



DANGER
ASBESTOS HAZARD

Asbestos-containing Materials (ACMs) in Workplaces



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Practical Guidelines on
ACM Management and
Abatement

Our vision:

A country where worker safety, health and welfare and the safe management of chemicals are central to successful enterprise

Asbestos-containing Materials (ACMs) in Workplaces

Practical guidelines on ACM Management and Abatement

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The aim of these guidelines is to provide a broad spectrum of guidance aimed at the prevention of occupational illness from exposure to respirable asbestos fibres. These guidelines provide practical advice to employers and those in control of workplaces on the necessary precautions to prevent exposure to asbestos fibres or, where this is not reasonably practicable, to reduce exposure to asbestos fibres.

These Guidelines are relevant to a wide range of people/dutyholders, including:

- Employers, including landlords, in charge of a place of work,
- Clients, as defined under the Safety, Health and Welfare at Work (Construction) Regulations 2013, procuring work in relation to asbestos,
- Designers, including architects and engineers,
- Project supervisors, including the Project Supervisor for Design Process and (PSPD) and Project Supervisor for Construction Stage (PSCS),
- Asbestos surveyors, analysts and consultants,
- Asbestos removal contractors and their employees,
- Construction and demolition contractors,
- Allied tradespeople, e.g. plumbers, electricians, mechanics, telecommunications engineers etc.,
- Maintenance operatives,
- Hazardous waste contractors,
- Those who engage in asbestos removal in domestic dwellings, and
- Any other person who could be exposed to asbestos fibres.

Each category of population mentioned above may be exposed to asbestos fibres in the course of their work, or may require others to undertake work where there is a risk of exposure to asbestos fibres.

With increasing knowledge and technical advances there will be on-going changes in effective practices and the equipment available to achieve the requirements of the 2006 Asbestos Regulations, as amended. These guidelines refer to publications issued by the UK Health and Safety Executive (HSE [UK]) which are likely to be subject to frequent and ongoing revision, reflecting the changes in what is 'accepted best practice'. The HSE publications which are referred to are current at the time of publication; however, in view of the improvements that continue to be made, care should be taken to ensure that any references, HSE (UK) or otherwise, which are quoted in these guidelines are still current.

In particular, these guidelines cross-reference HSE (UK) technical documents such as HSG 248 *The analysts' guide for sampling, analysis and clearance procedures*, HSG 264 *Asbestos: The Survey Guide* and HSG 247 *The Licensed Contractors Guide*. These are considered key technical documents for Irish asbestos professionals who provide analytical, surveying and abatement services. These guidelines do not attempt to replicate these technical standards but aim to inform those who commission asbestos-related work activities of key requirements within these HSE (UK) technical standards.

These guidelines are not intended to be a legal interpretation of the legislation referred to herein but provide guidance on what is 'accepted best practice'.

These guidelines must also be read in conjunction with Health and Safety Authority guidance for construction work, where certain work activities involving asbestos may be relevant for the purposes of the Construction Regulations.

Glossary of terms

'Act' means the Safety, Health and Welfare at Work Act, 2005 (No. 10 of 2005);

'Airborne asbestos' means any fibres of asbestos small enough to be made airborne. For the purposes of monitoring airborne asbestos fibres, only **'respirable fibres'** are counted;

'Asbestos' means the following fibrous silicates:

- (a) asbestos actinolite, CAS No 77536-66-4(*);
- (b) asbestos grunerite (amosite), CAS No 12172-73-5(*);
- (c) asbestos anthophyllite, CAS No 77536-67-5(*);
- (d) chrysotile, CAS No 12001-29-5(*);
- (e) crocidolite, CAS No 12001-28-4(*); and
- (f) asbestos tremolite, CAS No 77 536-68-6(*),

**references to 'CAS' followed by a numerical sequence are references to CAS Registry Numbers assigned to chemicals by the Chemical Abstracts Service, a division of the American Chemical Society;*

'Asbestos abatement' means a number of procedures that are available to control fibre release from 'ACMs' in a building, including removal, encapsulation, repair, enclosure, encasement, and operations and maintenance programs such as environmental cleaning;

'Asbestos-containing material (ACM)' means any material or article that, as part of its design, contains asbestos;

'Asbestos-contaminated dust or debris (ACD)' means dust or debris that has settled within a workplace and is (or is assumed to be) contaminated with asbestos;

'Asbestos Regulations' mean the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006 (S.I. No. 386 of 2006) as amended by Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2010 (S.I. 589 of 2010)

'Authority' means the Health and Safety Authority;

'Competent person' has the meaning assigned to it in the 2005 Act, i.e.

(2) (a) For the purposes of the relevant statutory provisions, a person is deemed to be a competent person where, having regard to the task he or she is required to perform and taking account of the size or hazards (or both of them) of the undertaking or establishment in which he or she undertakes work, the person possesses sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken.

b) Account shall be taken, as appropriate, for the purposes of paragraph (a) of the framework of qualifications referred to in the Qualifications (Education and Training) Act 1999.

'Directive' means Directive 2009/148/EC of the European Parliament and of the Council of 30 November 2009 on the protection of workers from the risks related to exposure to asbestos at work;

'Exposure limit value' for asbestos is a respirable fibre level of 0.1 fibres per cubic centimetre of air measured in a person's breathing zone and expressed as a time-weighted average fibre concentration calculated over an eight-hour working day;

'Friable asbestos' means that an ACM is less resistant to mild abrasion or damage and is more likely to release inhalable fibres;

'HEPA' means High Efficiency Particulate Arrestor with a collection efficiency of 99.95% for the most penetrating particle size. Filters with higher efficiency may be used;

'Non-friable asbestos' means material containing asbestos that is resistant to mild abrasion and damage and less likely to release inhalable fibres;

'Respirable fibre' means an asbestos fibre that is:

- (a) less than 3 microns (μm) wide,
- (b) more than 5 microns (μm) long, and
- (c) has a length to width ratio of more than 3:1;

'TWA' means time-weighted average;

'WHO reference method' means Determination of airborne fibre number concentrations: A recommended method, by phase-contrast optical microscopy (membrane filter method). World Health Organisation, 1997;

'0.1 f/cm³' means 0.1 fibres per cubic centimetre of air as an eight-hour time-weighted average. f/cm³ can also be expressed as fibres per millilitre of air or f/mL.

Abbreviations

- AC:** Asbestos Cement
- ACMs:** Asbestos-containing materials
- AIB:** Asbestos Insulating Board
- AMP:** Asbestos Management Plan
- ARCA:** Asbestos Removal Contractors Association
- DCU:** Decontamination Unit or Hygiene Unit
- HSA:** Health and Safety Authority
- HSE (UK):** Health and Safety Executive (United Kingdom)
- INAB:** Irish National Accreditation Board
- MAS:** Management Asbestos Survey
- NPU:** Negative Pressure Unit
- PCM:** Phase Contrast Microscopy
- PLM:** Polarised Light Microscopy
- PPE:** Personal Protective Equipment
- RDAS:** Refurbishment/ Demolition Asbestos Survey
- RPE:** Respiratory Protective Equipment
- TWA:** Time-weighted Average
- UKAS:** United Kingdom Accredited Services
- WHO:** World Health Organisation

Section 1: What is Asbestos?

Asbestos is a term used for the fibrous forms of several naturally-occurring minerals. All asbestos deposits originate from crystallisation of molten rock which, on cooling, produces the various types of fibrous forms. It is usually found as thin veins, up to a few inches thick, between layers of the parent rock, which may be in non-fibrous or crystalline form.

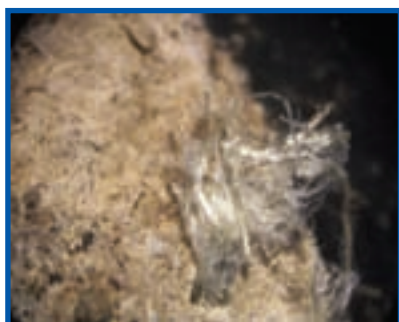
Asbestos types

There are two varieties of asbestos: amphibole and serpentine.



Amphibole	Crocidolite	often referred to as ' <i>blue</i> asbestos'
	Amosite	often referred to as ' <i>brown</i> asbestos'
	Anthophyllite	
	Tremolite	
	Actinolite	
Serpentine	Chrysotile	often referred to as ' <i>white</i> asbestos'

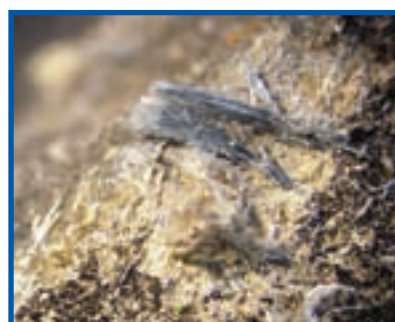
Although there are six regulated types of asbestos, Crocidolite, Amosite and Chrysotile are the main types of asbestos which have had any real commercial significance or usage in Ireland. Chrysotile asbestos was used in the majority of asbestos applications.



Chrysotile (white asbestos) in asbestos cement roof sheet



Amosite (brown asbestos) in Asbestos Insulating Board (AIB)



Crocidolite (blue asbestos) and Chrysotile (white asbestos) in corrugated roof sheeting

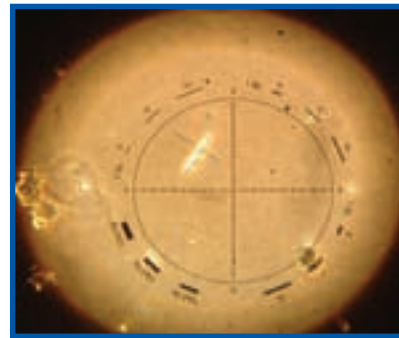
The presence of asbestos fibres in finished products is not obvious, and the different types of asbestos **cannot be distinguished by their visual appearance or colour**. Laboratory analysis is required to identify the type of asbestos; the methods are described in Section 8.

Physical/ chemical properties of asbestos

Asbestos fibres are minerals with exceptional physical and chemical properties. They do not burn; they are remarkably resistant to diverse chemical attacks, depending on the asbestos type, and they show a heightened mechanical tensile strength. They are good thermal and electrical insulators. These properties have led to the development of the use of asbestos fibres in multiple forms for manufacturing numerous widely-consumed industrial products and in the construction of buildings.

Definition of an asbestos fibre

The characteristics of the fibres to be taken into account when measuring the concentration of airborne fibres by Phase Contrast Microscopy (PCM) are defined by a WHO reference method as set out in the Asbestos Regulations. This standardised method defines a fibre as any elongated solid particle, natural or artificial, with parallel sides, having a diameter below 3 μm , a length above 5 μm and a length-width ratio above 3. These fibres are frequently called **respirable fibres**.



Respirable Amosite (brown asbestos) and translucent man-made mineral fibre under a phase contrast microscope (magnification x500)

Section 2: Asbestos in buildings

ACMs were widely used in the building and construction industry up until 1999. The majority of buildings built between 1940 and 1985, during which time asbestos production peaked, contain asbestos in some form.

Asbestos has been widely used in construction materials and for a number of purposes including:

- ▼ fireproofing
- ▼ thermal insulation
- ▼ electrical insulation
- ▼ sound insulation
- ▼ decorative plasters
- ▼ roofing products
- ▼ flooring products
- ▼ heat resistant materials
- ▼ gaskets
- ▼ chemical resistance

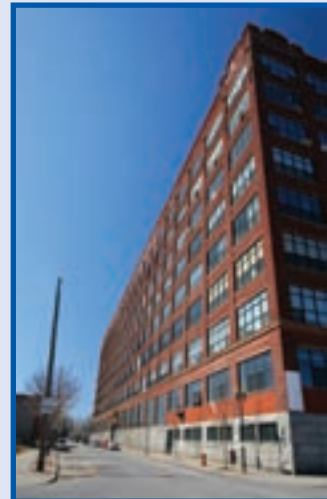


Figure 1 (Asbestos Building) details some typical locations for the most common ACMs and Appendix 1 contains photographic examples of some commonly found ACMs. Figure 1 can be found at the end of this Section.

Summary of the different forms of ACMs

Sprayed asbestos

Sprayed asbestos was applied as heatproofing, soundproofing and as protection against fire and condensation on beams, connecting pieces and stays made of steel. A mixture of asbestos types was used. Sprayed asbestos is extremely friable and has a high potential for fibre release unless sealed.



Loose asbestos lagging

Loose asbestos lagging was used as a filling material for heatproofing and soundproofing and as protection against fire for pipe ducts, loft insulation and insulation between floors.

Thermal Insulation/ Lagging

Thermal insulation was used to lag pipes, boilers and pressure vessels. It was either applied as a composite or in preformed pipe sections. The type and amount of asbestos used can vary greatly.



Asbestos cloths, tapes and cords

Asbestos tapes and cords are found as heatproof 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. Cloths were used as jointing and packing, gaskets, thermal insulation and lagging including fire-resistant blankets, mattresses and protective curtains, gloves, aprons, overalls, etc.



Asbestos board/ panels

Asbestos boards/panels were used as fireproof coverings for beams, connecting pieces and stays made of steel or wood. They can contain chrysotile, amosite or crocidolite or a mixture of asbestos types. They were used widely in ducts and for fire-stopping, infill panels, partitions, ceiling tiles, roof underlays, wall lining, bath panels, external canopies and porch linings.

Asbestos is also found in insulating board cores and linings of composite products used for acoustic attenuators, cladding infill panels, domestic boiler casings, partition and ceiling panels, oven linings and suspended floor systems. 'Asbestolux' and 'Marinite' are examples of the trade names.

Asbestos millboard, papers, cardboards, and gaskets

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. Gaskets were used as sealing for acids, oils and under conditions of high temperature and pressure. These gaskets are known as CAF (Compressed Asbestos Fibre) gaskets. All types of asbestos have been used, but only Chrysotile since 1965.



Asbestos containing textured coats and paints

Textured coatings can be found on ceilings and walls. They normally contain Chrysotile asbestos. They were phased out from the late 1980s but are still widely in place, for example as 'Artex' on walls and ceilings in both commercial and domestic buildings.



Asbestos-containing bitumen/ tar

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, and as joint sealant and casting compound.

Asbestos was added to fireproofing coatings, anti-rust paint, adhesives and plaster-containing filler.

Asbestos-containing floor coverings

Thermoplastic vinyl-asbestos tiles normally contain white asbestos (Chrysotile). They were mostly laid on bitumen adhesives, which can also contain asbestos. These tiles were laid on a large scale in public buildings, schools, etc., but also in private homes and offices.

Asbestos-paper backed PVC flooring are foam PVC goods (cut from a roll). They are coated on the underside with a white or light grey asbestos cardboard.



Asbestos cement products

Asbestos cement is predominantly a mixture of cement and asbestos fibres. All three common types of asbestos have been used but Chrysotile (white asbestos) is the most common asbestos type found in asbestos cement. Asbestos cement has been used as:

- **Profiled sheets:** Roofing, wall cladding and weather-boarding.
- **Semi-compressed flat sheet and partition board:** Partitioning in farm buildings and housing, shuttering in industrial buildings, decorative panels, bath panels, soffits, linings to walls and ceilings, portable buildings, propagation beds in horticulture, fire surrounds and composite panels for fire protection.
- **Fully compressed flat sheet and partition board:** Used in the same way as semi-compressed products where stronger materials are required.
- **Tiles and slates** (made from fully compressed flat sheet): Cladding, decking and promenade tiles and roofing.
- **Pre-formed moulded products:** Cistern and tanks, mains water pipes, sewer pipes, rainwater goods, flue pipes, fencing, roofing components, cable troughs and conduits, ventilators and ducts, and window boxes.



It should be noted that certain tiles and corrugated sheets used on roofs of buildings prior to 1990 are likely to contain asbestos fibres. However, since the early 1990s, such products have been gradually replaced or substituted with equivalent non-asbestos-containing materials – this change occurred on a voluntary basis prior to the formal ban on their use which came into force in the year 2000. Substitute materials for asbestos-containing corrugated sheets and tiles now exist so that, when removing asbestos-containing roofing slates or corrugated sheets, these substitutes can be installed to fulfil the same function.

Because of the wide use of asbestos cement, considerable amounts still remain in place.



ACMs in domestic properties

Asbestos was used in various domestic construction materials, applications and appliances between the 1950s and 1990s.

Exposure of workers and the occupier to asbestos fibres can occur during uncontrolled asbestos removal or disturbance.

In particular, those who commission works in domestic properties should identify ACMs prior to refurbishment, demolition or upgrades, e.g. energy efficiency projects.

Therefore, ACMs must be identified by a competent person, e.g. an asbestos surveyor, prior to building work.

ACMs can be found in domestic dwellings (non-exhaustive) as:

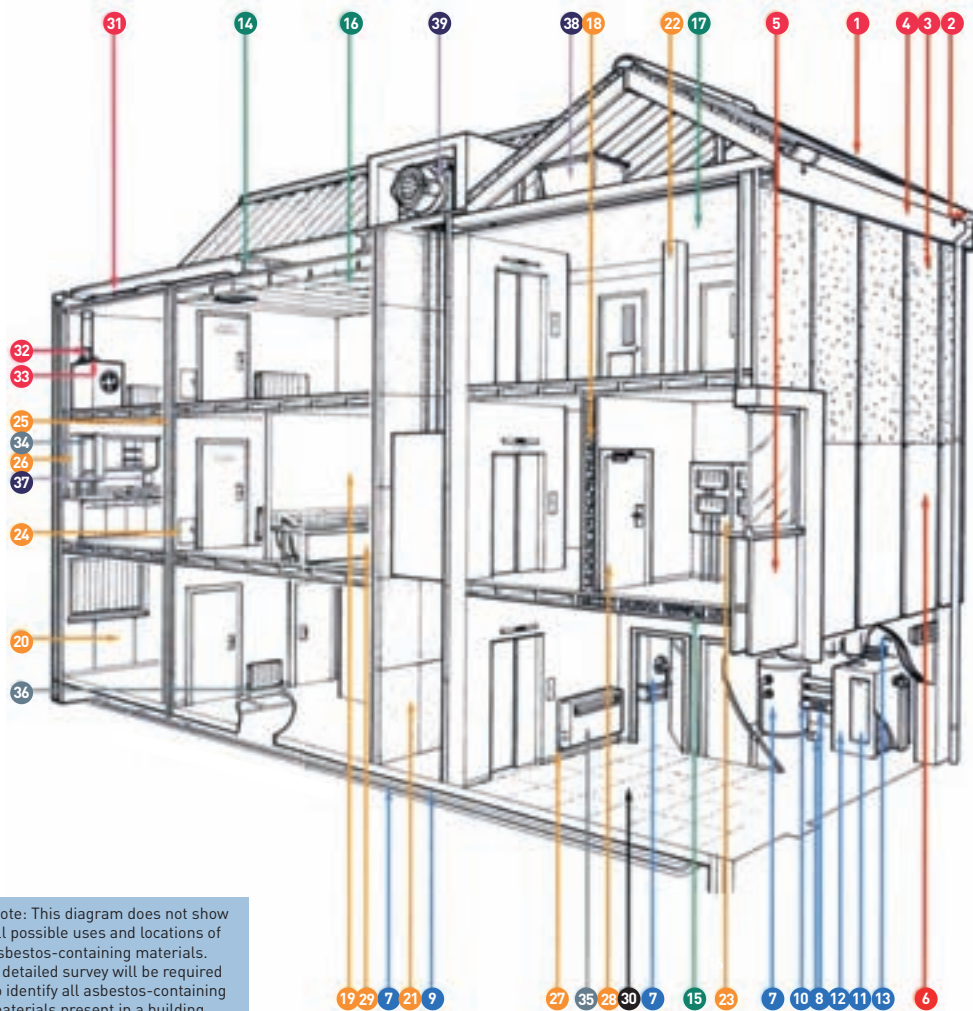
- Thermal insulation to boilers and associated pipes, under floors and between attic joists as loose asbestos lagging,
- Roofing materials – corrugated asbestos cement roofs on garages and sheds, roof tiles, felt, bitumen products, rainwater gutters and downpipes,
- Internal ceiling panels (house, garage or boiler room) – can be either asbestos cement or asbestos insulating board,

- Fireproofing – asbestos insulating board to rear of electrical fuse boards, boiler room doors, and as under-stair panelling,
- Ceiling applications – textured paints to ceilings and walls,
- Floor products – vinyl floor tiles and adhesive,
- Seals – rope seals to ovens, stoves and CAF gaskets in boilers, flues, etc., and
- Asbestos cement cowls, boiler flues and water pipes.

Any abatement work involving friable ACMs such as asbestos insulating boards, lagging, etc. should be undertaken by a specialist asbestos contractor. Work with friable ACMs in domestic dwellings undertaken by specialist contractors must comply with the relevant provisions of the Asbestos Regulations, e.g. plan of work, notification to the Authority and a visual inspection with clearance air testing by an independent analyst.

For work with other, lower risk ACMs in domestic dwellings, contractors should consult these guidelines for safe working procedures and specific requirements.

The Safety, Health and Welfare at Work (Construction Regulations) 2013, places duties on the homeowner as 'Client' and duties on appointed contractors. Further guidance for homeowners and contractors in relation to domestic dwellings can be obtained from the Health and Safety Authority's website www.hsa.ie.



Note: This diagram does not show all possible uses and locations of asbestos-containing materials. A detailed survey will be required to identify all asbestos-containing materials present in a building.

Figure 1 Asbestos building
Typical locations for the most common asbestos containing materials. Source: HSE(UK)

ROOF AND EXTERIOR WALLS

- 1 Roof sheets, slates and tiles
- 2 Guttering and drainpipes
- 3 Wall cladding
- 4 Soffit boards
- 5 Panel beneath window
- 6 Roofing felt and coating to metal wall cladding

BOILER, VESSELS AND PIPEWORK

- 7 Lagging on boiler pipework, calorifier, etc.
- 8 Damaged lagging and associated debris
- 9 Paper lining under non-asbestos pipe lagging
- 10 Gasket in pipe and vessel joints
- 11 Rope seal on boiler access hatch and between cast iron boiler sections
- 12 Paper lining inside steel boiler casing
- 13 Boiler flue

CEILING

- 14 Spray coating to ceiling, walls beams/columns
- 15 Tiles, slats, canopies and fire breaks above ceiling
- 16 Loose asbestos in ceiling/floor cavity
- 17 Textured coatings and paints

INTERIOR WALLS / PANELS

- 18 Partition walls
- 19 Loose asbestos inside partition walls
- 20 Panel beneath window
- 21 Panel lining to lift shaft
- 22 Panelling to vertical and horizontal beams
- 23 Panel behind electrical equipment
- 24 Panel on access hatch to service riser
- 25 Panel lining service riser and floor
- 26 Heater cupboard around domestic boiler
- 27 Panel behind/under heater

- 28 Panel on, or inside, fire door
- 29 Bath panel

FLOORING MATERIALS

- 30 Floor tiles, linoleum and paper backing, lining to suspended floor

AIR HANDLING SYSTEMS

- 31 Lagging
- 32 Gaskets
- 33 Anti-vibration gaiter

DOMESTIC APPLIANCES

- 34 Gaskets rope seals and panels in domestic boilers
- 35 'Caposil' insulating blocks, panels, paper, string etc in domestic heater
- 36 String seals on radiators

OTHER

- 37 Fire blanket
- 38 Water tank
- 39 Brake/clutch lining

Section 3: What are the health effects?



Asbestos is a Category 1 carcinogen and all six types can cause cancer. Blue and brown asbestos are known to be more dangerous than white asbestos. There is no cure for asbestos-related disease.

When ACMs are damaged or disturbed, asbestos fibres may be released into the air, which, if breathed in, can cause serious, and often fatal, diseases. Following exposure to asbestos, a person may develop one of the following three fatal diseases:

Asbestosis: fibres penetrating deep into the lung can cause scarring of the tissue, which restricts breathing, leading to decreased lung volume and increased resistance in the airways.

Asbestos-related lung cancer (bronchial carcinoma): a malignant tumour of the lungs' air passages. The tumour grows through surrounding tissue, invading and often obstructing air passages. **Smoking greatly increases the risk of developing asbestos-related lung cancer.**

Mesothelioma: a cancer of the cells that make up the lining around the outside of the lungs and inside of the ribs (pleura) or around the abdominal organs (peritoneum). By the time it is diagnosed it is almost always fatal.

The diseases can take many years (15–60) to develop. There are no immediate changes in someone's health after breathing in asbestos.

Other asbestos-related, non-fatal conditions exist, such as pleural plaques and pleural thickening, asbestos warts and corns.

There is now adequate evidence that asbestos causes ovarian and laryngeal cancer. However, the asbestos-related risk is much higher for lung cancer and mesothelioma than for other cancers.

The likelihood of developing an asbestos-related disease depends on:

- Asbestos type (blue, brown or white),
- Age at first exposure (likelihood increases if exposures start young),
- Dose or number of fibres inhaled,
- Number of exposures and duration of each exposure, and
- Smoking – a smoker who inhales asbestos is fifty times more likely to develop lung cancer than a non-smoker who has not been exposed to asbestos.

A one-off short-term exposure is unlikely to be of concern, but each time a person is exposed, the risk of developing an asbestos-related disease slightly increases.

Section 4: Risk from asbestos and ACMs

Workers at risk from exposure to asbestos fibres

Persons at work who, whether intentionally, unwittingly or consciously, disturb ACMs, can cause asbestos fibres to be released into the air, which can be inhaled.

