where breakage cannot be avoided, the methodology should be determined by a competent person (e.g., through the use of dust extraction hood).
- Waste disposal container shall be made out of material that does not easily be damaged, such as heavy-duty polyethylene. Containers such as paper bags should be avoided.
- Bagging of outlets from dust collection hoppers or vacuum cleaners should be designed to make bag changing easy and to minimize dust leakage.
- Bag changing should be conducted by a competent person trained to conduct this activity.
- Filled containers should be appropriately sealed to prevent escape of dust during handling. Plastic bags shall be appropriately tied and folded over and the neck shall be secured in a folded position by wire tie, adhesive tape, or other effective method.
- It is preferable that disposable bags/plastic that have been used to contain asbestos waste be disposed of together with the waste as asbestos waste.
- Asbestos waste in the form of sludge or slurry should preferably be placed in specially designed containers which are adequately sealed in such a way that no spillage could occur.
- Other disposable materials such as the plastic used for enclosure can be treated as waste, unless it is confirmed not to contain asbestos fibers. The inside of the enclosure should be spray painted (e.g., with polyvinyl alcohol or similar) with airless applicator to prevent any fibers from being released.
- Unbonded asbestos should be stabilized (e.g., with sealant), where practicable, to minimize fiber release.
- After collection, asbestos waste shall be ensured to be appropriately encapsulated (i.e., by bag/container) which does not result in potential release of fibers. Preferably a second bag/containers shall enclose the first bag to minimize any fiber release. The person handling the waste must take care of the waste placement such that the outside layer of the container/bag must be free of asbestos.

Section 9.2 of the ILO (1984) (link provided in Section 13) provides more detailed waste collection methods for the following types of waste, which should be referred to as necessary:

- Dust
- Loose fiber, swart, floor sweepings
- Waste material from fixing or removing insulation
- Offcuts, broken pieces and rejects of high-density material
- Sacks or bags which have contained asbestos
- Wet waste

11.2 Waste Storage

In the addition to national requirements, as a guide, the following measures should be considered:

- It is preferable that asbestos waste storage is minimized, and asbestos waste is disposed of to a lawful facility as soon as practicable.
- All asbestos waste waiting for disposal should be clearly marked on the bag/containers. It is preferable that the area is barricaded to prevent unauthorized access.
- Asbestos waste should be stored in such a way that it is not exposed to damage likely to cause release of fibers (e.g., by exposure to sun, chemicals, heat, pests, etc.).
- Asbestos waste should not be mixed with non-asbestos waste, as this may result in contamination of the non-asbestos waste. Where practicable, asbestos waste should be stored in a designated area.
- If asbestos waste is stored in long term, the bag/containers should be monitored for damage and any damage should be rectified. Remediation of surrounding area may be required where damage is identified.

11.3 Waste Transport

In the addition to national requirements, as a guide, the following measures should be considered:

- Waste transportation should be conducted by a competent person who is experienced in such activity. There may be national requirements for permit, licence or accreditation for waste transportation. In some countries, prior approval of disposal may be required from the disposal facility. The transporter should be inducted to the safe work method statement and understand the actions required should accidental spillage occurs.
- Asbestos waste should be transported in such a way that that there is no asbestos fiber or dust emitted during transport.
- Where accidental spillage occurs, action to contain the spillage and minimize the release of fibers should be conducted immediately. The appropriate actions should be determined by a competent person and may include containing spillage, wetting, covering, etc. Appropriate PPE should be worn when handling spillage.

11.4 Waste Disposal

Asbestos waste should be disposed of in a lawful facility.

In some countries, there may be legislation or requirements for facilities that can receive asbestos waste, location of such facility, permits/licence/accreditation for such facility, how asbestos waste must be handled and placed in the facility, placement of temporary and final cover material, and the long-term management for such facility.

The following guidance is not intended to provide guidance for disposal in a facility not designed for receiving waste (i.e., properties other than landfill). In the absence of national legislation/requirements, the following measures should be considered, which are in accordance with the ILO (1984):

- The site should be specifically designed to accept waste, particularly asbestos waste. Such site is generally referred to as a landfill and has specific designs on location, size, depth of burial, leachate and landfill gas control, etc, which may have national legislation/requirements and should provide appropriate measures to prevent pollution of soil, air and water.
- Placement of asbestos waste should be conducted by a competent person as such to minimize damage to the bags/containers encapsulating the waste and subsequent release of asbestos fibers. The competent person should be inducted to the safe work method statement for the work and be made aware of the potential hazards and risk of the activities.
- Asbestos waste is preferably covered daily with a daily cover (the ILO suggests 20-25 cm (8-10 in)) of non-asbestos material as soon as possible. There may be national requirements of the required type and depth of daily cover.

- At the completion of landfill life, a final cover is generally provided. The ILO recommends a minimum depth of 2m (6 ft 6 in) of final cover. There may be national requirements of the required type and depth of daily cover.
- The placement of waste should be as such that it will not be damaged and potentially release asbestos fibers as a result of vehicle movement.
- Vehicles and personnel conducting the work should be appropriately decontaminated prior to leaving the facility.
- Records of waste disposal (usually presented as waste dockets or invoices from the landfill facility) should be kept to track waste disposal. Location of waste disposal should also be kept as a record.

