

Miyamoto International

Pragmatic Guidance for Emergency Repairs of Structures That May Contain Asbestos in Ukraine

March 2023

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EXECUTIVE SUMMARY

The Law of Ukraine that prohibits the use of asbestos will come into force in October 2023. Meanwhile, Asbestos Containing Materials (ACM) products are extremely common, as Ukraine has been one of the largest consumers after the separation from the Soviet Union and prior to 1991 as a part of the Soviet Union. Due to the current active conflict, the public and workers are at tremendous health risk, as the asbestos contained in the damaged built environment poses a lethal threat.

This manual is designed to provide practical advice to the Ukrainian construction actors that are exposed to ACM. The targeted stakeholders are practitioners, trades people and the public that encounter asbestos during the buildings' repair activities. The scope is to minimize health risk during asbestos removal procedures and propose mitigation strategies pursuable in war circumstances.

We herein focus on non-friable asbestos, which represents the majority of asbestos found in Ukraine (e.g. fiber reinforced cement roof sheeting and pipes). Indications on how to seal in place friable asbestos are also outlined, as the strictest measures necessary to deal with the loose form of asbestos are beyond the scope of this manual. When encapsulated in another material, asbestos fibers are less dangerous. Hence, the first recommendation is to avoid doing anything that affects the integrity of the ACM and releases fibers in the air. Health risks commonly result from the inhalation of asbestos fibers mostly among workers who are directly exposed from handling ACM and, less frequently, among those who are exposed to environmental contamination. The latter includes households where asbestos fibers are brought home as contaminants of clothes or on body surfaces of workers who are heavily exposed.

The first layer of defense is to minimize the release of contaminated fibers in the air through constant water misting of the ACM. The second layer of defense is adequate PPE: various options are herein presented in function of the local availability.

These guidelines are rooted in the current context in Ukraine, which poses considerable challenges. The active conflict affects the work on the field, the availability of adequate Personal Protection Equipment (PPE) and tools, the procurement of specialized asbestos removal companies, and the creation of compliant and authorized asbestos landfill sites. The goal is to support the local communities in the reconstruction, raising the awareness on the seriousness of asbestos-related diseases and presenting viable and potentially life-saving practices.



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INTRODUCTION

Definition of asbestos and why it is dangerous

Asbestos is a naturally-occurring mineral fiber that comes in different forms: chrysotile (white asbestos), amosite (brown asbestos), crocidolite (blue asbestos), anthophyllite, actinolite and tremolite. All are equally dangerous. Its high tensile strength, flexibility, fire resistance, durability, and utility as chemical, thermal and acoustical insulation made it a widely utilized construction material. All types of asbestos have been classified as Group 1 carcinogen with sufficient evidence in humans by the International Agency for Research on Cancer (this category is used for substances for which there is convincing evidence that they cause cancer in humans)¹.

The danger of asbestos fibers lessens when they are encapsulated in cement or glue. However, when its integrity is altered (e.g. the item that contains asbestos is cut, drilled, crushed or broken), asbestos fibers are released into the air or water in dimensions that can be thinner than 1/700 of a human hair. The inhalation of asbestos can cause asbestos-related diseases (ARDs) which include mesothelioma of the pleura, peritoneum and pericardium, cancer of the lungs, bronchi, larynx and ovary, as well as asbestosis (i.e., fibrosis of lungs). Most ARDs are lethal.

A person who is in contact with asbestos is at risk of developing ARDs primarily via the inhalation of asbestos fibers due to:

1. Occupational exposure: it occurs among workers who directly handle raw asbestos, ACM, waste and rubble that contain asbestos.
2. Environmental exposure: it occurs among workers or people who do not directly handle asbestos, ACM or asbestos-containing waste and rubble. They are indirectly exposed to asbestos via being in or near the working, natural or residential environment that is contaminated with asbestos.
3. Household exposure: it occurs among family members who are exposed to asbestos fibers which often are brought home as contaminants of clothes or body surfaces of workers who are heavily exposed.

Asbestos was commonly used for ceilings, wall sheets, thermal, electrical and acoustical insulation, panels and fabric (see Figure 1), pipes (see Figure 2), brake pads, gaskets and more, although the most frequent use is for roofing (see Figure 3). It was also sprayed on structural steels. The latter is the most dangerous case because of its free or loose form which can easily release fiber into the surrounding air and expose workers to high concentrations of asbestos.

