



ASBESTOS HEALTH AND SAFETY REQUIREMENTS

Minimum Standards for Working with Debris Waste in Beirut

INTRODUCTION

All forms of asbestos, including chrysotile, are classified as known human carcinogens by the international Agency for Research on Cancer (IARC). Asbestos has been widely used in the construction industry in Beirut due to its low cost, heat resistant and insulating properties. The safe use of asbestos does not exist and there is no known acceptable safe exposure limit.

Asbestos is known to have been used in the construction of commercial and private buildings in Beirut, usually as roofing and rainwater pipe materials. Of the cement products tested in the Port area to date, around three quarters contained chrysotile (white asbestos), a fifth contained chrysotile and crocidolite (blue asbestos) and only around 3% did not contained any asbestos. The main asbestos containing material (ACM) present in the Port area was asbestos cement (AC), commonly used as roofing materials and wall cladding. It can be assumed that similar levels of asbestos contamination exist in the wider Beirut area.

Since the explosion on 4th August 2020, ad hoc sorting of debris resulting from damaged buildings has taken place, with some organised debris clearance continuing to take place. This continues to present a serious risk to public health resulting from the high levels of ACMs contained within debris in urban areas, some of which will continue to be broken up and therefore releasing asbestos into the air. If the unprotected handling of ACMs during the clean-up process in Beirut is not addressed as a priority, increased instances of long-term mesothelioma are likely.

The following presents a guide to international standards for handling and working around ACMs.

ASBESTOS LOCATIONS

1. Asbestos in Debris Piles

Debris from damaged and demolished buildings can be found throughout affected areas of Beirut. As well as debris spread around buildings and on public roads, temporary waste piles containing construction and demolition (C&D) waste have been created in some locations in the city, with rubble from various clearance operations having been moved to these locations. Visual inspection of general debris and these waste piles indicates the presence of asbestos, generally in the form of asbestos cement containing chrysotile and crocidolite. Due to the highly degraded nature of some of the debris and the uncontrolled segregation of asbestos waste, it is likely these waste piles are widely contaminated with asbestos.



Figure 1: asbestos containing materials within general debris

2. Asbestos in Vehicles

A number of vehicles parked under shelter or on the street in affected areas of the city were damaged to a higher or lesser degree by falling masonry and other building materials. Those vehicles have been rendered inoperable as a result of damage caused by the explosion remain stranded in the city. ACM debris from the explosion is present in the surrounding area and on these vehicles. Asbestos is also known to have been used in vehicle manufacture, particularly in the engines (in the form of gaskets or textile wraps to exhausts) and in friction products such as brake linings, in older vehicles.



Figure 2: private vehicle damage

EXPOSURE RISK

On the basis of the air monitoring results and the nature of the ACM identified during the testing in the Port area, it can be concluded that the general risk to occupants of affected areas (not disturbing or working with ACMs) from exposure to elevated fibre levels (i.e. above the clearance indicator limit) is low but non-negligible. As with the Port assessment, it can be concluded that the general wearing of PPE/RPE (Personal Protective Equipment/Respiratory Protective Equipment) is most likely to not be warranted.

However, where activity is ongoing that may disturb ACMs (such as demolition work, rubble moving operations and heavy vehicular movements over ACMs) it is safe to assume that it is likely that the exposure of operatives undertaking this work, and those in close proximity (within 20m) of this work, may exceed the clearance indicator limit (0.01f/ml) if this work is undertaken in an uncontrolled manner.

It is further assumed that close manual work with poor condition asbestos cement, if uncontrolled, has the potential to expose operatives to levels exceeding the Control Limit (0.1f/ml). Where asbestos remedial works are undertaken in a controlled manner (e.g. dust suppression, careful work) the expected fibre-levels could be reduced to below the control limit (<0.1f/ml).

The presence of crocidolite (blue) asbestos was detected within a number of the cement products in the Port area and can be assumed to also be present within the wider affected area. All types of asbestos are dangerous. However, amphiboles are known to be more hazardous to human health than serpentine fibres (chrysotile). Crocidolite is recognised as the most dangerous type of amphibole and is particularly associated with adverse health effects such as mesothelioma. While modern asbestos regulation typically place little emphasis on asbestos fibre type (i.e. exposure limits are the same regardless of fibre type), the significant presence (21% of samples contained crocidolite) of crocidolite in the Port area is noteworthy in terms of both occupational and general public health risk assessment and, while the levels outside the Port area are likely to be lower than the industrial environment of the Port, it can be assumed that these levels will still be dangerously high.