Where national legislation/requirements allow, there may be potential for burial of asbestos waste outside a landfill environment. There are many factors that need to be considered for this:

- National legislation/requirements
- Future use of the site
- Depth of placement, with consideration of the depth of soil that is likely to be disturbed in the future (e.g., for service maintenance, tree planting, etc.)
- How the risk of asbestos will be managed in the future and how this is communicated to future site owners/occupiers
- Ongoing records and ongoing management of buried asbestos as well as associated costs

Where there is no national legislation/requirement for burial in places other than a landfill, the above decision should be made by a competent person familiar with national legislation/requirements, with potential consultation with authority, to ensure that the long-term risk of asbestos is considered and managed.

12 MANAGING ASBESTOS EXPOSURE DURING DISASTERS

Disasters may be triggered by natural hazards (tsunamis, earthquakes, volcanic eruptions, etc.) or other events (e.g., explosions, fire, building collapse).

WHO has developed several hazards and safe practices for cleanup after disasters:

- WHO Regional Office for South-East Asia (2006) Asbestos - Hazards and Safe Practice for Clear-Up After Tsunami.
- WHO (2008) Asbestos - Hazards and Safe Practices for Cleanup After Earthquake.
- WHO Lebanon (2020) Asbestos - Hazards and Safe Practices for Cleanup After Beirut Blast.

Where WHO issues similar hazards and safe practice documents (like the above) for a particular disaster, or where there are national legislation/requirements, these documents should be implemented during management of the disasters. This chapter provides guidance, should specific WHO or other international directive or national legislation/requirements are not available.

12.1 Potential Asbestos Risk

As discussed in Section 2.5, ACM can result in the release of asbestos fibers that can be inhaled and result in asbestos-related diseases. Given that ACM has been widely used in many countries, a disaster may result in damage to ACM in buildings/structures, which may result in the release of airborne asbestos fibers.

Exposure to asbestos may occur to:

- Emergency workers accessing the area
- People living in close proximity of the disaster area and disposal area
- Cleanup workers
- Other people involved in the disaster relief, including volunteers

12.2 Risk Minimization

The guidance for managing asbestos presented in other chapters of this document should be followed to minimize the risk of asbestos exposure. Additionally, the following items may be considered in the absence of national legislation/requirements or WHO or international requirements:

- A risk assessment of potential asbestos impact should be conducted. Unless otherwise confirmed, damaged buildings/structures should be assumed to contain asbestos. Safe work method statements should be prepared for activities in the area. Workers working in the area should be inducted to the safe work method statements.
- Workers and other people accessing the area should be informed on the risk of asbestos in the area. This should also include requirement of PPEs and the need to wash clothing and equipment before eating, drinking or smoking and before returning home to minimize the risk of spreading asbestos fibers outside the asbestos impacted area.
- Competent person should conduct site inspection to identify asbestos, the hazards and the best course of action.
- The access to the area of potential asbestos impact should be minimized as much as practicable.
- Appropriate PPEs should be made available to workers and volunteers and be worn during work in potentially asbestos impacted area.
- Other asbestos handling measures provided in this guidance document should be implemented, where practicable.
- Where possible, disturbance of ACM should be minimized.
- ACM should be wetted during handling to minimize release of fibers.

- Decontamination area should be provided for washing up clothing and equipment.
- Where possible removal of ACM should be directed by a competent person to ensure that the removal process does not result in release of airborne asbestos fibers.
- The need for air monitoring should be assessed.

12.3 Disposal

Asbestos waste handling, storage and disposal should be conducted in accordance with Section 11, noting that:

- In a large disaster, there may be a need of disposal of large amount of potentially asbestos contaminated material within a short amount of time. Where space for disposal in an engineered landfill is not readily available, sites for temporary storage should be identified and prepared.
- Where possible asbestos waste should be segregated with non-asbestos waste.
- Handling and disposal of asbestos waste should be conducted by a competent person experienced with such activity.

13 LIMITATIONS

This publication was prepared to provide general guidance for managing asbestos risks and is not intended to provide a comprehensive methodology on asbestos management. Expert advice should be sought on case by case basis. This document was prepared based on professional experience of the authors and published literature and other available guidance documents as listed in this document. Each country or region may have its own legislation or guidelines which must be met.

14 USEFUL READING MATERIALS

The following documents provide more detailed guidance on working with asbestos.