Asbestos can be subdivided into two categories:

1. Friable: typically crumbly in texture and can be crushed by hand.
 - a. Loose fluff asbestos for walls and ceilings insulation
 - b. Lagging on pipes
 - c. Insulation for boilers, heaters and ovens
 - d. Sprayed on structural steel

¹ https://monographs.iarc.who.int/wp-content/uploads/2018/07/QA_ENG.pdf

2. Non-friable: typically bounded in other materials.

- a. Fiber reinforced cement sheeting: standard corrugated roofing sheets, super 66 corrugated sheets (larger), fake slate roofing, flat cement sheeting used in wet areas such as bathrooms and eave's lining
- b. Fiber reinforced concrete pipes, gutters, downpipes and drains

We hereby focus only on non-friable elements and contaminated rubble, which also are the most common in Ukraine. Brake pads, clutch linings, reinforced glues such as for PVC or tanking membranes are also excluded. Until clear national procedures are established, any friable asbestos containing material or contaminated item not covered herein should be damped down, gently sprayed with PVA glue and sealed in place with clear signs that identify the need for future removal.

It is also noted that when buildings collapse or are damaged, if asbestos is present, its fibers are freed and released into the air. As a result, the surrounding environment (air, soil and water included) becomes an extremely dangerous hazard for the local population and the humanitarian workers assisting the affected communities.



Figure 1 – Left: Hercules manufactured commercial grade asbestos cloth containing at least 75% asbestos². Right: pipes insulation containing asbestos³. Friable.



Figure 2 – Asbestos cement pipes (notice the wall thickness in comparison with the size of the mobile phone)⁴. Non-friable.

² <https://www.asbestos.com/products/textile-cloths-garments/> (The Mesothelioma Center)

³ <https://www.asbestos.com/products/insulation/> (The Mesothelioma Center)

⁴ Rehabilitation of asbestos cement water mains for potable water in the Czech Republic, Coufal M. et al., 14th SGEM GeoConference on Energy and Clean Technologies, 2014. DOI: 10.5593/SGEM2014/B31/S12.075



Figure 3 – Asbestos reinforced corrugated roofing sheets (Ukraine, 2022). Non-friable.

Asbestos in Ukraine

During its time under the Soviet Union, Ukraine was a major consumer of asbestos. Even after the recognition by the international community that asbestos poses a serious risk to health, Ukraine did not interrupt its commerce and use. The reasons are connected to the complex political and commercial relationship with Russia, as Kazakhstan and Russia have recently been producing about 65% of the global asbestos and a change of laws in Ukraine would have caused a reduction of Russian export⁵. In 2005, Ukraine used 183,000 tons of raw asbestos⁶ (distinct from asbestos in ACM). Cumulatively Ukraine consumed 1.4 million tons of raw asbestos since 1980⁷ placing the country as one of the highest consumer countries in recent years. In 2011, both Ukraine and Russia prevented the inclusion of chrysotile asbestos in the list of banned hazardous materials (Rotterdam Convention)⁸. It has been estimated that up to 60% of roofs are in asbestos-reinforced slate⁹; 75-85% is in cement production (e.g. corrugated or flat slates, pipes), 10-15% is in technical production (e.g. brake pads, linings, cardboard, cloth) and <5% heat insulating materials¹⁰. For the purpose of this manual and considering the most recurring damage observed so far, particular attention is paid to ACM in roofing and pipes insulation.

⁵ <https://www.wecf.org/milestone-achievement-asbestos-banned-in-ukraine/>

⁶ <http://www.ibasecretariat.org/lka-asbestos-update-ukraine-2022.php>

⁷ Chimed-Ochir O et al. Burden of mesothelioma deaths by national income category: current status and future implications. *Int J Environ Res Public Health* 2020, 17, 6900; <https://doi.org/10.3390/ijerph17186900>

⁸ <https://www.reuters.com/article/un-chemicals/canada-others-block-asbestos-from-un-hazardous-list-idUKLDE75N12320110624>

⁹ <https://blog.liga.net/user/koryvoruchkina/article/44864>

¹⁰ Asbestos Waste Management Protocol for UNDP Contractors and Partners V4, November 2022