During maintenance, refurbishment or demolition work, workers such as **painters, carpenters, plumbers, electricians, computer/air conditioning installers** etc. are all at risk of disturbing ACMs and so could potentially be exposed to asbestos fibres.

Others workers at high risk are **maintenance workers, boiler operators, caretakers, general repair persons** etc. who, during the course of their normal work and routine, could unwittingly disturb ACMs if they do not know of their existence or that the materials they are working on or with contain asbestos fibres.

Any other category of workers, e.g. **office, warehouse workers** etc., who work in a building where ACMs have not been identified or proactively managed by those in control of the workplace are also potentially at risk of low level exposure to asbestos fibres.

Specialist asbestos contractors, demolition contractors, hazardous waste management contractors, asbestos analysts and asbestos surveyors are also at risk of exposure but this group of workers should have the experience, training and skills to mitigate and control any significant potential for exposure to asbestos fibres.

Exposure limit value

The exposure limit value for asbestos is the maximum concentration of asbestos fibres in the air to which workers may be exposed at a place of work, measured or calculated with reference to an eight-hour period (i.e. the duration of an average work shift). The exposure limit value for all types of asbestos is 0.1 fibres per cubic



centimetre of air (fibres per cm^3) (equivalent to 100 fibres per litre of air). This exposure limit value is not a 'safe threshold'. It is calculated that lung cancer mortality through forty-five years of exposure to 0.1 fibres per cm^3 would amount to five additional deaths per thousand exposed people. This is roughly equivalent to an occupational risk level of 4×10^{-3} .

Risk from ACMs

If ACMs are in good condition and left undisturbed, it is unlikely that airborne asbestos will be released into the air, and therefore the risk to health is extremely low. It is usually safer to leave it and review its condition over time. However, if the asbestos or ACM has deteriorated, been disturbed, or if asbestos-contaminated dust is present, the likelihood that airborne asbestos fibres will be released into the air is increased.

If ACMs are disturbed or damaged, fibres can easily become airborne. ACMs that are hard and have a lower asbestos content, e.g. undamaged asbestos cement products, are less likely to release fibres than those that are soft and have a high asbestos content and which are more easily damaged, e.g. laggings, sprayed coatings. Table 1 lists ACMs in approximate order of propensity to release fibres.

Table 1

Products listed in order of potential for fibre release (High to Low)

- ▼ Asbestos-contaminated dust (including dust left in place post asbestos removal)
- ▼ Sprayed coatings, laggings and loose asbestos fill
- ▼ Millboard
- ▼ Insulating Boards
- ▼ Paper products & cardboard
- ▼ Ropes, yarns and cloths (textiles)
- ▼ Gaskets
- ▼ Asbestos cement products
- ▼ Textured decorative coatings and paints containing asbestos
- ▼ Asbestos bitumen roofing felts & damp proof courses; semi rigid asbestos bitumen products and asbestos bitumen-coated metals
- ▼ Unbacked vinyl & vinyl floor tiles
- ▼ Mastics, sealants, putties and adhesives
- ▼ Asbestos- reinforced PVC and plastics

While all types of asbestos share the same hazards, i.e. the potential for lung cancer, asbestosis and mesothelioma, they have varying degrees of risk (the likelihood that death from one of the hazards will occur).

The relative risk from Crocidolite (blue) and Amosite (brown) asbestos is greater than that from white asbestos. This means that the type(s) of asbestos in the product is particularly significant when assessing risk but the exposure limit value is 0.1 fibres per cm³ for all asbestos types.

Friable and non-friable ACMs

The **Asbestos Survey** (see section 8) should provide information to help determine whether an ACM is friable or non-friable. Generally, friability means that an ACM is less resistant to mild abrasion or damage and is more likely to release inhalable fibres, so the type of ACM, asbestos fibre type and condition are critical to determine friability. Table 1 has been modified below (see Table 2) to provide general guidance on friable/non-friable ACMs.

Table 2

Friable/ non- friable ACMs

- Asbestos containing dust (ACD)
- Sprayed coatings, laggings and loose asbestos fill
- Millboard
- Insulating Boards
- Ropes, yarns and cloths
- Paper products
- Vinyl flooring backed with asbestos paper
- Compressed Asbestos Fibre (CAF) gaskets
- Asbestos cement products in degraded state

Friable ACMs

- Asbestos cement products in non-degraded state
- Asbestos bitumen roofing felts & damp proof courses, semi-rigid asbestos bitumen products and asbestos bitumen-coated metals
- Unbacked vinyl & vinyl floor tiles
- Textured decorative coatings and paints containing asbestos on plasterboard
- Mastics sealants, putties and adhesives
- Asbestos- reinforced PVC and plastics

Non-friable ACMs

Exposure levels associated with asbestos work

The exposure from disturbing an asbestos product depends on a number of factors such as:

- Type of matrix in which the asbestos is present;
- Amount of asbestos and whether the asbestos is evenly dispersed throughout the matrix or is present as a layer on the surface,
- Type, rate, amount and area of disturbance inflicted on the asbestos-containing material,
- Frequency with which disturbance or work on the asbestos material is carried out,

- Controls applied to reduce airborne emissions, and
- Local conditions and the use of personal protective equipment.

Clearly, this number of variables will mean that for each product, a range of airborne asbestos fibre exposure levels will occur. Whilst accepting that there are many potential biases in any sampling data, Table 3 provides average exposures during work with various ACMs. It demonstrates the potential releases of fibres for well controlled removal (wet) and poorly controlled removal (dry) of different types of asbestos materials. No account is taken of any protection offered by respiratory protective equipment (RPE).

Table 3

Assessment of average personal airborne concentration of regulated asbestos fibres during removal of ACMs

Product group	Controlled wet removal / good practice (f/cm ³)	Limited controls / dry removal (f/cm ³)
Spray and other insulation products	14.4	358
Asbestos insulating board (AIB) including millboards	0.41	15
Asbestos cement	0.01	0.08
Fillers and reinforcements in a flexible matrix (incl. textured coatings)	0.02	0.08
Jointings (gaskets) and packing	0.05	0.2
Flooring	0.01	0.05
Moulded plastics and battery cases	0.001	0.01

Source: Health and Safety Laboratory (UK)

As indicated in the table above, for sprays and lagging the average fibre levels during poorly controlled dry removal are about 360 fibres per cm³, and for AIB, about 15 fibres per cm³ (some 3600 and 150 times the exposure limit value respectively). Even with controlled (wet) removal there is significant potential for release of fibres of around 140 times the exposure limit value for sprays and lagging and 40 times the exposure limit value for AIB.

The risk posed by asbestos cement products

Asbestos cement differs from AIB in that it is denser and harder to the touch. It is not friable in a non-degraded state. As the fibres are tightly bound in the cement matrix they will only be released if the material is subject to significant disturbance, such as drilling, sawing or sanding. It should be noted that while this material is not

friable in a non-degraded state, asbestos cement can be relatively brittle and so can be broken quite easily, e.g. if dropped from a height, driven over by vehicles or struck with tools or implements; and, of course, it is a fragile roof material which cannot withstand a person's weight.

Because the fibres in asbestos cement products are tightly bound in the material or matrix, they will only be released if the product is subject to mechanical damage, e.g. the use of abrasive tools or breakage, or as a result of weathering. This contrasts with other materials or products containing asbestos such as sprayed coatings and lagging which generally have a greater fibre content and, being loosely bound, release fibres relatively easily when damaged or disturbed. The level of risk depends on the ease with which fibres are released and the type of asbestos present.

Asbestos cement products such as roof sheets used externally will weather slowly. The low rate of fibre release means that the risk of exposure is extremely low if the sheets are left undisturbed.

After several years of external use, asbestos cement may become covered in lichen, algae or moss. Although such growths rarely have a noticeable effect on the strength, durability or lifetime of asbestos cement, they may become visually unattractive – although in some areas they can actually be regarded as mellow and pleasing, and are therefore encouraged. If these growths are removed without taking adequate precautions, there is a risk of fibre release and high exposures.

Table 4 gives examples of typical exposures during work with asbestos cement. It should be noted, however, that while this Table lists a number of techniques or activities involving asbestos cement, it does not infer that these techniques or activities are acceptable, e.g. machine cutting without exhaust ventilation, dry brushing etc., but provides a list of activities which could be performed and so provides an indication of the level of fibres expected to be released. The values assist in illustrating which work practices produce or result in high exposures and also illustrate the importance of using specific work practices to ensure that exposures are kept as low as is reasonably practicable. The values in this Table originate from measurements taken by the HSE (UK).

Table 4

Typical fibre concentrations for work with asbestos cement

Type of Activity	Typical Exposure Levels (fibres per cm ³)	
Machine sawing with exhaust ventilation	Up to 2	
Machine cutting without exhaust ventilation		
- abrasive disc cutting	15 - 25	
- circular saw	10 - 20	
- jig saw	2 - 10	
Hand sawing	Up to 1	
Machine drilling	Up to 1	
Removal of asbestos cement sheeting	Up to 0.5	
Stacking of asbestos cement sheets	Up to 0.5	
Remote demolition of asbestos cement structures (dry)	Up to 0.1	
Remote demolition of asbestos cement structures (wet)	Up to 0.01	
Cleaning asbestos cement	Roofing	Vertical cladding
Dry brushing (wire)	3	5 - 8
Wet brushing (wire)	1 - 3	1 - 2

Asbestos cement products such as roof sheets **may sometimes be found in conjunction with other asbestos-containing materials**. For example, a warehouse may have an asbestos cement roof which has a sprayed asbestos coating on the inner surface. The presence of this other asbestos-containing material would significantly alter the risk associated with work on the asbestos cement sheets. In these circumstances, more stringent precautions would be required than for work on asbestos cement alone, and the work would need to be carried out by a specialist asbestos contractor. This scenario could be very dangerous if the materials had not been identified prior to work commencing. The materials should have been identified in an asbestos survey carried out by a competent person, and should have been assessed thoroughly through the performance of a risk assessment, which would take into account the presence of the sprayed asbestos.

It should be noted that the majority of asbestos cement products contain only Chrysotile asbestos fibres, but some older products may also contain the more hazardous Crocidolite or Amosite asbestos fibres.



Is it Asbestos Insulating Board or Asbestos Cement?

It is essential to be able to distinguish between asbestos cement and AIB. Asbestos cement is defined as a cementitious material which, when in a dry state, absorbs less than 30% water by weight.

Where there is doubt, employers must take the precaution of assuming that the material is insulating board and engaging a specialist asbestos contractor or arranging to conduct a **water absorption test** as detailed in Appendix 4 of these guidelines.

As with any work activity the requirements of the Safety, Health and Welfare at Work Act, 2005 (S.I. No. 10 of 2005) and the Safety, Health and Welfare at Work (General Application) Regulations, 2007 as amended (S.I. No. 299 of 2007 & S.I. No. 732 of 2007) apply and must be considered with respect to the protection of workers at the place of work.

In addition, as regards specific work activities involving working with materials containing asbestos, particular attention must be taken concerning the requirements and control measures as outlined in the following legislation:

- Chemicals (Asbestos Articles) Regulations 2011 (S.I. No. 248 of 2011).
- The Safety, Health and Welfare at Work (Exposure to Asbestos) (Amendment) Regulations, 2010 (S.I. No. 589 of 2010).
- The Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006 (S.I. No. 386 of 2006).
- The Safety, Health and Welfare at Work (Construction) Regulations, 2013 (S.I. No. 291 of 2013).
- REACH Regulation.
- Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001 (S.I. No. 619 of 2001).
- Safety Health and Welfare at Work (Carcinogens) Regulations, 2001 (S.I. No. 078 of 2001).
- European Communities (Carriage of dangerous goods by road and use of transportable pressure equipment) Regulations, 2011 (S.I. No. 349 of 2011).
- Air Pollution Act, 1989.

Chemicals (Asbestos Articles) Regulations, 2011 (S.I. 248 of 2011)

The Chemicals (Asbestos Articles) Regulations, 2011 (S.I. No. 248 of 2011) (CAA regulations) came into operation on 31 May 2011. They specify how the Health and Safety Authority may issue a certificate to exempt an asbestos-containing article or category of such articles from the prohibition on the placing on the market of an asbestos-containing article provided for by Article 67 and Annex XVII of the EU REACH Regulation 1907/2006.

The CAA Regulations govern the regime under which persons or bodies must apply to the Health and Safety Authority (HSA) for an 'asbestos article exemption certificate' before they may place permitted asbestos-containing articles on the market – whether for payment or free – and make it an offence to place such articles on the market in the absence of such an exemption certificate.

Once a certificate is issued, for either a category of articles or in respect of a particular applicant only, and subject to any conditions and time limits, as appropriate, then the articles concerned may be placed on the market. Otherwise, asbestos-containing articles may not be placed on the Irish market. Examples of such articles would include second-hand acetylene cylinders, articles of historical value and classic/vintage cars.

The CAA regulations allow placing on the market of asbestos-containing articles without a certificate in the case of the following articles:

- a) asbestos articles transferred to specialists for asbestos removal and disposal,
- b) asbestos articles transferred to specialists to render them safe, and
- c) asbestos articles that are sent as samples for analysis.

This is to allow for the continued removal of asbestos-containing materials by specialist contractors. Point (c) is to allow articles to be tested for the suspected presence of asbestos, e.g. for compliance with health and safety legislation or quality assurance purposes. The provisions of the Asbestos Regulations will still apply to scenarios (a) to (c).

Further information on the CAA regulations can be found on the Business Licensing and Notification section of the HSA website at www.hsa.ie.

The Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006 & 2010

These are the key regulations relating to asbestos in the workplace, namely, the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006, [S.I. No. 386 of 2006] as amended by The Safety, Health and Welfare at Work (Exposure to Asbestos) (Amendment) Regulations, 2010 [S.I. No. 589 of 2010] (hereinafter referred to as the 'Asbestos Regulations'). The following table provides a general summary of the key regulations and relevant section in these guidelines.

Table 5:
Summary of key requirements in the Asbestos Regulations and relevant section in these guidelines

Asbestos Regulations:	Relevant Section in Guidelines
Apply to all places of work and all sectors of work where asbestos-containing materials (ACMs) may be present, including premises, buildings, installations, power stations, farms, vehicles, ships, aircraft, factories, plant and equipment including temporary or remote sites.	----
Specifically refer to the six types of asbestos as set out in Schedule 1 of the regulations.	Section 1
Relate to all employees and non-employees who may be at risk from exposure while at work, should exposure occur to any material or product containing asbestos fibres that could be released and then inhaled by those employees.	Section 4
Require employers to prevent exposure to asbestos by carrying out a written risk assessment for any activity where an employee may be exposed to dust containing asbestos. This assessment should determine the nature and degree of exposure, type and condition of asbestos and identify the necessary measures to be taken. Consultation with employees must take place.	Section 6 & 7
Provide for certain exemptions for lower risk asbestos work activities where exposure is low and sporadic. The exemptions relate to notification, health assessments and maintenance of health records.	Section 11

Asbestos Regulations:	Relevant Section in Guidelines
Set a single control level (exposure limit value) of 0.1 fibres per cm ³ for all types or mixtures of asbestos types. Exposure must be less than 0.1 fibres per cm ³ as an 8-hour time-weighted average (TWA), by the use of respiratory protective equipment if exposure cannot be reduced sufficiently using other means.	Section 4
Require employers to put in place preventative measures such as limiting number of personnel, designing work processes to avoid dust release, regularly cleaning and maintaining work areas, correctly packaging asbestos waste and collection, demarcating areas with warning signs and preventing unauthorised entry, use and supervision of suitable PPE/RPE and banning smoking in the work area. These measures must also be in place in areas where exposure limit value will be foreseeably exceeded.	Section 10, 11, 12, 14 & 17
Require air monitoring (sampling) to be carried out by an independent competent analyst, where exposure limit value will be exceeded. It must be representative of personal exposure by means of measurements or time-weighted averages. Samples must be analysed in accordance with the PCM method, or only fibres of specified dimensions may be counted.	Section 13
Require employers, based on risk assessment, to notify the Authority of asbestos work activities, including the plan of work, 14 days in advance of the work starting.	Section 6, 11, 12 & 16
Require employers to take all reasonable steps to identify asbestos-containing materials prior to demolition, maintenance or repair.	Section 6
Require employers to implement controls where unforeseeable elevated fibre levels occur.	Section 12 & 13
Require employers to draw up a suitable plan of work prior to any demolition, repair, maintenance or other work. Where the risk assessment indicates that an asbestos work activity is notifiable, the plan of work must also be submitted with the notification to the Authority. ACMs must be removed as far as reasonably practicable before demolition techniques are applied, except where this would cause a greater risk to employees.	Section 14
Require employers to obtain written verification, called a 'site clearance for reoccupation', following asbestos removal activities. This can be done by a competent person if air monitoring is not required or an independent analyst if air monitoring is required. A separate clearance certificate is also required for the decontamination or hygiene unit.	Section 11 & 13
Require employers to provide evidence of ability to carry out asbestos work activities with particular requirements set out in Schedule 4 of the regulations.	Section 9, 10, 11, 12 & 15
Require employers to ensure that adequate information, instruction and training is given to all employees who are, or are liable to be, exposed to asbestos, and to those who supervise such employees. The self-employed should have a similar level of knowledge and competence.	Section 9

Asbestos Regulations:	Relevant Section in Guidelines
Requires an employer based on risk assessment to use a responsible medical practitioner for the purposes of health assessments of employees at least once in every three years. Records must be retained for 40 years after last exposure and provisions are made for making these available to the Authority under certain circumstances.	Section 6, 11 & 15
Requires the Authority to maintain an Asbestos and Mesothelioma register and medical doctors to inform the Authority of such cases.	Section 15
Requires employers based on risk assessment to maintain occupational exposure registers for employees. Records must be retained for 40 years after last exposure and provisions are made for making these available to the authority under certain circumstances.	Section 15
Set out prohibitions in relation to asbestos spraying activities.	---

Safety, Health and Welfare at Work (Construction) Regulations, 2013 (S.I. No. 291 of 2013).

These Regulations place duties on clients, project supervisors for the design process (PSDP) and construction stages of work (PSCS), and designers and contractors to ensure that the health and safety aspects of the work are taken into account and then coordinated and managed effectively throughout all stages of a construction project, from conception, design and planning through to the execution of works on-site and subsequent construction, maintenance and repair, refurbishment, removal, demolition etc.

Under these Regulations a preliminary health and safety plan must be drawn up by the project supervisor for the design process, PSDP, on most construction projects. This plan must specify, among other items, any particular risk which exists at the premises, including the presence of asbestos-containing materials.

In the majority of situations work activities involving materials containing asbestos (including asbestos cement) are covered within

the definition of ‘construction work’ and so the Construction Regulations apply to this type of work activity. If any doubt exists regarding the overall description or nature of the work, clarification should be sought and specific reference made to the definition in the Regulations, including its inferred interpretation.

In particular, Schedule 1 to the Regulations refers to work involving ‘particular risk’, i.e. involving materials containing asbestos.

The Regulations require that:

- When planning works, clients must appoint a PSDP and preferably provide information on ACMs as ‘pre-construction’ information, or require the PSDP to arrange for the identification and information about the location, type and condition of ACMs on-site,
- Designers should take account of this information in their designs and, based on risk assessment, should remove or reduce the need to work with asbestos cement where possible,

- Project supervisors should ensure that information about asbestos which is relevant to the work in hand is available to designers and contractors as appropriate,
- The PSCS on-site should ensure that individual contractors are aware of the relevant information and that all workers are briefed,
- Anyone arranging for persons to design or undertake construction work must be reasonably satisfied that their appointees are competent to undertake the work safely and without risk to health,
- Where work with ACMs is part of the construction work, employers should provide employees with sufficient information, training and instruction to ensure that they are aware of the risk and the control measures, safe practices and safe systems required to perform their work activities in a safe manner, and
- At the end of a project a safety file, including relevant information about asbestos, must be prepared for the client by the PSDP.

It is recommended for those engaged in a PSDP role to ensure that they have appropriate insurance cover regarding the provision of instructions for asbestos remedial or removal works. Alternatively they should engage a competent asbestos consultant to assist in the compilation of the asbestos tender documentation.

In the case of demolition projects, all ACMs, including lower risk materials such as textured coatings and asbestos cement, must be removed prior to the demolition of the site, insofar as is reasonably practicable, unless the risks to the safety and health of workers exceed the risk from exposure to asbestos, e.g. remote demolition may be appropriate where a building is structurally unsound.

The Construction Regulations apply to asbestos consultants and asbestos contractors, including those who may take on the role of PSDP and PSCS respectively. Comprehensive guidance on the Construction Regulations is available on the Authority's construction webpages at www.hsa.ie.

Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation

The placing on the market, supply and use of asbestos fibres of all types, and of products containing asbestos fibres, is now prohibited under the **EU Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation**.

The restriction on asbestos fibres and products containing these fibres that applies in Ireland is contained in Annex XVII of the REACH Regulation. The legislation prohibits the use, reuse, sale, supply, further adaptation etc. of materials containing asbestos fibres.

The special labelling requirement for asbestos fibres and products containing asbestos fibres being placed on the market (permitted under specific derogations) still apply.

The restriction conditions for asbestos fibres can be found in entry no. 6 of Annex XVII of the REACH Regulation, amended by Regulation (EC) No. 552/2009.

The Health and Safety Authority is the lead Competent and Enforcement Authority for REACH in Ireland. Enforcement of REACH is facilitated under the **Chemicals Acts, 2008 and 2010**. Further information on the REACH regulation can be found on the REACH webpages of the HSA website www.hsa.ie.

Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001 (S.I. No. 619 of 2001)

The Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001 apply to any workplace where hazardous chemical agents are used. The Regulations lay down requirements to:

- Carry out a risk assessment for hazardous chemical agents,
- Put prevention and control measures in place following the risk assessment,
- Make arrangements to deal with accidents, incidents and emergencies,
- Provide information and training,
- Make arrangements for consulting with employees,
- Provide appropriate health surveillance, and
- Keep exposure records.

Safety, Health and Welfare at Work (Carcinogens) Regulations, 2001 (S.I. No. 078 of 2001)

The Safety, Health and Welfare at Work (Carcinogens) Regulations, 2001 (S.I. No. 078 of 2001) transpose several EU Directives relating to the prevention of exposure to carcinogens at work and place a responsibility on all employers in whose premises:

- A carcinogen is used,
- A mutagen is used, and
- A carcinogenic process is used to eliminate the risk of adverse health effects, namely cancer, due to exposure to these dangerous chemicals.

Although the Regulations are referred to as the Carcinogen Regulations they refer to Category 1 & 2 carcinogens and mutagens.

Regulation 7(1) (a) and (c) have particular relevance to guidance provided on 'short duration' work for maintenance and repairs provided in Section 11 of these guidelines.

European Communities (Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment) Regulations, 2011 (S.I. No. 349 of 2011)

This legislation, commonly known as the ADR regulations, provides the legal framework under which all dangerous goods, including asbestos, may be transported by road.

Further guidance on this legislation and a guidance note on ADR Special Provision 168 is available on the ADR webpages at www.hsa.ie.

Air Pollution Act, 1987

Local authorities are responsible for investigating any incidents of air and water pollution in their areas (e.g. incorrect disposal of asbestos) and can prosecute any infringements under the Air Pollution Act, 1987.

Section 6: Risk assessment of ACMs

Purpose of risk assessment

Risk Assessment is a key requirement of the 2005 Act and the Asbestos Regulations. Employers, including the self-employed, must identify and assess all ACMs present on-site before any maintenance, repair, demolition or refurbishment works commence, and they must carry out a written risk assessment. Risk assessments must be prepared by a competent person who has training, knowledge and experience of the type of work and control measures available.

Examples would include:

- An employer using his/her own employees, e.g. maintenance staff, to carry out work on his/her own premises,
- An employer whose employees are contracted to work on a client's premises, e.g. electrical contractor, plumbing contractor or asbestos removal contractor, and
- A self-employed person working on a client site.

Key point: Consultation with workers

Employers must consult (in accordance with Sections 9 and 26 of the 2005 Act) with their employees on the findings of the risk assessment; in particular, with those who may be engaged to carry out either low risk or high risk asbestos abatement works.

Risk assessment of ACMs also provides necessary information for:

- An employer or those in control of a workplace on how to manage ACMs and make decisions regarding the retention, remediation or removal of ACMs,
- A client, PSDP, PSCS or designer under the Construction Regulations, in order for them to make appropriate decisions regarding the presence of ACMs within the scope of a construction project, and



- An asbestos contractor, in order to develop relevant plans of work for the abatement of ACMs.

Generally, a written risk assessment for ACMs would apply to buildings built before the year 2000. It involves obtaining good and reliable information from the building owner or those in control of the workplace regarding the presence or absence of asbestos-containing materials.

Key point: Responsibility of those in control of workplaces

Section 19 of the Act places a duty on those in control of places of work, e.g. landlords, owners (as defined in section 15 of the Act), to carry out a written risk assessment to the extent that his or her duties may apply to persons other than his or her employees, i.e. identify the hazards in the place of work under his or her control, assess the risks presented by those hazards, be in possession of a written risk assessment and make that assessment available to any persons who may be exposed to the risk.