Table 2: Useful References and Further Reading

Author	Document Title	Link
International Labour Organization (ILO)	The ILO Position on Safety in the Use of Asbestos	https://www.ilo.org/global/topics/safety-and-health-at-work/areasofwork/occupational-health/WCMS_360580/lang--en/index.htm
International Labour Organization (ILO)	C162 – Asbestos Convention, 1986 (No. 162)	https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C162
United Nations Environment Programme (UNEP)	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	https://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-e.pdf
United Nations Environment Programme (UNEP) and Food and Agriculture Organization (FAO) of the United Nations	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	http://www.pic.int/Portals/5/download.aspx?d=UNEP-FAO-RC-CONVTEXT-2015.English.pdf
World Health Organization (WHO)	Outline for the Development of National Programs for Elimination of Asbestos-Related Diseases	https://www.who.int/occupational_health/publications/asbestosdoc/en/
Safe Work Australia	Code of Practice How to Safely Remove Asbestos	https://www.safeworkaustralia.gov.au/doc/model-code-practice-how-safely-remove-asbestos
Safe Work Australia	Code of Practice How to Manage and Control Asbestos in the Workplace	https://www.safeworkaustralia.gov.au/doc/model-code-practice-how-manage-and-control-asbestos-workplace
WHO Regional Office for South-East Asia	Asbestos - Hazards and Safe Practice for Clear-Up After Tsunami	https://www.who.int/publications/m/item/asbestos---hazards-and-safe-practice-for-clear-up-after-tsunami
WHO	Asbestos - Hazards and Safe Practices for Cleanup After Earthquake	https://www.who.int/publications/m/item/asbestos---hazards-and-safe-practices-for-clean-up-after-earthquake
WHO Lebanon	Asbestos - Hazards and Safe Practices for Cleanup After Beirut Blast	https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/who_asbestos_sep2020.pdf
World Bank Group[1]	Good Practice Note. Asbestos: Occupational and Community Health Issues	http://www.mtpinnacle.com/pdfs/AsbestosGuidanceNoteFinal.pdf

[a] This document has a comprehensive list of other international regulation and standards, however noting that some documents may be superseded by other versions.

APPENDIX A: ASBESTOS REGISTER EXAMPLE

Table A: Example of Minimum Standard Asbestos Register

Workplace address		ABC Manufacturing 123 Town Road, XYZ Town			
Date asbestos was identified	**Type of material (identified/assumed)**	**Is it bonded/ unbonded?**	**Condition of asbestos**	**Specific location**	**Is this in an accessible area?**
1/11/2000	Fiber cement wall	Bonded	Good condition	Conference room 1	No
1/1/2000	Pipe lagging	Unbonded	Deteriorated	Factory room 1, steam pipe #1	No
5/3/2000	Vinyl floor backing	Bonded	Good condition	Factory room 1 floor	Only accessed if vinyl floor is deteriorated/ requires removal
10/5/2000	Potential asbestos lining	Untested	Unknown	Factory room 1 sewer pipe	Inaccessible

Table B: Example of More Comprehensive Asbestos Register

Workplace address	ABC Manufacturing 123 Town Road, XYZ Town										
Date Asbestos was identified	**Location**	**Product type**	**Extent of damage**	**Surface treatment**	**Asbestos type**	**Quantity (m^2)**	**Normal occupant activity**	**Likelihood of disturbance**	**Human exposure potential**	**Maintenance activity**	**Management plan**
1/11/2000	Conference room 1	Fiber cement wall (bonded)	Good condition	Painted	Chrysotile	80m^2	Meeting	Unlikely	If disturbed (e.g. drilling)	Periodic painting	Leave and manage, no drilling
1/1/2000	Factory room 1, steam pipe #1	Pipe lagging (unbonded)	Deteriorated	None	Chrysotile	<0.5m^2	Box production	Likely during pipe maintenance	During pipe maintenance	None required	Remove and replace with non-asbestos lagging
5/3/2000	Factory room 1 floor	Vinyl floor backing (bonded)	Good condition	Vinyl floor above the asbestos	Not tested	100m^2	Box production	Unlikely if floor remains in good condition	During floor removal, or in deteriorated floor	None required	Leave, inspect annually
10/5/2000	Factory room 1 sewer pipe	Potential asbestos lining (untested)	Unknown	Unknown	Not tested	Unknown	Box production	Unlikely as location is inaccessible	Future maintenance/ removal of pipe	None required	Leave, label, manage

APPENDIX B: TOOL KIT

1 WORKING WITH ASBESTOS CHECKLISTS

1.1 For New Developments

Project sponsors should check that the following have been provided to avoid the use of asbestos in any new structures (Section 4.1):

- ☐ Adequate measures to avoid the use of asbestos in new buildings/structures/items, as appropriate consider:
  - Alternative products
  - Alternative suppliers
  - Alternative activities.
- ☐ Acknowledgement of any restrictions for asbestos use or requirements to manage asbestos use, as per internal policies
- ☐ Evidence of adherence to policies limiting asbestos use.
- ☐ Details of suppliers for materials used.
- ☐ Completed supplier checklists for materials where appropriate.
- ☐ Confirmation from vendor on asbestos content within the goods and instructions on how to safely use the product.

1.2 For Projects Under Implementation or Operation

1.2.1 General Duties/Responsibilities for Contractors and Project Managers/Employers

General Duties - check that the following details have been provided (further information is provided in Section 4):

- ☐ Confirmation of who has control over the workplace, such as details of the workplace management team.
- ☐ Confirmation of who is responsible for asbestos worker health and safety.
- ☐ The project plans identify the roles of employers/ project managers as per international best practice guidance and national legislation and obligations with respect to their responsibilities, providing appropriate information, training, monitoring and mitigation measures for asbestos risks.
- ☐ Documents confirming the requirements of workers/ subcontractors & contractors as per international best practice regarding understanding their responsibilities, providing appropriate information, training, monitoring and mitigation measures.
- ☐ The roles of sub-contractors (and other relevant parties) with respect to asbestos risks, are clearly defined in the project plans.
- ☐ Evidence that the workers (and other relevant parties) have the necessary expertise to manage the identified asbestos impacts.
- ☐ Safe work method statements prepared by subcontractors or workers which document their proposed task, any hazards and risks, mitigation measures, details on PPE and asbestos control.
- ☐ Details of any foreign supervisory personnel with expertise and appropriate certifications in asbestos work, if there is limited capacity to manage the asbestos impacts.
- ☐ Process for consultation with appropriate stakeholders.
- ☐ Health surveillance records for workers, where considered required.