European Union (EU) and Ukraine Standards

Asbestos is banned from use in the EU since 2005. Only in 2012 Ukraine issued the Order of Ministry of Health no. 762: *State Sanitary Norms and Regulations on the safety and protection of workers from the harmful effects of asbestos and asbestos-containing materials*. According to this document the new use of asbestos is prohibited; however, in 2017, it was replaced by the order no. 339: *On the safety and protection of workers from the harmful effects of asbestos and materials and products containing asbestos*¹¹, and then canceled¹². The Law of Ukraine no. 2573-IX, issued in September 2022 and effective from October 2023, reestablish a norm on asbestos management and aims to protect further builders and residents from the harmful effects of all types of asbestos¹³. Security and protective measures are outlined also in the law no. 474, issued in April 2022, that address the procedures for dismantling facilities and the law no. 1073, issued in September 2022, that address the procedures for handling waste generated by buildings damage. The law no. 473, issued in April 2022, describes the procedures for carrying out urgent work in response to Russian aggression. The law no.656, issued in August 2018, addresses the transportation of dangerous cargos and always applies.

¹¹ <https://zakon.rada.gov.ua/laws/show/z0702-17#Text>

¹² <https://zakon.rada.gov.ua/laws/show/v2859323-17#Text>

¹³ <https://zakon.rada.gov.ua/laws/show/2573-ix#Text>

KEY SAFETY STEPS

In case adequate testing resources are not available, any suspicious element should be treated as ACM. In order to mitigate the three main exposure types outlined in the introduction (i.e. occupational, environmental and household), the following key messages are critical.

For the general public

1. Stay away from ACM or any suspicious item, as much as possible.
2. Do not break it, cut it, drill it or disturb it, in order to avoid the release of fibers in the air. Most asbestos in Ukraine is in cement sheeting as reinforcing; it is less dangerous when encapsulated.
3. Where possible, cover it or seal it in place.
4. Get professional help, if available.
5. If ACM has to be handled, minimize dust keeping it damp at all times.
6. Use adequate PPE to cover the entire body (see following section for details).

For workers

Number one risk is caused by inhalation of asbestos fibers among workers. Therefore, the first layer of defense that should be ensured at all times is that ACM are damp.

1. Always keep ACM damp.

Regularly and gently spray the surfaces with water, or a 1:10 polyvinyl acetate emulsion (PVA), to always keep the asbestos containing material damp. A wetting agent (surfactant or detergent) may be added to facilitate a more rapid wetting.

The water pressure should be low and constant, in the form of a fine spray or mist, to prevent the generation of respirable dust. A garden hose fitted with a pistol grip can be used. The entire surface should be saturated and water run-off should be minimized. Do it before any material movement and immediately after to spray the area previously covered by the removed material.

2. Do not break it, cut it, drill it or do anything to release fibers in the air.

If it is strictly necessary to cut ACM, use low-speed, low-rotation tools. Do not use high-pressure water sprays, compressed air, high-speed abrasive power and pneumatic tools (e.g. sanders, saws, drills).

3. Use adequate PPE.

Once fibers are released in the air, the crucial, layer of protection is adequate PPE. It can be disposable or washable. If it is re-used, the PPE should be inspected every 7 days. All areas of the body should be covered.

- a) Mask: the most suitable equipment for the majority of asbestos removal operations is the power assisted respirator with a full-face mask (EN12942 class TM3). In the current context of Ukraine this may not always be possible, so the minimum should be to use a disposable mask with adequate filters (FFP3 as per EN149) or a respirator (compliant with EN140 and