RECOMMENDATIONS

1. Debris Handling Activities

Debris clearance work has been ongoing since soon after the explosion, with little asbestos controls in place (dust suppression, waste segregation, decontamination or PPE worn by operatives) in many areas. It is recommended that activity is stopped where possible until a program of asbestos remedial work can be undertaken to allow work to continue under controlled conditions.



Access to areas with high levels of visible asbestos debris should be restricted. Where this is required (such as for survey work), access should be undertaken by trained individuals using RPE (see Appendix C, Figure 4) and taking care to minimise disturbance of ACM debris.

Debris in urban areas and in debris piles should be assumed to contain extensive asbestos contamination. These should be treated as hazardous waste. Waste should not be removed from site until an asbestos waste management plan can be put in place that allows correct handling, transportation and safe waste disposal.

Should the above measures not be feasible, given the need for the public to clear areas to allow movement or to begin the rebuilding process, it is recommended that organisations managing the clean-up and rebuilding process should aim to follow the guidelines provided in Appendix A. These guidelines should be seen as a practical approach and minimum standard for anyone involved in working with or in close proximity to potential asbestos contaminated materials. For the PPE required by untrained members of the public who plan to handle or come into close proximity to ACMs, refer to Appendix C.

2. Refurbishment of buildings

It is recommended that asbestos survey work is undertaken in all buildings that are subject to refurbishment work to identify the possible presence of ACMs that may be disturbed as part of refurbishment works. It is recommended that surveys are undertaken by competent asbestos surveyors holding recognised qualifications with experience (such as BOHS P402: Surveying and Sampling Strategies for Asbestos in Buildings).

3. Demolition Work

Where buildings have to be demolished, it is recommended that it be carried out under standard demolition protocols, that all ACMs are removed prior to demolition and waste is segregated as asbestos waste. This will allow the building to be demolished as normal and waste to be separated into construction and demolition waste that can be reused.

Where safe access for asbestos removal works cannot be undertaken (due to structural integrity), the building should be demolished using controlled techniques. Prior to this every attempt should be made to spray the ACMs with a distinctive paint colour to aid identification of the debris after demolition.

Dust suppression methods must be used to minimise release of airborne asbestos fibres. It is important that this undertaken well in advance of the demolition works to allow pre-wetting of the building fabric. Controlled dust suppression can be undertaken by water spray and misting systems. This should continue during demolition, targeted on fresh, dry surfaces uncovered during demolition.

Following building demolition, it may be possible to undertake some asbestos removal works prior to moving of waste. However, it is likely the majority of the rubble will need to be treated as asbestos contaminated hazardous waste. Alternatively, asbestos segregation can be carried out, as detailed below.

Care must be taken when loading and transporting this waste to control dust releases. Transportation should be in covered lorries.

4. Salvage and Recycling

A number of materials may be able to be salvaged and reused. In particular it is recommended that the scrap vehicles could relatively easily be decontaminated and sent for onward processing. Decontamination can be achieved by careful removal of all visible ACM debris, then cleaning of dust from exposed surfaces. Cleaning of metals and glass materials is also a relatively simple process and these can be segregated easily.

Goods and stored materials with hard surfaces can also be decontaminated and do not necessarily need to be condemned as asbestos waste. It is, however, crucial that items of significant value that are cleaned are independently inspected before being permitted to return to the market, to avoid contaminated items entering the supply chain.

5. Asbestos Waste Storage (Short-term)

Asbestos waste that has been segregated, or is too contaminated to be segregated, should be stored separately in secure, covered, labelled, containers until transportation to an appropriate site takes place. It is recommended that appropriate containers or skips are used to store known asbestos waste. These should be labelled correctly and covered and should be locked when not in use to restrict access.

Alternatively, it may be feasible to store these materials as mounds in a dedicated, secured location. However, in this case the surface should be covered in large tarpaulins or similar to minimise wind dispersion. Periodic downwind air monitoring may be prudent to confirm the absence of fibre release.

