



European
Commission

PRACTICAL GUIDELINES
FOR THE INFORMATION AND TRAINING OF WORKERS
INVOLVED WITH ASBESTOS REMOVAL OR MAINTENANCE WORK

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INVOLVED WITH ASBESTOS REMOVAL OR MAINTENANCE WORK

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Foreword

Asbestos is a highly dangerous carcinogenic agent. Airborne fibres are very resistant when inhaled and can lead to asbestosis, lung cancer or cancer of the pleura¹.

Asbestos was used worldwide in building and other materials in many areas of our daily life. Since 2005, the use of asbestos is prohibited in Europe². It must be our long-term strategic target to remove and safely dispose of all asbestos products at the workplace and in the public or private environment. However, the removal of asbestos products can only lead to improved living and working conditions if carried out without causing additional risks to the individuals involved and the environment due to the release of asbestos fibres. It is therefore essential that this type of work is conducted by employees who have received the corresponding training and can draw on the necessary experience in this field of work to ensure their own safety, that of third parties and the protection of the environment.

In the short to medium term however, safety measures will be required in individual cases to prevent the release of fibres and the resulting environmental threats.

The manifold use of the mineral asbestos leads to a large number of employees, in particular in the building sector, being regularly exposed to asbestos-containing materials, i.e. exposed to a major risk. The consequence: in Europe, asbestos-related diseases lead to thousands of deaths each year and the number of the cases is rising.

One important goal of the European Union, in supporting its Member States in their effort to create more and better jobs, is improvement of the working conditions and the working environment regarding safety and health issues. Due to the existing risk, the aim should be to improve the protection of employees from exposure to the hazardous substance asbestos. It should be taken into consideration that the risks related to the handling of asbestos products are dealt with differently and also the prevention culture in the individual Member States of the European Union is quite different.

One instrument to achieve this aim would be **consistent Europe-wide guidelines** for the training of employees in dealing with asbestos.

The guidelines presented here are based on the evaluation of the existing regulations in selected Member States of the European Union and Turkey. The target groups of these guidelines are employees and employers of companies focusing on the removal of asbestos products as well as other firms that come into random contact with asbestos-containing, mostly building, materials.

¹ The studies of the carcinogenic effect of asbestos exposure show that occupational exposure to chrysolite, amosite and anthophyllite asbestos and to mixtures containing crocidolite results in an increased risk of lung cancer, as does exposure to minerals containing tremolite and actinolite and to tremolitic material mixed with anthophyllite and small amounts of chrysolite. "IARC Monographs, Supp. 7"

² The European Union's Directive 1999/77/EC bans the placing on the market and use of products containing asbestos with effect from 2005. And the Directive 2009/148/EC prohibits all activities in which workers are exposed to asbestos fibres in asbestos extraction or production/processing of asbestos products.

The aim of these guidelines is to raise awareness among employees and employers to the risks related to the handling of asbestos-containing products in their daily working environments and to motivate them to take preventive action to protect themselves and the environment from the risk related to asbestos fibres.

The first part of the guidelines (chapter 1 to 3) covers in detail the fundamentals, the health risks related to asbestos and the use of asbestos. The aim of these chapters is to create an understanding of the extent of the risk caused by this carcinogenic hazardous substance. The aim is to equip employees and employers with the knowledge necessary to evaluate possible asbestos risk at the workplaces they are working at or in charge of. This is the basis for ensuing concrete measures that support the planning, preparation and execution of removal work on asbestos-containing materials.

These guidelines were conceived as collection of recommendations to ensure the safety of workers and the environment when dealing with asbestos-containing products. They focus on the EU Directives and do not consider the domestic laws and regulations of the different Member States. The chapter 9 of these guidelines contains Best Practice examples from various Member States.

The guidelines can be used for training and informing of employees and other persons having or wanting to address this issue. They are accompanied by a presentation and hand-out material to be used in training courses and briefing instructions. This material is aimed to raise awareness of the risks posed by asbestos and does not replace the training for workers dealing with asbestos that is required by the national regulations. The practical training for workers has the foremost importance as it promotes safe handling of asbestos.

1 Asbestos

Asbestos is a naturally occurring silicate mineral with a fibrous structure. The term 'asbestos' is a collective name for a range of rocks made of fibrous crystals. There are two types of this mineral, the so-called 'serpentine' and the 'amphiboles'. Chrysotile, the so-called white asbestos, is the most frequently occurring serpentine. Amphiboles are subdivided into a number of forms, including crocidolite, also referred to as blue asbestos, amosite, the so-called brown asbestos and anthophyllite, the least important asbestos type in terms of product processing. With more than 90 % (globally), chrysotile made up the largest portion of asbestos used in production, mainly serving as an additive or admixture but also manufactured into mats and ropes. Crocidolite has a share of approx. 5 % and was predominantly used as sprayed asbestos and in high-temperature lagging. In contrast, amosite amounts to less than 2 %.

Asbestos-containing rocks are predominantly mined and then separated and milled in special facilities. The material is fragmented into fibres and then further processed. It is e.g. spun into mats or ropes or used to produce asbestos cement products or sprayed asbestos. Russia, China, Kazakhstan, Canada and Brazil are the main producers of asbestos. In the mid and late 1970s, the worldwide annual production amounted to five million tons. Even in 2000, the production still added up to two million tons.

The word "asbestos" is of Greek origin "ἀσβεστος" meaning "imperishable", "inextinguishable". This characterises the material's outstanding chemical and physical properties, such as:

- resistance to heat and corrosion, high melting point of more than 1200 °C;
- resistance to acids (crocidolite) and bases (chrysotile);
- resistance to decomposition, barely electroconductive;
- high elasticity and tensile strength;
- high resistance to ageing.

Yet if the respirable fibre dust is inhaled, these properties can also cause considerable damage to one's health. These negative properties also have an impact on the processing of asbestos waste in terms of environmental protection.

Asbestos products can be subdivided into:

- weakly-bound forms (such as sprayed asbestos, mats, ropes, cardboard) - low density. These products possess a high concentration of asbestos and low binder content.
- and strongly-bound forms (particularly asbestos cement) - high density. Binder content is high and the concentration of asbestos generally amounts to less than 20%.

Due to their respirability, the World Health Organisation (WHO) defined all fibres with the following geometrical dimensions as hazardous respirable fibres: length $L > 5 \mu\text{m}$, width $W < 3 \mu\text{m}$, L/W ratio $> 3:1$ ($1 \mu\text{m} = 1/1000 \text{ mm}$).

2 Risks to Health from Asbestos

Introduction

The catastrophic effects of asbestos fibres released into the air we breathe have made this dangerous substance the number one cause of death among occupational diseases in Europe³. Sources speak of "up to 500,000 asbestos deaths in Europe"⁴. Yet, even today in many countries the broader public is hardly aware of the health risks caused by asbestos fibres.

The "Dresden Declaration on the Protection of Workers against Asbestos" of the European Asbestos Conference 2003, called for a worldwide ban of asbestos. In relation to the manufacture and use of asbestos products, this aim has been achieved in all Member States. However, in the second half of the last century the use of the various types of asbestos was almost without limit due to its outstanding insulation properties and its great mechanical stability. Therefore, for many years to come exposure to asbestos fibre dust will remain an often incalculable risk during the renovation or removal of such asbestos-containing products.

Thus, there remains a latent risk not only for the general population but also for the environment, in particular through erosion and weathering of asbestos-cement-containing building materials. In the different Member States a range of approaches can be found: from asbestos management, to active removal. For years to come, enormous economic effort is required to systematically remove and safely dispose of products in those places where critical release of fibres is to be expected and poses a severe threat to the health of workers and the population⁵.

The problem of latency

When assessing the effects of asbestos on health, it must be borne in mind that both "benign" and malignant diseases occur with a considerable delay after the asbestos exposure. There are practically no acute symptoms of disease which are recognisable within months, and those that exist are extremely rare. As a rule it is not until many years, and mostly decades, after the initial exposure that complaints or diagnosable changes manifest themselves. This is called the latency, or latency period.

The scientific evaluation of the latency periods for asbestos-caused lung cancer and asbestos-caused tumours of the pleura and the peritoneum (mesothelioma) has confirmed an average time of approximately 35 to 36 years.⁶ Deaths resulting from lung asbestosis likewise exhibit latency periods of a mean of 35.4 years.⁷ Once

³ European Commission: Information notices on occupational diseases: a guide to diagnosis (2009)

⁴ Breuer, J. (2005)

⁵ Schmidt, E., G. Krüger (2004)

⁶ Butz, M (2005)

⁷ Drexel-Schlund, C. Butz, M. Haupt, B. (2003)

acquired, the risk of becoming ill with cancer continuously remains even if the last exposure to asbestos was a long time in the past. There are no solid pathophysiological data which verify a reduction in risks with increasing exposure-free time ('interim period').

However, once absorbed, asbestos fibres can hardly ever be removed from the body. Taking on the body's immune-defence cells, they begin their destructive work and cannot be stopped by therapeutic or prophylactic measures as there is no causal therapy for diseases due to asbestos. The only therapy is a modest influencing of some of the symptoms. The diagnosis of a mesothelioma is a death sentence.

Due to the latency period, neither the workers affected nor the employers responsible for occupational health and safety are warned during or immediately after exposure by specific symptoms or a rise in the number of disease cases.

Furthermore, because of the latency period the parties responsible for the practical maintenance of occupational health measures often do not have to bear the resulting high financial, but also social-ethical costs. The monetary consequences are shifted to the following generations 30 years to a maximum of 60–70 years later. Therefore such costs fall onto the shoulders of the state and society in general.

Because of this, the protection of employees and other affected persons can only be achieved through regulatory measures. Alongside such measures, the legislator must provide sufficient staff and financial resources so as to enforce the agreed regulations efficiently and competently with regard to occupational health as well as supervise the work places accordingly.

A positive commitment of the employers to act in relation to asbestos risks, supported by trade unions and workers has a crucial role in decreasing the number of asbestos-caused illnesses.

Asbestosis and benign changes of the pleura caused by asbestos fibres

Diseases of the lungs and/or pleura caused by asbestos fibre dust generally occur only after years or decades of exposure; however, depending on the level of exposure and individual susceptibility, changes can also occur significantly earlier. With deterioration not being dependent on further exposure, an **already existing asbestosis can progress even when the patient is no longer exposed.**

The (clinical) **symptoms of asbestosis are a slowly progressing dry cough, shortness of breath, especially under exertion, and chest pains.** There is no single symptom which characterises the disease. As it progresses, the patients additionally complain of chronic bronchitis and, in advanced cases, of changes to the lungs in the form of emphysema. In their advanced stages, changes to the lung also lead to right ventricular hypertrophy.

There is never any improvement, let alone healing, of changes once they have occurred. The only therapy possible involves influencing the consequences of the

disease by relieving the symptoms. **There is no therapy for the disease** that could counteract its cause.

The pleura is a membrane which both encloses the lungs and lines the thorax. Asbestos fibre dust causes both malignant and benign changes to this structure. In some cases, pleural changes of a certain extent or localisation have effects also on the functioning of the lungs.

Lung cancer

The early symptoms of the disease are often a sustained therapy-resistant dry cough, occasional blood in the sputum, ventilation malfunctions of different sections of the lungs.

In many countries (e.g. in Italy, Germany, Denmark, Spain) recognition of lung cancer as an occupational disease is conditional, among other things, on the presence of changes caused by asbestos.

The prognosis depends on a variety of factors. Not only the types of tumour cell, the localisation and extent, but also the patient's age at the time of diagnosis have an effect on the survival rate. Overall, the prospects of complete healing are slight.

Cancer of the larynx

The early symptom of the malignant disease of the larynx (or voice box) is usually hoarseness, followed by swallowing difficulties and the sensation of the presence of a foreign body. Subsequently, shortness of breath and swelling of the cervical lymph nodes may occur.

Good accessibility and the fact that early stages manifest themselves by hoarseness of the vocal chords mean that tumours of this type can often be diagnosed and successfully treated in good time. In advanced stages of the tumour, complete removal of the larynx sometimes leads to longer-term tumour-free survival. Early stages can be treated by partial resection of the larynx or sometimes radiotherapy. Mortality as a result of cancer of the larynx depends on the stage it has been discovered but overall figures amount to some 40% to 50% of patients.