If no information is available, works must not commence until ACMs have been identified. This is normally achieved through an asbestos survey (appropriate to the proposed works) which should be undertaken by a competent asbestos surveyor. Refer to Section 8 on Asbestos Surveys.

An asbestos survey will produce a **register of ACMs** (commonly known as the **asbestos register**) and should be provided in a format that is readily comprehensible. Employers must then assess the risks to health from any work that an employee may undertake which may expose them to asbestos and determine what precautions need to be taken to minimise the exposure.

A risk assessment for ACMs should be transparent, comparable and verifiable if it is to meet the requirement of objectivity. Therefore, each ACM identified in a survey and described in an asbestos register will normally be assessed for the potential to release asbestos fibres using the **materials assessment** algorithm on four separate elements, as follows:

- 1) The type of asbestos material, e.g. lagging, board etc.,
- 2) Its condition, e.g. good condition; low, medium or high damage,
- 3) Its surface treatment, e.g. composite materials, unsealed laggings, and
- 4) Type of asbestos identified, e.g. blue, brown, white etc.

Where an asbestos survey has been carried out, the competent surveyor will provide recommendations, e.g. remove, repair or manage ACMs in the long term etc. These recommendations will normally be based on further parameters, such as occupancy levels, potential for disturbance, maintenance and human exposure potential, giving a **Priority Assessment** for management decisions (See Section 7: Managing ACMs).

Material and Priority Assessments are algorithms which each give rise to a numerical score. These two scores are added to give an **overall risk rating** for identified ACMs.

Key components of a risk assessment for asbestos abatement activities

For those assessing the risks to asbestos removal operatives, maintenance workers or other workers, the information contained in the asbestos survey report and register will be

invaluable in compiling their own assessments in order to prevent exposure to asbestos and to develop safe systems of work (**plan of work**).

Where possible, the work should be planned to avoid disturbing identified ACMs. ACMs should only be worked on if absolutely necessary and when the necessary controls are in place.

The key steps for an **asbestos risk assessment** for asbestos removal are as follows:

- Ensure that risk assessments are prepared by a competent person who has training, knowledge and experience of the type of work and control measures available,
- Identify the type of asbestos and condition of the asbestos or asbestos-containing materials (asbestos survey information, i.e. **materials assessments**),
- Determine the nature and degree of exposure which may occur during the course of the work, i.e. expected exposures and number of people affected. (Use published exposure levels for similar tasks, or information from previous monitoring exercises). It is important that the written risk assessment takes account of all of the features and activities of a particular site and includes a sufficient basis for the estimate of possible exposure. The written risk assessment should consider exposure of all who could be affected (e.g. operatives, occupants, members of the public, other contractors),
- Set out and implement the steps to be taken to prevent exposure or reduce it to the lowest level reasonably practicable, e.g. priority assessments; procedures for the selection, provision, use and decontamination of personal protective equipment (PPE) including respiratory protective equipment (RPE); waste disposal; emergency procedures; provisions regarding equipment and training,
- Consider the results of any air monitoring of exposure, e.g. previous results from a similar activity. If previous air monitoring data relating to a specific task is not available, or not available in the form of documented 'typical exposure concentrations', then the

written risk assessment must identify the need to conduct personal/background air monitoring to support the plan of work,

- Use guidance published by the HSA or other authoritative sources, including information from PPE suppliers or equipment suppliers,
- Record significant findings of that risk assessment and retain every risk assessment in a permanent form,
- Consult with the employees concerned, or their representatives, or both, in respect of the risk assessment, and
- Review risk assessment regularly, especially if there is reason to believe that 1) the assessment is incorrect, 2) the existing risk assessment is no longer valid, or 3) there is a change of a material nature in the work activity.

In summary, the risk assessment should cover the following points:

- The type of work
- The type and quantity of asbestos involved and the results of analysis
- The details of expected exposures
 - o Number of people involved
 - o Whether the exposure limit value will be exceeded
 - o Frequency and duration of exposure
 - o Potential exposure of other persons
 - o Air monitoring of similar previous works
- Methods of asbestos removal and steps to be taken to reduce exposure to lowest level practicable e.g. dust suppression method
- Measures to prevent the spread of asbestos to the surrounding environment
- Provision, use and maintenance (including cleaning) of RPE & PPE
- Procedures for personal decontamination
- Procedures for dealing with emergencies
- Procedures for removal/ disposal of waste
- Thermal environment
- Other hazards

When developing the written risk assessment asbestos fibres may not be the only hazard present. There are many other hazards which commonly occur during asbestos works, some of which have the potential to cause serious injury or death, for example:

- Work at height, e.g. scaffolds, roofs and roof spaces etc.,
- Working on fragile roofs,
- Confined spaces,
- Biological hazards, e.g. Weil's disease, pigeon droppings (histoplasmosis, cryptococcosis, and psittacosis), mould spores, blood-borne pathogens from needle stick injuries,
- Presence of other hazardous chemicals, e.g. foam, sprays, chemical applications for encapsulating AC roofs, diesel fumes from generators, respirable crystalline silica,
- Noise and vibration,
- Thermal hazard,
- Manual handling, e.g. lifting negative pressure units or specialist floor grinders, and
- Electrical hazards.

Use of assessment algorithms

The materials assessment algorithm (see **Table 6**) looks at the type and condition of the ACM and the potential for fibre release if disturbed.

The assessment will depend on four different parameters: asbestos type, product type, extent of damage and surface treatment. Each parameter is scored high (3), medium (2), low (1) or very low (0). Presumed asbestos-containing materials are scored as crocidolite (3) unless there is a reasonable argument that another type of asbestos was almost always used in that type of application. The chosen scores from each

parameter are added to give a total materials assessment score. It does not necessarily follow that those materials with the highest scores will be the materials that should be given priority for remedial action.

A decision on prioritising identified ACMs will be based on priority assessment factors described in **Table 7**. As with the materials assessment each parameter is scored high (3), medium (2) low (1) or very low (0). The chosen scores from each parameter are added to give a total priority assessment score. If more than one factor under a general heading is chosen, then the scores under that heading should be averaged, rounding up where necessary. An example is given in **Appendix 6**.

The risk assessment must be carried out with detailed knowledge of all of the above. The surveyor may have some of the information, but the site owner/manager is responsible for ensuring that the assessment is carried out using the information obtained during the survey, together with their detailed knowledge of activities carried out on the premises. The preferred method is for the asbestos surveyor and site manager to carry out the assessments jointly.

The results of the risk assessments will be used to determine the order of prioritisation of remedial actions, including repair, sealing and removal, and the ongoing management of all remaining ACMs within the premises. The total risk will be assessed **by the combined risk scores from both the material risk and the priority assessments**. The scores will be split into categories, each category indicating the level of prioritisation for remedial action as set out in **Table 8**.

Table 6

Materials Assessment for Asbestos Containing Materials

Sample variable	Score	Examples of scores
Product type (or debris from product)	1	Asbestos reinforced composites (plastic, resins, mastics, roofing felts, vinyl floor tiles, semi-rigid paints or decorative finishes, asbestos cement)
	2	Asbestos insulating board, mill boards, other low density insulation boards, asbestos textiles, gaskets, ropes and woven textiles, asbestos paper and felt.
	3	Thermal installation (i.e. pipe and boiler lagging), sprayed asbestos, loose asbestos, asbestos mattresses and packing.
Extent of damage / deterioration	0	Good condition; no visible damage
	1	Low damages: a few scratches or surfaces marks, broken edges of tiles etc.
	2	Medium damage: significant breakage of materials or several small areas where material has been damaged revealing loose asbestos fibres.
	3	High damage or delamination of materials, sprays and thermal insulation; visible asbestos debris.
Surface treatment	0	Composite materials containing asbestos: reinforced plastics, resins, vinyl tiles.
	1	Enclosed sprays and lagging, asbestos insulating board (with exposed face painted or encapsulated) asbestos cement sheet etc.
	2	Unsealed asbestos insulating board, or encapsulated lagging and sprays
	3	Unsealed laggings and sprays.
Asbestos type	1	Chrysotile
	2	Amphibole asbestos excluding crocidolite
	3	Crocidolite
Total score		

Table 7

Priority assessment for Asbestos Containing Materials

Assessment factor	Score	Examples of score variables
<u>Normal occupant activity</u>		
Main type of activity in area	0	Rare disturbance activity (i.e. little used store room)
	1	Low disturbance (i.e. office type activity)
	2	Periodic disturbance (i.e. industrial or vehicular activity which may contact ACM's)
	3	High levels of disturbance (i.e. fire doors with asbestos insulating board sheet in constant use)
Secondary activities of area	As above	As above
<u>Likelihood of disturbance</u>		
Location	0	Outdoors
	1	Large room or well ventilated areas
	2	Room up to 100m ²
	3	Confined spaces
Accessibility	0	Usually inaccessible or unlikely to be disturbed
	1	Occasionally likely to be disturbed
	2	Easily disturbed
	3	Routinely disturbed
Extent / amount	0	Small numbers of items (i.e. strings, gaskets)
	1	≤ 10m ² or ≤ 10 m pipe run
	2	≥ 10m ² to ≤ 50 m ² or ≥ 10m to ≤ 50 m pipe run
	3	≥ 50m ² or > 50 m pipe run

Table 7 continued overleaf

Table 7 Cont'd
Priority assessment for Asbestos Containing Materials

Assessment factor	Score	Examples of score variables
<u>Human exposure potential</u>		
Number of occupants	0	None
	1	1 to 3
	2	4 to 10
	3	> 10
Frequency of use of area	0	Infrequent
	1	Monthly
	2	Weekly
	3	Daily
Average time area is in use	0	< 1 hour
	1	> 1 and < 3
	2	> 3 and < 6
	3	> 6 hours
<u>Maintenance activity</u>		
Type of maintenance activity	0	Minor disturbance (i.e. possibility of contact when gaining access)
	1	Low disturbance (i.e. changing lights bulbs in asbestos insulating board ceiling)
	2	Medium disturbance (i.e. lifting one or two asbestos insulating board ceiling tiles to access a valve)
	3	High levels of disturbance (i.e. removing a number of asbestos insulating board ceiling tiles to replace a valve or for re-cabling)
Frequency of maintenance activity	0	ACM unlikely to be disturbed for maintenance
	1	≤ 1 per year
	2	> per year
	3	> per month

Source: HSE (UK) HSG 227

Table 8

Combined risk assessment scores and prioritisation for remedial action

Category	Overall Risk score (combined risk & materials assessment scores)	Level of Risk	Action
Category A	18+	High risk	Immediate action
Category B	13-17	Medium risk	Near term action
Category C	9-12	Low risk	Regular inspection
Category D	8 or below	Very low risk	Annual inspection

Source: HSG 227

The scoring system above makes the assessment process transparent so that people can see how priorities were decided.

Asbestos cement roof algorithm

Significant removal of asbestos cement roofs takes place in Ireland. The following algorithm in table 9 can be used by a competent person for the assessment of asbestos cement roofing materials.

Table 9
Asbestos cement roof algorithm

Assessment parameter	Score	Examples of score variables
Material Solidity	1	The corners or the edges of the sheets break with a sharp sound using pinchers
	3	The corners or the edges of the sheets tend to bend or flake using pinchers
	9	The corners or the edges bend or flake easily when manipulated by hand
Appearance of fibres	1	Enclosed bundles of fibres can be seen in the cement matrix using a magnifying glass
	3	Partially enclosed bundles of fibres can be seen in the cement matrix using a magnifying glass
	9	The layers of fibres seen using a magnifying glass are easily removable using tweezers
Flaking, cracks, breakages	1	Absent
	2	Not very frequent
	3	Numerous
Friable or pulverulent material in the gutter	1	Absent
	2	Scarce
	3	Substantial
Stalactites	1	Absent
	2	Small
	3	Substantial size
Total sum		Judgement on the state of the roof

Source: Campopiano et al 2009

Chosen scores from each parameter should be added together to give a total between 5 and 27. Asbestos cement roofs scored **between 21 and 27 should be classed as very poor** with a significant potential to release fibres, and removal is recommended. Roofs scored **between 11 and 20 should be classed as poor** and condition evaluated on an annual basis. Those roofs scored **between 5 and 10 should be classed as low risk**, left in place and managed as they are with periodic condition assessments.



The Asbestos Regulations (Reg 5 (b)) provide for certain exemptions (from notification, medical surveillance and retaining health records) for removal **without deterioration of non-degraded materials** in which the asbestos fibres **are firmly linked in a matrix** e.g. asbestos cement products.

In order to help employers determine their obligations when considering removal of asbestos cement roofing materials, removal of asbestos cement roofs with a score of more than 11 using the asbestos cement algorithm must be carried out by a competent person who, in addition to complying with all other relevant provisions of the Asbestos Regulations e.g. risk assessment, plan of work, training etc must also:

- Notify the Health and Safety Authority in accordance with Regulation 11,
- Provide medical surveillance for relevant employees in accordance with Regulation 20 and Schedule 5, and
- Retain health records for relevant employees.

Asbestos management plans

Exposure to asbestos fibres must be prevented, insofar as is reasonably practicable. It is important to remember that as long as ACMs are not damaged or disturbed and remain in good condition, the risk of exposure from release of fibres is minimal and should not present any threat to the health of those occupying a building containing such materials. In good condition, ACMs do not necessarily require removal but should be assessed regularly and managed to ensure that their condition does not deteriorate.

The Regulations require that no work which may expose employees to asbestos, i.e. anything from replacement of light fittings to major refurbishment/demolition, be undertaken unless a risk assessment to determine the presence of asbestos in the workplace has been carried out. Therefore, an essential step in the process of managing the exposure to asbestos in workplaces is to establish an asbestos management plan (AMP) which aims to record the presence of ACMs and the manner in which exposure to asbestos fibres is managed, both during normal occupation and when work which may disturb ACMs is planned. This should be referenced or included in the workplace safety statement.

It's good practice for large and small workplaces

The steps and approach to managing risks from ACMs, described in this section, can be tailored to apply to all workplaces, from a small dry cleaning shop with an asbestos insulating board ceiling to a large portfolio of buildings with multiple occurrences of ACMs. Essentially, those in control of a workplace must:

- identify ACMs,
- assess the risks,
- identify and implement control measures,
- have arrangements for incidents / emergencies, and
- review plan periodically.

The AMP should be prepared with full consultation, involvement and information-sharing between all parties responsible for the workplace, and should be communicated to all employees or self-employed persons, including contractors and maintenance workers, who use the premises as a workplace and may be exposed to asbestos.

If a conclusion is reached that there are no ACMs present in a workplace, it must be capable of being justified by adequate evidence. It is considered reasonable to assume that any building built after the year 2000 is unlikely to contain ACMs. Where there is a large portfolio of buildings, prioritisation should be given to the identification of ACMs in older buildings, e.g. 1950–1985, or where imminent works are envisaged.

An AMP sets out how asbestos or an ACM that is identified at the workplace will be managed, e.g. what is going to be done, when and how.

An AMP must include:

- The identification of asbestos and ACMs, e.g. a reference or link to the asbestos register for the workplace and the locations of signs and labels,
- Decisions, and reasons for the decisions, about the management of asbestos at the workplace,
- Procedures for detailing accidents, incidents or emergencies of asbestos at the workplace, and
- A register of workers carrying out work involving asbestos and their roles, e.g. consultation, information and training responsibilities.

Other information that can be included in the asbestos management plan is:

- An outline of how asbestos risks will be controlled, including consideration of appropriate control measures,
- Timetable for managing risks of exposure, e.g. priorities and dates for any reviews,

circumstances and activities that could affect the timing of action,

- Identification of each person with responsibilities under the asbestos management plan, and the person's responsibilities,
- Procedures, including a timetable for reviewing and, if necessary, revising the asbestos management plan and asbestos register, and
- Air monitoring procedures at the workplace, if required.

The person with management responsibilities or control of the workplace must ensure that the asbestos management plan is reviewed and, if necessary, revised when:

- There is a review of the asbestos register or a control measure,
- Asbestos is removed from or disturbed, sealed or enclosed at the workplace, or
- The plan is no longer adequate for managing asbestos or ACMs at the workplace.

The person with management responsibilities or control of the workplace must ensure that the asbestos management plan is readily accessible to:

- An employee who intends to carry out work at the workplace,
- Other employees,
- Safety representatives,
- Those appointed under the Construction Regulations,
- An employer who intends to carry out work at the workplace, and
- Emergency services, i.e. fire authorities.

The asbestos management plan should be kept at the workplace to ensure that it is accessible.

Identifying measures to ensure risks from ACMs are controlled

Once an asbestos survey has been carried out by a competent person, those in control of a workplace should know, as far as is reasonably practicable, the location, type and condition of ACMs. Some of the asbestos may:

- Be damaged,
- Have deteriorated or degenerated with time,
- Be liable to be damaged as a result of its location,
- Be in good condition, or
- Be situated in areas due for maintenance, refurbishment or demolition.

Based on this information and a Priority Assessment, a decision is to be made on what remedial action is required and on how to manage the ACMs, i.e. left in place or removed.

There is a difference in the risk presented by ACMs located inside compared with outside a building. Inside the building the ACMs may be at greater risk of accidental damage or disturbance, and any fibres released may be close to the occupants or accumulate on flat surfaces, pipes etc. and be disturbed later. Such matters need to be taken into account when making a decision on how to deal with the material.



ACMs which are in good condition and are not likely to be disturbed can be left where they are (indicating their location and marking them as asbestos-containing materials) but they will need to be managed.

If ACMs are only slightly damaged, they can be repaired and sealed, the material left where it is and managed. Ultimately the assessment of the material by the surveyor will determine whether any surface needs to be sealed, labelled and managed.

Sealing involves the application of a coating (polymeric, bituminous or cement-based paint), the type of which will depend on the nature of the material, the level of damage and protection required.

Where it is possible that some damage may reoccur, instead of removing the ACM, it can be enclosed or encased. This involves repairing any minor damage and then covering the ACM with a non-asbestos material, forming a physical barrier. Labelling should be used to indicate enclosed ACMs, where practicable. However, resistance to the spread of fire must be maintained. The enclosed area between the covering and the ACM should be sealed and adequate cavity fire barriers constructed. In addition, any enclosed ACM should be indicated on the plans of the building to ensure that, should future work activities be planned, they can be carried out safely with the knowledge that ACMs are present.



Consideration should be given to removing ACMs if they are in poor condition or are likely to be damaged or disturbed as a result of building maintenance, refurbishment, demolition works or normal work activities within an area, or if there are plans to change work activities in the area which may subsequently damage or disturb the existing ACMs.

Appropriate **labelling** or **signs** should be used to avoid inadvertent damage or injury/death (e.g. falling through an asbestos cement roof).



Labelling in public areas can give rise to unnecessary alarm; therefore, alternatives to asbestos labels can be considered, e.g. designating such locations as 'controlled areas' and introducing a **permit to work** or other similar control scheme to avoid inadvertent damage by maintenance staff or contractors.

Management of contractors is critical to an effective asbestos management plan. A **permit to work** system should be introduced or modified to ensure known ACMs are brought to the attention of contractors and are not inadvertently disturbed by the proposed works.

Arrangements must also be made to **carry out inspections at regular intervals** to ensure that the condition of the ACM does not deteriorate and/or that there has not been an increase in the potential risk to persons of exposure to asbestos fibres due to, for example, a change of use of an

area. A record of all such inspections should be maintained and signed off by a competent person.

The time period between monitoring will vary depending upon the type of ACM, its location and the activities in the area concerned, but would not be expected to be more than 12 months in most cases. ACMs in locations where there is a lot of activity will need more frequent monitoring. The surveyor may make recommendations in this respect.

Decisions about what to do in order to manage the risk relating to ACMs in each area of the premises must be recorded in the asbestos management plan, and any records/drawings must be kept up to date, e.g. if a decision is made to remove ACMs, the management plan and any relevant drawings/records must be updated.

Arrangements to manage accidents, incidents and emergencies

Employers should have emergency procedures in place for any accident, incident or emergency relating to asbestos, e.g. accidental disturbance of ACMs during building work, unless the amount of asbestos in the premises is so small that any risk would be minimal. These procedures should be contained in the asbestos management plan and include the steps to be taken to minimise the risks of exposure to asbestos and measures in place to carry out emergency repairs.

In any circumstance where there is an accidental uncontrolled release of asbestos into the workplace, the cause of the uncontrolled release should be identified and adequate control implemented as soon as possible.

Any persons in the affected area must leave immediately. All tools and materials should be left in the potentially contaminated area. The area should be sealed to prevent further access and to prevent the spread of asbestos fibres to other areas. Where persons have been contaminated with visible dust or debris,

arrangements should be made to decontaminate those affected. Any clothing or personal protective equipment should be decontaminated or disposed of as contaminated waste.

Appropriate arrangements must be in place to ensure that the extent of the contamination is assessed by a competent person and that the area which may have been contaminated by asbestos fibres is thoroughly cleaned of visible debris or dust. This work should only be carried out by operatives or contractors who have been trained and are competent to carry out the work, and who have the appropriate equipment. In the case of a significant disturbance of asbestos insulation or asbestos insulation board, this will almost certainly require the use of a specialist asbestos contractor.

Air sampling should also be carried out where necessary to ensure that the remedial measures taken have been effective in reducing the potential for exposure to asbestos fibres.

If there is a risk that an employee has been exposed to asbestos fibres as a result of an incident, the employer should make available a health assessment through an appropriate medical practitioner, e.g. GP, to determine if their exposure was significant and if a note should be made on their personal medical record. In some circumstances the GP may refer the employee to a specialist in respiratory medicine.

Monitoring and reviewing the asbestos management plan

The management plan should be reviewed at least every twelve months, e.g. in conjunction the company's safety statement, to ensure that the management processes remain effective and the arrangements are being properly implemented.

Any changes in the arrangements or circumstances affecting the management of exposure to asbestos, such as new staff having responsibility for implementing the arrangements, or the deterioration or removal of ACMs, must be recorded and the asbestos register updated accordingly.

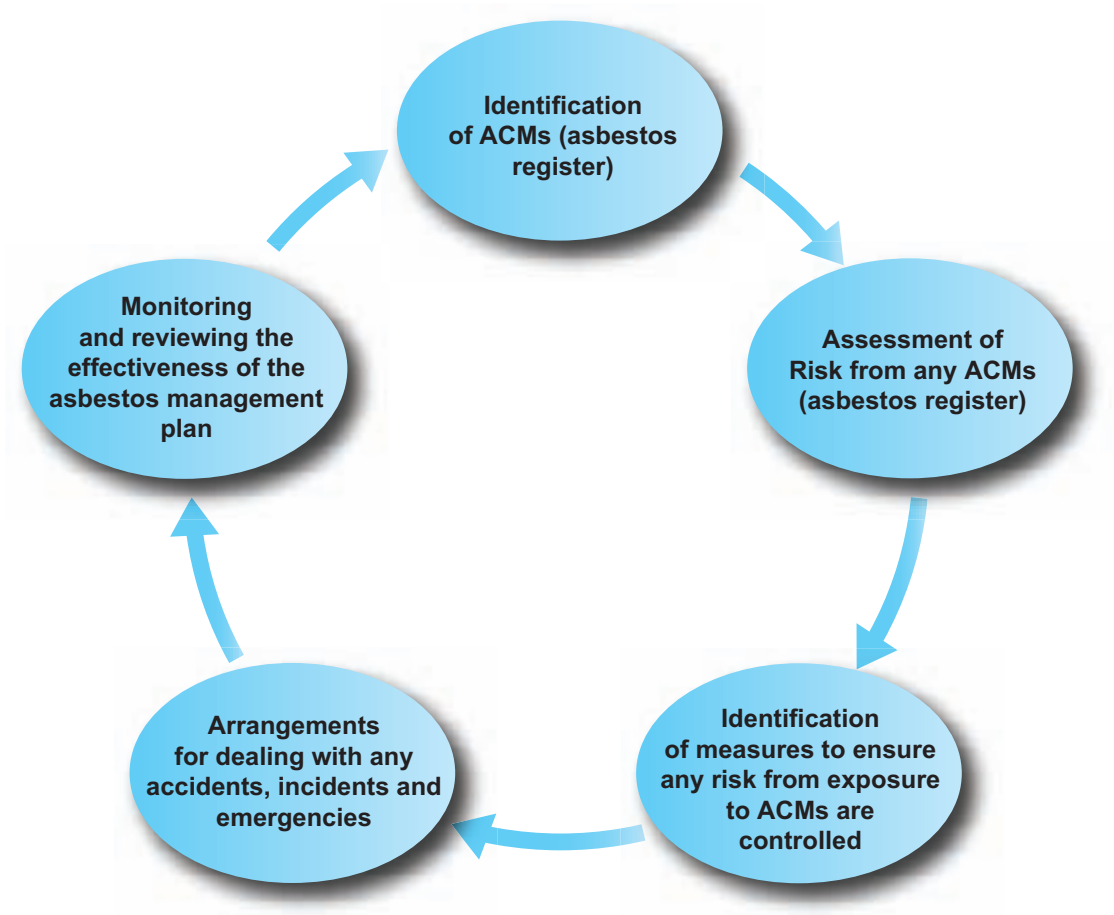


Figure 2 - The Asbestos management process

Section 8: Asbestos Surveys



This section provides an overview of the asbestos survey process. More detailed information can be found in HSE (UK) technical standard HSG 264 *Asbestos: The Survey Guide*.