6. Asbestos Waste Storage (Long-term)

Asbestos waste requires to be stored and handled correctly until disposal at a long-term waste site. It is understood that currently there is no asbestos waste facility available in or near Beirut. When selecting a waste site, the risks of exposure to nearby residents are important factors to consider. Also, adequate controls must be put in place at the site to protect workers when handling and disposing of waste to ensure direct contact is avoided and fibre-release is minimised. Refer to Appendix B for guidance on the selection and development of a long-term asbestos disposal site.

7. Public Awareness

Due to the known level of ACM contamination and widespread nature of affected areas of Beirut, clean-up operations are not feasible in the short-term. The first step in reducing the general public's direct contact with ACMs is therefore a public awareness campaign. The campaign should be aimed at widespread coverage and provide simple and easy to understand information that describes:

- What asbestos is;
- Where it might be found and what it might look like;
- The hazards associated with direct or indirect contact with asbestos; and
- That only trained personnel with adequate protective equipment should handle asbestos containing materials.

8. Asbestos Handling

Reducing the health risks associated with handling asbestos is based on two principles:

1. Minimise the disturbance of ACMs; and
2. Minimise the extent to which people have contact with ACMs.

The situation in Beirut means that ACMs have already been disturbed and dealing with them is the reality. Once the broad scale of contamination is ascertained and a public awareness campaign launched, the steps shown in Appendix A should be used as a guide to minimising contact with asbestos.

9. Asbestos Disposal

If asbestos is not dealt with or is improperly disposed of it can cause additional health risks. ACMs mixed with debris and remaining in the urban environment can be attractive to children or scavengers, who are not aware of the risks.

Asbestos waste should not be disposed of with other wastes. It should be enclosed in a sealable container and disposed of at dedicated asbestos disposal facilities. As it is understood that dedicated facilities are unavailable at this time, asbestos waste should be sealed in triple lined bags, disposed of at a secured waste site and kept separate from other types of waste. While work with the local government to identify a suitable and safe site is ongoing, a record should be kept of the location of all disposed asbestos. See 'Asbestos Handling and Disposal Guidelines International Best Practice' for more detailed information.

10. Asbestos Awareness Training

Training should be made mandatory for anyone working directly with asbestos or ACMs and are therefore liable to be exposed to asbestos fibres, including those involved in building demolition, debris clean-up, transport and disposal. Asbestos awareness training should be designed around the activities to be undertaken and should include:

- The legal position concerning work with and disposal of asbestos waste;
- Procedures people should take to protect themselves;
- What control measures are required;
- What equipment people need to do the job properly;
- How to choose, use and look after personal protective equipment (PPE), including respiratory protective equipment (RPE);
- Decontamination of yourself, work equipment and work areas (see Appendix D);
- Waste handling and waste disposal;
- Emergency procedures.

Supervisors of clean-up and disposal work should be trained at an appropriate level to help those at risk of asbestos fibre exposure carry out their work safely.

Those working in asbestos waste clean-up require a lower level of training, based on raising awareness of safe working procedures. Such training should take the form of on-site discussions and could be delivered in a short briefing ahead of work starting. Such training should be repeated periodically for those working with asbestos clean-up over a number of weeks.

Supervisors should monitor worker compliance periodically to ensure adherence to practical rules and prevent slippage over time. New workers should be provided with a briefing prior to starting work.

DECONTAMINATION

Anyone working with asbestos materials will need to self-decontaminate to prevent further spread of asbestos fibres (see Appendix D for details).