1.2.2 Asbestos Training

- ☐ Is a 'competent person' conducting work where asbestos may be present? (Section 5.1 of the GPG and Section 3 of this Tool Kit for Competency Matrix).
- ☐ Have workers been trained following the training modules? (Section 5.2)
- ☐ Is work being conducted in accordance with national legislation/requirements or international best practice? (Section 5.2)
- ☐ Are there licences/permits/accreditation required? If so, has a copy of these been obtained? (Section 5.2)

1.2.3 Asbestos Identification

- ☐ Do the employers/project managers have reasonable grounds to believe asbestos is not present in the workplace? (Section 6.1)
- ☐ If present or suspected, has a survey/testing been completed by a competent person (occupational hygienist, individual with adequate training/ experience or contractor with appropriate asbestos licence)? (Section 6.1 and 6.2)
- ☐ If present, is there sufficient detail in the form of a survey to verify/confirm the presence and location asbestos in the project? (Section 6.1)
- ☐ Is the survey in a form that meets international best practice guidance and national legislation/ requirements? (Section 6.1)
- ☐ If asbestos is suspected or present, has it been tested? (Section 6.2)
- ☐ Has the testing been conducted in laboratories with appropriate accreditation (eg International Laboratory Accreditatiton Corporation (ILAC)) and/ or national accreditation? (Section 6.2)
- ☐ Has an asbestos risk assessment been conducted by a competent person and is it appropriate for the type of asbestos, asbestos hazards, and the proposed asbestos work activities? (Section 6.3)

1.2.4 Managing Asbestos Risk

- ☐ Has elimination of asbestos been considered? (Section 7.2)
- ☐ Have substitution, isolation or engineering controls been placed on the identified asbestos and have these been performed in line with international best practice? (Section 7)
- ☐ Have adequate measures been implemented to avoid, minimize and mitigate adverse worker health and safety impacts, ideally in the form of a safe work methods statement, or similar? (Sections 7 and 8)
- ☐ Have adequate measures been implemented to document asbestos impacts, ideally in the form of an asbestos register, in instances where asbestos is known to exist within existing project infrastructure? (Section 7.6.1)
- ☐ If an asbestos register is present, does it include key requirements as per international best practice and national legislation/requirements? (Section 7.6)
- ☐ If an asbestos register is not present, does it need to be prepared (i.e., is there asbestos in the workplace)?
- ☐ Has an asbestos management plan been prepared by a competent person and issued in line with international best practice and national legislation/ requirements? (Section 7).
- ☐ Are safe work method statements available for activities in and around asbestos and have these been prepared by a competent person in line with international best practice guidance and national legislation/requrements? (Section 7.6.3)
- ☐ Are the minimum requirements for PPE documented as per international best practice guidance and national legislation/requirements? (Section 7.8)
- ☐ Have employees, workers, subcontractors been inducted on asbestos register, asbestos management plan and safe work method statements? (Section 7)

1.2.5 Working Safely with Asbestos

- ☐ Are the management strategies within asbestos management plan consistent with international best practice and national legislation/requirements? (Section 8)

- ☐ Has the safe work method statement been prepared by a competent person and does it incorporate signage, enclosures (if necessary), decontamination areas, cleanup requirements and laundering? (Section 8)
- ☐ Is there appropriate health surveillance for employed workers? (Section 8.8)
- ☐ Are there sufficient details regarding requirements for ambient asbestos-in-air quality monitoring? (Section 8.2)
- ☐ Do contractors have appropriate accreditation, permits, licenses, and insurance? Does the company have previous experience with this type and nature of asbestos removal work and do the individual workers have task specific asbestos knowledge and appropriate licences? (Section 8.7).
- ☐ Will the work performed by contractors be audited to confirm its full scope was completed and that it was carried out and it is performed in a manner that meets international best practice and national requirements? (Section 8.7).