Asbestos survey types

Choosing the correct type of asbestos survey is critically important. Asbestos surveys can be classified into two types:

1. Management Asbestos Survey (MAS)

The purpose of the **management asbestos survey** is to manage asbestos-containing materials during the **normal occupation and use of premises**. A **MAS** must locate ACMs that could be damaged or disturbed by normal activities, by foreseeable maintenance, or by installing new equipment. It involves minor intrusion and minor asbestos disturbance to make a **materials assessment**. This shows the ability of ACMs, if disturbed, to release fibres into the air. It guides those in control of a workplace (e.g. employer, landlord, client in construction) in prioritising any remedial work using **priority assessments** and **risk assessment ratings**.

2. Refurbishment/demolition asbestos survey (RDAS)

A **refurbishment/demolition survey** is required where the premises, or part of it, needs

upgrading, refurbishment or demolition. This type of survey does not need a record of the condition of asbestos-containing materials (ACM).

Note: Type 1, Type 2 or Type 3 asbestos surveys are no longer referred to.

Selecting a competent surveyor & quality assurance

Competent surveyors will have appropriate survey knowledge and will understand the risks associated with surveying workplaces for ACMs. Surveying bodies will have an in-house documented quality management system.

Surveyors must have industry-specific training and experience, and recognise their limitations. Relevant qualifications would include the **British Occupational Hygiene Society P402** proficiency module, covering buildings surveys and bulk sampling for asbestos and **RSPH Certificate in Asbestos Surveying**. Further details on these qualifications can be found at:

BOHS: <http://www.bohs.org/education/examinations/proficiency-modules/> or

ATAC: <http://www.atac.org.uk/asbestos-testing-consultancy/asbestos-training-courses.asp>

In addition to the technical knowledge gained from undertaking these qualifications, the analyst, in meeting the requirements of competency as defined under the Safety, Health and Welfare at Work, 2005 Act, will also be expected to have a thorough knowledge of relevant Irish legislation as described in Section 5.

Surveyors must show independence, impartiality and integrity, i.e. must not be involved in abatement of ACMs identified in the survey. Surveys must conform to industry best practice technical standards i.e. HSE (UK) technical guidance document **HSG 264 Asbestos: The Survey Guide**.

Pre-survey requirements

The quality and completeness of a **MAS** or **RDAS** survey depends on the success of the planning phase (or **contract review**) between those commissioning a survey and the surveying organisation.

The **contract review** should involve, in most cases, a pre-site meeting in order to:

- Confirm the exact scope of the survey (e.g. RDAS, MAS or a mixture of both types),
- Identify possible limitations,
- Access requirements and accompanying personnel,
- Obtain a schedule of the site works,
- Confirm report format and deadlines,
- Obtain existing building information and site plans,
- Highlight site safety matters,
- Agree protocols on discovering ACMs in poor condition, e.g. air monitoring, and
- Decide on sampling protocols.

Particular attention should be paid to the proposed time allocated for site inspection, and reasonable enquiries should be made as to its appropriateness. Sufficient time should be given for surveys to be conducted, including analysis and report production, to be completed by the surveying organisation.

Surveyor plans of work (method statements)

Following the contract review, and prior to site works, the surveyor should be in a position to provide a detailed plan of work (method statement) including site-specific risk assessments (see below).

Site safety matters & risk assessments

Surveys, by their nature, involve other hazards in addition to asbestos. These must be identified and assessed by the surveying organisation with the assistance of those in control of the workplace and in accordance with other relevant Health and Safety Legislation.

Surveyors should have the following PPE available to them:

- Hard hats (bump caps)
- Safety boots, shoes
- High visibility jackets
- Hearing protection
- Goggles/ Safety Glasses
- Gloves
- Tight fitting respirator (with P3 filter) and current face-fit test certificate

The common hazards (non-exhaustive) are provided below:

- Unsafe structures, e.g. derelict buildings
- Working at heights, in particular on asbestos cement roofs
- Enclosed or confined spaces, e.g. under ground service ducts, tank rooms
- Electrical hazards, e.g. access to electrical installations must be provided by qualified competent persons
- Chemical hazards
- Microbiological hazards e.g. Weil's disease, Legionnaires' disease
- Noise
- Lone working, e.g. on isolated sites
- Heat stress
- Entry to contaminated areas (must not spread asbestos contamination)
- Safe access to ceiling spaces

Management asbestos survey (MAS) – key points

This is a standard asbestos survey that should be carried out for the continued management of asbestos in premises. The purpose of the survey is to locate, as far as reasonably practicable, the presence and extent of any suspect ACMs in the building and assess their condition. The survey will primarily involve sampling and analysis to confirm the presence or absence of ACMs. This is the most common approach that has been used for surveys.

However a MAS can also involve presuming the presence or absence of asbestos. The survey can be completed using a combination of sampling ACMs and presuming ACMs or, indeed, just presuming. Any materials presumed to contain asbestos must also be assessed i.e. material assessment. Any area not accessed should be presumed to contain asbestos.



By presuming the presence of asbestos, the need for sampling and analysis can be deferred until a later time (e.g. prior to any work being carried out). However, this approach has implications for the management arrangements. There is a risk that those commissioning the survey may bear additional costs of management for some non-ACMs. Any work carried out on 'presumed' materials would need to involve appropriate contractors and work methods in compliance with the Asbestos Regulations, regardless of whether the material was actually an ACM or not. Alternatively, prior to any work starting, sampling and analysis can be undertaken to confirm or refute the presence of asbestos.

The results will determine the work methods and contractors to be used. The 'presumption' approach has the disadvantage of being less rigorous; it can lead to delays before work can commence, and it is more difficult to control. It may be suitable in some instances, e.g. small or simple premises.

When sampling is carried out as part of a management survey, samples from each type of suspected ACM should be collected and analysed. If the material sampled is found to contain asbestos, other similar materials used in the same way in the building can be strongly presumed to contain asbestos. Less homogeneous materials (e.g. different surfaces/coating, evidence of repair) will require a greater number of samples.

The sample number should be sufficient for the surveyor to make an assessment of whether asbestos is present or not. Sampling may take place simultaneously with the survey or, as in the case with some larger surveys, can be carried out later as a separate exercise.

All areas should be accessed and inspected as far as is reasonably practicable. This includes under carpets, above false ceilings, and inside risers, service ducts, lift shafts etc. It may also involve some minor intrusive work such as accessing behind fascia, panels, other surfaces or superficial material. The extent of intrusion will depend on the degree of disturbance that is or will be necessary for foreseeable maintenance activities. This should include installation of new equipment or cabling.

Asbestos surveyors should come with the correct equipment, prepared to access such areas. Any areas not accessed must be presumed to contain asbestos. The areas not accessed and presumed to contain asbestos must be clearly identified in the survey report and must be managed appropriately, i.e. maintenance or other disturbance work should not be carried out in these areas until further checks are made.

Refurbishment/ demolition asbestos survey (RDAS) – key points

This type of asbestos survey is used to locate and describe all ACMs in the area where the refurbishment work will take place or in the whole building if demolition is planned. The survey will involve **destructive inspection**, as necessary, to gain access to all locations, including those that may be difficult to reach.



Refurbishment work may vary from relatively small-scale to large projects. Small-scale work may occur in different parts of a building at different times over several years. A full sampling programme should be undertaken to identify possible ACMs and estimates of the volume and surface area of ACMs made. The survey is primarily designed to identify ACMs so that they can be removed in preparation for refurbishment or demolition.

There is a specific requirement in the Asbestos Regulations for all ACMs to be removed, as far as is reasonably practicable, prior to major refurbishment or final demolition.

Removal of ACMs would also be appropriate in other refurbishment situations, e.g. more minor works which involve structural or layout changes to buildings, e.g. removal of partitions or walls. Where the construction work attracts the requirements of the Construction Regulations, the survey information can be used to assist in the tendering process for the removal of ACMs from the building prior to the work starting.

The asbestos survey report should be supplied by the client as pre-construction information to designers and contractors who may be bidding

for the work so that the asbestos risks can be addressed. In this type of survey, where the asbestos is identified in order for it to be removed (rather than to 'manage' it), the survey does not assess the condition of the asbestos, other than to note areas of damage or where additional asbestos debris may be expected to be present. However, if refurbishment or demolition proposals change, e.g. postponement or cancellation, the RDAS report must be reviewed and made appropriate for long-term management of the ACMs identified.

An **RDAS** is intended to locate all the asbestos within a building, as far as is reasonably practicable. It is therefore a disruptive and intrusive survey which may need to penetrate all parts of the building structure. By its definition, aggressive inspection techniques will be needed to lift carpets and tiles and break through walls, ceilings, cladding and partitions.

Controls should be in place to prevent the spread of debris which may include asbestos. Because of the nature of the investigations to be carried out, a **RDAS** should only be conducted in unoccupied areas to minimise any risks to members of the public or employees on the premises. Ideally the building should not be in service and all furniture and furnishings should be removed.

For minor refurbishment, this would only apply to the room involved or even part of the room, where the work is small and the room large. In these situations, there should be effective isolation of the survey area (e.g. full floor to ceiling partition), and furniture and furnishings should be removed, if possible, or protected using sheeting. The 'surveyed' area must be shown to be fit for reoccupation before personnel reoccupy. This will require a thorough visual inspection and, if appropriate (e.g. where there has been significant destruction), reassurance air sampling with disturbance. Under no circumstances should staff remain in rooms or areas of buildings when intrusive sampling is performed.

There may be some exceptional circumstances where a building is still occupied while an RDAS is carried out. In such situations, the RDAS will need to be managed carefully with relocation of personnel, equipment and furnishings while the survey progresses through the building. Again, there should be effective isolation of the survey areas and the 'surveyed' area must be shown to be fit for reoccupation before personnel reoccupy.

Locating all ACM occurrences

It is important for surveyors to look beyond the obvious ACMs described earlier in these guidelines. For example:

- Residue from over-spraying asbestos can be found behind plasterwork, below floor screeds, under wood block floors, behind skirting boards, under false floors, inside partition walls and inside cable trays,
- Offcuts from the original construction work may have been used as packers and spacers,
- Residue from hand applied lagging may be found on floors and walls, or behind thick layers of paint in old boiler rooms,
- Drainage systems and sumps in old boiler/plant rooms can contain insulation debris/residue from original asbestos installations,
- Dust may be found in contaminated ventilation systems,
- Wiring may be contaminated if wires were pulled through asbestos insulating board firebreaks, and
- Particular attention should also be paid to areas where previous asbestos removal works were carried out, as standards were not always good.

Asbestos survey reports

The final surveyor's report must be clear, unambiguous and readily accessible to those who need to use it. Caveats should be limited, fully justifiable, agreed and documented in the report in a separate section.

Each asbestos survey report should contain as a minimum:

An executive summary of the survey

- Bullet points on scope, date and main findings,
- Overall recommendations and conclusions, and
- Further actions.

Introduction covering the scope of work

- Commissioning of survey (contract reference),
- Purpose – management, demolition or refurbishment,
- Type of survey (management or refurbishment), and
- Compliance or conformance with Irish legislation, guidance and HSG 264 Asbestos: The Survey Guide.

General site and survey information

- Scope of buildings surveyed clearly identified,
- Brief description of premises, age, structure etc. including photograph,
- When carried out, by whom, accompanied by whom, and
- Sampling at the time of survey or later.

Survey procedures

- Inspection basis and areas accessed,
- Inaccessible areas – reasons for no access,
- Means of identifying areas not accessible,
- Any building elements not included/excluded from survey,

- Sampling protocols and frequency,
- Any air monitoring carried out – static/ personal air tests, and
- Confirm all waste disposed of as asbestos waste.

Survey results (Asbestos register)

- List of asbestos materials found/ sampled /confirmed,
- Extent or quantity of the materials should be recorded for both MAS and RDAS, and
- Building number/room number/location etc.

Assessment of risk

- Materials risk assessments,
- Priority risk assessments, and
- Risk assessment ratings.

Conclusions and actions

- Management actions, and
- Remedial actions.

Asbestos survey bulk sample analysis results

- Can be included in an appendix (if sub-contracted, by whom).

Survey plans and drawings

- Can be included as an appendix showing presence/extent of ACMs and sampling points.

Photographs

- Representative photographs should be included in the survey report.

Schedule of no asbestos detected (NAD) locations or No Access Areas

- A record of rooms, areas etc surveyed but where no asbestos or asbestos containing materials were identified, may also be included in the survey report. This record may also include No Access Areas. This could be presented in a similar format to the asbestos register or it may be appropriate to incorporate NAD locations or No Access

Areas within the asbestos register. However, it is critical that asbestos occurrences are not 'hidden' in a large register of NAD locations or No Access areas and therefore may be inadvertently overlooked.

Asbestos registers

The asbestos register should be structured so that the information is clear, unambiguous, easily disseminated and protected from unauthorised changes. Paper or electronic records may be appropriate, and the register can be used as a source of information to assist asbestos management regimes. An example of an asbestos register can be found overleaf.

Example of an asbestos register												
Client	ASb Ltd											
Site	Building A, Asb Ltd, Chrysotile Road											
Floor	Date Surveyed 12th June 2012											
Room ID Description	Material	Building element	Sample comments	Condition	Location	Exposed Population	Accessibility	Encapsulation/sealant	Quantity	Analysis result	Priority rating	
Gr	G01 - Board Room	Bitumen product	Ceiling	Bitumen patches to ceiling above susp'd ceiling	Fair-scratched/ marked surface	Internal	Office Area	Low - above susp'd ceiling	Sealed - reinforced	<1m ²	Chrysotile	C
Comment & recommendation												
Low risk - Periodic inspection - Manage - in situ - Label												
Gr	G02 - Boiler room	Insulation	Wall	Insulation residue to wall	V.poor, severely damaged	Internal	Unoccupied - serviced	Easily	None	<2m ²	Amosite	A
Comment & recommendation												
High risk - Immediate Action - Remove under controlled conditions using specialist asbestos contractor												
Gr	G02 - Boiler room	CAF gaskets	pipework	CAF gaskets to flanges	Fair-scratched/ marked surface	Internal	Unoccupied - serviced	Difficult	None	<2m ²	Chrysotile	C
Comment & recommendation												
Low risk - Immediate Action - Periodic inspection - Manage - in situ - Label												
1st	F01 - Lift lobby	Insulating Board	Ceiling	AIB ceiling tiles	Fair-scratched/ marked surface	Internal	Thoroughfare	Moderate - stepladder	None	8m ²	Amosite	B
Comment & recommendation												
Medium risk - Near term action - Encapsulate, periodic inspection, Label and manage in situ												

Sampling suspect ACMs (bulk sampling)

Bulk sampling may be carried out as part of a survey or as a 'one-off' bulk sampling exercise. Sampling ACMs can give rise to exposure to asbestos. The sampling work must be carried out in a manner which avoids disruption to operations and which protects the health and safety of all persons who may be at risk.

Areas to be sampled inside buildings should be unoccupied, as far as is reasonably practicable, and entry should be restricted, e.g. use of notice **'KEEP OUT – asbestos sampling in progress'** during the sampling period.

Bulk sampling should be carried out by a competent person in accordance with in-house documented procedures based on appropriate industry-recognised standards, e.g. HSE (UK) HSG 248: *Asbestos: The Analysts' Guide for*



sampling, analysis and clearance procedures and HSE (UK) HSG 264 *Asbestos: The Survey Guide*. Relevant training would include the **British Occupational Hygiene Society P402 proficiency module covering buildings surveys and bulk sampling**, as mentioned previously.

The following PPE and sampling equipment is recommended for sampling materials suspected of containing asbestos.

Table 10

Protective equipment recommended for use during asbestos sampling

Protective equipment , including:

- Respirators, ori-nasal and full-face
- Suitable footwear
- Disposable overalls
- Disposable overshoes
- Disposable gloves

Survey Box/ Bag containing:

- Hammer
- Screwdrivers, flathead and phillips
- Tweezers
- Filler
- Stanley knife
- Torch
- Polythene sample bags, small and large
- Atomiser spray
- Asbestos warning labels
- Chisel, ideally 2 No.
- Pliers
- Coring tool
- Paint or ET10/150
- Foil tape
- Camera with date stamp facility
- Damp cloths/tack rags
- Warning sign
- Magnifying glass
- Mirror

Optional equipment, dependent on type of work anticipated:

- Collapsible framing for enclosure
- 1000 gauge polythene for enclosure
- large 500 gauge waste bags
- Light weight step ladder
- Bucket and sponge
- H-type vacuum cleaner

It is the responsibility of the analyst to ensure that appropriate sampling equipment, sampling bags etc. are available for all sampling activities.

Before conducting bulk sampling activities, it is important that an assessment of the risks to health and safety of sampling personnel is carried out. If bulk sampling is part of a survey, a register of site-specific health and safety risks should be available to the sampling personnel. No attempt should be made to obtain a sample until safe access to the bulk material can be guaranteed.

Typical risks on-site may include:

- Working at heights, in ceiling voids or on fragile roofs,
- Working on plant,
- Working in confined spaces,
- Chemical hazards,
- Electrical hazards,
- Biological hazards,
- Noise hazards, and
- Lone working.

Sampling personnel must also take into account physical and practical factors prior to sampling. These include the following non-exhaustive examples:

- **Accessibility of the material to be sampled.** For example, floor ducts can be a source of draughts; the removal of a floor duct cover can result in asbestos fibres being blown out of or along the duct. Therefore, a polythene enclosure should be erected before the removal of the duct cover. Cable chambers require gas checks before entry and due to their location, i.e. below ground level, are often partially flooded. A further consideration is the presence of rat droppings.
- **High level materials such as roofing or ceiling tiles.** Is a ladder adequate or should a scaffold tower be considered?
- **Wet surfaces.**
- **High temperatures.** The sampling strategy here may require two or more people due to safety reasons and short sampling periods.
- **Concealment behind other materials.** If damage is anticipated in reaching a sample, consideration should be given to an enclosure, which may in turn require decontamination procedures and air monitoring to be carried out.
- **Lifts.** A lift engineer may need to be present and may require suitable safety harnesses.
- **Friability of the material to be sampled.** The more friable the material, the greater the likelihood of release of airborne fibres during sampling. Again, dependent on location or occupancy of the area to be sampled, a polythene enclosure may be required.
- **Correct precautions.** Disposable gloves, disposable overalls and at least an ori-nasal mask should be worn. In certain circumstances, e.g. where the respirable fibre concentrations are unknown, increased personal protective equipment is advised, together with either disposable overboots or boots that can be cleaned.
- **Correct sampling tools.** This is very much dependent on the type of material to be sampled. The aim is to obtain a sufficiently representative sample, causing minimum disturbance to the material being sampled and, therefore, minimum fibre release.
- **Occupancy.** If sampling is likely to cause undue consternation to occupants or if there are inconvenient enclosure requirements, it may be necessary to conduct sampling procedures at night/at the weekend/early in the morning.
- **Material integrity.** Will sampling compromise integrity of building component? e.g. sampling an asbestos flue pipe may damage the flue and release gases.

Personal protective equipment (PPE) for bulk sampling

Sampling personnel must wear adequate personal protective equipment. The type of material sampled and amount of disturbance required will dictate the PPE and respirator type required.

Disposable overalls, overshoes and gloves should be worn when there is a likelihood of asbestos contaminating clothing during bulk sampling. Overalls must be category Type 5 and carry the CE mark. They can be worn over normal clothing but should be carefully removed after use by turning inside out and **must be disposed of as asbestos waste**. For some sites, more stringent decontamination procedures may be necessary, e.g. in cases where there are contaminated crawl ducts, spray insulation in ceiling voids etc. Positive pressure respirators, transit procedures, a decontamination unit and full decontamination procedures would be required in these instances. Such occurrences would be identified during the initial site assessment.

Appropriate respiratory protective equipment (RPE) should be worn during sampling.

Sampling strategy and methodology

If the same type of suspected ACM appears to be extensively used throughout the premises, it may not be necessary to sample every unit, e.g. ceiling tiles. A representative number of samples should be taken. However, the surveyor must ensure that the visual inspection identifies any difference in size, shape, colour, surface texture, bevelled edges etc. which may indicate differences in material types. Samples should be taken of each apparently different material observed. After assessing the extent of the material and any variations or repairs, representative samples should be taken of about 3–5 cm² area and through the entire depth of the suspect material.

For detailed information on bulk sampling methodology for various ACMs, competent persons should consult HSE (UK) technical

guidance (UK) **HSG 264 Asbestos: The Survey Guide**.

Analysis of suspect ACMs using polarised light microscopy (PLM)

Analysis of bulk samples should be carried out in accordance with Appendix 2 of the **HSE (UK) technical guidance document HSG 248 Asbestos: The analysts' guide for sampling, analysis and clearance procedures**.

The analytical method involves initial examination by eye of a suspect material, followed by detailed examination under a low power stereo microscope. Fibres observed in the course of these examinations are categorised tentatively on the basis of morphology and certain physical properties. Each fibre type recognised is mounted in a suitable refractive index (RI) liquid. The fibres are then positively identified as one of the six regulated fibres on the basis of their detailed optical properties using polarised light microscopy (PLM)



Analytical bodies should have in-house documented procedures which conform to a recognised quality assurance system such as the international standard *ISO 17025: General requirements for the competence of testing and calibration laboratories*.

Quality assurance (QA) is critical to ensure that results are both accurate and reproducible. The following are some of the key requirements of an effective QA programme for bulk analysis:

- Routine QA checks to assess the quality of results produced,

- Written protocols describing the procedures of each step,
- Limits on maximum samples analysed in one day as set out in HSG 248. Reanalysis by another analyst should be conducted for 20% of excess samples,
- Analyst/laboratory should perform satisfactorily in the AIMS scheme (see below),
- Microscopes and ancillary equipment should be maintained in good order, and alignment checks carried out before each use, and
- Routine checks on refractive index fluids and associated records.

It is strongly recommended that accreditation to ISO 17025 for bulk sample analysis is obtained by the analytical body. Accreditation is provided by the Irish National Accreditation Board (INAB) which independently evaluates whether an analytical body has the ability to meet the required standards.

INAB assessments cover areas such as organisation, quality systems, control of records, personnel, accommodation and environmental conditions, test and calibration methods, method validation, equipment, handling of test and calibration items, and reporting results.

Training is of fundamental importance for this analytical method. Function-specific proficiency training for this method is provided by the British Occupational Hygiene Society (BOHS). A relevant proficiency module is **P401 – Identification of**

Asbestos in Bulk Samples (PLM).

In addition to the technical knowledge gained from undertaking the above recommended qualification, the analyst, in meeting the requirements of competency as defined under the Safety, Health and Welfare at Work, 2005 Act, will also be expected to have a thorough knowledge of relevant Irish legislation as described in Section 5.



Notwithstanding an analytical body's accreditation status, the Authority requires satisfactory performance in internationally recognised proficiency schemes such as the **Asbestos in Materials Scheme (AIMS)** for bulk materials analysis, administered by the UK Health and Safety Laboratory, which demonstrates independent verification and indication of analytical competence and a commitment to continually improving performance.

Section 9: Training, instruction and information

The Safety, Health and Welfare at Work Act, 2005 (No. 10 of 2005) imposes specific duties on employers to provide adequate information, instruction, training and supervision to their employees to ensure their safety, health and welfare at work.

The Asbestos Regulations require employers to provide appropriate training and adequate information (Regulation 17) to employees who are liable to be exposed to asbestos-containing dust. The regulations specify particular information that must be covered during training.

The extent and level of the training required will depend on the nature and degree of the employee's exposure to asbestos-containing dust. Appropriate training should equip employees with the relevant skills and knowledge to enable them to work safely by minimising their exposure to asbestos fibres. This section outlines the minimum topics that should be covered during training courses:

- All training should be presented in a style, manner and form that are readily understood by trainees,
- The training must be in a language that the trainees know and understand,
- Account should be taken of trainees whose first language is not English,
- Evaluation of trainees' understanding of the course material is important, and exercises such as multiple choice questions or other established assessment methods should be incorporated,
- Basic awareness and lower risk work training should be carried out by a competent person,
- The trainer should have the necessary skills, knowledge and experience to be a trainer,
- The trainer should have adequate personal practical experience in the asbestos sector, theoretical knowledge of all relevant aspects of the work and the ability to deliver effective training courses,
- Specialist asbestos abatement training must be carried out by a competent independent training body,



- Certificates of attendance should be provided and signed by the competent person, and
- The awarded certificate should have the person's name and address on it, the title of the course, the body responsible for the providing the course and the date awarded.

Frequency of training

Training should be provided:

- On recruitment,
- In the event of a transfer of an employee or a change of task assigned to an employee,
- On the introduction of new work equipment, systems of work or changes in existing work equipment or systems of work, and
- On the introduction of new technology.

Regular refresher training at least every three years should be carried out to reinforce procedures and safe systems of work and to remind employees of the risks they face when working with asbestos. Information and training updates covering, for example, new working techniques or changes to legislation, should be given at regular intervals and should not wait for refresher training. In any case, the need for refresher training should be assessed annually.

Annual refresher training is recommended for specialist asbestos removal contractors involved in higher risk asbestos removal work.



Basic asbestos awareness training

Basic asbestos safety awareness training must be provided to all employees who are or are likely to be exposed to asbestos-containing dust, e.g. in cases where the fabric of a building will be disturbed. As the aim of this training is to impart knowledge, this training will usually be theory-based. The use of teaching aids such as photographs, diagrams and videos is strongly recommended.