Malignant disease of the pleura

In its initial stage, mesothelioma barely causes any symptoms or complaints indicative of the disease. Only later do patients complain of chest pains, shortness of breath, coughing and effusion. Costal pleural effusions which fail to recede or persistently recur despite therapy are usually the first indication of this disease.

After absorption in the lungs, asbestos fibres migrate through the whole body. They even cross the border presented by the diaphragm (or midriff) and access the abdominal cavity. Here, too, they can lead to malignant changes. Peritoneal

mesothelioma is a confirmed consequence of exposure to asbestos. In the case of this tumour localisation, the initial symptoms are vague stomach complaints, constipation (sluggishness of the bowels) and ascites (abdominal dropsy). In later stages the bowel can become obstructed with corresponding symptoms.

In all cases an early histological clarification is desirable.

After a confirmed diagnosis, the prognosis is poor. As a rule, patients die within the next 12 to 18 months. If the disease is diagnosed at an advanced stage the patient may only have a few months to live.

Recognition of asbestos-related occupational diseases

According to a Eurogip Report⁸ the above-mentioned diseases are recognised in all EU countries as occupational diseases.

In Norway and France stomach carcinomas are additionally recognised as having occupational origins. In France patients with tumours of the pharynx, the oesophagus and the rectum have also received compensation as victims of asbestos contamination. In Norway tumours of the large bowel are recognised as well. According to the Eurogip Report, however, up to 2003 the total number of recognised cases with these localisations was very low (12), and these forms of cancer are therefore not presented in detail here.

Subsequent costs of ill health due to damage caused by asbestos inhalation

In Germany the costs per case of illness of lung asbestosis is given on average as 100,000 €. In contrast the costs for every case of illness of asbestos-caused lung cancer or mesothelioma amount to on **average about a quarter of a million euros**.⁹

The total costs paid in 2005 by the economy within the framework of employer's liability insurance benefits where:

- lung cancer/cancer of the larynx due to asbestos 149,400,000 EUR
- asbestos-caused mesothelioma 149,100,000 EUR¹⁰

Alone in the year 2007 the amounts to be raised for diagnosed cases of mesothelioma and asbestos-caused carcinoma in Germany were 406,500,000 EUR. This means that together with the costs for those suffering ill health due to asbestosis, at present annual costs of half a billion euros are to be raised for the consequences of asbestos illnesses alone in one Member State.

⁸ Eurogip (2006)

⁹ Breuer, J. (2005)

¹⁰ Statistics of DGUV (2007)

It should be noted that because of different reasons e.g. restrictive recognition practices of occupational diseases, lacking information on the issue, a further not inconsiderable estimated number of unreported cases of asbestos illnesses with an occupational cause should be added to these numbers. In addition there are no reliable figures regarding private persons who were exposed to asbestos through reasons not related to work but still became ill as a result of asbestos inhalation. Again and again, however, there are descriptions of deaths, for example of illnesses of wives who regularly washed the asbestos-contaminated work clothes of their husbands. Typically no compensation was paid to them¹¹.

Projected for EU Member States according to the figures for 2003 this would mean an annual payment in the region of 1 billion EUR for asbestos-caused illnesses. At the same time it should be taken into consideration that the relationship of compensated mesothelioma illness to compensated bronchial carcinoma illness fluctuates very strongly from country to country. There is no significant cause of mesothelioma in Europe other than asbestos fibre dust. For lung carcinoma numerous risk factors are known, including those that are not work-related. As such the costs for asbestos-caused lung carcinoma may be by far underestimated.

It is to be expected that the costs per case will increase significantly in future on the basis of new, costly methods of treatment and longer survival times.

¹¹ Schneider, J., K. Großgarten, H.-J. Weitowitz (1998)

3 Use of Asbestos in Buildings

Introduction

Its favourable technical properties led in the past to asbestos – albeit in varying amounts – being used in almost all branches of trade and industry. Thus asbestos is found in ships, train coaches, aeroplanes and military vehicles as well as in industrial buildings and private homes. There were well in excess of 3000 uses of asbestos.

Most imported raw asbestos, 70-80% by weight, was used in all European countries for the manufacture of asbestos cement products. The rest was used for construction products, for floor coverings, for brake and clutch linings, for asbestos textiles, asbestos cardboards, insulating board, spray insulation, filter materials etc.

Asbestos can be encountered in various ways within and on buildings. Here are its most important uses:

Asbestos cement products (Asbestos content approx. 15 %)

Asbestos cement products were used as corrugated roofing sheets and flat roofing tiles (so-called artificial slate), large and small facade panels, ceiling and wall panelling, as lining for bath tubs, separating walls in offices and toilets, sewage pipes and pressure pipes, ventilation ducts and as exhaust chimneys for gas heating. In horticulture they served to border cultivation beds and composting facilities. The following further products are also known: window sills, distance pieces for concrete walls, mouldings for water tanks, troughs, guttering, and cable ducts.

Sprayed asbestos (asbestos content up to 85 %)

Sprayed asbestos was applied as heat- and soundproofing and as protection against fire and condensation on beams, connecting pieces and stays made of steel. On ceilings in indoor swimming pools asbestos spray served to balance humidity. Sprayed asbestos also played a role in fire protection bulkheads in hollow cavities.

Loose asbestos lagging (asbestos content up to 100 %)

Loose asbestos lagging was used as a filling material for heat- and soundproofing and as protection against fire for pipe ducts and fireproof doors.

Asbestos fabrics, tapes and cords (asbestos content highly variable, from 3-90 %)

Asbestos tapes and cords are found as heat and fireproof sealing material in fireproof doors and fireproof shutters, in smokeproof doors and gates, in kilns, boilers and high-temperature installations, in flanges on heating pipes and ventilation ducts. Cords and tapes were also used as filling materials in expansion joints.

Asbestos fabrics served predominantly in the manufacture of fireproof covers, fire curtains and heat-protective clothing.

Asbestos panels (asbestos content 5-50 %)

Asbestos panels were used as fireproof coverings for beams, connecting pieces and stays made of steel or wood. They are also found as panels in fireproof doors, ceiling and interior wall coverings, separating walls and ventilation ducts, behind heater niches and under window sills, lightweight stud partitions, separation wall systems, as fireproof shutters in ventilation ducts, protective underlay for lamps, the lining of electrical installation casings and as hung ceiling panels. Instead of lightweight panels, asbestos-containing plaster was also applied for the purposes of fire protection.

Asbestos papers, cardboards, and gaskets (asbestos content 50-90 %)

These were used in particular for heat insulation and as fire protection in electrical appliances, to wrap electrical wires, as asbestos cardboard under floor coverings and to manufacture filter materials.

A special class of product is rubber-asbestos gaskets that have a density of more than 1500 kg/m³ and were used as sealing for acids, oils and under conditions of high temperature and pressure. These gaskets are known as CAF gaskets (Chrysolite Asbestos Fibre).

Asbestos-containing construction chemical products (asbestos content up to 20 %)

Asbestos-containing bitumen and tar products were used in the manufacture of roofing felt, as a coating for flat roofs and guttering, as humidity insulating paint on the outer walls of cellars, as joint sealant and casting compound.

Tiles were laid using the thin-bed method with asbestos-containing tile adhesives. Furthermore asbestos was added to fireproofing coatings, antirust paint, adhesives and plaster-containing filler.

Asbestos-containing floor coverings (asbestos content 15-90 %)

The following types of covering can be distinguished:

Vinyl-asbestos tiles, also known as flex panels, were manufactured mostly as grey or brown-streaked square panels or beam coverings and contained about 15 % asbestos. They were mostly laid on bitumen adhesives, which can also contain asbestos. Flex panels were laid on a large scale in public buildings, schools and the like, but also in private homes and offices.

Cushion-vinyl coverings ("CV coverings") are foam PVC goods (cut from a role). They are coated on the underside with a white or light grey asbestos cardboard only a millimetre thick that consists of up to 90 % asbestos (white asbestos).

There are also PVC coverings that have light brown jute felt on the back. This material is asbestos-free.

Asphalt tiles were manufactured on an asphalt or bitumen base. They are very brittle and crumble easily. Because of their brittleness asbestos fibres are very easily released during their removal.

Use of asbestos in the EU Member States

The range of asbestos-containing products used in the EU Member States varied greatly. In Eastern European countries, for example, less asbestos was generally used in building than in the West European countries. The most-used asbestos product in East European countries is asbestos cement.

Asbestos-containing products were made by a variety of manufacturers and offered on the market under various names. The same products can therefore be encountered under different designations.

Recognition of asbestos products

Asbestos-containing materials can be recognised by the layman only with difficulty.

Since January 1st, 2005, the manufacture and use of asbestos has been banned in the EU. Even before this, the use of certain products was forbidden. The national restrictions on use chiefly concerned weakly-bound asbestos-containing materials such as sprayed asbestos, asbestos plaster and lightweight panels. Because of this, in the case of some materials it is possible to ascertain whether asbestos was used on the basis of the building documentation, although this cannot be taken as an entirely reliable guide.

A visual examination can also help to ascertain whether asbestos has been used. Cardboards, tapes, and asbestos-containing panels are always light grey, grey or grey-brown, never absolutely white. Weakly-bound asbestos products are soft and brittle.

For all building materials, fibres protruding at fractures indicate only that a fibrous material has been used, but this does not necessarily point to the use of asbestos.

Asbestos cement products were replaced with asbestos-free fibre cement panels, which on the basis of colour are barely distinguishable from those containing asbestos. When new, the asbestos-free panels are a green-grey shade, while asbestos-containing panels were made in a light grey (cement grey) colour. Asbestos-free panels are often marked with the date of manufacture and the abbreviation "AF" (asbestos free) or "NT" (new technologies).

Asbestos cement is hard and brittle and sounds like stone when worked; fibre cement feels more similar to hardwood and sounds rather hollow when worked.

In spite of the distinguishing features that aid recognition of asbestos-containing or asbestos-free products, they can by no means be identified with any certainty. The characteristics described can only be the first step in decision-

making, and accurate identification is only possible by means of an electronic examination in the laboratory. (See also Best Practice 4)

Risks posed by asbestos in buildings

Different EU Member States see the risks from asbestos products for the users of a building in different ways, and there is variation as to what measures have to be undertaken to minimize that risks. Thus in some Member States there exists the principle that weakly-bound products are to be removed when this is practically possible and the products are open to the room.

In other Member States the measures deemed necessary are dependent on an assessment of the material. In the course of this, the material must be assessed according to various criteria. After the results have been evaluated a decision is made as to whether steps must be taken to remove or protect the material, or if the product must only be recorded and managed. To the extent that measures must be carried out, loose, brittle material is usually removed, while material in a relatively good condition can be contained or separated off from the room.

When deciding whether the material must be removed or not the following criteria are generally assessed:

- overall condition, possibility of repair
- accessibility, can it be damaged easily?
- does the surface exhibit marked damage?
- is safe containment still possible?

If the material is contained, this must be noted in the documentation so that it can be taken into consideration in later work.

In all Member States there is a large degree of consensus that there are no risks from built-in asbestos cement products or from flex panels provided the products are not heavily damaged and no work is carried out on them.

Independently of the rules or regulations in individual Member States, weakly-bound asbestos products in buildings should be regularly examined and assessed by experts, as even due to vibration and fluctuations in temperature fibres can be released very easily, and this can pose risks.

4 Requirements and Measures when handling Asbestos

4.1 Organisational measures

According to the EU Asbestos Directive 2009/148/EC, before starting work and even before submitting a tender for work with materials containing asbestos, an employer must take a number of different steps. Such measures, taken by the employer in advance, are called 'organisational measures'.

By planning and preparing the work procedures carefully, an employer can avoid exposing workers to risks, e.g. as a result of improvisation or disruption of the work process, and thus provide the basis and the necessary conditions for safe completion of the work.

The most important measures prescribed by the Directive are the **notification to the authorities, the risk assessment and the work plan**. In addition, employees must be given the opportunity to have a **medical examination**. Moreover, before starting with demolition and refurbishment work the companies should give proof of their expertise and, if the national legislation requires, be in possession of an official licence for working with asbestos.