1.2.6 Asbestos Incidents

- ☐ Is an incident management process available? (Section 9).
- ☐ Is the incident management process in a format that can be clearly followed (e.g., flow chart) and follows international best practice guidance and national legislation/requirements? (Section 9)
- ☐ When an incident occurs, is the incident management process followed? (Section 9)
- ☐ Has personal clothing equipment etc. been appropriately decontaminated and has the incident area been sealed and clearly marked with appropriate signs to minimize entry? (Section 9.2, 9.3)
- ☐ Have appropriate staff been informed to minimize unauthorized entry and to begin incident assessment process? (Section 9.4)
- ☐ Has a competent person conducted an investigation and recommended mitigation measures in accordance with international best practice guidance and national legislation/requirements? (Section 9.5)
- ☐ Have mitigation measures been implemented and the area validated by a competent person? (Section 9.7)
- ☐ Does the asbestos register need to be updated? Are there any processes that need to be updated to minimize reoccurrence? (Section 9.7)

1.2.7 Managing the Risks of Asbestos Removal

- ☐ Has a Risk Assessment been completed by a competent person for the removal work? (Section 10 and 6.3)
- ☐ Has a Safe Work Method Statement been prepared for the removal work, including choice of wet or dry methods and appropriate tools and equipment? (Section 10 and 7.6.3)
- ☐ Has a competent person with appropriate licence/permit/accreditation been engaged to conduct the removal work? (Section 10)
- ☐ Was the removal work conducted in accordance with international best practice guidance and national legislation/requirements? (Section 10)
- ☐ Has the removal work been validated and a clearance certificate prepared following international best practice? (Section 10.6).

1.2.8 Waste

- ☐ Is there sufficient evidence of the necessary capacity to adequately manage the generation of asbestos waste? (Section 11)
- ☐ Has the quantity of known or potential asbestos waste materials that will be generated during project activities been provided? (Section 11)
- ☐ Has a safe work method statement been prepared for the handling of asbestos waste, including collection, storage, transport and disposal? (Section 11)
- ☐ Does the project plan include interim storage to ensure asbestos waste is appropriately handled? Is waste handling conducted by a comptent person and in accordance with international best practice guidance and national legislation/requirements? (Section 11.1)
- ☐ Is temporary waste storage required? If so, can waste be stored that does not present unacceptable risk? (Section 11.2)
- ☐ Is there sufficient evidence that the asbestos waste transporter has the appropriate controls, licences, and facilties to contain the materials while in transit? (Section 11.3)
- ☐ Has the landfill/disposal location been identified as an appropriate facility to contain the estimated quantity of asbestos waste? Does the facility have appropriate permits/licence/accreditation in accordance with national legislation/requirements? (Section 11.4)

☐ If asbestos waste is disposed of in a site that is not covered by permits/licence/accreditation, has the long-term risk of asbestos and the management strategy been identified? (Section 11.4).

1.2.9 Managing Asbestos Exposure During Disasters

☐ Has a risk assessment been completed for the facilities to confirm damage? (Section 12)
☐ Have the risks of asbestos been communicated to all workers and the surrounding community?? (Section 12)
☐ Has a competent person been engaged to identify asbestos, the hazards and the best course of action? (Section 12.2)
☐ Has a competent person been engaged to conduct asbestos removal work? (Section 12.2)
☐ See Checklist 1.9 on waste disposal.

2 CHECKLIST FOR COMPLETION OF ASBESTOS WORK

The Checklist for Completion of Asbestos Work can be used by Project and Site Managers to evaluate any work involving asbestos against the Good Practice Guidance. Depending on contractual or other project obligations, check that the following details have been confirmed and verified upon completion of the asbestos work:

For New Structures

☐ If building and construction materials were used throughout the project, these materials do not contain asbestos and/or they comply with the current policy on asbestos use. Documentation has been provided by vendors showing the materials provided do not contain asbestos.

General Duties/Responsibilities

☐ Confirmation of the relevant experience and capabilities of the asbestos workers can be verified.

Asbestos Training

☐ All workers are appropriately trained/licensed to conduct the work – training records/licence provided.

Asbestos Identification

☐ Asbestos in workplace is documented in an asbestos register.

Managing Asbestos Risk

☐ Asbestos risk assessment conducted and documented.
☐ Asbestos management plan established.
☐ Safe work method statements for working with asbestos established.

Working Safely with Asbestos

☐ The results of ambient air quality monitoring can be interpreted to form an opinion as to whether asbestos was contained within the designated asbestos-work area.

Asbestos Incidents

☐ Asbestos incident documented and adequate mitigation measures implemented.

Asbestos Removal / Decomissioning

☐ The project footprint does not contain levels of residual asbestos fibers that exceed national legislation/requirements (e.g., certification through an independent certifier and clearance certificate provided).

Asbestos Waste

☐ Prior to disposal, asbestos waste arising from the project was temporarily contained onsite in a secure facility or conditions.
☐ Asbestos waste removed from the project was transported and disposed in accordance with the approved asbestos management plan and contractual obligations.

- ☐ The ultimate/final disposal location of the asbestos waste can be verified as an appropriate facility to receive and contain such waste and meets the national legislation/requirements.
- ☐ If asbestos waste has been contained within the project footprint (e.g., in an asbestos burial pit), an environmental mangement plan has been prepared for the site which shows the location and depth of the waste, as well as the type of asbestos buried, and any ongoing management requirements.

3 EVALUATING COMPETENCY FOR ASBESTOS-RELATED WORK

3.1 Key Performance Indicators and Supporting Documents

For people to be deemed competent to perform asbestos-related work, they will need to provide evidence of their competency.

Competency for asbestos-related work may be attained in several different ways, such as:

- Formal education and training
- Workplace experience and on-the-job training
- Experience gained in non-workplace settings (such as volunteer work)
- Any combination of the above

To verify competency, some countries/jurisdictions may require an asbestos worker to have a licence, permit or specific accreditation for certain asbestos tasks (e.g., asbestos removal work, issuing clearance certificate, etc.). In countries where such regulatory and permitting requirements are absent and/or inadequate, international best practices should be followed.