- fitted with P3 filters). Beards can pose a risk for the adequate fitting of the mask. Disposable respiratory protective equipment should be disposed of as per ACM.
- a. Examples of disposable masks available in Ukraine are: respirator ШБ-1 «Пелюстка - 200» (“Petal-200”), ШБ-1 «Пелюстка -40» (“Petal-40”) and ШБ-1 «Пелюстка -5» (“Petal-5”), in decreasing order of protection.
 - b. Examples of reusable masks are: respirator «АСТРА -2» (“Astra -2”) and respirator «Ф-62Ш», in decreasing order of protection.
- b) Goggles: to cover as much as possible the exposed skin, use goggles that must be thoroughly washed after every use.
 - c) Gloves: use single-use disposable nitrile gloves. If latex gloves are used, powder free gloves are preferred. Re-usable plastic gloves can be used; however, they must be thoroughly washed. When leaving the asbestos removal area, hands and fingernails should be accurately washed.
 - d) Clothes: wear disposable or easily washable clothes that do not allow fibers to lodge in. Possibly a coverall with hood and cuffs (EN ISO 13982-1, type 5, category 3) or disposable hazmat outfits that prevent the penetration of asbestos fibers. The coverall should be large enough to prevent ripping at the seams and it should be disposed of as asbestos waste after a single use. Alternatively, it must be meticulously washed and decontaminated. Considering the current war context in Ukraine, a pragmatic solution can be plastic raincoats or normal clothes covered by plastic over trousers and jackets for motorbikes. The material should be plastic to avoid fibers penetration, pockets and Velcro fastenings should be avoided. They must be disposed of after a single-use or thoroughly washed.
 - e) Footwear: plastic gum boots, that can be easily washed, are a practical solution. Safety footwear, such as steel-capped or rubber-soled work shoes, can be used, possibly avoiding laces and eyelets that are difficult to clean. Disposable overshoes are not suggested as not particularly effective. Store the shoes upside-down to minimize asbestos contamination inside the footwear.
4. Pack the material in minimum two layers of 0.2mm thick polythene sheeting or a glove bag. Only fill bags half full to minimize the risk of splitting. The ACM should be kept damp at all times, until it is sealed in the plastic cover. Label the bags with “*Danger! Asbestos*”, “*Avoid creating dust*” and “*Cancer and lung disease hazard*” may also be added in the local language.
 5. Transport ACM in a covered truck.
 6. Dispose of ACM burying it. Create a solid base in concrete, asphalt or compacted soil, covered by a 1.5mm geomembrane layer and by a 0.5m soil layer. Allow a minimum of 1m of soil on top of it the ACM. Install proper signs on the surface to inform of the risk. A safe burying site should be agreed with the local authorities. It is recommended to be 2km from water (e.g. ponds, rivers, or water fund facilities) and 0.2 km from agricultural land.
 7. Report to the local authorities: <https://e-construction.gov.ua/>, <https://zakon.rada.gov.ua/laws/show/1073-2022-%D0%BF#n102>, <https://zakon.rada.gov.ua/laws/show/474-2022-%D0%BF#n86>
 8. Decontamination occurs when the work is complete and before leaving the working area. A decontamination area, purposely created outside the removal working area, can also be used. Firstly, all the working tools (e.g. hammer, plier, ladder) should be meticulously washed. If they cannot be successfully decontaminated, they must be processed as asbestos waste. Secondly, the disposable contaminated PPE must be wet, sealed and managed as necessary for ACM waste.

Non-disposable PPE must be accurately laundered and the PPE herein described should be worn during the process. Non-disposable PPE should be made of plastic or a similar material so that fibers do not lodge in and can be removed by running water. Do not use a washing machine: the basket may get contaminated and asbestos fibers may become airborne. Do not burn the PPE, asbestos fibers are not destroyed by fire and become breathable smoke. Workers must shower and carefully wash every exposed surface, in order to remove the dust and avoid cross-contamination. Enclosed spaces are more dangerous. Remove as many objects as possible to limit contamination before any work occurs. Use a vacuum cleaner with a high efficiency particulate air (HEPA) filter and H-class dust collection devices to clean the surroundings when the works are complete.

Notes on asbestos sheeting

The most frequent type of asbestos in Ukraine is asbestos sheeting. In order to identify it:

- Nail heads do not embed into asbestos fiber reinforced sheeting, because it's a rock and cannot be compressed, while they do embed into cellulose reinforced sheeting. Exposed flat nail heads or screws with cup washers may facilitate the identification of asbestos sheeting.
- Asbestos sheeting is commonly made by mixing a wet mixture that is poured into a mold with a sieve base to dry in. If sieve marks can be seen on the back of the sheets, it may be ACM.

As per the Ukrainian legislation that will come into force in October 2023 and EU Standards, asbestos cement roof sheets must be replaced, not repaired, and ACM material is not usable at any time. Ideally, all asbestos containing roofing should be replaced, not just the damaged portion. As a temporary measure, only a few sheets can be replaced with asbestos-free material.

In the context of the humanitarian crisis in Ukraine, where there may be uncertainty if the sheeting contains or not asbestos, and trained and licensed professional may not be available, the following steps should be taken:

- Individual broken sheets should be removed and replaced with new asbestos-free sheeting. "*Asbestos free*" should be clearly written on their underside. New sheeting should have a certificate of compliance.
- When removing sheets every care should be taken not to further break damaged sheets.
- Appropriate PPE should be used, as described in the previous section.
- Damaged sheets and surrounding roof should always be kept damp through gentle misting.
- Nails holding down damaged sheets should be gently punched through, while being misted, and then sheets gently slid out of place.
- Remaining nails should then be removed, while keeping the working area damp, and disposed of with sheeting.
- Removed sheets should be kept damp, wrapped in plastic and sealed.
- Sealed sheets should then be transported in a covered truck to an agreed disposal site, and then gently lowered into a prepared hole and buried.