The more conscientiously the employers and their workers observe these rules, the smoother and therefore the more economically the work can be carried out.

(See also Best Practice 3)

Proof of expertise

Before carrying out demolition and refurbishment work companies should provide proof of their expertise. This is necessary to ensure that companies have adequately trained staff and the necessary equipment and facilities. Proof must be provided in accordance with the statutory requirements or usual practice in the particular country.

Companies must meet particularly strict requirements concerning staff and safety equipment when carrying out extensive work on weakly-bound products (such as fire-proof panels or sprayed coatings). Demolition and refurbishment work on such asbestos products requires considerable effort and special equipment, including decontamination equipment and air locks. Moreover, the decontamination equipment must be regularly maintained and checked and hygiene must be strictly observed since in view of the high exposure risk the employer must be especially careful to protect his staff during such work.

A licence is issued when the responsible authority is convinced by the documentation submitted, by inspection and discussion, that the company has the necessary management systems and equipment, and that staff training requirements have been fulfilled.

Where a country's regulations do not provide for the issuing of a general licence the company must submit a separate proof of competence for each individual job. The requirements to be met are at the discretion of the authority. The minimum requirement is that **staff has been trained in working with asbestos and have a certificate documenting the course.**

Notification

Since working with asbestos carries a high risk of exposure, the employer must notify the occupational health and safety authority responsible for the work site of any demolition, refurbishment and maintenance work prior to commencement.

Formally, this obligation only applies above an EU threshold value of 100.000 f/m³ ¹². However, since in practice the degree of asbestos fibre concentration is usually unknown, and especially with demolition work maximum values must be expected, in the vast majority of cases the assumption must be that the threshold values will be exceeded and notification is thus required.

Timely¹³ notification allows the occupational health and safety authority to intervene even before work has started if the documents submitted suggest that the protective measures may not be adequate. Additionally, notification makes state supervision of the execution of the work possible.

Notification should include at least the following points:

- location, commencement date and duration of the work;
- number of workers involved;
- characteristics and quantity of the asbestos products;
- work to be carried out and procedures to be used;
- measures to be taken to limit the exposure to asbestos;
- the starting date and duration of the work;
- how waste is to be dealt with.

In principle companies should work closely with the responsible occupational health and safety authorities, informing them in detail about their work with asbestos to prevent misunderstandings and conflicting technical assessments and ensure the protection of those involved in a spirit of cooperation.

¹² In some Member States the threshold values are significantly lower.

¹³ The interpretation of 'timely' varies according to the relevant national laws, e.g. that the authorities must receive the notification 7 days before the work begins

Risk assessment

The EU Framework Directive on Occupational Health and Safety 89/391/EEC obliges all employers in the EU to identify the risks of exposure incurred by employees at their workplaces, to assess them and to take the necessary precautions. In addition, they must carry out a thorough risk assessment covering both the hazardous materials present and the work to be carried out.

For work with asbestos, the companies must take into account the physical condition of the product, the amount of asbestos and the working conditions and procedures to be employed.

If necessary, material samples must be taken for the purpose of determining the:

- work procedures,
- protective measures

Consideration must also be given to the protection of third parties.

After their initial implementation employers must check the effectiveness of the measures used and if necessary improve them. **Essentially, they should be striving for continuous improvement of the protective measures.**

Every company must document all steps in the risk assessment process and the actors taken into account in the choice of work procedures and protective measures.

Work plan

Taking the risk assessment as a basis, companies should lay down the technical and personal protective measures to be taken in a work plan. This document should be regarded primarily as a set of instructions to the supervisors on how the work is to be carried out, the aim being to avoid misleading instructions and improvisation in the work process. Depending on the nature and extent of the work the work plan can either be kept very short and limited to a number of bullet-points or be very comprehensive.

It should address the following points:

- arranging the building site and access arrangements;
- how the work and the work procedures are to be carried out, including consideration of technical precautions and personal protective equipment;
- how the work is going to be supervised;
- how unforeseen issues are to be dealt with;
- rules on working hours and breaks (especially when respiratory protective equipment is used);
- dealing with waste;
- re-opening of the site after completion of the work;

- communication with the client.

Working instructions

Although not explicitly required by the Directive 2009/148/EC, working instructions are an indispensable component of staff training. They point out the risks to the workers and explain to them the protective measures required.

Whilst the work plan is primarily addressed to supervisors, the working instructions are intended for the workers themselves, identifying the risks, the corresponding protective measures and their expected behaviour. Information relating to their workplace and tasks enables workers to act safely in full awareness of the risks.

Working instructions should be concisely and clearly formulated, so that all employees can understand them. They should be displayed at the place of work where they are clearly visible. The staff should observe the working instructions of the employer. The instructions must give information on:

- the type of work and specific tasks;
- the hazardous materials containing asbestos;
- personal protective equipment;
- necessary protective and hygienic measures;
- what to do in the case of breakdowns, accidents and other emergencies;
- how to deal with waste

For simple tasks this information can be included in the work plan, which then replaces the working instructions.

Training

Staff training is one of the central provisions of the EU Directive 2009/148/EC. It is important that it is carried out in such a way as to be understandable to the workers. Written instructions are not always carefully read and the workers may not understand the content at all points therefore practical training should be seen as a very important method. **Employers are obliged** not simply to rely on the issue of instruction, but **to train their employees properly**. The training must be based on the type of work the employee will be expected to carry out, and in relation to particular jobs, the risk assessment, the work plan and the working instructions. **It must be carried out before the employment commences and repeated at regular intervals** (e.g. at least once a year). If the work procedures, the working conditions or individual protective measures are substantially changed, the employer must retrain the staff.

To ensure that the training is consistent and monitored, employers are strongly recommended to document the training sessions and have their staff sign a confirmation that they have received training.

In the training, it is especially important to cover the following:

- the properties of asbestos and its effect on health including the aggravating effect of smoking,
- medical examination requirements,
- specific products containing asbestos used in the work,
- tasks during which exposure can occur,
- safe work practices and use of personal protective equipment,
- decontamination procedures,
- what to do in the case of breakdowns, accidents and other emergencies,
- how to deal with waste.

4.2 Requirements for staff handling asbestos-containing products

A careless and improper approach to asbestos in the course of **demolition, clearance or maintenance work can lead to a considerable and uncontrolled release of fibres**. In order to minimise the risks, strict requirements are imposed on the specialist staff. In order to ensure that this is the case, the European asbestos Directive 2009/148/EC requires proof of expert knowledge in the field. In many Member States authorisation is a prerequisite for carrying out extensive renovation work with asbestos products. These requirements are directed at the operational managers in particular. This means that the company should have a competent responsible person at its disposal to assess the health and safety requirements of the work and can arrange the necessary organisational and technical preconditions. In addition a supervisor should see that the measures are implemented on location and qualified personnel must be employed to execute the work.

The transfer of theoretical and practical specialised knowledge necessitates comprehensive training, as a broad spectrum of preventive measures have to be taken into consideration.

Expert responsible person/supervisor

The task of the expert responsible person is to prepare the measures according to the safety rules and regulations in the course of planning and carrying out the work. He is to establish the organisational and technical prerequisites for the safe implementation of the building measures and bears the responsibility on the construction site. The tasks of this person are:

- notifying the responsible OHS institution,
- carrying out risk assessment and preparing the work plan,
- instructing the workers,
- arranging occupational health examination for the workers,
- arranging waste disposal,

- providing working appliances.

The tasks on the construction site are:

- placing barriers and signs where necessary,
- controlling use of the protective equipment,
- managing the concluding work and putting the premises into operation.

As health and safety regulations must regularly be adapted to new knowledge, the progression of technology and legal provisions existing in parallel with the regulations or new EU directives, **competency must be regularly updated once acquired.**

The ventilation facilities and other equipment must be regularly checked, maintained and kept in a good state of repair. This should be the task of persons with the corresponding skills: sufficient knowledge on how to deal with asbestos-containing dangerous materials, the functioning of the safety equipment to be checked (its condition and ability to function). In addition to the general knowledge on how to reduce the risks of exposure during work with asbestos they should also have specific knowledge of the use of equipment. This can, for instance, be acquired by participating in appropriate manufacturer seminars.

If no extensive work with asbestos products is carried out in the company the necessary maintenance and checks can also be made by other qualified companies or appropriately trained service engineers.

It can be useful to appoint a coordinator when several companies work together and mutual risks cannot be ruled out. The coordinator should possess expertise and the authority to issue instructions. The coordinator is usually appointed by the client.

Basic competences for asbestos workers

Crucial issues to be considered regarding personnel are:

- the personnel have to be qualified to carry out the work,
- employees should be carefully briefed on the working methods,
- the personnel have to be suitable for the work (the assessment of which takes place during occupational health examination),
- there should be knowledge and willingness to consistently use the personal protection equipment and a readiness to work in a responsible manner,
- the personnel have to be aware of the potential risks.

Use of sub-contractors

If the principal contractor appoints sub-contractors, the same requirements as regards personnel apply to the sub-contractor. The principal contractor should

evaluate if the sub-contractor is sufficiently competent for the particular work. Only firms which have the necessary expert knowledge and the required appliances for the job at hand should be used. The principal contractor must ensure that the sub-contractor is informed of the existing sources of risks on location and of the required procedures. **However the principal contractor cannot exonerate itself by claiming the sub-contractor was responsible.**

Costs of work according to regulations

Considering an example of an asbestos cement roof that is to be dismantled and opposing it to the costs of dismantling an asbestos-free fibre cement roof one can come to the following results:

The costs of setting up the scaffolding, guard rails and the building site facilities are the same in both cases. The additional costs for removing an asbestos cement roof come from the required PPE, the increase in working hours and the provision and use of additional technical equipment. In particular, the PPE consists of half-masks equipped with particle filters and disposable protective suits for employees. The increase in working hours is due to the fact that the wearing of respirators requires rest periods that amount to 20% of the working hours. However, it should be taken into account that workers can still carry out light work, e.g. transport activities, whenever they are not wearing their masks. Thus, an increase in building time of 15% seems plausible. A further increase in working hours stems from the fact that an asbestos cement roof must be dismantled if possible without breakage of the asbestos containing parts and by wetting the parts to be removed. The removed roof sheets must then be properly disposed of. This additional effort in terms of time amounts to 10%.

The costs incurred for waste disposal are approximately the same, so this does not entail any extra costs. The use of technical devices, such as industrial vacuum cleaners and wetting equipment, results in additional costs to be considered. The corresponding equipment is however designed for multiple uses, so the additional cost is estimated at 2%.

Thus, it may be assumed that the total extra costs of properly dismantling an asbestos cement roof are higher than when working without taking the necessary safety measures. These extra costs must be measured against the benefits of properly carrying out asbestos work.

When the client (building owner) ensures that the work is properly conducted, he/she meets the obligation to avoid any potential risks arising from the work. The employer complies with his or her obligation to protect human and environmental safety by conducting risk assessment and applying the resulting protective measures.

By respecting these protective measures, the employee is not exposed to health risks and therefore does not have to fear long-term consequences of asbestos exposure. So, the safety of all individuals involved in the construction process justifies the somewhat higher costs.

4.3 Installations and equipment

According to the purpose of their use, installations and equipment used in asbestos control can be sub-divided into three groups:

- dust removal installations and equipment,
- injection equipment (for wetting weakly-bound asbestos);
- working equipment,
- personnel and material locks.

Dust removal installations and equipment are meant to intercept and capture asbestos-containing dust. By means of air filter systems, the dust is captured from the ambient air or sucked up from surfaces by mobile dust extractors or industrial vacuum cleaners. **The industrial vacuum cleaners can capture asbestos-containing dust directly at the source.**

Air filter systems are a part of the special site equipment required when setting up a construction site¹⁴. They are used to generate a technically controlled routing of airflow and negative pressure on the construction site. The technically controlled routing of airflow aims at reducing the fibre concentration in the working environment. It should be ensured that fresh air is routed from the fresh air opening towards the workplace and from there to the air filter system. The airflow can be checked with smoke tubes. The fresh air openings have to be equipped with check valves to prevent a leak of asbestos-contaminated ambient air in case of a failure of the air filter system.