The competency checklist for asbestos-related work is designed to assist Project Teams to identify whether the asbestos-related work proposed in a project will be completed by a competent person, as demonstrated by their evidence of competency.

3.2 How to use the competency checklist

The competency checklist provides a non-exhaustive list of evidence that may be used as a guide by Project Teams when assessing the competency of a person (or a company) conducting asbestos-related work.

In this Tool Kit, competencies have been divided into seven discrete areas, each with their own set of key assessment criteria, and some examples of evidence of competency. Project Teams are encouraged to consider all areas of competency during their assessment.

The Competency Checklist for Asbestos-Related Work includes the following information:

- Column 1 provides a list of the seven discrete, but interconnected, areas of competency and their associated level of importance (i.e. essential or desirable).
- Column 2 describes some common key assessment criteria typically required to attain the corresponding areas of competency.
- Column 3 provides some examples of evidence of competency that would generally be issued or documented upon attainment of successful completion of a competency indicator. This list of examples is non-exhaustive, and other similar forms of evidence may be considered on a case-by-case basis.

3.3 Competency Checklist for Asbestos-Related Work

As a general guide:

- Evidence of all 'essential' areas of competency should be provided.
- A single form of evidence may contribute to more than one area of competence.
- The examples of evidence provided in the checklist are non-exhaustive, and other similar forms of evidence may be considered on a case-by-case basis.

Areas of Competency and Level of Importance	Key Assessment Criteria	Examples of Evidence of Competency - Checklist
Knowledge of asbestos safety **Essential**	☐ Completion of formal education in work, health and safety, occupational hygiene or a related field. Duration of course should be commensurate with the proposed asbestos work (e.g. a day-long course would not be suitable for a major asbestos removal operation). ☐ Skills and knowledge established through alternative means which confirm an understanding of the current state of knowledge with respect to asbestos safety.	☐ Certificate of course completion issued by a recognized training body or a tertiary education on occupational health/hygiene or a related field that enables demonstration of asbestos safety in nominated area of expertise. ☐ Statement of attainment towards a qualification from a recognized training body. ☐ Demonstrated completion of ADB/EBRD training (Chapters 1-5). ☐ If no formal qualifications, the person can demonstrate knowledge via other means, such as a letter of attendance from a recognized training body, written reports, papers, articles, logbooks, professional journals authored by the person that demonstrate a level of knowledge of asbestos safety. Minimum 12 months experience required.
Technical Proficiency of Asbestos-Related Work **Essential** (It is noted that the licence, permit, or certificate of proficiency may also be considered to meet the "Knowledge" area of competency, depending on the level of detail provided in those documents)	☐ If the person is responsible for asbestos identification, the person has the skills for the collection of samples and the interpretation of the results. ☐ If the person is responsible for asbestos monitoring, the person has appropriate equipment and skills to use the equipment and analyze the results. ☐ If the person is responsible for the clearance of asbestos that has been removed from a particular location, the person has the appropriate certifications in asbestos identification.	☐ Licences, permits, or tickets that allow the person to conduct work such as: - Asbestos handling. - Asbestos removal. - Asbestos clearance. - Asbestos air monitoring. ☐ Certificate of proficiency (or similar) issued by a recognized certifying body enabling a licence, permit, or ticket to be issued for asbestos safety tasks. ☐ Demonstrated completion of ADB/EBRD training (Chapters 6-8). ☐ Logbooks documenting a history of asbestos work activities.

Areas of Competency and Level of Importance	Key Assessment Criteria	Examples of Evidence of Competency - Checklist
Industry/Sector Experience **Essential**	☐ The person or company can demonstrate industry experience in asbestos-related work in a similar manner to the work described in the proposed project. ☐ The person or company has previously worked on similar projects, plant, or equipment, and addressed similar issues to those identified in the proposed project.	☐ Curriculum Vitae / Resume confirms industry and/or sector experience with asbestos-related work. ☐ Written referee reports confirm industry and/or sector experience with asbestos-related work.
Understanding of WHS Obligations and Management Systems **Essential**	☐ The person or company can demonstrate familiarity with and/or application of work, health, and safety (WHS) legislation as it applies to the jurisdiction. ☐ The person or company has current management systems in place for managing asbestos health and safety risks for asbestos-related work. ☐ The person or company's approach to asbestos safety is consistent with the hierarchy of controls (i.e. elimination, substitution, engineering controls, administrative controls, and personal protective equipment) to afford the highest level of protection so far as is reasonably practicable.	☐ Statement which identifies accreditation to WHS legislation relevant to the project jurisdiction, e.g. ISO 45001. ☐ Statement providing evidence of compliance with WHS obligations during prior asbestos-related work. ☐ Alternative evidence, such as logbooks, professional journals, referee reports confirming evidence of an appreciation of WHS obligations. ☐ Current and comprehensive Work Health and Safety (WHS) Management System which includes specific provisions for asbestos work: - WHS policy for asbestos-related work. - WHS procedures for asbestos-related work. - Risk management strategy. - Comprehensive safe work methods statement for the relevant for asbestos-related work. ☐ Completed safe work methods statement for the relevant asbestos-related work which includes safety requirements, and warnings, and requirements for use of personal protective equipment.
Recent Professional Experience **Desirable**	☐ The person or company can demonstrate evidence of recent activity conducting asbestos work. ☐ The person or company can demonstrate a degree of longevity in conducting asbestos work.	☐ Curriculum Vitae / Resume confirms recent industry or project activity (e.g. within the last two years). ☐ Statement of experience clearly describes recent industry or project activity. ☐ Online professional profile which indicates current industry or project experience.