The training should cover:

- The properties of asbestos and its effects on health, including the synergistic effect of smoking,
- The types of materials or products that may contain asbestos and where they are likely to occur,
- The potential risks to health from exposure to dust arising from asbestos or asbestos-containing materials,
- The operations which could result in asbestos exposure,
- How the condition of the material or products affects the ease of release of fibres,
- What to do if materials suspected of containing asbestos are encountered, and
- The relevant legislation and regulations.

A basic safety awareness course should be a minimum of one day's duration with a maximum of twelve trainees per course.

Lower risk asbestos work

In addition to the basic asbestos awareness training which should be provided to all operatives who work foreseeably be exposed to asbestos whilst carrying out their normal day-to-day work, persons who will intentionally disturb low risk ACMs, such as asbestos cement and textured coatings, should receive additional training, specific to the risks associated with low risk asbestos work.

Workers likely to fall within this category include roofers and demolition operatives removing asbestos cement roof sheets, maintenance workers etc.



The training should cover the points mentioned in the asbestos awareness training section and should also cover:

- The operations that could result in asbestos exposure,
- The importance of effective control measures to prevent or minimise exposure to airborne asbestos and to prevent spread of asbestos contamination,
- Safe working practices that minimise exposure, including control techniques,
- Personal protective equipment, risk assessments and written instructions (plan of work),
- The role of respiratory protective equipment, selection of the appropriate type of respiratory protective equipment, and its proper use,

- Proper care and maintenance of personal protective equipment and respiratory protective equipment,
- Procedures for personal decontamination,
- Emergency procedures to cover situations such as accidental damage to asbestos-containing materials, or personal injury or illness while engaged in the asbestos work,
- Waste disposal, suitable containment (e.g. bagging or wrapping) of all waste to prevent spread of contamination, labelling and placing in a secure skip or container on-site, and
- Transport by an authorised asbestos waste disposal contractor to an approved (or licensed) site.

For operatives and supervisors, the training must include practical work to ensure that they become familiar with examples of materials and accustomed to proper use and maintenance of equipment and techniques.

For supervisors and employers, the training should also cover legal responsibilities and monitoring of the work.

For those workers for whom the requirement on health assessment (See Section 15) cannot be waived, training should cover:

- Medical examination requirements, including the purpose and importance of medical examination and the need to have certificates showing that medical examination has been completed, and
- The information and advice that workers may be given after a medical examination.

The **duration** of this type of training will be dependent on the practical tasks and other hazards (e.g. roof work) involved.

Specialist asbestos contractors

Specialised training is required for workers involved in notifiable work with ACMs such as asbestos insulation, asbestos insulation board and asbestos coatings. The training of asbestos

removal workers must include practical sessions (approximately 50% of the course content) so that trainees learn how to use and maintain equipment that affects safety, e.g. enclosures, personal protective equipment, respiratory protective equipment, decontamination facilities, dust suppression equipment and controlled removal equipment. Practical training should not be carried out in active working areas that may be contaminated with asbestos.

The training should be appropriate for the role for which the person is being trained (e.g. operative or supervisor), the nature of the work being trained for and the type of training being provided, i.e. initial training or refresher training. It should allow employees to acquire the necessary knowledge and skills as regards prevention and safety when working with asbestos and asbestos-containing materials.

The core syllabus of the training given to all employees should cover the following topics in appropriate detail and in a manner which can be easily understood by the trainees (especially non-Irish nationals):

- The effects of asbestos on health, including the relationship between exposure and risk of disease to show the importance of preventing or minimising exposure, and
- The types of products that may contain asbestos, including detail on how the particular characteristics of the products may affect their removal.



Safe working practices would include:

- Good planning of the work, including good site layout (positioning of equipment such as the airlocks and decontamination unit, identification of the shortest safe route for carrying waste to a secure skip),
- A suitable and sufficient risk assessment covering all aspects of the work, and a plan of work detailing the job,
- The preparation of a site prior to erecting an enclosure, including pre-cleaning if required,
- Practice in construction of an enclosure, extra protection of the floor and any weak spots,
- Ensuring all parts of the enclosure structure can be sufficiently cleaned, i.e. no dust/debris traps,
- Provision of waste locks, airlocks, viewing panels (and closed circuit TV where needed), negative pressure units in which pre-filters can be easily changed, leads to power supplies outside the enclosures to allow fuses etc. to be changed,
- Maintenance of an enclosure in good order (effectiveness of the ventilation system – negative pressure unit, integrity of the enclosure, regular inspections etc.), including the importance of smoke testing prior to commencement of work, and
- Practical methods of removing asbestos with minimal release of dust, including dust suppression techniques such as wet stripping, prompt bagging of material to prevent spread (on feet, equipment or clothing),
- Cleaning of the enclosure, airlocks and hygiene facilities; fine cleaning (working from top to bottom),
- Effective communication (including between, inside and outside of enclosure),
- Re-cleaning in the event of an enclosure failing to pass clearance tests,
- Procedures for cleaning up and dismantling the enclosure,
- Use of respiratory personal protective equipment, extended to include positive pressure respiratory protective equipment and/or air-fed respiratory protection,
- Cleaning/maintaining respiratory equipment,
- Recognising the importance of face-fit testing and factors that can affect or change the face-fit,
- Knowing how to inspect, test, and wear the respirator and how to clean and maintain it,
- Use of different types of respiratory protective equipment, and knowledge of their advantages and limitations,
- Emergency procedures in the eventuality of the supply to a respirator failing in a working situation,
- Knowledge of the possible restrictions (e.g. on visibility) and difficulties in using respiratory protective equipment,
- Correct use and maintenance of equipment associated with asbestos removal works, and
- Awareness of other potential hazards, e.g. asbestos removal at high temperatures, working at heights, erection and use of access equipment for high surfaces.

Training for emergency procedures would cover procedures for:

- Aiding someone who is injured or taken ill in an asbestos enclosure,
- Emergency (e.g. fire) evacuation,
- Failures of electrical power or equipment (negative pressure, respirators etc.),
- Leakage detected outside enclosure, and
- Loss of water supply to the hygiene unit.

Training for personal decontamination would include:

- The use of airlocks for entry to/egress from the enclosure and to the decontamination unit, where the decontamination unit may be

either directly linked to the enclosure or separate,

- Changing personal protective equipment, showering and disposal of overalls,
- Maintenance of a decontamination unit in good order, and
- Personal decontamination in the eventuality of accident or evacuation.

Training for waste disposal would include:

- Procedures for bagging and wrapping waste,
- Secure containment (e.g. wrapping and/or bagging),
- Labelling,
- Safe transit via bag lock and designated route from enclosure to secure storage,
- Transport of waste from site by an authorised asbestos waste contractor to an approved waste disposal site, and
- Evidence of traceability of waste from site to disposal (e.g. waste transfer forms).

For those workers for whom the requirement on medical surveillance cannot be waived, training should cover:

- Medical examination requirements, including the purpose and importance of medical examination and the need to have certificates showing that medical examination has been completed, and
- The information and advice that workers may be given after a medical examination.

For supervisors and employers, the training should also cover:

- Good planning,
- Inspections and testing of equipment (e.g. decontamination unit, enclosure, suppression equipment etc.) and how to recognise faults,

- Auditing the work in progress,
- Monitoring the effectiveness of fibre control techniques,
- Reviewing competence and training needs,
- Record-keeping,
- The need to closely supervise new operatives,
- Producing a risk assessment (for exposure of operatives and others) and a plan of work,
- Relevant legislation and Regulations, and
- Their roles and responsibilities.

For all the personnel involved in asbestos removal work, training should provide an understanding of the air sampling and clearance testing that will be undertaken during and after the asbestos removal work.

Employers must keep records of training given to individual employees and these must be available to an inspector on request. The records will confirm that employees have received all necessary training and information at the appropriate time. Training records will also provide evidence for compliance with Section 10 of the Safety, Health and Welfare at Work Act, 2005 (S.I. No. 10 of 2005).

Section 10: Personal protective equipment

Personal protective equipment (PPE), including respiratory protective equipment (RPE) is the last line of defence against exposure to asbestos fibres, which should be prevented or reduced to as low as is reasonably practicable by engineering controls before RPE is employed. Once it is established that exposure is liable to exceed the control limit of 0.1 f/cm^3 despite the precautions taken, RPE must be provided and worn. This will normally include all notifiable asbestos work.

Respiratory protective equipment (RPE)

Various types of RPE are available and it is essential that the RPE selected matches the type of work to be done, taking into account the working environment, the wearer, other PPE in use and the exposure concentrations (expected or measured). In practice, asbestos workers are most likely to wear a limited range of PPE. A filtering facepiece (FF) particulate filter No.3 (P3) mask may be used for various tasks such as site pre-clean, site set-up, enclosure dismantling, waste handling outside the enclosure and decontamination unit (DCU) cleaning, whilst a full face power-assisted respirator with a P3 filter is required for entry into a live enclosure.

To obtain adequate performance during use, the selected RPE must be suited to the individual and must be worn correctly every time. An essential aspect of the performance of RPE, with any tight-fitting respirator, is the need for a good contact between the face seal of the mask and the operative's skin.



Asbestos worker with filtering facepiece respirator



Asbestos worker using orinasal respirator (half mask)



Asbestos worker with full face powered respirator

A good fit can only be achieved if the operative is clean shaven in the areas of contact and the mask is of a suitable size and shape to fit the wearer. For workers who normally wear glasses, either contact lenses or a full-face mask which permits the fixing of special frames inside the face piece should be worn. If neither of these options are suitable, equipment that does not rely on a good face seal for protection should be provided, e.g. a powered or air-supplied hood or blouse.

Face fit tests, which involve the individual testing of the face seal on the wearer, must be carried out as part of the initial selection of the RPE and/or where the model of RPE is changed. Due to the high risk nature of asbestos they must also be repeated at least **once every 12 months** and if the individual loses or gains weight, undergoes any substantial dental work or develops any other facial changes around the face seal area. The user should also carry out a fit check on every occasion when a respirator is worn to ensure that a good fit has been obtained.

A poorly fitting respirator may create a false sense of security and result in significant exposure to asbestos fibres. Employers should maintain a written respiratory protection program with specific procedures for fit testing and training.

Employees must be given adequate instruction, information and training on the following:

- How to fit and use the RPE correctly (including pre-use fit check each time it is worn),
- The uses and limitations of all RPE worn in the work area,
- How to recognise a reduction in air flow and what to do if it happens,
- How to identify and replace worn or defective parts,
- The manufacturer's instructions on the use, storage and maintenance of the equipment,
- How to clean contaminated RPE when leaving the work area, and
- How to recognise medical signs and symptoms that may limit or prevent the effective use of RPE.

RPE may be prone to misuse or careless storage, or may not be suited to an individual, so it is essential that the use of RPE be subject to a strict management system. Guidance on a suitable approach and fit testing is given in HSA guidance document **A Guide to Respiratory Protective Equipment**.



Asbestos worker incorrectly wearing full face respirator (head straps outside hood). The worker must remove his respirator to allow him to remove his contaminated overalls which is poor practice.

Other personal protective equipment

Other PPE will be required, including:

- Coveralls to prevent asbestos being spread from the workplace enclosure,
- Wellington boots or other smooth, easily cleanable footwear (without laces),
- Disposable underclothing, socks and gloves, and
- Other PPE as required, if shown necessary by the risk assessment.

Protective one-piece coveralls constructed from a material that will resist penetration from fibres, with seals at fasteners, neck, wrists and ankles, must be worn whenever asbestos is likely to be deposited on clothing. Disposable coveralls are strongly recommended, but where non-disposable coveralls are worn, these must only be decontaminated by a specialist laundry equipped to accept and process asbestos-contaminated items.

A Type 5 (EN ISO 13982-121), disposable coverall is the appropriate standard for asbestos work, and is the most commonly used in practice. The coveralls should be worn in such a way as to reduce the ingress of dust inside the garment. The coverall hood should be worn over the straps of the RPE and the coverall legs should be worn over footwear.

Recommended colours for different aspects of asbestos work include:

- Transit overalls – **white**
- Work area – **Red**
- At other times e.g. soft strips, when sheeting up, de-tenting - **Blue**

Further PPE may be required based on the outcome of the assessment, e.g. waterproof clothing for outdoor work.

Personal clothing that accidentally becomes contaminated must be decontaminated or treated as asbestos waste.



Section 11: Lower risk work with ACMs

This section describes the limited types of work activities with ACMs which are deemed lower risk and can avail of certain exemptions provided within the Asbestos Regulations.

It is important to refer to other sections in these guidelines which are relevant for this type of work, i.e. risk assessment, training, personal protective equipment, plans of work and waste disposal.

Exemptions from the Asbestos Regulations

Based on the required written risk assessment, Regulation 5 (b) of the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006 & 2010 allows certain work activities to be carried out on specific types of ACMs wherein certain requirements of the regulations may be 'waived'.

The specific Regulations which may be waived relate solely to the need for an employer e.g. demolition contractor or maintenance contractor to:

- 1) Notify to the Authority of the intent to remove ACMs fourteen (14) days in advance of commencing the work (Regulation 11),
- 2) Make available an assessment of the health of employees (Regulation 20), and
- 3) Maintain the medical records relating to health assessment of employees (Regulation 21).

It should be noted that these three regulatory requirements may be waived only for specific tasks, where it is known that certain requirements are met which demonstrate that the activity is of low risk regarding potential exposure to asbestos fibres.

These exceptions may only be introduced where the written risk assessment demonstrates that the exposure limit value (airborne concentration of asbestos in excess of 0.1 f/cm³ as an eight-hour time-weighted average (TWA)) will not be exceeded and that the work intended will ensure

that employees' exposure is sporadic and is of low intensity.

It should be noted that 'sporadic and low intensity' relates to the exposure and not the frequency of asbestos work activities. RPE must not be used in the determination of low intensity and sporadic exposure to asbestos as the initial written risk assessment is based on exposure and does not take into account assigned protection factors for respiratory protective equipment.

No exposure to asbestos will be sporadic and of low intensity within the meaning of Regulation 5 (b) if the concentration of asbestos in the air exceeds or is liable to exceed 0.1 f/cm³ airborne fibres averaged over an 8-hour period. Work which is likely to result in exposures at or above this level cannot be considered to produce sporadic and low intensity exposure, therefore the exemptions provided by Regulation 5 (b) will not apply.

When these criteria are established, only certain work activities may be performed without the need to notify the Authority, to make available health assessments and to retain medical records relating to health assessments, as follows:

- Short, non-continuous maintenance activities in which only non-friable materials are handled,
- Removal without deterioration of non-degraded materials in which the asbestos fibres are firmly linked in a matrix,
- Encapsulation or sealing of asbestos-containing materials which are in good condition, or
- Air monitoring, control and collection of samples to ascertain whether a specific material contains asbestos (**See Section 15 on Health Surveillance**).

Therefore, the exemptions to some of the Regulations described can be applied only when a written risk assessment demonstrates that the exposure limit value will not be exceeded and that the work will involve certain types of activities. However, the requirements as provided by the

remainder of the Regulations will apply to all work with asbestos-containing materials (ACMs). In particular, the work must be undertaken by trained workers in accordance with a plan of work and using proper controls to prevent exposure to and spread of asbestos as described in Section 12.

Key point

Any work with asbestos insulation (e.g. pipe/thermal insulation), asbestos coatings (e.g. 'limpet' spray coating) or asbestos insulating board IS NOT deemed lower risk work. Work with these materials must be carried out by competent specialist asbestos contractors.

Maintenance activities involving planned work with ACMs

Where work on ACMs is necessary, e.g. as a result of planned maintenance activities, repair or emergency works, the written risk assessment will be required to determine if the work activity meets the following criteria:

- exposure is sporadic and of low intensity,
- exposure limit will not be exceeded, and
- work involves short, non-continuous maintenance activities in which only **non-friable materials are** handled.



Maintenance activities involving non-friable ACMs and some friable ACMs

In addition to non-friable ACMs, it is accepted that properly assessed and conducted short duration work involving **some** ACMs in the friable category (see Table 2 – Section 4) or deliberate activities e.g. drilling holes in asbestos cement, which cause non-friable ACMs to release fibres would not necessarily exceed the exposure limit value. Such exposure would be considered sporadic and low intensity if the work activity was short in duration and non-continuous and was carried out using the standard work methods and controls.

Examples (non-exhaustive) of non-friable ACM maintenance activities, permitted friable ACM maintenance activities and maintenance activities involving deliberate disturbance of non-friable

Table 11

Non exhaustive list of non-friable ACM maintenance activities, permitted friable ACM maintenance activities and activities involving deliberate disturbance of non-friable ACMs

Non-friable ACM activities

- Removing less than 10 m² of non-degraded asbestos cement panels or roof sheets to access services behind them
- Removing non-degraded asbestos cement downpipes, gutters, bargeboards, ridge tiles or flue pipes/cowls without deterioration
- Repairing small section of damaged asbestos cement
- Removing asbestos cement or reinforced plastic product e.g. tank, duct, water cistern
- Painting non-degraded asbestos cement sheets
- Removing metal cladding lined with asbestos-containing bitumen
- Removing asbestos-containing bituminous products
- Removing an asbestos-containing 'arc shield' from electrical switchgear
- Removing a single asbestos-containing gas or electric heater
- Replacing an asbestos-containing fuse box or single fuse assembly
- Removing asbestos-containing mastic, sealant, beading, filler, putty or fixing

Permitted friable ACM short duration activities

- Removing and replacement of a compressed asbestos gasket from a pipe flange
- Removing and replacement of an asbestos rope seal to a boiler
- Removing an asbestos fire blanket
- Removing asbestos friction linings
- Removing flexible asbestos duct connectors (gaiters)

Activities involving deliberate disturbance of non-friable ACMs

- Drilling holes in asbestos cement and other highly bonded materials
- Cleaning debris from guttering on an asbestos cement roof
- Removing small amounts of asbestos cement remnants, e.g. debris from broken sheet
- Drilling and boring through textured coatings
- Inserting and removing screws through textured coatings
- Removing textured coating from a small area, e.g. 1 m²
- Cleaning up debris following collapse of a ceiling or wall covered with textured coating
- Removing small amounts of asbestos-containing floor tiles and mastic



Short, non-continuous maintenance activities involving working with some “friable” ACMs should not exceed one hour per employee in any seven-day period and is limited to two hours where more than one operative is involved. The one- or two-hour period commences when the ACM is physically disturbed and ceases when the area has been thoroughly cleaned.

This time criterion is recommended to significantly reduce the amount of time ACMs are worked with by maintenance personnel. However, short time duration jobs, if done poorly, can also lead to high levels of exposure. Therefore, written risk assessment and an appropriate plan of work are key to managing and minimising exposures.

Appropriately risk assessed and planned short non-continuous maintenance activities involving non-friable ACMs should not give rise to exposures above the exposure limit value, and in the majority of cases, should be well below the exposure limit value. The recommended time criterion is more applicable to activities involving friable ACMs, e.g. rope seals, gaskets etc., or where deliberate controlled release of fibres, e.g. drilling, is envisaged. However, works should be planned in such a way as to keep the time required to work on all ACMs to a minimum.

Guidance on particular maintenance tasks involving ACMs

Guidance on some of the tasks is provided in the appendices of these guidelines. A list of Health

and Safety Executive (UK) asbestos essentials task sheets relevant to this Section are available for download from the HSE (UK) website (<http://www.hse.gov.uk/asbestos/index.htm>) and provide a good resource for developing relevant plans of work in conjunction with guidance. A sample plan of work is provided in Section 14 (plans of work) of these guidelines.

Each task sheet covers access, equipment, PPE, procedure, cleaning and visual inspection requirements. If the procedures are followed closely they will prevent or reduce exposure to asbestos fibres to as low a level as is reasonably practicable.

Note: Any maintenance or repair work with asbestos insulation, spray coatings or insulating board should be restricted to specialist asbestos contractors.

Work with ACMs where asbestos fibres are firmly linked in a matrix

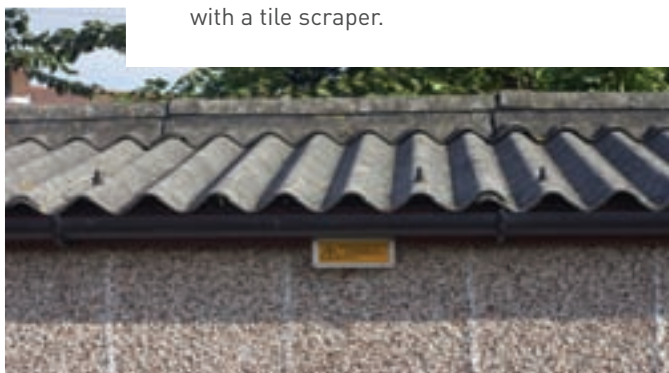
Based on written risk assessment, the exempted regulations may apply where the works involve the removal of non-degraded ACMs in which the asbestos fibres are firmly linked in a matrix, without causing further deterioration.

Materials in which the asbestos fibres are firmly linked in a matrix include those listed as non-friable in Table 4. They include:

- Asbestos cement products in non-degraded state,
- Textured decorative coatings and paints which contain asbestos, and
- Any article of bitumen, plastic, resin or rubber which contains asbestos (e.g. vinyl floor tiles, toilet cisterns, roofing felt).

The exemptions will apply where these materials are in a non-degraded condition and can be safely removed without deterioration, for example:

- Asbestos cement with a score of less than 11 using the asbestos cement algorithm,
- Asbestos cement roof tiles removed whole with minimal damage,
- Textured coating applied on plasterboard, where the plasterboard with the textured coating can be removed whole with minimal damage, and
- Vinyl floor tiles which can be removed whole with a tile scraper.



Encapsulation can be achieved by various methods: application of thin sealant coating or thick sealant coating, impregnating the ACMs with a liquid that will harden. However, wetting may cause a material to detach from its substrate due to the weight of absorbed water.

The system employed to encapsulate will depend on the nature of the ACM, its condition and the type of protection required, taking into account flammability requirements. The coat must adhere firmly and the ACM must be sufficiently able to carry it.

Sealing (enclosure) can mean encasing the ACMs in a structure.

Supervision of work

An experienced, competent operative should supervise any work that is carried out and prepare the plan of work (or method statement) for undertaking the work.

Encapsulation of low risk asbestos-containing materials

Based on written risk assessment, the exemptions may apply to certain work activities involving encapsulation or sealing of asbestos-containing materials which are in good condition. A plan of work is required for encapsulation or sealing (enclosure) works.

The asbestos survey report may recommend that some or all of the ACMs in a building be made safe by encapsulation or sealing (enclosure).

Work activities involving encapsulation or sealing of insulation (vessel/pipe insulation) or asbestos insulating board in good condition are excluded from the exemptions. Such work should be carried out by competent specialist asbestos contractors. **It is strongly recommended not to encapsulate asbestos spray 'limpet' materials and to arrange to have such materials removed by a specialist asbestos contractor, where reasonably practicable.**

Working methods for lower risk work

The following are some key working methods that should be employed to ensure minimum release of fibres during lower risk asbestos works:

- Do not use power tools on ACMs: they create dust,
- Only use hand-tools,
- Ensure that surfaces which may get covered in dust and debris are covered with polythene sheeting,
- The asbestos work area should be segregated to ensure the safety of others, to prevent the spread of asbestos fibres and prevent the exposure of people not involved in the work. Whatever means of segregation is used, there is a need to post asbestos warning notices. How much you need to do depends on the outcome of your risk assessment, e.g. the risk will be greater within an occupied building compared with



Do not use power tools on asbestos containing materials.



external work. In most cases it is sufficient to mark out the work area with signs to prevent non-asbestos workers approaching,

- If the work is likely to result in significant disturbance, you must consider erecting a physical barrier for segregation purposes. A physical barrier should prevent the spread of debris and airborne fibres, i.e. contain any dust which may be generated during the work activity, and so also assist in cleaning up the 'contaminated area', which should be within the segregated zone. This is usually done using the fabric of the building and heavy gauge polythene sheeting,
- The minimum number of workers should be used,
- Methods to minimise the release of asbestos fibres, e.g. shadow vacuuming using a H-Type vacuum or wetting, should be employed.

Specialist wetting agents can make work easier, but some asbestos materials do not absorb liquid easily, so other methods will

also need to be used to control dust exposure, e.g., a H-Type vacuum cleaner,

- Use of damp cloths/tack cloths is recommended,
- Do not sweep or use compressed air.
- Minimising breakage of any ACM will also help reduce fibre release,
- Do not allow waste to accumulate – clear it up as you go. Do not let vehicles drive over it and crush it,
- Working with ACMs overhead should be avoided,
- Use personal protective equipment (PPE). The type of PPE used must be based on the written risk assessment but may include suitable respiratory protective equipment (RPE), disposable overalls etc (see below),
- Carefully put asbestos waste into a suitable sealed container such as a heavy duty polythene bag. Then put it in a second bag and label it to show that it contains asbestos,
- Wash hands and face before eating, drinking or smoking and at the end of the day's work,
- Where there is no choice but to use power or pneumatic tools, set them at the lowest effective speed with additional control measures such as local exhaust ventilation (LEV). Typical measures include:
 - o A cowl fitted with LEV located around a drill bit (the cowl should be fitted with a spring so that it remains in contact with the surface of the material as the drill bit penetrates), or
 - o Shadow vacuuming (this is where the nozzle of a Type H vacuum cleaner, fitted with a suitable attachment, is held as close as possible to the source of fibre release throughout the task).
- Make sure the work area is thoroughly clean on completion of the work, and
- For asbestos cement, where reasonably practicable, avoid the need to attach items to it and avoid routing items such as wiring and pipes through it.