The required extraction capacity of the air filter system is calculated on the basis of the construction site's room volume. For work involving the risks of high fibre concentration, an at least five times air change on the construction site should be provided. The effective operation of the air filter system can be ensured through the use of approved filters, filter leak tests and fibre concentration measurements in the exhaust air of the installations.

The dimension of the fresh air openings should be aligned with the capacity of the air filter system to generate sufficient negative pressure on the construction site. Negative pressure prevents contaminated ambient air from being released into the environment through leaks in the partitioning.

For work involving the risks of high fibre concentration, negative pressure of at least 20 Pa should be provided on the construction site. Consistent low-pressure can be verified using vacuum gauges and measuring instruments. An optical and acoustic alarm must be automatically triggered in case of a drop in negative pressure.

The suitability of industrial vacuum cleaners can be confirmed within the scope of a type approval test by a relevant institution. An expert has to ensure the correct function of the vacuum cleaners through regular maintenance. **Experts should inspect and**

¹⁴ By construction site is meant a place where demolition and clearance, refurbishment or maintenance work is carried out.

service all installations and equipment at least once a year and document the inspection results.

When authorised mobile dust extractors and industrial vacuum cleaners are used, exhaust air might as well be returned to the work area if the ongoing work is only of limited extent or involving work procedures with low exposure levels and if a discharge into the open air is impossible or requires disproportionate effort.

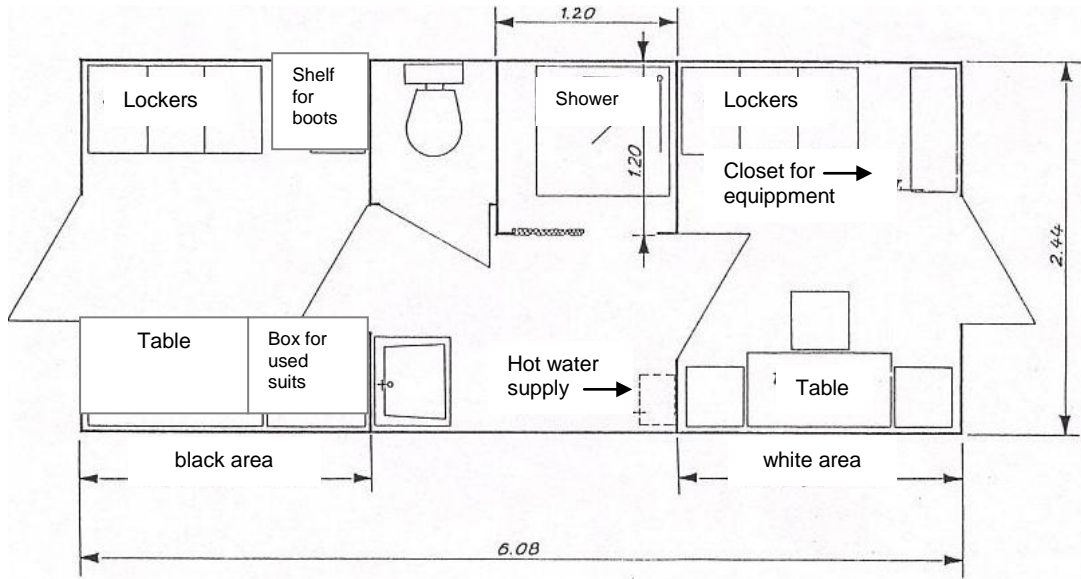
Vacuum cleaners used for refurbishment work involving asbestos must not be used in other areas unless their motor housings are thoroughly cleaned.

Working equipment that keeps fibre release as low as possible should be used. If the cutting up of asbestos products is inevitable, e.g. for packaging and transportation purposes, slowly operating separation devices can be used, such as hand saws or slowly running saws. **Use of devices that raise a lot of dust like cutting machines should be avoided.** Dust arising through the operation of the devices on site should be extracted directly with suitable suction devices, e.g. an industrial vacuum cleaner.

Sprayers are used to minimise fibre release during dismantling and transportation and to bind fibres to material or room surfaces. Sprayers contain water and suitable binding agents. Hand-held pump sprayers and airless sprayers are proven devices for this purpose.

In case of major work and high level of asbestos exposure, the work area (black area) must be partitioned from the surrounding area (white area) and be dustproof. A multi-chamber personnel lock (3 chambers with an antechamber or 4 chambers) must be provided for access. In the course of work, a negative pressure must be created in the work area and regularly recorded. Pressure drops must trigger an alarm. To exclude contaminated air leak, negative pressure can be maintained also outside working hours.

Figure 1: Black and white areas (an example of a self build personnel lock)



A construction site must only be entered and exited via sufficiently dimensioned personnel decontamination installations (personnel locks). The personnel lock is used for the cleaning and taking off of personal protective equipment. It also provides washing facilities for the personnel and enables separate storage of protective/working and street clothes. The protective and working clothes are stored in the black area and the street clothes in the white area. **The number of cleaning stages and thus the number of lock chambers should be planned according to the expected fibre release on the construction site.**

For large-scale work, especially with spray-applied asbestos products, a **multi-chamber system** consisting of three chambers with an antechamber or four chambers in a modular system or as a permanent container installation, e.g. according to figure 1, must be provided. The essential requirements are:

- floors, walls and ceilings are made of a solid, washable, smooth material,
- a sanitary block with an automatic shower control and hand shower,
- automatically closing chamber doors, preferably with a mutual automatic locking mechanism,
- routed airflow through the lock in the direction of the black area. This might e.g. be achieved by maintaining negative pressure in chamber 3 and the antechamber or in chamber 4 with a negative pressure measurement in chamber 3. The negative pressure here must not be higher than in the black area (work area),
- diagonal ventilation of all chambers with an at least 10 times air change per hour in chamber 3 and the antechamber or in chamber 4. Infiltrations must be avoided,
- that sufficient ambient air and water temperatures are ensured,

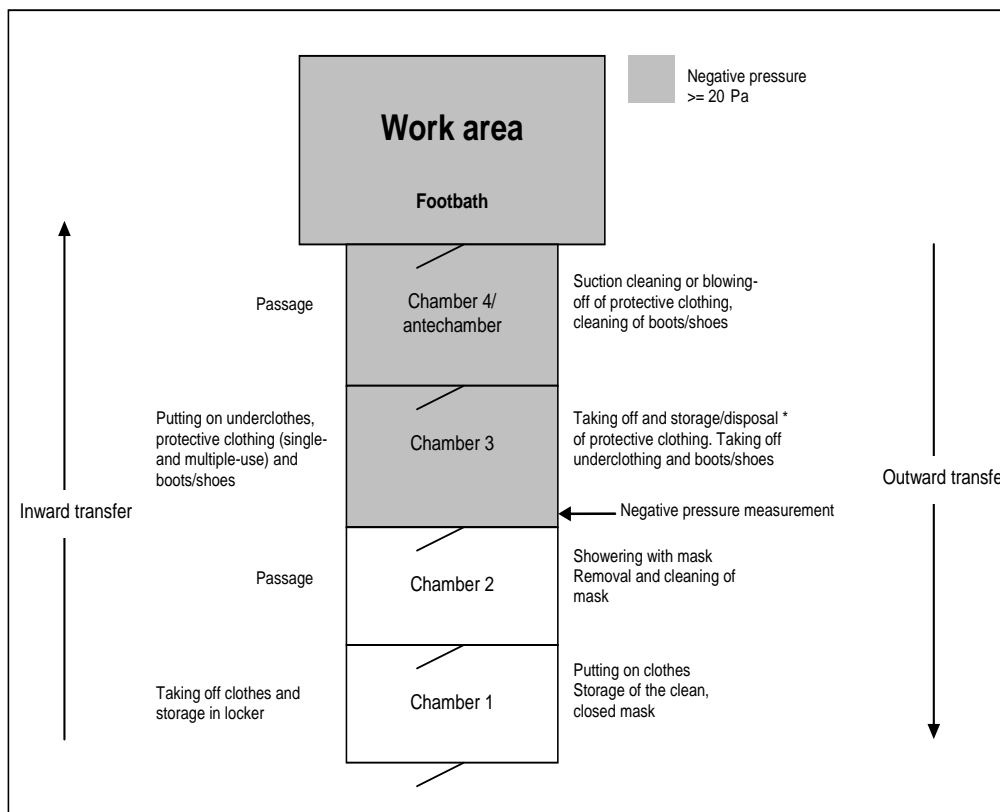
- cleaning of the shower water in a filtering system and discharge into the sewerage.

The automatic locking mechanism prevents several chamber doors from being opened simultaneously.

A **two-chamber lock** is normally sufficient for work on asbestos-cement products, one for cleaning the protective clothing when leaving the working area, and a second one for changing the clothing.

If in special cases only a **one-chamber lock** is used, it is recommended to take off the protective clothing with respiratory protection in the black area and to store it there in order to prevent an inappropriate contamination of the antechamber which basically has the function of a vestibule.

Figure 2: Personnel lock (schematic diagram)



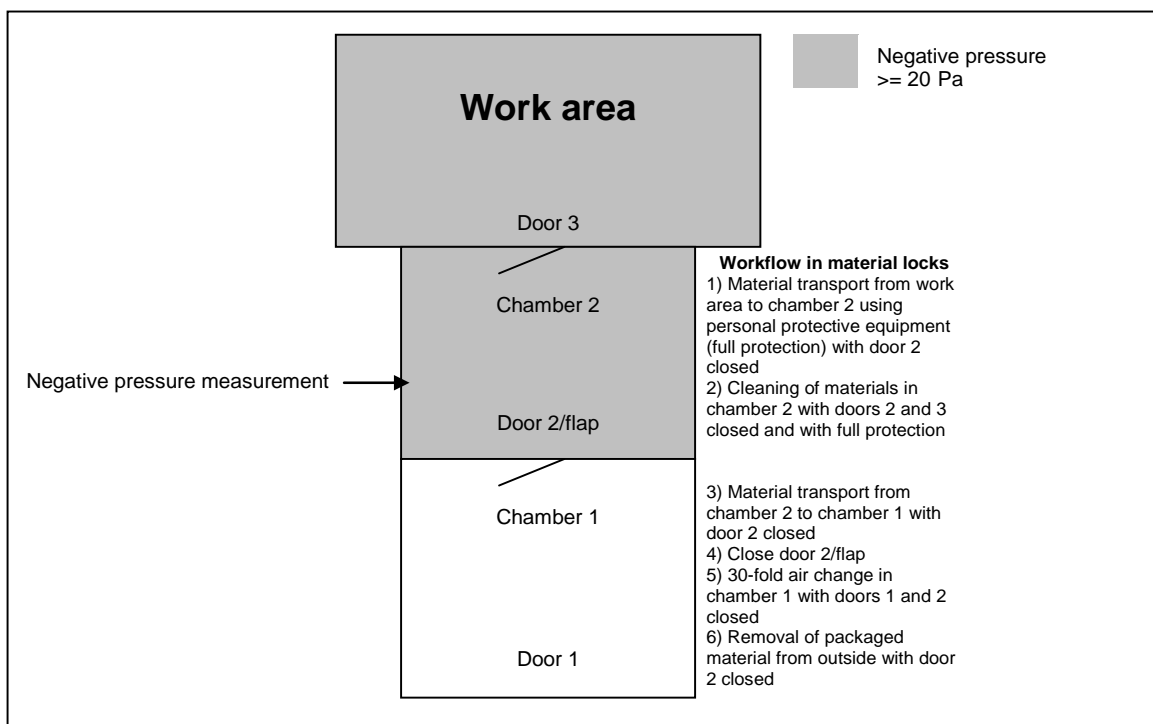
If, during this large-scale work, material should be transported from the construction site to e.g. the waste container, this transport should take place via a two-chamber material lock.

Essential requirements for a material lock are:

- controlled maintenance of negative pressure in chamber 2. The negative pressure must not be higher than in the working area,

- ventilation and exhaust ventilation of the chambers (10 times air change per hour and diagonal through-flow in chamber 2),
- an at least 30 times air change in chamber 1 prior to the removal of material,
- automatically closing chamber doors,
- locking of doors to ensure that doors 1 and 2 as well as doors 2 and 3 cannot be opened simultaneously,
- cleaning of washing water in a filtering system and discharge into the sewerage.