Areas of Competency and Level of Importance	Key Assessment Criteria	Examples of Evidence of Competency - Checklist
Communication Skills **Desirable**	The person is able to explain what needs to be done to control any asbestos hazards or risks, and draft reports or associated documents that are legible and easy for others to understand.	☐ Written communications (such as prior reports, asbestos safety plans, or safe methods statements) clearly identify the risks and control measures required to mitigate those risks. ☐ Written communications (such as prior reports, asbestos safety plans, or safe methods statements) are appropriate for the intended audience. ☐ Written communications (such as prior reports, asbestos safety plans, or safe methods statements) provide a logical process that can be followed easily.
Professional Association **Desirable** (Particularly if the project is high profile, or high risk)	The person or company is affiliated with a relevant industry or professional association that requires the attainment and continuing development of work, health and safety knowledge, skills, and experience for membership.	☐ Evidence of membership to a professional association. ☐ Statement of involvement with a professional association. ☐ Statement of continuing development with a professional association.

4 ASBESTOS MANAGEMENT AND MONITORING

Fostering a positive and collaborative relationship among all project stakeholders is key to managing the risks associated with asbestos during all phases of the project, including during the operational phase.

Project managers and supervisors are in a good position to facilitate a partnership with contractors and suppliers to ensure adherence to international best practice with respect to asbestos management.

Key performance indicators are a way of monitoring and managing asbestos risks during project implementation and operation.

Key performance indicators should consider the strategies detailed in the asbestos management plan and any other plans that refer to asbestos management and safety, and whether any new and unexpected asbestos risks during implementation of the project (e.g., during construction, demolition, remedial works) occurred.

4.1 Key Performance Indicators and Supporting Documents

Depending on the contractual obligations, use the following checklist items (as relevant) as a guide for monitoring key performance indicators.

Table C: Key Performance Indicators and Documentary Evidence

Key Performance Indicator	Documentary Evidence Options (as appropriate)
Construction materials used in the project do not contain asbestos	- Completed supplier checklists - Laboratory test reports (from supplier) - Laboratory test reports (independent) - Summary of test results
Any additional asbestos impacts encountered during the project (i.e., those not captured during the due diligence process) have been recorded and managed	- Updated asbestos register - Updated asbestos management plan - Updated project plans - Details of the asbestos contractor
Asbestos control measures have been conducted in accordance with the asbestos management plan (or other project plans, as appropriate)	- Asbestos contractor daily records - Completed safe work methods statements - Photographs/evidence of containment measures - Photographs/evidence of workers wearing personal protective equipment - Audits during asbestos work
Airborne asbestos impacts have been contained within the designated asbestos work environment	- Ambient air quality results - Summary of air quality results
Asbestos waste is securely contained on site prior to removal	- Photographs/evidence of the storage facility/ conditions - Site drawings showing the storage locations - Description of storage management measures - Inspection by competent person
Asbestos waste was transported in accordance with the approved asbestos management plan	- Details of any interim storage facilities (on or offsite) - Photographs of waste being loaded onto transport - Photographs of the waste contained within the transport (with appropriate cover) - Trip logs of the transporter
The final, ultimate destination/facility of the asbestos waste can legally accept the type and quantity of the asbestos waste generated by the project	- Licence or permit conditions of the waste facility - Quantities of the asbestos waste received at the waste facility - Type of waste generated (friable/non-friable) - Confirmatory laboratory test reports
The project footprint is free of residual asbestos fibers that may have become airborne and deposited as asbestos dust during asbestos work	- Asbestos clearance certificate through an independent certifier - Validation report, as required

REFERENCES

ALS Global. (Undated). *Asbestos Analytical Methods*. Retrieved November 12, 2020, from https://www.alsglobal.com/-/media/als/resources/services-and-products/environmental/data-sheets---usa/asbestos-analytical-methods.pdf.

Brody, A. (2018). How Inhaled Asbestos Causes Scarring and Cancer. *Current Respiratory Medicine Reviews*, 14, 204-271.

Furuya, S., Chimed-Ochir, O., Takahashi, K., David, A., & Takala, J. (2018). Global Health Disaster. *International Journal of Environmental Research and Public Health*, 15(5). doi: 10.3390/ijerph15051000

Hoffman, W., & Asgharian, B. (2003). The Effect of Lung Structure on Mucociliary Clearance and Particle Retention in Human and Rat Lungs. *Toxicological Sciences*, 73(2), 448-456.

HSE. (Undated). *Where Can You Find Asbestos?* Retrieved November 12, 2020, from https://www.hse.gov.uk/asbestos/building.htm.