Hygiene arrangements for lower risk work with ACMs

When the removal work is completed, the surface of the working area and any equipment used should be wiped down with appropriate cleaning rags soaked in water. A contaminated rag should never be re-soaked as this will contaminate the water. Tape may be useful for removing small dust deposits.

Any asbestos waste, debris or contaminated material (including cleaning rags) should be placed into a suitable, UN-approved red bag which displays the appropriate asbestos warning label, and then sealed with tape. The red bag should then be wiped clean before being carefully placed into a suitable approved clear asbestos bag which should then also be sealed. The waste bags must be labelled to identify that they contain asbestos waste.

If the asbestos waste, debris or other material cannot fit into a waste bag, it must be double-wrapped in two layers of strong polythene. A red asbestos 1,000 gauge bag or printed label (with the same information as the bag) should be securely attached to indicate that it contains asbestos waste.

Operatives must decontaminate themselves after working with asbestos in order to ensure that they do not expose themselves or others to asbestos fibres. The decontamination procedure should ensure that any asbestos contamination is removed prior to removal of the respirator. Contaminated clothing should be vacuumed using a Type H vacuum cleaner, and should be removed on leaving the work area for work-breaks and at the end of the work period. It should be stored separately from clean clothing.

Existing site washing facilities can be used but access should be restricted to the asbestos workers while they carry out their work, and the facilities thoroughly cleaned afterwards. All disposable personal protective equipment should be disposed of as asbestos waste following each working shift.



Visual inspection, environmental or personal monitoring

For lower risk asbestos work, a visual inspection post-works, as a minimum, must be carried out by a 'competent person'. A 'competent person' must possess suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. For example, the competent person may be a maintenance supervisor or operative, a foreman on a demolition site or a health and safety officer who has the appropriate training, knowledge and experience.

A thorough visual inspection is required to confirm that an asbestos work area is safe to be returned to normal use. It is the principal component in determining the successful removal of ACMs. The competent person must **self-certify via a written statement** stating that the area:

- Has been thoroughly cleaned and visually inspected, and
- Has no remaining visible traces of dust and debris and is suitable for reoccupation.

Table 12**Contents of a written statement of cleanliness and completion following low risk asbestos work**

- Details of competent person,
- Site address,
- Location of works,
- Date of works,
- Start/finish times (duration),
- Scope of work (e.g. type of ACM worked on, nature of task, quantity removed etc.),
- Confirmation that work has been completed as per plan of work,
- Confirmation that work area is free of debris and visible settled dust,
- Confirmation that associated waste and contaminated materials have been disposed of appropriately,
- Name and signature of competent person, and
- Countersignature e.g. client or representative, site manager, health and safety officer etc.



There is normally no need for environmental or personal monitoring to be carried out during low risk asbestos work as the required control measures should reduce levels of exposure to well below the exposure limit value.

The need for air monitoring should be determined as part of the assessment of the work. It may be required for one or more of the following reasons:

- To confirm that the method of work is adequate, that airborne concentrations of asbestos fibres are as low as reasonably practicable and that the correct choice of RPE has been made,

- To confirm that there has been no measurable spread of airborne fibres to areas adjacent to where work has taken place, and
- To confirm that the work area has been adequately cleaned before being returned to normal use.

Air monitoring should be conducted by an independent competent analyst and carried out in accordance with Section 13. The independent analyst may also be employed to conduct the visual inspection and issue a site clearance for reoccupation certificate appropriate to the nature of the works.

Dealing with incidents

If there is the possibility that an employee has been exposed to asbestos fibres as a result of an incident, the employer should make available a health assessment through an appropriate medical practitioner, e.g. GP, to determine whether their exposure was significant and whether a note should be made on their personal medical record. In some circumstances, the GP may refer the employee to a specialist in respiratory medicine.

Section 12: Work with higher risk asbestos-containing materials

This section provides practical guidance to employers on the minimum standards required for the abatement of higher risk ACMs, where encapsulation or removal of ACMs is considered the most appropriate option. Most work with ACMs which can lead to a high release of asbestos fibres must be restricted to specialist asbestos contractors. Specialist asbestos contractors must also consult HSE (UK) HSG 227 *The Licensed Contractors Guide*, for further technical information on acceptable best practices.

Selecting a Specialist Asbestos Contractor

In accordance with Section 18 of the Safety, Health and Welfare at Work Act, 2005 and Regulation 16 of the Asbestos Regulations, the importance of careful selection of a suitable contractor to undertake repair or removal of ACMs cannot be overestimated.

The Asbestos Regulations (Schedule 4) require such companies to provide evidence of their ability to carry out the work to those commissioning asbestos works and inspectors on request. This includes the following:

- Company safety statement and associated risk assessments,
- Training plan and individual training certificates including safe pass cards,
- Individual training records for employees (operatives),
- Confirmation of health assessments (medical certificates) of employees undertaking the asbestos work,
- Respiratory protective equipment face-fit certificates for employees undertaking the asbestos work, and
- Relevant experience.

Confirmation that appropriate insurances are held by the specialist contractor for work with ACMs and references should also be requested.

Although not mandatory, membership of a relevant trade association, e.g. ARCA (Ireland), is also an indicator of professional attitude and the association can be contacted to verify the competence of the contractor. ARCA carries out mandatory annual site auditing of their full members.

In order to ensure that contractors quote on the same basis for a particular job, the following information should be provided to the contractors:

- The scope of the work to be carried out,
- The results of the relevant parts of the survey of the premises,
- Accurate bill of quantities to determine extent of ACMs and for accurate waste estimation,
- Site plans,
- Information about site-based hazards that the contractors may need to take into account,
- Site safety rules including permit-to-work regimes,
- Access to the working area including location of decontamination facilities and waste skips,
- Access to water and power supplies,
- Use of site facilities,
- Time constraints,



- Penalty clauses,
- Whether the work area is unoccupied or if there will be people working near it,
- Emergency procedures,
- Arrangements for liaison during the contract,
- Whether the work will be supervised/ managed by a third party, and
- Any other issues that might affect the way the contractors will carry out their work.

The information should also include a list of the information you need to be included in the quote. The list below indicates the range of information that a contractor should provide in addition to the price for the work:

- The estimated duration of the contract,
- The estimated number of personnel expected to be on-site,
- Risk assessment(s) for the job, including estimated exposures for removal,
- Plan of work (method statement) – see below,
- Emergency procedures, and
- A possible start date.

The specialist contractor will almost always need to visit the site and assess the job in order to provide a detailed quote. The contractors should be made aware of any constraints on their work which may affect costs, such as working times, and any site safety training requirements.

Supervision of asbestos removal work

In most cases a minimum of three operatives (including the site supervisor) is recommended on-site at any one time when notifiable asbestos removal work is being undertaken. An 'outside man', i.e. an operative outside of the working enclosure, must be available at all times whilst work is taking place in the enclosure.

Although in practice this person is often the supervisor, this need not be the case.

If consideration is being given to using less than three operatives on a project, this must be clearly justified in the plan of work.

Site documentation

The specialist contractor should maintain a site pack with the following documentation (non-exhaustive list):

- Notification form,
- Plan of work,
- Safety statement,
- Risk assessments,
- Training certificates,
- Face-fit tests,
- RPE examination records,
- Evidence of medical examinations,
- Test certificates for all plant and equipment used on the site,
- Site log i.e. daily checks of DCU, enclosure, airlocks, NPU's and H-Type vacuums,
- Air monitoring results e.g. personal, leak testing, background, clearance tests and previous clearance cert for hygiene unit,
- Record of smoke test,
- Safe pass cards, and
- Documentation required under the Construction Regulations, as appropriate.

Working methods for higher risk asbestos-containing materials

Encapsulation

The removal of existing ACMs can itself present the greatest risk of significant exposure to asbestos fibres. In some cases it may not be necessary to remove the ACMs, and the materials can be protected or encapsulated.

These processes require proper management, as control limits may be exceeded, especially when working on asbestos insulating board or thermal insulation. Therefore, encapsulation would require a specialist contractor with an understanding of the techniques necessary to carry out the work, as fibres may be released. Before choosing this option, consideration should be given to the following matters:

- The type and condition of the ACM,
- Whether the substrate is sound enough to allow the encapsulation to adhere,
- Whether any water penetration via the substrate will increase the weight on the encapsulation and cause it to fall away from the ACM,
- Whether further damage could occur due to traffic operations, bird or rodent attack, or vandalism,
- Whether access is available to allow the process to be effective,
- Whether the encapsulant will ensure that the thermal and acoustic attributes of the structure are maintained, and
- Whether taking this approach would be simply putting off the need for removal of the asbestos at a later stage, at further significant cost.

Various types of encapsulation are available, each suitable for particular applications. Each has its particular advantages, be it 'boxing in' the ACM with board materials, or the use of bulk brush- or spray-applied polymeric or cementitious

materials. The correct choice depends on the location and condition of the ACM, its ability to take the weight of any encapsulant and the ease in which the encapsulant can be applied to the ACM. Some materials will simply seal the surface and not offer any protection against impact damage.

Removal of asbestos insulation, asbestos insulation board and asbestos coatings

Work involving the removal of asbestos insulation, asbestos insulation board or asbestos coatings must be carried out in a manner that reduces the potential exposure to asbestos fibres of those undertaking the task and other persons in the vicinity. The contractor carrying out the removal of ACMs will be expected to include details in the plan of work (or method statement) of the control measures that are to be put in place to achieve this aim.

If the removal involves work at heights, then the plan of work must specify safe procedures for this type of work. Scaffolds, towers or mobile elevated work platforms may be required to access the ACMs. The plan of work should include measures for protecting this equipment from cross-contamination, e.g. by wrapping or covering with polythene, decontamination prior to removal of enclosure and inspection prior to dismantling.

The method of removal of the asbestos will have an obvious effect on the amount of asbestos fibre that becomes airborne – the method selected should minimise fibre release. The methods to be used should be clearly stated in the plan of work, but **uncontrolled dry stripping of asbestos, use of power tools, power washing and hot working must never take place.**

There are two broad categories of controlled stripping techniques which can be used to minimise the release of fibres during asbestos removal:

- Controlled wet stripping, and
- Dry stripping with control at source.

The method (or combination of methods) used will depend on a number of factors including:

Section 12: Work with higher risk asbestos-containing materials

- The type of ACM, e.g. lagging, sprayed coating, board,
- The thickness of the ACM,
- The presence and nature of any coating on the ACM,
- The type and nature of fixing, e.g. nailed, screwed, and
- Miscellaneous factors, e.g. whether pipework is redundant, whether the material is damaged, accessibility etc.

Wet methods

The **wet spray method** is the preferred asbestos removal method and should be used for the removal of asbestos from structures and plant. The wet spray method requires the use of a constant low-pressure water supply for wetting down asbestos and related items to suppress asbestos fibres. This can be achieved with a mains-supplied garden hose fitted with a pistol grip. If no water supply is readily available, a portable pressurised vessel (for example, a pump-up garden sprayer) may be used. Other methods involve the use of airless sprayers or 'Gracos', which are suitable for larger ACM removal projects.

The design of the spraying equipment will depend on the availability of a water supply and access to the area to be sprayed.



The wet spray method involves applying a fine water spray to the asbestos in a manner that ensures that the entire surface of the asbestos is saturated and the run-off is minimised. The asbestos should be maintained in a wet condition throughout the removal.

A wetting agent (surfactant), e.g. detergent, may be added to the water to facilitate more rapid wetting of the asbestos. A manually controlled, consistent, low-pressure, fine spray (for example, from an adjustable pistol-grip garden hose) is recommended.

For very small areas, a small spray water bottle may be sufficient. In all cases, water should be in the form of a mist to minimise the potential to generate respirable dust.

The asbestos should be wetted through to its full depth and the water spray should be directed at the site of the cut. The wetted material should be removed as the cut is progressed.

Immediately after the asbestos is removed from its fixed or installed position, spray should be directed on the sides that have not been previously exposed.

Wherever reasonably practicable, a H-Type vacuum cleaner should be used in conjunction with the wet spray method. The H-Type vacuum cleaner should be used prior to spraying asbestos with water and for the collection of any dust spread over a large area.

Consideration should be given to applying a PVA emulsion, as it may be more effective than water (with a wetting agent) in minimising fibre release. PVA can be applied and allowed to dry on asbestos cement roofing prior to the removal of the roofing, as an alternative method to prevent slip hazards.

Saturation and water injection method

The soaking method with total saturation should be used if the asbestos is so thick that the spray method will not suppress the asbestos significantly. This method involves injecting water or a water-based solution under low pressure (3.5 bar) directly into friable asbestos such as laggings, sprayed coatings and painted AIB. It is a process that requires specific training in relation to the use of the equipment and the process.

The asbestos is soaked by the introduction of water or other wetting agents through an appropriate applicator that consists of an injection head with numerous side holes or outlets through which the water or wetting agent is fed to the asbestos.

To facilitate more rapid wetting of the asbestos, holes or cuts should be made in the outer covering to enable the water or wetting agent to be injected in such a manner as to ensure that the asbestos is saturated and not just washed out through a liquid passage.



The soaking should be done before removal. The quantity of water or wetting agent and the time to soak will depend on the thickness of the asbestos, access to the asbestos and location of the holes.

The saturated asbestos should then be removed in sections, placed in a properly labelled container, sealed and disposed of as with the spray method.

Dry methods

The dry method is not advisable, as there is a much greater potential for airborne asbestos fibres to be generated. The dry removal method can only be used if the wet spray or soaking methods are not suitable.

The **wrap and cut method** is also used, in particular for pipework/vessels which are redundant. This method requires less contact time with asbestos. Flanges containing compressed asbestos fibre (CAF) gaskets on redundant pipework should be cut either side or disposed of rather than opened up to remove the individual CAF gaskets.

Glovebags can only be used without an enclosure where the assessment shows minimal risks to other people if the glovebag leaks or fails. This may be the case where the site is remote from other workers, e.g. runs of open-air pipework in a chemical works where the prevailing weather conditions could make building and maintaining an enclosure impractical.

However, it should be noted that there is still the potential for relatively low concentrations of fibres to leak out from the glovebag during use, especially through small holes. Consequently, the work area still needs to be segregated.

Glovebags should not be used in occupied areas without additional precautions, such as enclosures and negative pressure units (NPU).



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The **shadow vacuum technique** involves local exhaust ventilation using H-Type vacuum cleaners to capture any asbestos fibres released during work with ACMs. Such controls can be used during the removal of ceiling tiles by carefully

vacuuming the top of the ceiling tile during removal. Similar techniques can be used whilst unscrewing AIB.



Enclosures

Enclosures are a **fundamental component** in the control of the risks associated with the release of asbestos fibres during removal work, and are required for almost all notifiable asbestos removal work. If consideration is being given to such work without the provision of an **enclosure**, this should be discussed with the Health and Safety Authority at an early stage.



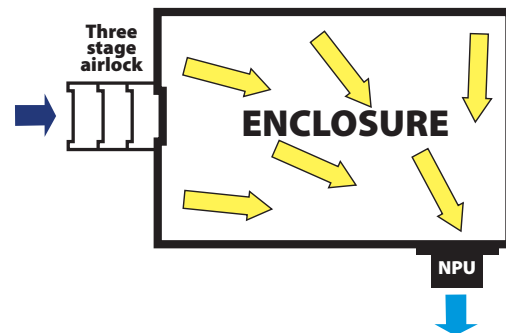
Prior to constructing an enclosure, consideration should be given to the following:

- Whether a pre-clean of the area is required using a H-Type vacuum and PPE/RPE,
- Disposing of non-asbestos waste in the area (including transit routes and waste routes),
- Removing or covering items that would be difficult to clean if they became contaminated

(e.g. protecting carpets by covering with disposable timber panels and polythene),

- Blocking openings (such as air conditioning systems, ventilation systems) to prevent the spread of asbestos fibres,
- Sealing openings (e.g. pipe penetrations) using expanding foam (note: such use of chemicals must be risk assessed for both human health and fire),
- Ensuring that the enclosure does not obstruct emergency escape routes or that adequate alternative routes are signposted,
- Ensuring that smoke alarms are deactivated, and
- Ensuring that electricity is isolated by a competent person and that an isolation certificate is obtained.

Enclosures are formed using timber, 1,000 gauge polythene, tape and spay-tac adhesive. Enclosures should be a reasonable size and should correspond to sketches in the contractor's plan of work. They should be designed to allow sufficient airflow through to avoid 'dead spots'.



The enclosure should be maintained under negative pressure (e.g. 5 Pa), and the pressure should be as uniform as possible throughout the enclosure. Negative pressure units with pressure monitoring facilities and supplementary air inlets should be located to achieve good air flow and to avoid dead spots. Air movement should be checked during the smoke test following

construction of the enclosure. The negative air units should operate continuously (twenty-four hours a day) until all asbestos removal work and decontamination within the enclosure has been completed, a clearance certificate issued and the enclosure dismantled. If the units stop during removal work, the specialist contractor must ensure that all removal work ceases immediately until the problem is rectified and the required number of units are in operation. To minimise the risk of airborne asbestos fibres

escaping the enclosure, the delay should be as short as possible to avoid interruption. Consideration should be given to backup NPUs and the use of a generator. NPUs should be ducted outside.

With the use of appropriate NPUs, there should be at least eight air changes per hour within the enclosure. Therefore, accurate ventilation calculations for enclosures are critical. This is achieved as follows:

Enclosure calculations

The required NPU size in cubic feet per minute (CFM) can be calculated using the formula:

$$(\text{Enclosure volume (cubic ft)} \times \text{No. of air changes per hour}) / (60 \text{ (minutes)}) = \text{CFM (req)}$$

N.B. 1 cubic foot = 0.0283 cubic meters

	NPU unit required (Cubic feet per minute [CFM] required)
Enclosure Area (cubic feet)	8 air changes per hour
≤3,750	500
≤5,000	*
≤11,250	1,500
≤15,000	2,000
≤20,000	*
≤30,000	4,000
≤40,000	*
*Use combination of NPUs to achieve required negative pressure	

Section 12: Work with higher risk asbestos-containing materials



Each enclosure **must have a viewing panel** (minimum 600 mm x 300 mm) or bubble window, wherever possible, including a viewing panel on the inner stage of the **three-stage airlock**. The use of closed circuit television (CCTV) may be required to enable the work and workers to be inspected without needing to enter the enclosure, e.g. basement boiler rooms, roof spaces, complex enclosures etc.

An **exclusion 'buffer' zone** around the enclosure should be created, as far as practicable, using red asbestos barrier tape. Depending on the location, additional barriers (e.g. heras fencing) should be installed to stop unauthorised access.

Additional signage, as appropriate, must be used and should comply with the Safety, Health and Welfare at Work (General Application) Regulations, 2007 (Chapter 1 of Part 7: Safety Signs at Places of Work) (S.I. No. 299 of 2007).

Airlocks and bag locks should be of an appropriate size for the controlled movement of personnel, waste and equipment in and out of the work area. They should be constructed from minimum 50 mm x 50 mm timber battens, 1,000 gauge polythene and duct tape to minimum dimensions 1 m x 1 m x 2 m (height). Airlock flaps should cover airlock openings and should be weighted.

Appropriate signage must be displayed on the airlock and bag lock to warn people and to control unauthorised access.

Enclosures may only be dismantled once all of the following are done:

- Asbestos removal work has been completed,
- Visual inspection by an independent person is satisfactory, and
- Air monitoring results are found to be less than 0.01 f/ml.

The polythene that formed the enclosure must be disposed of as asbestos waste, along with any other contaminated material that assisted in forming the enclosure. In some cases, structures used in building the enclosure (other than the polythene that formed the enclosure) may be wrapped and sealed in plastic and not opened until in a similar controlled environment, such as another asbestos removal enclosure (for example, collapsible rods used to form the enclosure frame).

Smoke tests

A smoke test using a non-toxic smoke generator should be carried out on all enclosures as part of an integrity inspection prior to works commencing. This should be witnessed, where possible, by those commissioning the works or his/her representative or an analyst, and a record should be made by the asbestos contractor. The test should be carried out with NPUs deactivated and then turned on. This will allow the witnesses to detect 'dead spots'. Dead spots can be addressed using 'roving heads' attached to the NPU.



Sometimes it may not be possible to conduct a smoke test due to inability to deactivate local fire detection systems etc. In such circumstances, the person in control of the workplace must be informed and suitable air monitoring arrangements must be put in place to detect asbestos fibre leaks and establish enclosure integrity.

Thorough visual inspection of the work area enclosure and the air extraction equipment installed should be carried out at the beginning of each working shift.

Maintenance of plant and equipment

This section applies to all forms of equipment used to control levels of dust, such as vacuum cleaners, air extraction equipment and filtration units. All equipment should be subject to regular visual inspection (at the start of every shift), monitoring and maintenance, all of which should be recorded. Chapter 2 (Use of Work Equipment) of Part 2 of the Safety, Health and Welfare at Work Regulations, 2007 (S.I. No. 299 of 2007) applies to all work equipment.

All new equipment used in the controlled removal of ACMs should comply with the British Standard BS 8520-2009: Equipment used in the controlled removal of asbestos-containing materials.

This British Standard has 3 parts:

- Part 1: Controlled wetting of asbestos-containing materials – Specification (BS 8520-1:2009),
- Part 2: Negative pressure units – Specification (BS 8520-2:2009), and
- Part 3: Operation, cleaning and maintenance of class H vacuum cleaners – Code of practice (BS 8520-3:2009).

The performance of the NPU should be checked after it has been thoroughly examined in order to establish that airflow through the unit and pressure drop across the HEPA filter meet the manufacturer's specification. Where the airflow

has dropped below its design capacity (e.g. a 2,000 cubic feet per minute [cfm] unit is only achieving 1,500 cfm), this should be clearly marked on the unit itself and included on the test certificate. The lower figure must be used in ventilation calculations. NPUs should have a non-return flap to prevent reverse flow, and a pressure gauge.

Thorough examination and testing of negative pressure equipment must be carried out regularly, e.g. every six months, in accordance with the manufacturer's instructions, by a trained and competent person. The unit should be electrically tested and have its filter tested (usually a DOP [Di-Octyl Phthalate or dispersed oil particulate] test). Maintenance work on these units should only be performed after they have been thoroughly decontaminated, or the work may be carried out under controlled conditions, such as in an asbestos removal enclosure while wearing appropriate PPE.

A coarse pre-filter should be installed on the air intake side of the NPU to prolong the useful life of the HEPA filter. These pre-filters may need to be changed once per work shift or more frequently depending on dust loads. Used pre-filters must be disposed of as asbestos waste.

H-Type vacuum cleaners should be thoroughly examined regularly, e.g. every six months, by a competent person and in accordance with the manufacturer's instructions. The effectiveness of the HEPA filter should be established during these examinations, but a filtration test for the entire vacuum cleaner must be available, not just the HEPA filter.

Defects in any equipment should be reported and corrected as soon as possible. Where a defect may result in exposures above the relevant control limit, the work should be stopped until the defect is repaired and adequate control resumed.

Hygiene measures

Asbestos workers are most at risk of developing asbestos-related diseases. Removal processes

Section 12: Work with higher risk asbestos-containing materials

by their nature disturb and release asbestos fibres, resulting in operatives and their clothing being contaminated with fibres which can become airborne and thus become inhaled.

Operatives must not eat, drink or smoke in an asbestos work area or in the washing and changing facilities. They must not take food, drink or cigarettes into such areas. Sufficient notices should be put up in prominent places in and around asbestos work areas on the prohibition of eating, drinking and smoking.

Where eating and drinking is necessary during working hours, a designated area should be agreed for such purposes. The area should be situated away from the asbestos work area, and entry to the eating and drinking area while wearing contaminated personal protective equipment or carrying equipment contaminated with asbestos should be prohibited.

Any operative working with asbestos insulation, asbestos insulation board or coatings should be subjected to rigorous decontamination procedures. This will prevent the spread of asbestos contamination outside the work areas. This is not only important for the operatives themselves but also for others who may become exposed to asbestos fibres which are not removed.



The provision of an appropriate hygiene unit, usually referred to as a **decontamination unit, or DCU**, is essential for notifiable asbestos work. A DCU is a three-stage unit with a shower between a 'clean end' and a 'dirty end'. The DCU should be fully cleanable, with adjustable heated shower and separate areas for clean clothing and for discarding contaminated disposable work clothing. The unit should display, in a prominent position in the clean end, a copy of the **clearance certificate** from the most recent asbestos removal job.

A minimum of one shower (decontamination unit) should be available for every four operatives involved in the asbestos work. There should be filtration of waste water to prevent spread of asbestos.

Extract ventilation with a HEPA filter produces a flow of air (through grilles) from 'clean end' to 'dirty end' of the decontamination unit. Self-closing doors maintain the separation of the sections. In cold seasons, the clean end should be heated to provide an adequately warm environment for changing and showering.