Figure 3: Material lock (schematic diagram)



At the end of each shift, the locks have to be thoroughly cleaned and included into the clearance measurements that have to be carried out on completion of the e.g. refurbishment work, if required.

4.4 Arrangements at the construction site

In the following part, the requirements stipulated in the Council Directive “Minimum safety and health requirements for the workplace” (89/654/EEC and the Annex IV, parts A and B of the Directive 92/57/EEC as well as the Directive 92/58/EEC) and some general precautions concerning work with materials containing asbestos are given. For further information on the necessary technical equipment, such as partitioning or asbestos-specific equipment and installations, such as vacuum devices, we refer to the chapter "Installations and equipment".

Rest rooms

Rest rooms can be used during breaks or other types of work interruptions. Such rooms should be made available if more than 10 employees are on site. If less than 10 persons are employed, the employer must ensure that all workers can change clothes, wash themselves, warm themselves and eat in a weather-protected environment. Moreover, rooms with separate storage places for street and work clothes have to be provided.

Rest rooms can be workers' caravans, cabins, containers or rooms in existing buildings. Depending on the number of staff, they must be large enough, have tables and seats, coat hooks or wardrobes, and a vestibule. The rest rooms should be kept at a suitable temperature.

No one should enter rests rooms with asbestos-contaminated work clothes or protective suits. The work clothes must be stored separately from the street clothes.

Washrooms / toilets / changing rooms

When carrying out demolition, clearance or maintenance work on components containing asbestos, workers must have access to washrooms comprising washing and showering facilities. If a construction site has available personnel locks with showers, no other showers are required. However, a washing facility must still be provided outside of the personnel lock. An average of one washing basin for 5 individuals can be suitable.

In general, there must always be a washing possibilities provided on site even for work involving sporadic and low-intensity exposure, as this is considered a minimum hygiene measure. The employer must arrange also for the cleaning agents and drying facilities.

Every workplace has to have available a separate lockable toilet for men and women either on site or nearby.

When working in the open air one should always try to clean the protective clothing and boots/shoes outside, in order to prevent the contamination of the black area as far as possible. As asbestos fibres are released in particular when putting on or taking off asbestos-contaminated clothing, protective clothing should be always taken off with the respiratory protection. **The respiratory mask should be always put on first and only then the protective clothing.**

First-aid rooms

Depending on the size of the site and the number of workers employed, a first-aid room or a similar arrangement should be provided. The room should be easily accessible with stretchers or by ambulance. The provision of a stretcher is required. First-aid kit must be available at all times.

There should be at least one worker trained in first-aid on site, depending on the size of the site.

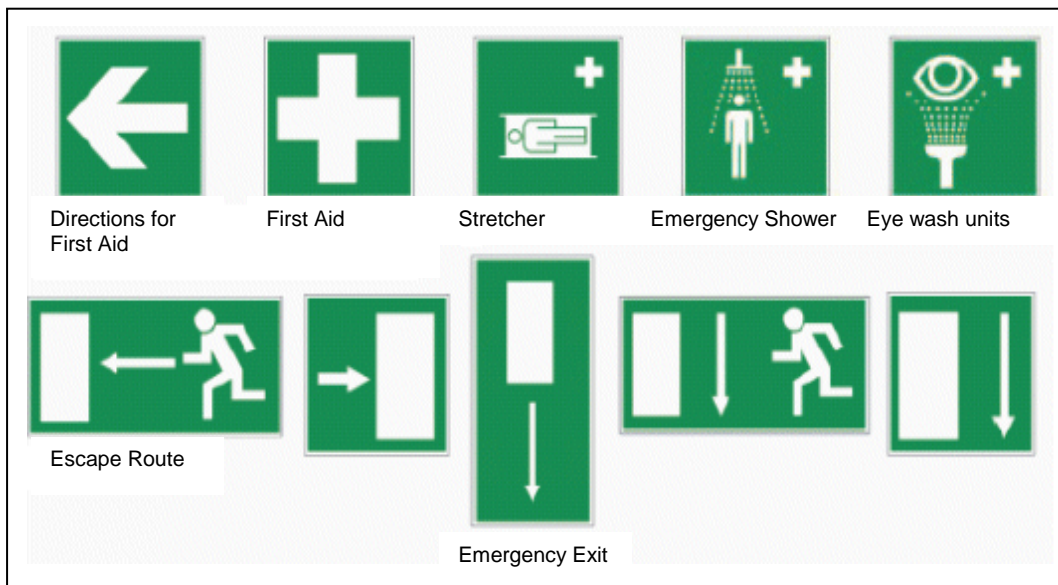
First-aid rooms and storage places for first-aid material must have the first-aid emergency sign affixed to them.

A telephone must be positioned in a way that employees can call a medical doctor or the ambulance immediately in case of emergency.

Signs required at the workplace

In general, the following signs (white sign on a green background with a white surround) must be used.

Figure 4: Emergency signs



In order to prevent unauthorised persons from entering asbestos-contaminated work areas thereby being passively exposed to asbestos, **the work area must be clearly partitioned from other work areas and marked with the prohibition sign "Stop No trespassing" and signs specific to asbestos (see figure 5).**

When working in the open air, the work area can be demarcated by means of warning tape. For sensitive areas, such as kindergartens, schools or hospitals, fixed barriers should be installed.

Figure 5: Prohibition and warning signs at the workplace



4.5 Personal protective equipment

Personal protective equipment (PPE) should be used only if all collective, technical and organisational measures have been considered and there is still a hazard or residual risks to be averted. PPE should always be seen as a measure of last resort in the attempt to protect oneself against a hazard.

If operational measures do not offer employees an adequate level of protection, which will always be the case when working with asbestos, personal protective equipment should be selected very carefully applying health as well as ergonomic principles.

If the risk assessment indicates the use of personal protective equipment, the workers must be provided with the equipment and wear it. **The employer must not tolerate the employees' refusal to wear personal protective equipment. Non-use can be considered a serious breach of the worker's responsibilities and action taken under industrial agreements or labour legislation.**

General requirements for PPE

Since the 1st of July 1995, personal protective equipment must comply with the requirements laid down in the corresponding EU Directive (89/686/EEC) to be legally placed on the market within the EU. **It must have the CE marking** affixed to it, by which manufacturers declare that all safety requirements set out in the Directive are met. CE markings must be clearly visible, legible and indelible. If this is impossible in particular cases, the CE marking can be affixed to the packaging. This applies to private as well as commercial use.

All PPE must be supplied with written information issued by the manufacturer in the national language. Users have to be provided with the following information:

- name and address of the manufacturer,
- protective function,
- information on storage, use, cleaning and servicing and,
- if applicable, the expiry dates of certain parts of the PPE.

If, in exceptional cases, it is to be used by different people, it must be thoroughly cleaned prior to passing it on to other users.

The selection should be made following the risk assessment. In doing so, the type of hazard and the degree of risk it poses as well as the working conditions should be taken into consideration.

In addition to the protective function, PPE should be:

- comfortable to wear and
- easy to handle.

Experience has shown that wearing comfort is vital to the autonomous, consistent and correct use of personal protective equipment.

Thorough training of employees on the appropriate use of PPE plays a major role in this process. Training should take place prior to first use, based on the instructions provided with the PPE and the corresponding risk assessment. It is useful to involve the users in the choice of the personal protective equipment. Also the occupational physician can be consulted for advice.

The employer must make personal protective equipment available to all employees free of charge and ensure that the equipment is maintained.

PPE that is usually used on a construction site (helmet, hearing protection, safety boots and others) should be suitable for use in combination with the PPE against the risks posed by asbestos.

Protective suits

A protective suit is largely to prevent the contamination of underclothing and the skin. For activities involving asbestos hooded full protection suits with wrist and foot rubber bands should be worn. These suits should protect against spraying and particles. For reasons of wearing comfort, protective clothing should be air permeable and antistatic.

Depending on the weather and the ambient temperature, one has to wear protective clothing above the work clothes e.g. when engaged in activities involving asbestos cement or above the underwear e.g. when engaged in activities involving weakly-bound products.

Both single and multiple-use protective suits exist. Single-use protective suits are worn during one shift and disposed of at the end of the shift. They have proven successful in the past and are mostly standard nowadays.

The use of multiple-use protective suits is restricted to major and extensive refurbishment work with asbestos products. The employer must make sure that they are cleaned on a regular basis and that asbestos contamination is taken into account when doing arrangements for cleaning.

It can be useful to wear boot overshoes when working extensively with asbestos products because lace-up shoes are difficult to clean.

Respiratory protection

Using respiratory protection, no doubt, brings additional stress to employees because of the weight and the respiratory resistance of the respiratory protective device.

In line with their mode of action respiratory protective devices are divided into respirators and breathing apparatus. Breathing apparatus function irrespective of the ambient atmosphere while respirators remove pollutants from the ambient atmosphere depending on the type of filter contained. The use of respirators requires the oxygen content in the ambient atmosphere to amount to at least 17%. They must not be used if the environmental conditions are unknown.

For activities involving asbestos only respirators are used in general. They are divided into:

- respirators with replaceable filters and with or without a ventilator;
- respirators with filters that cannot be replaced.

Among the respirators with replaceable filters are, e.g. half and full rubber face masks with or without a ventilator or safety helmets with respiratory protection.

Among the respirators with non-replaceable filters are "filtering half masks". They fully or partially consist of filter material and are called FFP masks. These masks are available with or without an exhalation valve; the valve considerably reduces respiratory resistance.

FFP masks can be worn only during one shift and must be disposed of afterwards. Replaceable filters should not be used for more than one working period either. If a greater respiratory resistance due to saturation of the filter is detected, the filter should be changed immediately.

Respiratory protection must not be changed within the contaminated area nor should the batteries of powered respirators with a ventilator.

Particle filters have to be in good order to protect the workers from breathing in asbestos fibres. The filters are marked with the letter "P" and grouped into classes P1, P2 and P3 based on their filter capacity. Particle filters of class P1 have only a low filter capacity and are not suitable for activities involving asbestos.

The protective effect of respiratory protective equipment mainly depends on the seal seat. Individuals who have beards in the area of the seal of the respiratory protective device cannot wear these devices efficiently.

Operating instructions for the right application and use should be created and should indicate wear time limits to help prevent overstraining of the wearer. In addition, **all employees involved need to take part in an extensive theoretical introduction based on the instructions for use issued by the manufacturer, followed by a practical exercise in applying the respiratory protective device and checking the “face fit” with the seal.**

The wear time limits should be based on working conditions, such as the physical demands, climate conditions, work posture and weight of the device, etc. When using half masks or filtering half masks with exhalation valves, a wear time limit of two hours followed by a recovery time of 30 minutes will help to prevent overstrain of the wearer. The recovery time allows the respiration rate of the wearer to recover. Wearers of this equipment must only do light work during the recovery phase (see also Best Practice 3).

Since wearing respiratory protective equipment places an additional strain on the wearer, medical check-ups should be performed to ascertain if the worker is physically fit to wear the equipment.

4.6 Medical surveillance

The following part on preventive medical examinations shall be seen linked with the chapter "Risks to Health from Asbestos".

Preventive medical examinations allow for early detection of work-related health problems and for identification of potential greater health hazards associated with asbestos-related work. They are necessary whenever workers are exposed to special strains.

An important part of occupational health prevention is to raise awareness and give advice to workers on the interaction of work and health. It is a vital tool of preventive medicine.

The prevention of work-related diseases and the preservation of employability have become ever more important in recent years due to developments in the field of occupational diseases.

Certain risks in the workplace (including the risks posed by asbestos) require preventive medical examination prior to taking up the activity. Employment restrictions due to the protection of minors or maternity protection must be also complied with.

The EU Directive on the protection of workers from the risks related to exposure to asbestos 2009/148/EC requires that workers have access to health assessment prior to taking up activities involving materials containing asbestos. The assessment is to be repeated every three years as long as exposure continues.

The employer must arrange for:

- medical assessment before taking up an activity,
- regular follow-up examinations every three years at least,
- medical assessment once the asbestos-related activity has been stopped.