A. KEY POINTS FOR THE SAFE HANDLING OF ASBESTOS

SAFE HANDLING OF ASBESTOS¹



1. PROVIDE PROTECTIVE EQUIPMENT AND TRAINING

- As a minimum, provide workers with gloves, goggles, disposable clothing or replacement clothing, adequate footwear and disposable masks (see Appendix C for specifications)
- Dispose of contaminated clothing and protective equipment in the same way as other asbestos-containing materials (ACMs)
- Provide washing facilities for workers and training to all involved if possible, or work supervisors as a minimum



2. IF POSSIBLE, DO NOT DISTURB IT, BREAK IT OR CUT IT

This can release asbestos dust which contains hazardous fibres



3. DO NOT BURN IT

Never burn suspected ACMs as this releases dangerous fibres into the air



4. WET IT

- If it is necessary to move, saw or break up the materials, keep them thoroughly wet to reduce the amount of airborne fibres
- Work only in well-ventilated areas
- Take particular care with friable materials
- Clean any contaminated surfaces by wetting the area or using damp cloths. Never dust or sweep as this propels fibres into the air



5. COVER IT

- When disposing of it, keep piles of ACMs covered with plastic sheets until they can be disposed of
- Always wet the materials before moving



6. WRAP IT UP

- Store asbestos-containing waste in sealable containers until it can be disposed of safely
- Use metal or plastic drums or strong polyethylene bags
- If using bags put one bag inside another and seal with strong tape
- Label the containers in the local language(s) and include a hazard warning before disposal

¹ A Brief Guide to Asbestos in Emergencies: Safe Handling and Breaking the Cycle, Proact & Shelter Centre

B. DEDICATED ASBESTOS DISPOSAL SITE SELECTION AND DEVELOPMENT

ASBESTOS SITE SELECTION AND DEVELOPMENT²



1. Site

In collaboration with the local government, locate a site where adequate cover material is available, access is good and controllable and where the waste cannot be exposed by water or wind erosion, slope failure, further disasters or re-excavation



2. VEHICLES

Clearly label vehicles transporting asbestos waste and ensure they are operated by trained personnel



3. EMISSION PROTECTION

During and after the disposal of asbestos waste, make sure no visible emissions occur and cover waste with at least 15cm of compacted non-asbestos-containing material within 24 hours of disposal



4. BARRIERS

If no natural barriers exist around the site to deter access, install fencing, trenches or other barriers to prevent unauthorised access to the designated area



5. WARNING SIGNS

Post warning signs at the entrance of the site and around the perimeter



6. CLOSURE

Final closure of an area containing asbestos waste requires at least an additional 75cm of compacted non-asbestos material to provide a 1m final cover. This must be done within 90 days of the last deposition

² A Brief Guide to Asbestos in Emergencies: Safe Handling and Breaking the Cycle, Proact & Shelter Centre

C. PPE REQUIREMENTS WHEN COMING INTO CONTACT WITH ASBESTOS CONTAINING MATERIALS

Personal protective clothing and equipment is an essential line of defence for minimising the risks presented by contact with asbestos when elimination and isolation of the hazard is not practicable. It is essential that workers receive prior training on the use of personal protective equipment.

WHAT IS PERSONAL PROTECTIVE EQUIPMENT (PPE)?

PPE is clothing or equipment which provides protection to the user from a potential hazard.

WHAT PPE MUST BE WORN WHEN ASBESTOS IS OR MAY BE PRESENT?

If asbestos or asbestos containing materials are present, or there is a possibility of presence, the following should be worn:

- **Respiratory Protective Equipment (RPE)** should be used by those designated to handle asbestos whenever practicable – to avoid inhaling asbestos fibres
- **Overalls** disposable, to avoid the risk of carrying asbestos fibres away from the worksite on clothing
- **Footwear** – appropriate for the work being undertaken (see next page for details).

WHAT PPE IS REQUIRED

Although controls must be in place to prevent or reduce exposure to asbestos fibres when working with ACMs (see Appendix A), when exposure cannot be avoided the last line of defence against dangerous exposure is the use of appropriate PPE. The following details the levels of PPE recommended for work with asbestos materials, from that which provides the best protection to the minimum standard required.



Figure 1: Full face covering

Respiratory Protective Equipment

For long periods of continuous use in demolition related works, effort must be made to use the highest level of mask available and practical in the circumstances. Figure 1 shows the type of mask, covering the whole face, which should be used by those working significant amounts of time with or in close proximity to ACMs. Full face masks should conform to BS EN 136 standard with P3 filter and should be used by licensed operators.



Figure 2: Reusable face covering

If a full-face mask is not available to those needing to clear debris containing or potentially containing ACM, then a face mask covering nose and mouth should be used. Figure 2 shows a reusable mask (applicable standard EN140 with P3 filter), covering nose and mouth, which would be suitable for those working for regular periods in debris clearance.