GRAPHIC MANUAL

Stay away from rubbles and do not disturb, if not really necessary



Get professional help whenever possible



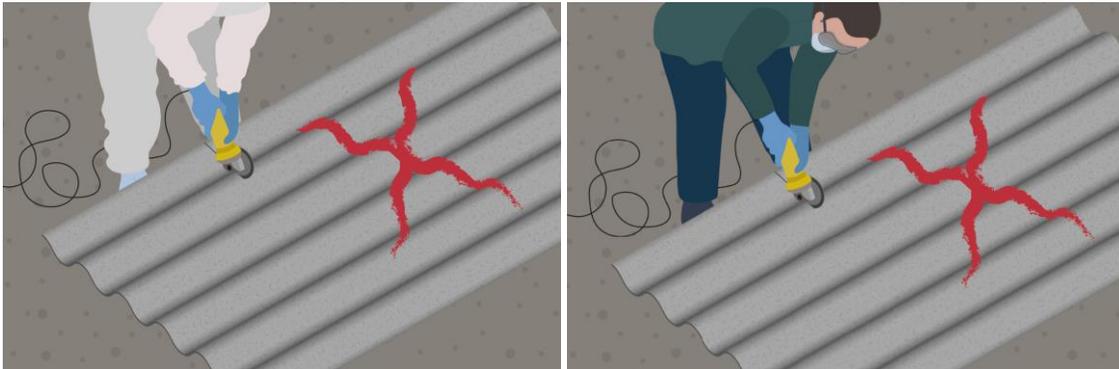
Use correct Personal Protective Equipment (PPE) and safety procedures¹⁴



See page 10, section 3 and 8.

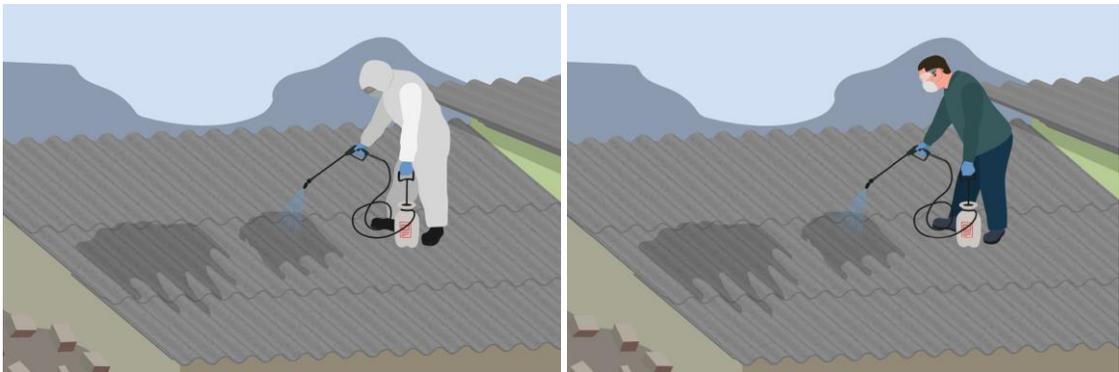
¹⁴ The full specification version on the left-hand side is the preferred standard under conventional conditions.

Do not cut it, drill it, break it or do anything that release fibers in the air ¹⁵



See page 10, section 2.

Keep it gently damp to reduce dust ¹⁵



See page 9, section 1.

Cover or seal it whenever possible ¹⁵



See page 11, section 4.

¹⁵ The full specification version on the left-hand side is the preferred standard under conventional conditions.

Transport safely (damp, covered or sealed)



See page 11, section 5.

Dispose of it burying in a well-marked safe place



See page 11, section 6 and 7.

Don't re-sell it, re-use it or buy more



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Resolution of the Cabinet of Ministers of Ukraine no. 474, dated 19/04/2022.

Resolution of the Cabinet of Ministers of Ukraine no. 473, dated 19/04/2022.

Resolution of the Cabinet of Ministers of Ukraine no. 1073, dated 27/09/2022.

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DISCLAIMER

This manual has been developed by Miyamoto International to assist the construction stakeholders and members of the public in the repair of the built environment damaged by the current active conflict in Ukraine. Under these special circumstances, the available resources may be limited and conditions on the field dangerously unpredictable. Miyamoto International accept no responsibility for any loss or damage caused by the use of this manual or for inaccurate or incomplete information.

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save lives, impact economies