Examinations are carried out by occupational physicians or by medical doctors specialising in occupational medicine. In this case, occupational health care professionals or company doctors are meant. The medical doctor should be familiar with the working conditions on site.

In some Member States the occupational health care professionals are authorised to reduce the intervals of follow-up examinations, if necessary. Even with low concentration of fibres the employer should offer workers exposed to asbestos voluntary medical check-ups because health risks can never be completely excluded, not even in cases of very low exposure.

Also in the case of sporadic and low intensity works examinations can be offered to the workers. "To offer" here means that the employer must explicitly draw attention to the existence of occupational medical healthcare and enable the worker to take advantage of it. Under the general duty of care, the employer has to continue to offer medical examinations, even if the offer is rejected.

If a worker is no longer exposed to asbestos or is retired, regular health surveillance should be pursued due to the long latency of asbestos-related diseases and because diseases can be detected at an early stage by means of regular medical check-ups.

If medical surveillance of workers is required, **the employer must keep individual employment and health records of the exposed workers.** The employment record must state the nature and duration of the activity as well as the risks to which the worker was exposed. The health record must contain all medical certificates regarding occupational health care. Workers must have access to their personal data. **The records must be kept over a period of 40 years and be provided at the request of the relevant authority.**

If the company doctor has reservations about the engagement of a particular worker in certain activities, the employer must immediately check the risks assessment and initiate additional protective measures. If health concerns cannot be removed, the employer must assign a different type of work to the employee.

The organisation of preventive health care rests with the employer. Examinations normally count as working time. Potential additional costs are the responsibility of the employer.

As mentioned earlier, preventive medical examinations are an important instrument in the prevention and early detection of diseases or in preventing an aggravation of existing health problems.

5 Undertaking work involving asbestos products

Certain requirements apply to all types of work involving asbestos products:

- **The release of asbestos fibres should be prevented as far as possible.**
- **If the release of fibres cannot be prevented, make sure that they remain inside the work area.**
- **Individuals who carry out this type of work must apply the required protective measures.**
- **Safe management and disposal of waste must be ensured.**

(See also Best Practice 5)

Demolition work

Demolition work comprises the pulling down of buildings or parts thereof.

Prior to the demolition of the complete building, workers must remove and dispose of all materials containing asbestos, such as roof and facade coverings made of asbestos cement and weakly-bound asbestos products inside the building.

The concept of demolition also refers to the breaking up of vehicles and vessels, as well as to the disassembling of installations and devices, including all incidental activities.

In order to comply with the requirements stated above, it is better to remove the objects containing asbestos carefully rather than damage them, in order to prevent the release of asbestos fibres.

Asbestos cement products should not be tossed to the ground. Lifting equipment such as building hoists or roof tile lifts and even cranes should be used to lower these products from the roof or scaffolding to the ground. For demolition work on facades, hoists attached to the upright frames of the scaffolding can be used, e.g. for small sheets. In doing so, additional anchoring requirements issued by the manufacturer must be followed. The asbestos cement sheets must be transported in suitable load bearing devices and thereby prevent overload of the lifting device. Lifting equipment must be subject to the normal equipment test and examination regime.

Asbestos cement roofs are normally considered fragile and should not be walked on. They must only be accessed via a walking surface that spreads the load or via a gangway. Depending on the nature of the work and the roof structure, additional fall protection towards the interior of the building may have to be provided in addition to gangways, e. g. nets. Scaffolding access platforms may be required outwards for the roof edges.

Clearance work

Clearance work targets the removal of risks arising from asbestos products that threaten the health of individuals at work or at their place of residence. This may arise if the evaluation of asbestos-containing components indicates that clearance work is required for an office or residential building because the concentration of asbestos fibres exceeds the threshold level permitted for interior spaces.

Risks might arise from sprayed asbestos, asbestos boards or mats as well as from other building components and equipment installed, attached and processed containing asbestos.

Clearance measures include:

- removal,
- coating,
- spatial separation.

Removal refers to the complete dismantling and removing of all materials containing asbestos.

In case of major work and high level of asbestos exposure, the work area must be partitioned and a multi-chamber personnel lock must be provided for access.

A high-performance vacuum suction device should be used to remove large amounts of sprayed asbestos. Sprayed asbestos must be bound in a closed system. Materials containing asbestos or contaminated objects must pass a material lock of at least two chambers. The partitioning must not be dismantled without prior cleansing measures.

Apart from partitioning and the required personal protective equipment (respiratory protection P2/P3, protective suit), the following measures should be taken:

- a personnel lock;
- ventilation device or an approved industrial vacuum cleaner discharging the exhaust air into the open air;
- the use of dust collectors and dust-proof packaging;
- thorough cleaning and 30 times air change before dismantling the partitioning;
- washing facilities, showers.

When removing asbestos cement in interior spaces, particular attention should be paid to fracture-free and dust-free working methods. The work area should be kept closed; if fracture cannot be prevented, asbestos cement products should be wetted.

Coating is used to seal off an asbestos product in a dust-proof manner. If the fibre structure is very loose, it may be required to harden the surface. Hardening and coating materials require test certificates.

Spatial separation is used to separate asbestos products from their surroundings in a dust-proof manner by means of additional building components. Joints and cable ducts must be sealed very carefully.

Maintenance work

Maintenance work usually comprises short-term activities that may also be necessary at short notice, e.g. maintenance, inspections or repairs. See chapter 6 for details.

6 Work involving sporadic and low-intensity Exposure

The EU Directive 2009/148/EC contains minimum requirements for the protection of employees from asbestos. Employers shall ensure that no worker is exposed to airborne concentration of asbestos in excess of 0,1 fibres per cm³ as an 8-hour time-weighted average. Below this level, and under particular conditions specified in Article 3, the Directive allows employers to dispense with official notification and medical examinations for certain work processes.

The probability of becoming asbestos-related disease increases with the level and duration of exposure to the fibres. Even when the threshold value is not exceeded there remains risks of disease. To reduce this risks the exposure should be reduced by applying appropriate protective measures. Reducing these precautions is only justifiable in the case of very low exposure levels or short exposure times. Experience has shown that this threshold applies to minor and occasional servicing and maintenance work when minimum technical precautions are taken.

Minor work can, for example, be:

- removal of individual faulty roof or facade panels made out of asbestos cement;
- removal of seals and gaskets containing asbestos;
- removal of asbestos cement covers or cladding in order to carry out maintenance on the facilities behind them;
- washing exterior wall surfaces without pressure.

The following minimum technical precautions should be taken:

- thorough planning of the work;
- covering up the surroundings of the work site if necessary;
- keeping doors, windows, openings in the immediate working area closed;
- working as much as possible with wetted material;
- vacuum-cleaning dust with a suitable vacuum cleaner;
- removing material without damaging it;
- thorough cleansing of the work site before declaring it safe.

Only low-emission processes and equipment should be used. Cleaning of the asbestos cement sheets is only allowed if the surface will not be damaged. Grinding, brushing and high- or low-pressure cleaners are not permitted. One should not clean or coat roof coverings comprising uncoated asbestos products. The cleaning water must be collected and disposed of like waste water.

In Germany for specialised tasks model work processes have been developed and tested to ensure that, provided the instructions are strictly adhered to, the exposure of employees is under 15 000 F/m³ and interior spaces are not contaminated after completion of the work. (See also Best Practice example 4)

7 Concluding work and waste disposal

For all demolition, clearance and maintenance work, certain final tasks have to be accomplished completing of the actual work involving asbestos. The air in and around the workplaces should be as clear of asbestos fibres as possible and this condition must be maintained (to avoid deposited fibres from being whirled up at a later stage).

On completion of work in confined spaces, partitions and enclosures, the removal area, the surrounding area and the partition or enclosure itself requires thorough vacuum cleaning. **Smooth surfaces have to be wet-cleaned** and areas with a rough structure, such as e.g. the brickwork support of a windowsill made from asbestos cement or wall ducts with removed seals or fills have to be sprayed with a residual fibre-binding agent. As a precondition, floor covers with a roughened surface, such as carpets or flagstones, have to be covered and masked with a thick enough sheet before starting work. Furthermore, **the devices, machines, construction equipment and tools used in the work should be vacuumed and wet-cleaned before taking them out of the workplace.** Electrically driven hand machines in particular but also tools that do not tolerate wet cleaning should be used for work on asbestos only and stored in a fibre-proof container until the next use.

In addition to a visual inspection, a **measurement should be carried out** in order to verify whether the admissible maximum value of fibre concentration is exceeded. Only if it is not the case the partitioning or enclosure can be removed. The measurement might be omitted for work involving sporadic and low-intensity exposure. The same applies to maintenance work and work on asbestos cement products in confined spaces where these are removed in a non-destructive manner and only if an appropriate change of air has been carried out (up to 30 times) after cleaning, as in these cases low fibre release can be assumed.

When work with asbestos cement is carried out in the open air, namely on roof and facade claddings, the substructure should be vacuumed after removal. In the course of time, the underlying thermal insulation, which is often also made of fibre material and sometimes not covered by foil, may absorb a certain amount of asbestos fibres which cannot be removed. This is due to ageing and movement with an abrasion of the asbestos cement cladding. If it is not planned to remove the insulation and to dispose of it together with the asbestos-containing waste, spraying it with a binding agent is recommended.

The same holds true for rough wooden surfaces of the supporting substructure. It should be borne in mind that scaffoldings used to perform the work must only be dismantled and removed only after thorough suction and cleaning.

In all cases, devices that have absorbed asbestos fibres, i.e. suction devices and equipment to maintain low pressure and ventilation devices, require fibre-proof closing and storage after having been cleaned at the inlets and outlets.

Asbestos waste should be packed for transportation and disposed of in a way that no fibres can be released. Furthermore, the packaged waste should be marked accordingly.

To protect workers and the environment, asbestos-containing waste that accumulates during demolition or clearance work should be collected in suitable, closed containers directly on the work site and in compliance with occupational health and safety measures. Suitable containers usually include tear-proof plastic bags, plastic or metal containers with lids that can be secured with locking rings. Large-sized boards can be stacked on pallets, wrapped in a dust-proof packaging, e.g. strong plastic sheeting. When using plastic bags and containers, they have to be filled in the work area. If immediate packaging is not possible and asbestos-containing material should be kept moist or covered in the work area for short-term storage.

The packaged waste should be taken into the two-chamber material lock. First of all, the surfaces of the bags have to be cleaned on the side adjacent to the work area before they are put into another, fabric-reinforced bag. This second bag should be cleaned as well and then taken into the second chamber of the material lock. When using containers, the second packaging may be omitted. In this case, only the outside of the container should be thoroughly cleaned.

Following an adequate air change in the second chamber – as a rule, a 30 times air change is sufficient – the cleaned containers with asbestos-containing waste may be taken out of the second chamber of the lock without the need for personal protective equipment.

If due to a lack of space it is impossible to set up and operate a material lock, the containers with asbestos-containing waste may remain in the still active black area. During the rough and final cleaning required on completion of the asbestos removal, the containers have to be thoroughly cleaned as well. Hence, the containers are included in the air analysis, which is carried out in order to prove that the safety measures can be suspended.

Containers with asbestos-containing waste are to be labelled in a way that clear reference is made to their content. This may be done using hazardous substances labels stating “Danger: contains asbestos”.

In line with the ALARA (“as low as reasonably achievable”) principle, further treatment of asbestos-containing waste must be avoided. **Only for asbestos dust e.g. released through filtering systems or sprayed asbestos, a consolidation with binders like cement may be useful as this reduces fibre release in case of an accident.**

Due to its high risk potential, the transportation of asbestos-containing waste should be carried out by reliable carriers. Where possible, only specialised companies should be entrusted with this task. **It must be ensured that no fibres are released during transportation and unloading.** Containers with asbestos-containing waste must not be thrown or overturned.

The disposal of asbestos-containing waste should be subject to a strict control and made traceable by means of suitable organisational measures.

It is of utmost importance that asbestos-containing waste is properly disposed of. To this end, suitable landfills have to be set up where waste can be deposited in specially labelled zones. The containers can not be demolished before compaction. Compaction takes place only after sufficient covering with loose earth.