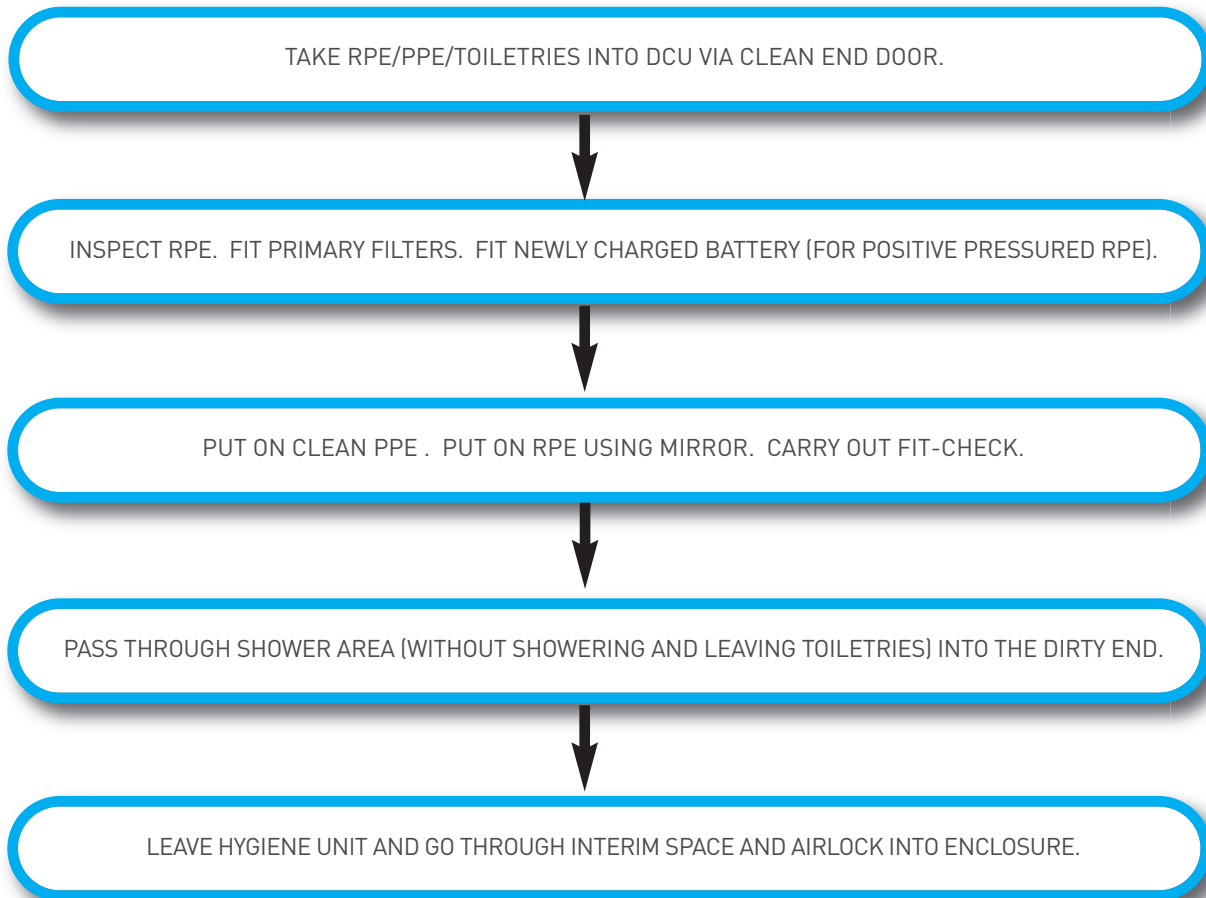
Ideally, a DCU should be connected to the enclosure. Where transiting arrangements are in place (i.e. the DCU is not directly linked to the enclosure), additional procedures, PPE and preliminary decontamination is required at the enclosure before travelling to the DCU for full decontamination. There must be a bucket of clean water and sponge and a dedicated H-Type vacuum should be available in the airlock for primary decontamination. The following **flowcharts** describe recommended procedures for operatives (and analysts) when transiting and when the DCU is attached directly to the enclosure.

Arrangements should be made for the facilities to be cleaned at least at the end of each working day. The daily cleaning should include the removal of all dust by vacuum cleaning and then thorough wash down or wet mopping of all exposed surfaces. Debris should not be allowed to accumulate but should be cleared and bagged for disposal as asbestos waste.

FLOWCHART 1

**DECONTAMINATION PROCESS
DECONTAMINATION HYGIENE UNIT (DCU) ATTACHED TO ENCLOSURE**

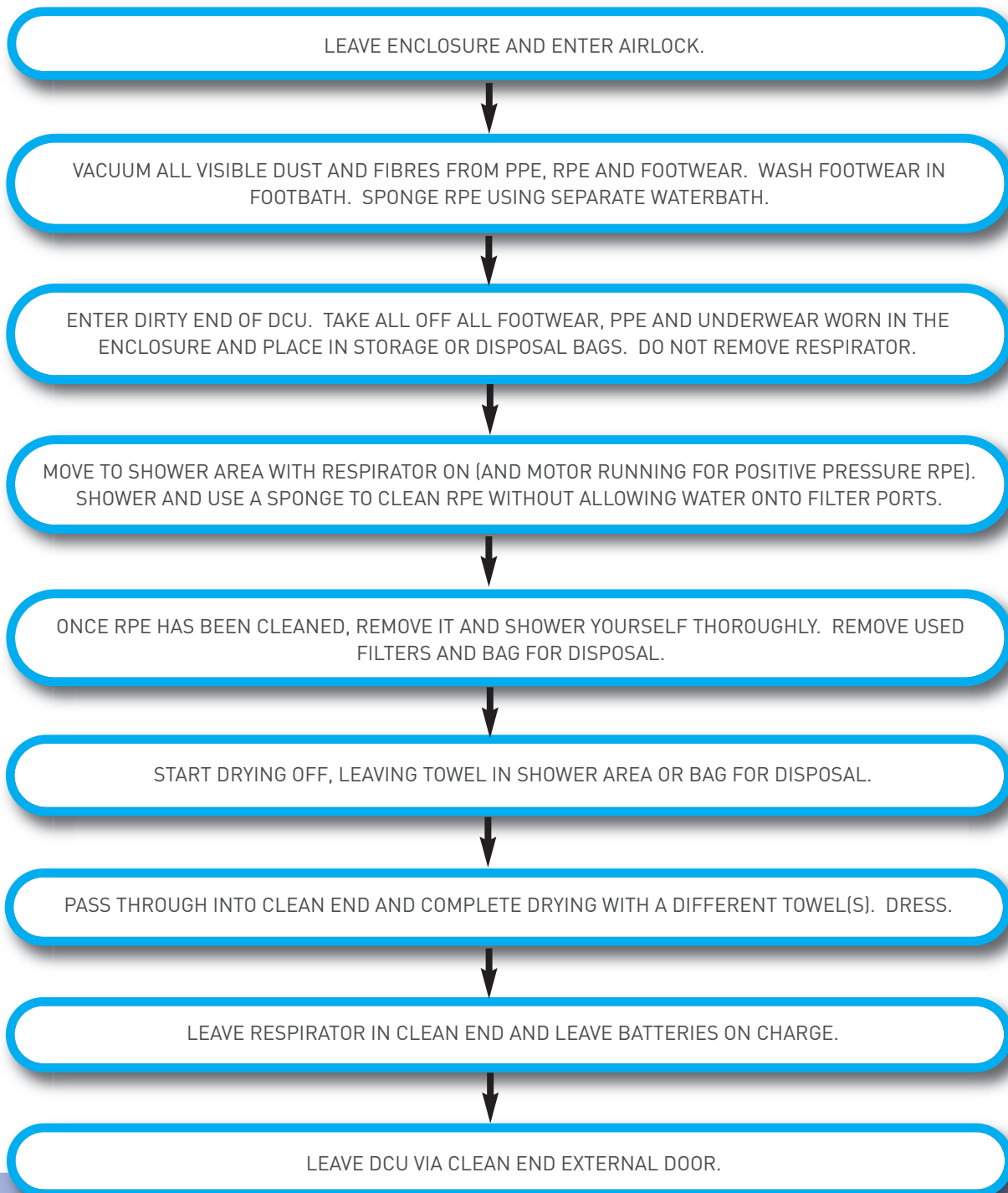
A - ENTERING ENCLOSURE



FLOWCHART 2

**DECONTAMINATION PROCESS
DECONTAMINATION HYGIENE UNIT ATTACHED TO ENCLOSURE**

B – LEAVING ENCLOSURE



FLOWCHART 3

TRANSITING PROCEDURE

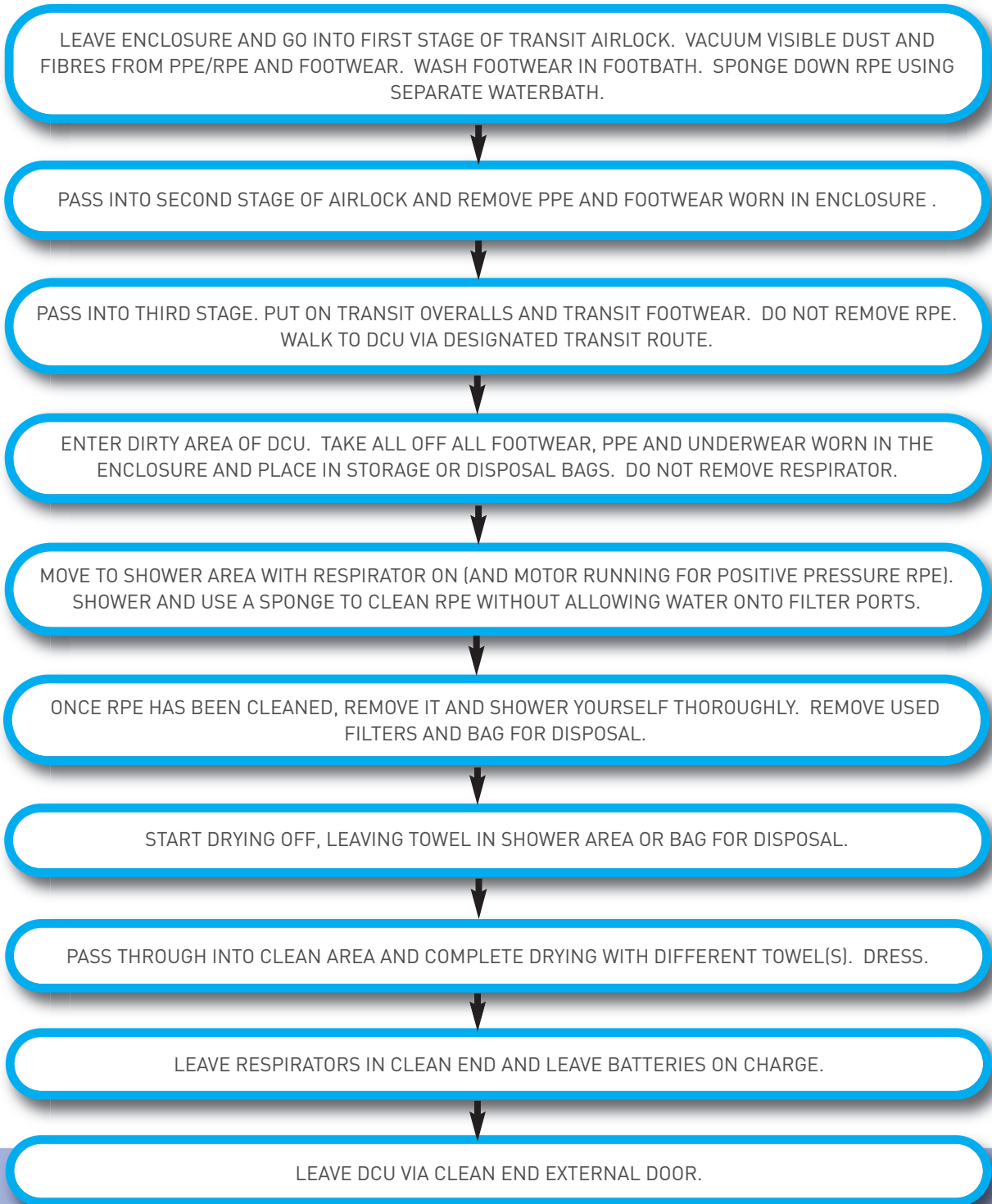
A – ENTERING ENCLOSURE



FLOWCHART 4

**DECONTAMINATION PROCESS
TRANSITING PROCEDURE**

B – LEAVING ENCLOSURE



Arrangements to deal with accidents, incidents and emergencies

There is always a risk of an accident occurring in an enclosure during asbestos removal, e.g. a worker collapsing or falling from a height within the enclosure. Emergency procedures for the evacuation of ill or injured personnel, therefore, need to be written into the plan of work.

Decontamination should be carried out as far as possible. Where practicable, employees should vacuum themselves and the victim, and sponge down RPE and boots, but evacuation of the seriously ill or injured person should not be delayed by over-elaborate attempts to decontaminate the casualty. If the victim can be moved, work colleagues can move them outside, if necessary, by slitting the walls of the enclosure. In some situations it may be necessary for the casualty to be treated inside the enclosure.

Arrangements for contacting the emergency services should be established in advance. If an accident occurs, information should be given to the relevant accident and emergency services at the time of the call to enable those services to prepare their own response and precautionary procedures for asbestos and other hazards. Spare disposable protective clothing and disposable respiratory protective equipment should be kept available for personnel who have to enter the enclosure and who do not have their own equipment, e.g. paramedics.

As asbestos personnel work in many different premises and buildings, it is important that they are familiar with the procedures and arrangements in the event of a fire or other emergency which may require evacuation. Even in unoccupied buildings, there may be specific factors associated with the site which increase the potential risk of fire or other emergency situation, so the means of identifying such an event and the means of escape must be planned.

This is particularly important if the enclosure or DCU is located in a relatively inaccessible area or if the escape route is awkward or lengthy. Although, where practicable, basic



decontamination is desirable if escape becomes necessary, evacuation from the premises must be the overwhelming priority and should not be delayed by undergoing decontamination.

After reaching a safe area after an accident or emergency, PPE and RPE should be decontaminated as far as possible.

Section 13: Role of the independent competent analyst

An independent competent analyst ('analyst') will be required for all notifiable work and may also be required for some lower risk asbestos abatement works in order to provide **'site clearance certification for reoccupation'** (clearance certificate) and other types of air monitoring as described in this Section. The competent independent analyst, in undertaking all aspects of analytical and clearance testing work, must conform to the technical requirements set out in the HSE (UK) technical guidance document HSG 248: *Asbestos: The analysts' guide for sampling, analysis and clearance procedures*.

An 'independent' analyst

It is strongly recommended that the person commissioning the asbestos works **directly appoints** the independent analyst/analytical laboratory, i.e. analytical body.

The Asbestos Regulations require that the 'employer', i.e. the asbestos contractor, arranges for a clearance certificate for site reoccupation. Therefore, the asbestos contractor must utilise the appointed analytical body for the purpose of obtaining the clearance certificate.

Independence and impartiality of the analytical body is seen as a key element in ensuring that external influences are minimised. To be impartial, the analytical body must be independent from the asbestos contractor. This means that if the analytical body has any 'links' with a removal contractor by common ownership, common management, contractual arrangements, informal understanding or other means that may have an ability to influence the outcome of a clearance certificate, then the analytical body shall not perform site clearance for that removal contractor which has links with the analytical body.

If, due to exceptional circumstances, the analytical body has to perform site clearance certification for a removal contractor that has links with the laboratory, then the analytical body must demonstrate that the analysts involved have the necessary independence to be completely impartial when conducting site clearance certification. Those commissioning the asbestos works should be informed of such circumstances.

Any analytical body, whether it has links with removal contractors or not, should identify the circumstances in which analysts may encounter commercial, financial or other pressures that may affect their impartiality and operational judgement in carrying out on-site clearance work, and must demonstrate the measures taken to assure impartiality.

Quality assurance and competence

Analytical bodies should have in-house documented procedures which conform to a recognised quality assurance system such as the international standard *ISO 17025: General requirements for the competence of testing and calibration laboratories*.

It is strongly recommended that accreditation to ISO 17025 for fibre counting and sampling is obtained by the analytical body. Accreditation is provided by the Irish National Accreditation Board (INAB) which independently evaluates whether an analytical body has the ability to meet the required standards.

INAB assessments cover areas such as organisation, quality systems, control of records, personnel, accommodation and environmental conditions, test and calibration methods, method validation, equipment, handling of test and calibration items, and reporting results.

Non-accredited organisations may find it helpful to consult the United Kingdom Accreditation Service's website (<http://www.ukas.com/>) and obtain an up-to-date copy of their Lab 30 publication. (*Application of ISO/IEC 17025 for Asbestos Sampling and Testing [Edition 2, April 2008]*)

Notwithstanding an analytical body's accreditation status, the Authority requires satisfactory performance in internationally recognised proficiency schemes such as the **Regular Inter-laboratory Counting Exchange (RICE)** for



fibre counting, administered by the UK Health and Safety Laboratory, which demonstrates independent verification and indication of analytical competence, and a commitment to continually improve performance.

Independent competent analysts must hold appropriate recognised qualifications. The recommended industry-specific qualifications are provided by the **British Occupational Hygiene Society (BOHS)** and the **Royal Society for Public Health (RSPH)** and are described below.

Table 13
Recommended qualifications for independent competent analysts

Work Activity	Recommended Qualification (s)
Air sampling and fibre counting	BOHS P403: Asbestos Fibre Counting (PCM) (including Sampling Strategies) RSPH Certificate for Asbestos Analysts (Air)
Asbestos four-stage clearance	BOHS P404: Air Sampling of Asbestos and MMMF and Requirements for a Certificate of Reoccupation following Clearance of Asbestos RSPH Certificate for Asbestos Analysts (Air)

Further details on these qualifications can be found at:

BOHS: <http://www.bohs.org/education/examinations/proficiency-modules/>

ATAC: <http://www.atac.org.uk/asbestos-testing-consultancy/asbestos-training-courses.asp>

In addition to the technical knowledge gained from undertaking the above recommended qualifications, the analyst, in meeting the requirements of competency as defined under the Safety, Health and Welfare at Work Act, 2005, will also be expected to have a thorough knowledge of relevant Irish legislation as described in Section 5.

Phase contrast microscopy (PCM)

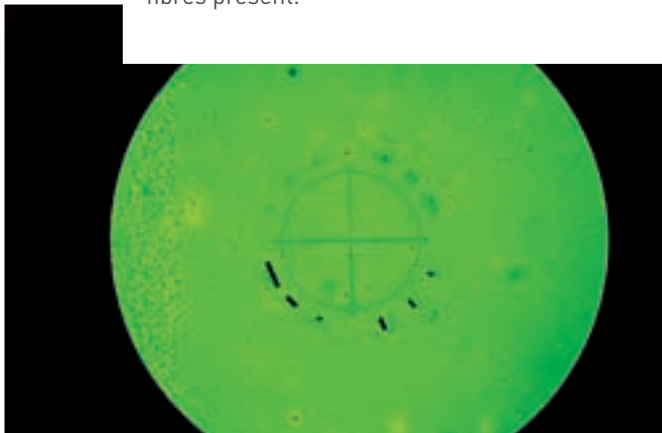
Determination of asbestos fibre number concentrations in air must be carried out by the recommended WHO method of 1997 using phase contrast microscopy (PCM) or equivalent as per Regulation 10(3) of the Asbestos Regulations.

A sample is collected by drawing a known volume of air through a membrane filter by means of a sampling pump. The filter is rendered transparent (cleared) and mounted on a microscope slide. Fibres on a measured area of the filter are counted visually using PCM and the number of fibres in the volume of air is calculated.

A full description of the PCM method is set out in the HSE (UK) technical guidance document HSG 248: *Asbestos: The analysts' guide for sampling, analysis and clearance procedures*.



Many fibres are too small to be visible by optical microscopy. The smallest visible fibres will be about 0.2–0.25µm wide. Therefore the PCM method represents only a proportion of the total number of fibres present and the result is only an index of the numerical concentration of fibres and is not an absolute measure of the number of fibres present.



The method does not identify the chemical composition of the fibres or discriminate between asbestos and non-asbestos fibres. However, other methods can be used, such as polarised light microscopy, scanning electron microscopy and transmission electron microscopy. Further details on the last two methods can be found in Appendix 4.

Air monitoring (sampling)

The need for air monitoring should be determined as part of the assessment of the work. It may be required for one or more of the following reasons:

- To confirm that airborne concentrations of asbestos fibres are as low as reasonably practicable and that the correct choice of RPE has been made,
- To confirm that there has been no measurable spread of airborne fibres to areas adjacent to where work with asbestos cement has taken place, and
- To confirm that the work area has been adequately cleaned before being returned to normal use.

Those who commission the asbestos removal work must ensure that the results of the air monitoring are given to the following persons:

- Workers at the workplace,
- Health and safety representatives for the workplace,
- Persons conducting businesses or undertakings at the workplace, and
- Other persons at the workplace.

If the workplace is a domestic premises, the asbestos removal contractor must ensure that the results are given to the following persons:

- The person who commissioned the work,
- Workers at the workplace, and
- The owner/occupier of the domestic premises.

Air monitoring is thereby classified, depending on its purpose, as follows:

- **Compliance monitoring** is conducted to check that exposure to workers does not exceed the control limit of 0.1 f/cm³
- **Background monitoring** is generally conducted to check that fibre levels in the air are below the recommended level, usually during minor remedial works or when accidental damage has occurred to ACMs. Recommended airborne fibre levels should be below 0.01 f/cm³.
- **Leak (enclosure check)** monitoring is performed outside the enclosure while asbestos removal work is in progress, to check that control measures are adequate. It should be used to augment frequent, thorough visual inspections of the enclosure. A number of sample locations should be considered, e.g. airlocks, bag locks, negative pressure unit exhausts. Action should be taken as follows based on results of leak testing:

Action level	Control measure
< 0.01 f/cm ³	<ul style="list-style-type: none"> No new controls necessary. Review control measures.
>0.01 but less than 0.02 f/cm ³	<ul style="list-style-type: none"> Investigate cause of breach. Implement controls to eliminate or minimise exposure and prevent further release.
> 0.02 f/cm ³	<ul style="list-style-type: none"> Stop removal work. Investigate the cause: conduct a thorough visual inspection of the enclosure and associated equipment in consultation with all workers involved with the removal work. Implement controls to eliminate or minimise exposure and prevent further release. <p>Extend the isolated/barricaded area around the removal area/enclosure as far as reasonably practicable (until fibre levels are at or below 0.01 f/cm³), wet wipe and vacuum the surrounding area, seal any identified leaks (e.g. with expandable foam or tape) and smoke test the enclosure until it is satisfactorily sealed.</p> <ul style="list-style-type: none"> Do not recommence removal work until further air monitoring is conducted. Do not recommence until fibre levels are at or below 0.01 f/cm³.

- Personal monitoring** is where operatives' exposure is measured within an enclosure during asbestos removal works to check that the protection factor of their respiratory protective equipment (RPE) is not exceeded. The filter holder should point downwards and be fixed to the upper lapel or shoulder of the worker's clothing. It should be within 0.2m of the worker's mouth/nose. If a respirator is worn, sampling should be carried out away from the clean air exhaust. For work with asbestos insulation spray and insulating board materials, it is recommended that sampling be conducted at a frequency of no less than one sample for every four operatives at the commencement of the work, and subsequently every working day.

- Clearance air monitoring** – A four-stage clearance (4SC) is the procedure carried out following the removal of friable asbestos

where an enclosure under negative pressure has been used. A visual inspection must be conducted by the analyst to ensure that the area has been cleaned to a satisfactory standard and is suitable for reoccupation. Clearance air monitoring with dust disturbance is then conducted inside the enclosure to check that airborne fibre levels are below the recommended limit, i.e. 0.01 f/cm³. However, if one or more sample results exceed this limit, where four samples were taken, a further cycle of measurements must be undertaken after appropriate remedial action is completed. For larger areas, 1 in 5 sample results may lie **between 0.01 f/cm³ and 0.015 f/cm³**. Once satisfactory results are achieved, the analyst will issue a site clearance certificate of reoccupation.

- Reassurance monitoring** – This may be conducted in certain circumstances (such as

when an enclosure has been removed on completion of asbestos remedial works) to confirm that the airborne fibre levels are satisfactory, i.e. **below 0.01 f/cm³**.

- **Prevalent sampling** – air monitoring performed during normal occupancy of an area where asbestos materials are being managed. Recommended airborne fibre levels should be **below 0.01 f/cm³**. Air conditioning systems should be left on. Normal occupancy activities should continue in their usual manner.

Contents of an air monitoring report

All relevant sampling and analytical information should be recorded. The **sampling records** should include relevant site information and should contain sufficient information to establish the traceability of any calibrations, to calculate the results and to assure the quality of the sampling. The **analytical records** should contain sufficient information to establish the traceability of the calibrations, to calculate the results reported and to assure the quality of the analysis. The **report** should include sufficient information on the sampling and analysis so that the results are traceable and the purpose and outcome of the sampling are clear. If the results are covered by INAB accreditation, it may be necessary to record additional information. As sampling and analysis may be carried out by different individuals and bodies, the analytical report should either append or contain the appropriate sampling information.