IARC. (2018). Asbestos (Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, and Anthophyllite. *IARC Monographs* – 100C, pp. 219-309.

ILO & WHO. (2007). *Outline for the Development of National Programmes for Elimination of Asbestos-Related Diseases.* Geneva: International Labour Office & World Health Organization.

ILO. (1984). *Safety in the Use of Asbestos.* Geneva: International Labour Office.

IPCS. (2010). *WHO Human Health Risk Assessment Toolkit: Chemical Hazards.* Geneva: International Programme on Chemical Safety.

Kazan-Allen, L. (2019, July 15). *International Ban Asbestos Secretariat.* Retrieved April 6, 2020, from Current Asbestos Ban: http://www.ibasecretariat.org/alpha_ban_list.php.

Li, J., Dong, Q., Yu, K., & Liu, L. (2014). Asbestos and Asbestos Waste Management in the Asian-Pacific Region: Trends, Challenges and Solutions. *Journal of Cleaner Production*, 81, 218-226.

Loomis, D., Dement, J. M., Wolf, S. H., & Richardson, D. B. (2009). Lung Cancer Mortality and Fiber Exposures Among North Carolina Asbestos Textile Workers. *Occupational and Environmental Medicine*, 66(8), 535-542.

National Research Council (US) Committee on Nonoccupational Health Risks of *Asbestiform Fibers. (1984). Asbestiform Fibers: Nonoccupational Health Risks.* Washington, DC: National Academies Press (US). Retrieved November 12, 2020, from https://www.ncbi.nlm.nih.gov/books/NBK216753/.

Safe Work Australia. (2012, October). Asbestos-Related Disease Indicators. Canberra. Retrieved April 14, 2021, from https://www.safeworkaustralia.gov.au/system/files/documents/1702/asbestos-related-disease-indicators-2012.pdf.

Safe Work Australia. (2020). Code of Practice How to Safely Remove Asbestos.

Takahashi, K., Landrigan, P. J., & Ramazzini, C. (2016). The Global Health Dimensions of Asbestos and Asbestos-Related Diseases. *Annals of Global Health*, 82(1), 209-213.

WHO. (2003). *Asbestos in Drinking-water, Background Document for Development of WHO Guidelines for Drinking-Water Quality.* Geneva: World Health Organization (WHO). Retrieved February 12, 2021, from https://www.who.int/water_sanitation_health/water-quality/guidelines/chemicals/asbestos.pdf.

WHO. (2006). *Elimination of Asbestos-related Diseases.* Geneva: WHO. Retrieved November 11, 2020, from https://www.who.int/occupational_health/publications/asbestosrelateddiseases.pdf.

WHO. (2008). Asbestos - Hazards and Safe Practices for Cleanup After Earthquake.

WHO. (2011). National Programmes for Elimination of Asbestos-Related Diseases: Review and Assessment. Bonn: World Health Organization Regional Office for Europe.

WHO. (2014). *Chrysotile Asbestos.* Geneva: World Health Organization. Retrieved April 15, 2021, from https://www.who.int/ipcs/assessment/public_health/chrysotile_asbestos_summary.pdf.

WHO. (2014). *Chrysotile Asbestos.* Geneva: World Health Organization. Retrieved April 15, 2021, from https://www.who.int/ipcs/assessment/public_health/chrysotile_asbestos_summary.pdf.

WHO. (2020). *Asbestos in Drinking-water, Background Document for Developmetn of WHO Guidelines for Drinking-water Quality, 14 December 2020, Version for Public Review.* Geneva: World Health Organization (WHO). Retrieved February 21, 2021, from https://www.who.int/docs/default-source/wash-documents/wash-chemicals/gdwq-asbestos-background-document-for-public-review.pdf?sfvrsn=b324fee9_5.

WHO. (2020). I*nternational Programme on Chemical Safety* – Asbestos. Retrieved November 11, 2020, from https://www.who.int/ipcs/assessment/public_health/asbestos/en/.

WHO Lebanon. (2020). Asbestos - Hazards and Safe Practices for Cleanup After Beirut Blast.

WHO Regional Office for South-East Asia. (2006). Asbestos - Hazards and Safe Practice for Clear-Up After Tsunami.

World Bank. (2009). *Good Practice Note: Asbestos: Occupational and Community Health Issues.*

Good Practice Guidance for the Management and Control of Asbestos

Protecting Workplaces and Communities from Asbestos Exposure Risks

All forms of asbestos are considered carcinogenic to humans. However, around 125 million people globally are exposed to asbestos in the workplace, with an estimated 233,000 deaths every year attributed to the inhalation of airborne asbestos fibers. This publication aims to increase awareness of the health risks associated with asbestos in the workplace and provides recommendations and checklists on avoiding and managing the risks of exposure. It covers the duties of employers and contractors; training requirements; and the identification, containment, safe removal, and management of asbestos waste.

About the Asian Development Bank

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members —49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

URBAN CLIMATE CHANGE RESILIENCE TRUST FUND
Asian Development Bank

The ROCKEFELLER FOUNDATION

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Economic Affairs SECO

UKaid
from the British people

ADB

ASIAN DEVELOPMENT BANK
6 ADB Avenue, Mandaluyong City
1550 Metro Manila. Philippines
www.adb.org