Figure 6: Marking for asbestos-containing waste



8 Guidance for do-it-yourself workers

Work on asbestos-containing structures should be carried out by companies proficient in this field and by specially trained workers.

Although at one time asbestos-containing materials used to be an accepted building material, it is now recognised, that: **Asbestos is a health hazard!**

The fact that do-it-yourself (DIY) workers come into contact with asbestos containing materials when carrying out renovation or maintenance work themselves is a problem. This mainly happens when removing asbestos-containing building components, e.g. the roofing of houses or garages, facade sheets or small parts, such as windowsills. In interior spaces it is also possible to come into contact with asbestos-containing products during renovation work, e.g. flooring materials, board under interior windowsills, gaskets, seals or fire protection plates. If the asbestos fibres contained in a product are weakly-bound, even minor movements can cause the release of large quantities of asbestos fibres. A layperson will find it difficult to tell if a building part or material contains asbestos. Fibres sticking out from the break-line should always sound a warning bell. **Only after analysis carried out by an expert can one be sure that the product does not contain asbestos.** If the building was built after the national ban on the use of asbestos-containing products came into force, it can be expected that no contaminated materials will be found.

In doubt it should be always assumed that the product does contain asbestos and suitable measures should be taken.

The fine dust released during work outside can cause harm also to other persons or to the environment. In interior spaces this generates a level of contamination that will drop only over longer time period. It is advisable that a DIY worker leaves this type of work to a specialised company. If a DIY worker nevertheless decides to carry out this type of work, he/she should take the same approach and requirements required for the specialised companies.

The DIY workers should take the same fundamental precautions:

- The release of asbestos fibres should be prevented as far as possible;
- If the release of fibres cannot be prevented, it must be made sure that fibres do not get out of the work area;
- The required protective measures for the individuals carrying out the work must be taken;
- Safe waste management and disposal must be ensured.

This means that in the course of the work water or fibre-binding agents should be applied, asbestos cement slates and other asbestos-containing parts must be dismantled, sawing, cutting and breaking is only allowed using sharp handsaw (powered abrasive tools should not be used) and that dust must be collected at the

source using an asbestos-rated vacuum cleaner. The dismantled parts containing asbestos must be transported with care and can not be dropped or thrown around. The asbestos containing parts must be collected in with warning signs labelled plastic bags (big bags) the bags must be tightly sealed by means of adhesive tape so that no fibres can get out. Once the work has been finished, the work area must be vacuumed and wet-wiped as thoroughly as possible.

The devices and material required to carry out this work can be obtained from dealers specialising in the field.

Respiratory protective equipment must be worn, e.g. a half-mask, with particulate filters P2/P3 (It should be made sure that there is a tight seal to the face. It can be check by covering the filter port with the palm of your hand: when doing so, it should not be possible to breathe in). Moreover **a disposable protective suit must be worn** (the hood should be pulled over the head after putting on the mask) to protect the street clothes from being contaminated with fibres.

During breaks and after the work has been finished it is not allowed to leave the work area wearing the contaminated protective suit (risks to other persons). The surface of the protective suit must be vacuumed. After this it should be taken off very carefully (rolling it down from top to bottom and from the inside to the outside) and disposed of together with the asbestos-containing waste. Having taken off the respiratory protective equipment the filter should be removed, depending on the type of mask, a bucket with low surface-tension water (with a washing-up liquid) should be used to take out the filter material and dispose of it together with the asbestos waste

The mask must be scrubbed, the hands and face washed and the contaminated wash-water dispose of via the sewer (toilet).

For the cases where the exposure is sporadic and of low intensity, different safety requirements apply. Practical guidelines for the determination of sporadic and low-intensity exposure (small fibre quantities are released in the process) as well as requirements and workflows stipulated shall be available at the national responsible institutions. More information on this issue can be found in chapter 6 and best practice example 4.

In all cases the details of the procedures used and the safe execution of the work should be clarified before starting it. This also holds true for waste disposal as appropriate disposal site should be located and the required paperwork completed. Commissioning an authorised waste disposal contractor is a good option.

Once again: **handling of asbestos containing material entails risks and major effort. Demolition or asbestos clearance work should be carried out by persons/companies that are familiar with the precautions and safety measures.**

9 Best Practice Examples

9.1 Best Practice 1 – Bulgaria

Inspections show that the issue of ensuring the safe control of asbestos during demolition and dismantling of buildings or the removal of insulation materials remains a problem of the present day. These processes are usually accompanied by a lot of dust which cannot be efficiently controlled by the usual technical equipment and methods. Some employers undertake several organisational and technical measures:

- The activities are managed by persons having special qualifications and practical experience related to the safe methods and techniques for dismantling and are carried out by specially trained and instructed personnel.
- The type and quantity of the asbestos-containing materials used in the construction and insulation are identified from the available documentation.
- A project plan for the organisation and implementation of the dismantling activities is prepared, indicating the technological consequence, the types of devices for implementation (including those for collective protection), the organisation of work and the particular events, ensuring safety at work.
- The sites where dismantling activities are performed are enclosed and the access of people who do not work on the site is restricted. At the exit of the site decontamination cabins for cleaning equipment and changing clothes are installed. Washing rooms and places to store the street clothes are provided.
- Asbestos cement and frictional products are dismantled without breaking. The asbestos waste dust is collected by vacuum cleaner. All asbestos-containing material is placed in plastic bags.
- When removing asbestos insulation it is watered or made wet by an appropriate detergent, if this is not prevented by the requirements for electrical safety of the site.
- When dismantling a big quantity of asbestos insulation using “the dry” method, the site is isolated from the surroundings by an improvised cabin of suitable plastic material in which the necessary minimum negative pressure is provided to prevent the escape of asbestos into the surrounding area.
- Special personal respiratory equipment is provided and used as well as protective clothes are provided for the head and the body.

9.2 Best Practice 2 – France I

Alongside the collective system of compensation, there is an individual compensation system run by the Fonds d'Indemnisation des Victimes de l'Amiante, FIVA, (Compensation fund for asbestos victims) which every salaried worker developing an asbestos-related illness, whatever the enterprise which he/she is part of, can apply for compensation and recognition of his/her occupational illness.

The FIVA was set up by the law, on social security financing for 2001, of the 23rd December 2000 in Article 53, as amended by Article 43-11 of the law of the 21st December 2001, and the Application Decree of the 23rd October 2001.

A Ministerial Order of the 5th May 2001 established a list of asbestos-specific illnesses opening the right to compensation for the harm done to victims with these illnesses who make an application.

The FIVA is a national public organisation which is administrative in character and aims to compensate asbestos victims and their authorised representatives. From its foundation and up to the end of 2009, FIVA had registered 60,418 applications for compensation, made 51,793 offers of compensation, and paid out 2,329 billion euros in compensation.

The procedure is free, without cost, and without need for a lawyer.

Victims of asbestos-related illnesses and their authorised representatives can obtain full compensation from FIVA for the harm they have suffered.

This compensation mechanism complements other schemes, notably those provided through social security regimes.

FIVA makes it possible for victims to avoid contentious litigation procedures.

The damages covered by compensation are:

economic losses: permanent partial handicap, professional loss (loss of revenue), costs of care, other additional expenses such as recourse to third persons, adapting a vehicle or lodging, and in the case of a victim's death, the funeral expenses, which the authorised representatives have to cover, up to 5000 euros.

other losses: moral and physical damage, damage to one's pleasure/charm/attractiveness, esthetic damage and in the case of a victim's death attributable to asbestos, personal damage suffered by kin linked to them having to support the victim in the terminal phase of her/his life and the moral suffering associated with the eventual death of the victim.

The compensation scale of FIVA, adopted by the Council of Administration on the 21st January 2003, takes into account the specifics of asbestos-related illnesses. It is calculated on the basis of tribunal case law on compensation for bodily harm.

For future years ambitious objectives in 4 strategic directions have been set:

- Strengthen the quality of service to victims and authorised representatives from the different services in order to complete in the quickest way possible and in the shortest possible period the compensation payments (6 and 12 months respectively) with special attention being given to gravely ill victims.
- Put in place management control tools and of internal control: with a view to having a standards treatment of case files and with judicial and financial confidentiality in the treatment of case files.
- Simplify procedures and promote collaboration with FIVA's "direct" partners (social security bodies, lawyers mandated by FIVA) and with representatives of the victims (Lawyers for the victims, associations, trade unions).
- Improve governance in revamping FIVA's information tools to better directing the work flows and to revamp the human resource organisation to accompany the new organisation.

9.3 Best Practice 3 – France II

The head of the enterprise must carry out a risk assessment for each work station involved in asbestos confinement or removal activities. Each employee exposed to the risk of inhalation of asbestos dust must receive an information note/instruction on the risks and the means in place to remedy them. Before asbestos decontamination begins and after visiting the places to be worked on, the employer must develop a removal plan.

For each asbestos decontamination work site, precise detailing of work should be estimated and submitted in advance to the company doctor, who must approve the periods for wearing PPE and the rest periods which will vary according to the temperatures at the work site. The company doctor must estimate, in relation to the limits imposed by the work station, the maximum length of time for wearing PPE clothing and using PPE respiratory equipment and hence the permitted duration of work time in the containment zones. In the example below, the effective daily work time comes to 8 hours. It includes times for putting on and removing clothing and PPE, and recovery time but not meal times.

Recovery time must not involve significant physical activity. Work site preparation and removal of waste are excluded from this time. However the maintenance of PPE and clothing can be carried out during this time.

The maximum length of time of wearing PPE up to temperatures of 25° and under normal conditions: 2H.30

Example of a working day

Arrival at the work site	7 :30
Dressing, putting on PPE	7 :45
Work involving PPE	9 :45
Putting on clothing and equipment (1)	10 :00
Recovery time (2)	10 :30
Putting on clothing and equipment	10 :45
Work involving PPE	11 :45
Taking off clothing, equipment (1)	12 :00
Recovery time (2) then meal break	13 :30
Putting on clothing, equipment (1)	13 :45
Work involving PPE	15 :45
Removing clothing, equipment (1)	16 :00
Recovery time (2)	16 :30
Leaving the work site	

Source: conseil interprofessionnel du désamiantage (Interprofessional council for asbestos decontamination)

9.4 Best Practice 4 – Germany I

Work with limited exposure, occasional and minor servicing and maintenance work

For specialised tasks model work processes have been developed and tested to ensure that, provided the instructions are strictly adhered to, the exposure of employees is under 15 000 F/m³ and interior spaces are not contaminated after completion of the work. These are referred to as 'standardised' or 'tested' limited-exposure working processes.

Such work processes are available mainly for strongly-bound asbestos products, but a limited number as also available for weakly-bound products.

Tested processes with limited exposure include those

- for removing vinyl asbestos floor panels
- for removing cushioned vinyl floorings
- for separating AC (asbestos cement) pipes
- for drilling into AC water pipes
- for the drilling of scaffolding anchors
- for grinding off bitumen adhesives containing asbestos
- for removing magnesium cement floorings containing asbestos

The processes are only applicable to the uses described and when the instructions are consistently followed. The latest list of limited-exposure tested processes can be found in the internet at

<http://www.dguv.de/bgia/de/pr/asbest/index.jsp>

When using low-exposure processes respiratory masks, protective suits and measurements prior to declaring the work complete can be dispensed with. The work must be carried out by expert workers who have received the appropriate instruction. Instruction must be carried out based on the risk assessment and working instructions.

Although respiratory masks can be dispensed with it is recommended that respiratory protective equipment be held ready in order to be able to respond swiftly and appropriately if things go wrong. In addition, individual workers should be able to use the protective equipment if they choose.

Limited exposure work processes are not formally subject to compulsory notification. However, it is recommended that a one-off company-specific notification be made in order to settle any differences with the authority in good time.

9.5 Best Practice 5 – Germany II

Dangers posed by asbestos in buildings

In Germany the legal duty to evaluate asbestos-containing materials applies only to weakly-bound products. All products with a density of $< 1000 \text{ kg/m}^3$ are considered weakly-bound. The evaluation is conducted according to a guideline specially created for the purpose, the "Richtlinie für die Bewertung und Sanierung schwach gebundener Asbestprodukte in Gebäuden" (guideline for the evaluation and renovation of weakly-bound asbestos products in buildings; asbestos guideline). The guideline contains an evaluation table according to which the various criteria must be investigated and evaluated. If a predetermined overall result is exceeded, measures must be undertaken that protect against the risks posed by asbestos.