Figure 3: Basic disposable face covering

Figure 3 shows the minimum standard face mask that must be used by anyone working with or near ACMs if higher level masks are not available. This equipment should be suitable for most short-duration non-licensed work, especially for open-air debris removal and disposal activities.

The mask used should be of FFP3 or FMP3 standard and should be used at all times when in close proximity to ACMs. When using FFP3 (applicable standard BS EN 1827) or FMP3 (applicable standard BS EN 149) masks, these should be properly disposed of at the end of each day and a new mask worn the following working day.



Figure 4: Safety goggles

Safety Goggles

Should one of the masks shown in Figure 3 or Figure 6 be used, then it is recommended that safety goggles are used, meeting BS EN 166 standard) as shown in Figure 4.



Figure 5: Wellington boots

Footwear

Appropriate footwear is an important part of the PPE required when working with asbestos contaminated debris. It is recommended that Wellington Boots designed specifically for this purpose be worn by everyone involved in this work. Wellingtons should be EN ISO 20345:2011 compliant, to provide solid sole protection from penetration and steel toecaps. An example of this footwear is shown in Figure 5.

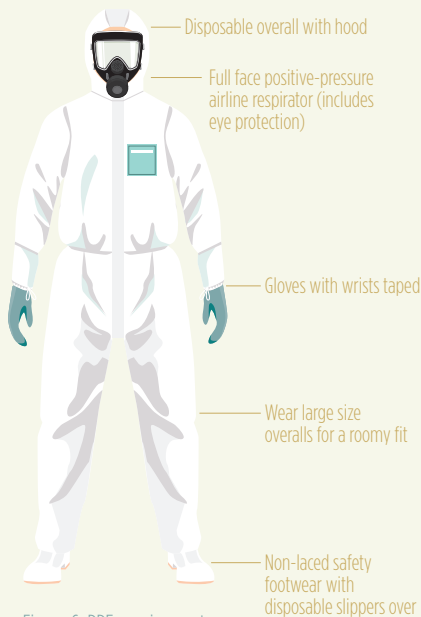


Figure 6: PPE requirements when working with asbestos

Full RPE for High Risk Work

Figure 6 shows the necessary full PPE required when working to clear ACMs. This is the level of PPE necessary for trained people spending significant amounts of time working to separate and dispose of ACMs who will therefore have a high level of exposure to asbestos over a sustained period. Disposable overalls should be Type 5/6 (relevant standard BS EN ISO 13982+A1). Gloves should be Type 5/6 single use and be appropriately disposed of at the end of each day. Footwear should be solid sole, ankle high wherever possible. Wellington boots (see Figure 5) or non-laced pull-on footwear is preferable as these are easier to clean. Disposable overshoes should be used if non-laced footwear is not available. Disposable overalls, gloves and overshoes should be treated as hazardous and disposed of with other asbestos waste.

D. PERSONAL DECONTAMINATION

It is important that everyone working with or near asbestos materials ensures they are fully decontaminated before leaving the workplace. This will help alleviate the possibility of taking asbestos fibres home on clothing and exposing family and friends.

The following procedure should be followed by each person working at on debris clearance involving asbestos materials.

PROCEDURE



Damp Rag



Asbestos Waste Bag

- Clean boots with damp rags
- Use damp rags in a gentle 'patting' action on overalls (rubbing can disturb fibres)
- Where there are two workers, they can help to clean each other
- Peel off disposable overalls. They should be inside-out when they have been removed. Put the overalls in a suitable asbestos waste bag (UN-approved Class 9 plastic bag)
- Remove RPE last. If using disposable face covering, place these in the asbestos waste bag. For non-disposable RPE, clean after use and store in safe place away from contamination
- Tape the waste bag securely closed and dispose of with hazardous waste

REFERENCES

1. UK HSE EM2: Asbestos information, instruction and training
2. UK HSE EM6: Personal Protective Equipment (including RPE)
3. UK HSE EM7: Using damp rags to clean surfaces of minor asbestos contamination
4. UK HSE EM8: Personal decontamination
5. UK HSE EM9: Disposal of asbestos waste