The following measures are considered:

- removal,
- coating,
- separation from the room of the asbestos-containing material.

If the predetermined result is not exceeded, the material must be re-evaluated periodically as in the course of time a deterioration in its condition can take place.

A table, to be used as a checklist for the evaluation of building parts in buildings containing weakly-bound asbestos that might pose risks to persons, is included in this Best Practice example.

Evaluation of the urgency of a removal

Line	Group	Asbestos products - Evaluation of the urgency of a removal	Evaluation*	Evaluation points
		Building: Room: Product:		
1	I	Type of asbestos use		
2		Sprayed asbestos	<input type="radio"/>	20
3		Asbestos plaster	<input type="radio"/>	10
4		Lightweight asbestos-containing panels	<input type="radio"/>	5, 10 or 15
		Other asbestos-containing products	<input type="radio"/>	5, 10, 15 or 20
5	II	Type of asbestos		
6		Amphibole asbestos	<input type="radio"/>	2
		Other types of asbestos	<input type="radio"/>	0
7	III	Surface structure of the asbestos product		
8		Loose fibre structure	<input type="radio"/>	10
9		Rigid fibre structure without or with an insufficiently dense surface coating	<input type="radio"/>	4
		Dense coated surface	<input type="radio"/>	0
10	IV	Surface condition of the asbestos product		
11		Severely damaged	<input type="radio"/>	6
12		Slightly damaged	<input type="radio"/>	3
		No damage	<input type="radio"/>	0
13	V	External damage to the asbestos product		
14		The product is vulnerable to damage due to its direct accessibility (floor to grip height)	<input type="radio"/>	10
15		Occasional work is carried out on the product	<input type="radio"/>	10
16		The product is exposed to mechanical influences	<input type="radio"/>	10
17		The product is exposed to minor shocks	<input type="radio"/>	10
18		The product is exposed to unfavourable cyclic weather conditions	<input type="radio"/>	10
19		The product is located in an area of strong air movements	<input type="radio"/>	7
20		The asbestos-containing product is located in a room with strong air movements	<input type="radio"/>	3
21		Improper operation of the product might cause friction	<input type="radio"/>	0
			The product is not vulnerable to any external damage	
22	VI	Utilization of the room		
23		Room is regularly used by children, young persons and athletes	<input type="radio"/>	25
24		Room is permanently or often used by other individuals	<input type="radio"/>	20
25		Room is used occasionally	<input type="radio"/>	15
		Room is rarely used	<input type="radio"/>	8
26	VII	Location of the product		
27		Directly in the room	<input type="radio"/>	25
28		In the ventilation system of the room (lining or casing of leaking ducts)	<input type="radio"/>	25
29		Behind leaking suspended ceiling systems or linings	<input type="radio"/>	25
		Behind tight suspended ceiling systems or linings, behind dust-proof underpinnings or coatings, outside of tight air ducts	<input type="radio"/>	0
30	Sum of evaluation points			
31		Immediate removal required (Degree of urgency I)	<input type="radio"/>	≥ 80
32		Re-evaluation required in the medium term (Degree of urgency II)	<input type="radio"/>	70-79
33		Re-evaluation required in the long term (Degree of urgency III)	<input type="radio"/>	< 70

* Please tick appropriate boxes. If several values have been ticked within a group, only one value, i.e. the highest value, is to be considered in calculating the sum (line 30).

9.6 Best Practice 6 – Poland

Energe Ltd. is a medium-sized enterprise located in southern Poland. The company operates in the field of industrial construction. In business since 2003, it employs a highly specialised staff. One of the areas in which the company is leading is the removal and disposal of asbestos-containing materials. The company also cleans up “fly tipping” sites where asbestos has been dumped removes asbestos from industrial installations and buildings difficult to access (chimneys, coolers, and towers). The Energe Ltd. puts special emphasis on the safety of the work and complying with the law. Energe Ltd. removes asbestos-containing materials in a procedure containing 6 phases.

Phase 1 involves an assessment of the technical state during which air and material samples are collected to evaluate the risks of dust emissions. An assessment of the materials containing asbestos and a developed approach for concrete disposal work is also carried out. The drawn-up work plan includes the identification of the asbestos type, the evaluation of the technical condition, the estimation of the quantity of waste to be removed together with the method of disposal and the ways to reduce the release of asbestos dust into the air. Additionally, risk assessment plan contains information about the anticipated risks (on a scale, their type, location and time considered), about separation and marking of places of work, information on how to conduct staff training, ways of identification and handling of hazardous materials on site, and an indication of the technical and organisational measures to prevent hazards in the work zone.

Phase 2 includes the dismantling of asbestos products (asbestos cement panels and other asbestos-containing materials), which is carried out using the special “wet” method. All work is carried out by trained workers and equipped with personal protection measures. During the demolition, a testing of the air in the working area is undertaken. Before the beginning of disposal work, the object in question and the area around it are protected by marking and placing warning signs. During frontage work, cover sheeting is used for the facade, and the ground is covered with foil. The building is carefully secured (sealed windows and doors). After the completion of the asbestos removal the work areas are cleaned.

Phase 3 includes the securing of asbestos waste and their preparation for transport. All waste is put into a special big bag and marked appropriately and indelibly.

Phase 4 comprises the transport of the properly secured asbestos waste. It is carried only by authorised transport companies having vehicles designed to carry hazardous materials transport (ADR) and possessing the appropriate licence.

Phase 5 is the disposal of asbestos waste. Asbestos waste marked with codes 17 06 05* and 17 06 01* is disposed on specially prepared landfills.

Phase 6 consists of activities to comply with the formal requirements. The company provides the customer with a “Waste transfer card”, the “Statement of the proper execution of work” and the “Report on the research into air”. The company has numerous references confirming the high quality of services for asbestos removal.

Energy Ltd. removes asbestos-containing materials from the public buildings (police stations, academic institutions) and also industrial and private buildings.

9.7 Best Practice 7 – The United Kingdom

Information campaign on asbestos “Hidden Killer”

The ‘Hidden Killer’ campaign aimed to raise awareness among tradespeople as to why asbestos still poses relevant risks for them and to encourage them to seek more information.

Awareness increased significantly following the campaign with 8 out of 10 having seen or heard some publicity about the risks of asbestos.

Recognition of the radio and press elements of the campaign was very high at a national level (72%). A high proportion (80%) of 18-34 year olds had seen or heard the campaign press or radio adverts. A high proportion (43%) had received a campaign pack in the post.

53% thought that the campaign had told them something new, with the number of asbestos-related deaths being most commonly cited as the new information.

The highest spontaneous message take-out was raising awareness of asbestos and its dangers (Figure 1). The message with the greatest upward shift from the pre to post stage was how many people still die due to asbestos-related diseases, eg. Every week 6 electricians die from this hidden killer (pre stage 1% up to 22% post stage). This demonstrates that this message was delivered by the campaign.

Spontaneous message take out	National main before	National main after
Raising awareness of asbestos and its dangers	33%	38%
The number of asbestos-related deaths/How many people still die due to asbestos-related illness	1%	22%
Precautions to take: don't work it/touch it etc	16%	15%
Featured tradesmen/electricians/plumbers/joiners etc	3%	14%
It can lead to death/asbestos kills	8%	8%
It is a hidden killer/a hidden danger	4%	6%
Report it/contact the right people/authorities if you find it	4%	4%
Other	10%	5%
Don't know	26%	18%

Prior to the campaign most maintenance workers perceived asbestos to be a low risk (82%) in their current job. While encouragingly the perceived risk did increase following the campaign, there remained around two thirds (65%) who claimed the risk was low.

Encouragingly 71% of those who recognised the campaign said they have either taken, or plan to take, more safety precautions to avoid exposure to asbestos following the campaign.

The national rollout of the 'Hidden Killer' asbestos campaign has performed extremely well, in line with expectations based on the successful performance of the pilot campaign in the North West region. Recognition of the campaign was very high amongst the target audience, particularly for the radio adverts. A substantial proportion of maintenance workers heard the radio adverts and saw the press adverts. A good proportion of the target received a leaflet about asbestos. Like the pilot campaign, maintenance workers were very positive about the campaign material.

The advertising made asbestos more 'top of mind' for the target audience with a significant increase in those spontaneously aware of the danger of asbestos in their current job. There was also an increase in perceived risk of exposure to asbestos, when prompted. Furthermore, given the difficulty in being able to detect asbestos, it is particularly positive to see such a large decrease in those claiming to do nothing on a day to day basis when they are not sure asbestos is present at a site.

Overall many of the campaign's target audience still perceive asbestos to be a low risk for them but the national campaign has made good progress in terms of changing attitudes leading to claimed behaviour change. There is still a long way to go but future campaigns should aim to build on the success of this campaign.

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10 References

The European Union's Directives:

- Commission Directive **1999/77/EC** of 26 July 1999 adapting to technical progress for the sixth time Annex I to Council Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations (asbestos)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0077:EN:HTML>

- Directive **2009/148/EC** of the European Parliament and of the Council of the 30 November 2009 on the protection of workers from the risks related to exposure to asbestos at work (codified version)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:330:0028:0036:EN:PDF>

- Council Directive **89/391/EEC** of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work

http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=31989L0391&model=quichett

- Council Directive **89/654/EEC** of 30 November 1989 concerning the minimum safety and health requirements for the workplace (first individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=en&numdoc=31989L0654&model=quichett

- Council Directive **89/686/EEC** of 21 December 1989 on the approximation of the laws of the Member States relating to personal protective equipment

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31989L0686:EN:NOT>

- Council Directive **92/57/EEC** of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites (eighth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0057:EN:HTML>

- Council Directive **92/58/EEC** of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work (ninth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=31992L0058&model=quichett

- Council Directive **89/656/EEC** of 30 November 1989 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace (third individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=31989L0656&model=quichett

Literature:

- Breuer, J.,(2005) Asbest – eine globale Herausforderung, BARbBl, 20 – 25
- Butz, M. (Juli 2005) Beruflich verursachte Krebserkrankungen. Eine Darstellung der im Zeitraum 1978 bis 2003 anerkannten Berufskrankheiten. HVBG, Sankt Augustin, 8. Auflage, ISBN 3 - 88383 - 682 – 6
- Drexel-Schlund, C. Butz, M. Haupt, B. et al. (August 2003) Asbestverursachte Berufskrankheiten in Deutschland - Entstehung und Prognose. HVBG, Sankt Augustin, ISBN 3 - 88383 - 646 – X
- Eurogip, March (2006) Asbestos-related occupational diseases in Europe, Réf Eurogip - 24/E
- Schmidt, E., G. Krüger (2004) Asbest – Erfahrungen einer Aufsichtsbehörde für Arbeitsschutz bei Abbruch- und Sanierungsarbeiten. Ergo-Med 3, 87 – 92
- Schneider, J., K. Großgarten und H.-J. Weitowitz (1994) Tod an Pleuramesotheliom durch Haus-haltskontakt - sozialmedizinische und sozialjuristische Aspekte. Die Sozialgerichtsbarkeit, Wiesbaden, 41: 557-559

Others:

- European Commission (2009) Information notices on occupational diseases: a guide to diagnosis
- http://infosaludlaboral.isciii.es/pdf/Guia_CE_EP_2009.pdf (June 2010)
- IARC Monographs, Supplement 7 (1987) 106-116
<http://monographs.iarc.fr/ENG/Monographs/suppl7/Suppl7-20.pdf> (July 2010)
- SLIC – Senior Labour Inspectors Committee (2006) A practical guide on best practice to prevent or minimise asbestos risks in work that involves (or may

involve) asbestos: for the employer, the workers and the labour inspector, European Commission Employment, Social Affairs and Equal Opportunities

- Statistics of Deutsche Gesetzliche Unfallversicherung (DGUV) 2007 <http://www.dguv.de/inhalt/zahlen/documents/dguvstatistiken2007d.pdf> (January 2010)