Any report should include the following information:

- The name or letterhead of the body carrying out the work,
 - The full postal address of the body and other electronic contacts,
 - The INAB accreditation mark and number (and any appropriate disclaimer, if relevant),
 - The printed name(s) of the person(s) who carried out the work,
- The name and signature of the person who authorised the release of the report (this may be the same person who carried out the work),
 - The date the report was authorised for release, and
 - A suitable report identifier or number.

The sampling report should also include:

- The location of the sampling (e.g. name and address),
- The date of sampling,
- The type of sampling being carried out, and
- The sampling information for each sample, including:
 - o A unique identifier (e.g. sample number),
 - o The type of sample (e.g. personal or static and compliance, background, clearance etc.),
 - o The position of the sample (e.g. name of person or location),
 - o The sampling time started and ended for each period and,
 - o The calculated volume of air sampled,
- Reference to any specific activities or events taking place during the sampling (e.g. during demolition, immediately after demolition etc.).

The analytical report should also include:

- The method of analysis used for each sample,
- The sample number,
- The volume of each sample (if not given elsewhere), and
- The fibre concentration.

The concentration value must be calculated correct to 3 decimal places to distinguish between 0.009 f/ml (which is acceptable) and 0.010 f/ml, which is unacceptable.

The recommended reporting procedure, however, is as follows:

Calculated value	Report result as:
Value <0.010 f/ml	<0.01 f/ml
0.010 < Value <0.015	result to 3 decimal places
Value >0.015 f/ml	result to 2 decimal places

As well as containing the information reported, the sampling and analysis records may also include:

- The sampling strategy, including any variations from standard procedures (e.g. for very dusty conditions sampling times may need to be very short to prevent overloading and a stopwatch may give a more accurate measure of the sampling period),
- Any relevant environmental conditions which may significantly influence the results (e.g. fog or rainfall if sampling outside, large temperature and pressure differences between the calibration and field conditions for float type flow meters),
- The type of filters in use and batch number,
- The type and identifier for the flow measurement device,
- The type and identifier for the air sampling pump,
- The identifier for the timing device,
- The measured flow rate at the start and end of each sampling period and any checks in between,
- The name of the analyst(s) carrying out the fibre counting,
- The identifier for the stage micrometer,
- The identifier for the test slide,
- The measured diameter for the Walton-Becket graticule,

- The block number where the gratings are still visible on the HSE test slide,
- The number of graticule areas examined for each sample,
- The number of fibres counted for each sample, and
- Any additional information for the discrimination counting.

Clearance certification

The analyst must not issue a four-stage clearance certificate to the 'employer', i.e. asbestos contractor, unless they are satisfied that the asbestos removal area and the area immediately surrounding it are free from visible asbestos contamination. To do this, they must conduct a visual inspection for evidence of dust and debris. Air monitoring must also be conducted and the results of that test must show that asbestos concentrations are below 0.01 f/mL.

If a clearance certificate has not been obtained, the asbestos removal area must not be reoccupied for normal use or other work activities. A clearance certificate must be issued before the area can be reoccupied for demolition or other work.

Unauthorised persons cannot enter the asbestos removal work area prior to a clearance certificate being issued, and any protective barricades should remain in place all asbestos removal work is complete and the final clearance certificate has been issued.

Site clearance certification procedure

The site clearance certification process for notifiable work involves four stages (4SC):

Stage 1 – Preliminary check of site condition and job completeness

Stage 2 – Thorough visual inspection inside the enclosure/work area

Stage 3 – Clearance air monitoring

Stage 4 – Final assessment post-enclosure/work area dismantling

The 4SC process:

- Minimises the risk of the 'cleared' area becoming recontaminated with asbestos from the immediate surrounding areas, the fabric of the enclosure or from beneath covered plant after the enclosure has been removed,
- Minimises the risk of asbestos debris being found on transit and waste routes and areas around the skip and hygiene facility, post-clearance, and
- Reduces the risk to site employees and others of exposure to asbestos after the contractors have left site.

Stage 1

Whilst carrying out the Stage 1 preliminary inspection of areas surrounding the enclosure/work area, transit and waste routes, the analyst shall record the presence of materials such as building rubble and debris, where this may give rise to any doubt regarding the completeness of the Stage 1 inspection. The analyst shall initially consult with the asbestos removal contractor, requesting that interfering materials be cleared. If this is not possible or practicable, relevant details shall be recorded on the certificate of reoccupation. A detailed inspection of the hygiene unit should also be made to establish that it is fully operational.

The analyst shall also record, and request the removal of, any obvious asbestos debris arising from the removal work. Particular attention should be paid in areas adjacent to waste skips (and the contractor's vehicle, if present during the inspection). In the event that substantial asbestos debris remains within the area and indicates that the final clean has not been undertaken thoroughly enough, then the analyst shall record (and report) a clearance failure at Stage 1.

A copy of the contractor's plan of work or method statement must be reviewed by the analyst when carrying out the Stage 1 inspection in order to establish the extent of works to be undertaken. If this information is not available, the Stage 1 fail must be recorded. In the event that a copy of the diagram from the contractor's plan of work is not available, the analyst shall produce a site diagram including approximate dimensions, detailing the location of the enclosure, airlocks, hygiene unit, transit and waste routes etc.

This diagram shall form part of the laboratory's formal records system. Where changes or amendments to the site layout have been made, these should be noted and the revised diagrams countersigned by the contractor to verify their authenticity.

The analyst shall record the presence or absence of viewing panel(s) for the purpose of inspection of enclosures from the outside. Other methods of viewing, such as webcams or CCTV, may also be useful during inspections. In the event that viewing panels are not present, the analyst must record the absence of viewing panels within the site records and proceed with the inspection. Additionally, the analyst should discuss with the contractor's representative whether smoke tests or leak testing have been carried out on the enclosure and should record details of any discussions held (and any documentation examined). Asbestos contractors should carry out daily visual checks of enclosure integrity. The analyst can also check the contractor's records for supporting evidence. Such evidence may be of use to the analyst in assessing the integrity of the enclosure as part of the Stage 1 inspection. The analyst should, however, bear in mind that such testing may have been carried out some time prior to the clearance. The integrity of the enclosure must be verified again and recorded as part of Stage 1.

The presence of any known asbestos-containing materials (ACMs) that are to remain in situ following site clearance certification must be recorded by the analyst on the certificate of reoccupation. A record shall be kept of any ACMs noted to remain in the enclosure during the Stage 2 visual inspection.

It is advisable for laboratories to obtain photographic records of prevailing conditions inside and adjacent to enclosures (including records of any suspected asbestos-containing materials in or around the enclosure). The laboratory should obtain the permission prior to taking photographs.



Stage 2

The analyst must inspect the airlock and bag lock prior to entering the enclosure. The standard of cleanliness of these can provide an indicator of conditions within the enclosure. On entering the enclosure, the analyst (wearing suitable PPE) must record the presence of leaking pipes, seepage of groundwater, 'dusty' surfaces (which may compromise the ability to read the filters after air sampling), inaccessible asbestos etc. on the certificate of reoccupation.

The analyst must record whether any sealants or lockdown sprays have been used in or around the work area. There should be no use of sealants prior to the four-stage clearance procedure (unless they are used as part of the control during the removal process, e.g. removing AIB ceiling tiles, or as permanent sealing). If sealants, e.g. PVA, have been used in a bid to obtain clearance, then this is a potential fail. If there is evidence of unauthorised use of sealant, the analyst should direct that sealants be removed before proceeding any further with the 4SC procedure. The analyst can authorise the use of sealants, but reasons and justification for their use, e.g. where non-asbestos dust within the enclosure may cause an air test failure, must be recorded on the certificate of reoccupation.

The analyst must check for the completeness of the removal of ACMs from underlying surfaces, the presence of any visible asbestos debris and any fine settled dust. A bright torch, screw-driver/chisel and mirror are critical tools for visual inspections. Other equipment may also be necessary, such as ladders, lighting, H-Type vacuums and means of primary decontamination in the airlock, e.g. sponge, water etc.

The analyst must be accompanied by a representative from the specialist contractor. Minor remediation can be carried out by the contractor during the visual inspection. The analyst must decide when 'minor' becomes 'major', and must withdraw and fail the enclosure at that point.

The following scenarios may also be relevant during a Stage 2 inspection:

- *Enclosure is wet:* The area within an enclosure should not be wet, but there are occasions, e.g. groundwater issues, when having a completely dry area within an enclosure is not possible. All reasonable efforts should be made to remedy wet areas within an enclosure before an analyst passes a visual inspection.
- *Loose rubble floors:* This would be relevant in undercrofts. If not addressed in the plan of work, the analyst should agree a specified excavation depth to ensure contaminated rubble/soil is fully removed.
- *Waste ACMs remaining in enclosure during visual inspection:* This sometimes occurs when it is difficult to remove wrapped ACMs from an enclosure via the bag lock, e.g. large AC/AIB panels. The analyst should complete the visual inspection (including checking the wrapped ACMs) and the ACMs can then be removed after dismantling of the airlocks.
- *Inaccessible ACMs:* It is sometimes impossible to remove all traces of ACMs, e.g. overspray on breeze-brick walls. Analysts should satisfy themselves that



all reasonable efforts have been made to remove residue before allowing the affected areas to be treated with sealant, e.g. atomised polymeric emulsion paint.

The findings of the Stage 2 inspection should be recorded on the certificate of reoccupation.

Stage 3

Clearance air testing will only take place once the analyst has completed a satisfactory visual inspection. If a lot of fine cleaning was required during Stage 2, then it may be appropriate to allow the enclosure to vent for additional time before air testing.

Representative sampling within the enclosure should be carried out in accordance with guidance in Appendix 4. Once the analyst re-enters the enclosure with sampling pumps, he/she should ensure that any H-Type vacuum exhaust and hose are sealed with duct tape. The negative pressure unit (NPU) should be switched off and the pre-filter covered and sealed with polythene.

The filter holders should point downwards and be fixed 1–2 m above the floor by using integrated masts. It is not good practice to attach the filter holders to polythene sheeting with tape. Sampling in risers, lift shafts etc. will have to take place at representative heights.

Dust disturbance must take place once the pumps are activated. This should be done on horizontal surfaces where dust may have settled in the vicinity of the sampling pumps, and should be undertaken by sweeping all areas with a (new) brush. Brushes must be disposed of as asbestos waste.

After air sampling the analyst must check the final flow rate (which must be within $\pm 5\%$) and collect samples for PCM analysis. The enclosure will pass if results are below 0.01 f/cm^3 or, as discussed earlier, under 'clearance testing'.

Information to be recorded should include enclosure details (including the information which is required by HSG 248), sampling position(s), calibration of individual sampling pumps, details of 'pooled' samples (where relevant), on/off times of pumps with dates and relevant environmental conditions (to include temperature and barometric pressure).

A copy of Stage 3 of the report should be posted outside the area during the dismantling of the enclosure.

Stage 4

This is the final stage of the 4SC process. The analyst (wearing suitable PPE) must check areas following dismantling of the enclosure and carry out additional reassurance air sampling during the dismantling period and afterwards, if required. The analyst should record the findings and the outcome on the certificate of reoccupation.

Hygiene facility

The analyst must discuss with the removal contractor whether testing is required in the hygiene unit. It should be noted that separate clearance certification must be issued for this purpose. The analyst must record the outcome of any relevant discussions held with the contractor. A visual inspection is required. Air testing should take place in the shower and dirty end of the DCU by propping the separating door open and using one sampling pump.

Contents of a site clearance certificate of reoccupation for notifiable enclosure work and hygiene facilities

The following key items, which must be included in site clearance certification for reoccupation, are taken from HSE (UK) technical guidance document HSG 248. A template is set out in Appendix 5.

Table 14

Contents of site clearance certification for enclosure work

Preliminaries

- Laboratory name, address and contact details
- Accreditation logo and number (if relevant)
- Contract, job and reference numbers
- Accredited or other methods used
- Name, address and contact details of those commissioning the asbestos work
- Site address for clearance
- Areas to be assessed and brief description of work
- Attachment numbers, if adding drawings, pictures, plans of work or notification forms
- Name and address of asbestos contractor
- Name and contact number for asbestos contractor's site supervisor
- Anticipated start and confirmed start of 4SC assessment

Stage 1 – Preliminary check of site condition and job completeness

- Plan of work checked (any issues, ACMs to remain)
- Work areas, enclosures/NPUs and hygiene facilities
- Skip area/waste route, transit route
- DCU
- State if passed/failed – record comments/observations
- Record time, date and signature of analyst

Stage 2 – Thorough visual inspection

- Airlock, bag lock, enclosure free of debris, waste bags etc.
- All ACMs removed from enclosure
- Interior surfaces free of debris and fine settled dust
- State if passed/failed – record comments/observations
- Record time, date and signature of analyst

Table 14 (continued)

Contents of site clearance certification for enclosure work (continued)

Stage 3 – Clearance air monitoring

- Record if areas were dry
- NPUs deactivated
- No evidence of lockdown sprays
- Original floor surface uncovered
- Disturbance used (state type)
- Total time of disturbance
- Area/volume of enclosure
- Number. of air samples collected and diagram indicating locations of sampling pumps
- Results of air tests
- State if passed/failed – record comments/observations
- Record time, date and signature of analyst

Stage 4 – Assessment of the site for reoccupation

- Former enclosure area free of dust and debris
- Transit route and waste routes free from debris/sacks and waste
- All ACMs removed as per POW and any ACMs remaining intact
- State if passed/failed – record comments/observations
- Record time, date and signature of analyst

Contractors acknowledgment and distribution of certificate

- Contractor to sign certificate based on assessment of analyst, i.e. all four stages passed, Stage 2 fail etc.
- Analyst to record names of those who received/will receive a copy of the certificate

Table 15

Contents of site clearance certification for hygiene facilities

Preliminaries – Record the following

- Laboratory name, address and contact details
- Accreditation logo and number (if relevant)
- Contract, job and reference numbers
- Accredited or other methods used
- Name, address and contact details of those commissioning the asbestos work
- Site address of DCU for clearance
- DCU identification number/chassis number
- Areas to be assessed and brief description of work
- Attachment numbers, if adding drawings, pictures, plans of work or notification forms
- Name and address of asbestos contractor
- Name and contact number for asbestos contractor's site supervisor
- Anticipated start and confirmed start dates

Thorough visual inspection – Record the following

- Hygiene facilities free from waste/debris, dust, contaminated clothing
- State if passed/failed – record comments/observations
- Record time, date and signature of analyst

Clearance air monitoring in the DCU

- Areas are dry
- NPU deactivated
- Disturbance method used and duration of disturbance
- Floor area of shower/dirty end of DCU
- Number of air samples collected
- Results of air tests
- State if passed/failed – record comments/observations
- Record time, date and signature of analyst

Contractor's acknowledgement and distribution of certificate

- Contractor to sign certificate based on assessment of analyst
- Analyst to record names of those who received/will receive a copy of the certificate

Section 14: Plans of work

A plan of work (also referred to as a method statement), as required by Regulation 15 of the Asbestos Regulations, must be developed and complied with for all works which might disturb ACMs. The plan of work must be drawn up in writing before any work commences. The employer whose employees are intended to perform these work activities is responsible for drawing up the plan.

The plan of work should be discussed and explained to the employees concerned and they must be given information and instruction in the methods and control measures planned to be used on-site, including the use of respiratory and personal protective equipment.

The method and requirements related to decontamination measures must be explained and implemented by all concerned and must be appropriate to the risk from exposure and any possible contamination which could occur while performing the work.

Where any additional risk of exposure arises, other than those identified initially and on which

the plan of work was developed, work must be stopped immediately and the plan of work must be revised and further developed to take account of those changes and the risks involved.

Lower risk plans of work

The plan of work must include information on:

- The nature and duration of the planned work,
- The number of persons working,
- The address and location of the work,
- The planned methods and control measures to be used,
- Arrangements relating to keeping the plant, equipment and site clean, and
- The handling, storage and disposal plans for the ACMs.

The plan of work must include a site drawing.

Table 16

Plan of work for the removal of compressed asbestos fibre (CAF) gaskets

PLAN OF WORK	
Location	Plant room 101
Date	Ongoing
Operative(s)	J.C & B.H.
Supervisor	J. Smith
Work activity	Removal of compressed asbestos fibre (CAF) gaskets from process line 101
Duration of works	Less than 1 hour – non-continuous short duration work
Expected exposure level	Less than 0.1 f/m ³ based on initial written risk assessment dated 12/12/2010

Table 16 (continued)

Plan of work for the removal of compressed asbestos fibre (CAF) gaskets

PLAN OF WORK	
Procedure	
Access	<p>Take precautions to prevent the risk of falling if this work is at height.</p> <p>Minimise the number of people present.</p> <p>Restrict access - close doors, and use warning tape and notices.</p> <p>Ensure adequate lighting.</p>
Equipment	<ul style="list-style-type: none"> • 500 gauge polythene sheeting and duct tape • Warning tape and notices • H-Type vacuum cleaner (EN5415) to collect adhering gasket residues • Scraper • Garden-type sprayer • Bucket of water and rags • Asbestos waste container, e.g. labelled polythene sack
Personal protective equipment (PPE)	<ul style="list-style-type: none"> • Disposable overalls fitted with a hood - Type 5 • Boots without laces (laced boots are hard to decontaminate) • Respiratory protective equipment (FFP3) • Gloves - single use disposable • Hearing protection
Enabling works	<p>Ensure the system has been made safe (pipework emptied, electrical supply isolated etc.).</p> <p>Protect surfaces in the restricted area from contamination. Cover with 500 gauge polythene sheeting and fix with duct tape.</p> <p>Protect vulnerable components with polythene sheeting.</p>
Removal	<p>Unbolt or unscrew the flange, or dismantle the equipment.</p> <p>Once accessible, dampen the asbestos. Continue dampening as it is exposed.</p> <p>Ease the gasket or rope seal away with the scraper and into the asbestos waste container.</p>

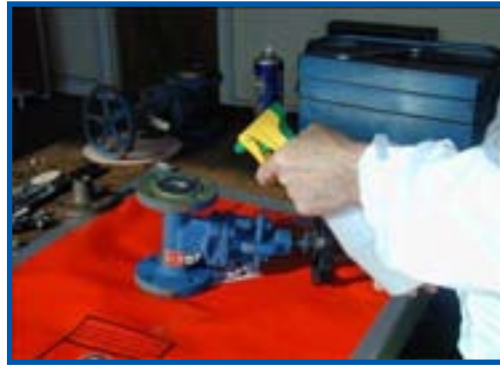
Table 16 (continued)

Plan of work for the removal of compressed asbestos fibre (CAF) gaskets

PLAN OF WORK	
Cleaning	<p>Keep damp and scrape away asbestos residues.</p> <p>Where there is a lot of residue, gently scrape it away using 'shadow vacuuming'.</p> <p>Clean the equipment and the area with a H-Type vacuum cleaner and/or wet rags.</p> <p>Put used rags, polythene sheeting and other waste in the waste container.</p> <p>Tape the container closed.</p>
Visual inspection	<p>Visually inspect the area to make sure that it has been cleaned properly – no visible traces of dust and debris must remain.</p> <p>When area is deemed suitable for reoccupation, complete self-certification form.</p> <p>Clearance air sampling is not required.</p>
Personal decontamination	<p>Clean boots with damp rags</p> <p>Where available, clean overalls with the brush attachment on a H-Type vacuum cleaner, then vacuum off the brush. Otherwise, clean overalls with damp rags using a 'patting' action. Rubbing can disturb fibres.</p> <p>Peel off disposable overalls. They should be inside out. Put them in a suitable asbestos waste container.</p> <p>Bag up reusable overalls for a specialist laundry.</p> <p>Finally, remove your disposable respirator and place it in the asbestos waste container.</p> <p>Tape the container closed.</p> <p>Use site wash facilities and restrict access until finished. Ensure wash facilities are cleaned.</p>



Use of tape and polythene sheeting to protect a work area before cleaning asbestos gaskets from a valve



Damping the asbestos gasket on a valve



Use of shadow vacuuming to capture dust released in cleaning asbestos from a valve



Cleaning up the work area carefully with H-Type vacuum cleaner and wet waste rags

Higher risk plans of work

The following is a summary of the elements which should be considered in a plan of work (method statement) for removal of ACMs subject to notification. This list is not intended to be exhaustive, and each job must be considered individually by the specialist asbestos contractor.

Table 17

Contents of a plan of work for higher risk asbestos work

1. Scope of working:

- Name of those commissioning the asbestos work
- Name of supervisor
- Full address of site
- Name of waste disposal contractor
- Name of consultant/air monitoring organisation
- Name of project supervisor – design stage
- Name of project supervisor – construction stage
- Names of any other relevant sub-contractors
- Details of survey carried out – by whom and when
- Type of asbestos identified
- Form of asbestos e.g. lagging, spray, asbestos insulating board etc.
- Location of asbestos, e.g. roof space
- Quantity to be removed, e.g. number of bags
- Number of operatives required, including persons working outside enclosure
- Start and finish date – to include setting up and dismantling of enclosures

2. Hygiene facilities

- Description of facilities to be used, e.g. mobile unit complying with HSE (UK) publication HSG 247, Appendix 8.1 'Minimum design criteria for asbestos hygiene units'
- Location of hygiene facility (shown on site plan)
- Designated transit route

3. Waste disposal

- Bagging system to be used
- Temporary storage of bags
- Waste routes (shown on site plan)
- Skip locations (shown on site plan)
- Transportation and final disposal arrangements

4. Enclosure(s) of work (shown on site plan)

- Construction of enclosure
- Volume of enclosure
- Location of airlocks (personnel and bag locks)
- Additional screening, if required e.g. heras fencing
- Details and locations of viewing panels
- Warning notices

Table 17 (continued)

Contents of a plan of work for higher risk asbestos work

5. Control measures

- Details of expected exposure levels
- Specification of negative pressure units
- Number of air changes per hour
- Siting of negative air pressure units (shown on site plan)
- Method of smoke testing and witnessing
- Type and specification of respirator (positive pressure type)
- Maintenance arrangements for RPE and equipment
- Protective clothing
- Decontamination of employees
- Specification of vacuum cleaner
- Examination of controls etc. and record-keeping

6. Method of work

- Wet strip technique to be used
- Additional local exhaust ventilation required
- Tools to be used
- Access equipment
- Lighting
- Clearance of waste
- Additional controls to reduce exposure

7. Decontamination features

- Cleaning and vacuuming before leaving enclosure
- Removal of contaminated overalls
- Washing of boots and masks
- Removal of masks
- Disposal of transit and working overalls

8. Air monitoring

- Air sampling plan for duration of works
- Systems for monitoring and controlling the effectiveness of the enclosure
- Analysis – by which laboratory

9. Final clearance

- Final cleaning arrangements
- Thorough visual examination
- Air monitoring (see 8 above)
- Removal of enclosure and disposal
- Final visual

Table 17 (continued)

Contents of a plan of work for higher risk asbestos work

10. Emergency procedures

- Fire precautions
- First aid arrangements
- Minor incident procedures
- Major incident procedures
- Co-ordination with external emergency services, i.e. local emergency services numbers

11. Site documentation

- Safety statement and risk assessments
- Plan of work (method statement)
- Training certificates
- Medical certificates
- Face-fit certificates
- Equipment maintenance and inspection records (including test certificates for NPU and H-Type vacuum cleaners)
- Record of inspections and tests of enclosures
- Records of air tests of decontamination unit (DCU)
- Site log

12. Other matters

- Protection of other persons on or near the work site
- Supervision of job
- Site requirements
- Work on live plant etc.
- Heat stress
- Liaison with site representatives/employees
- Special characteristics of site

A copy of the plan of work must be kept at the workplace where the asbestos removal works are taking place for the duration of the works.

Health assessments

Health surveillance is about systematically watching out for early signs of work-related ill health in employees who are exposed to certain health risks, such as asbestos. Health surveillance is required where workplace conditions increase the likelihood of employees becoming susceptible to a disease associated with a particular substance in use (e.g. asbestos and cancer), and where it is possible to detect the disease or adverse change and reduce the risk of further harm.

Employers must make adequate and suitable health assessments available to employees who are engaged in activities where the exposure limit value may/will be exceeded. In the case of sporadic and low intensity asbestos work activities, examinations can be made available to the workers. Employees must co-operate with their employer in attending medical examinations. The obligation to organise 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.

The health assessment must be carried out by a responsible medical practitioner with knowledge of the medical issues arising from work with asbestos. The health assessment must be carried out prior to the employee engaging in the work activity and **every three (3) years** thereafter, where the relevant work activities continue (with or without interruption).

Health monitoring must include the following and should follow current principles and practices of occupational medicine:

- Consideration of the worker's demographic, medical and occupational history,
- A personal interview,
- Consideration of records of the worker's personal exposure, and

- A physical examination of the worker with emphasis on the respiratory system, including standardised respiratory function tests unless another form of health monitoring is recommended by a registered medical practitioner.

The medical practitioner may decide on further tests, e.g. sputum cytology tests or chest X-rays, in accordance with the latest occupational health knowledge available. The medical practitioner may also indicate that health surveillance shall continue after the end of exposure for as long as she or he considers it necessary.

Medical records relating to health assessments

The responsible medical practitioner must record the following in an individual's medical record:

- Name and address of employee,
- Name of employer and relevant address(es),
- Date of birth of employee,
- Date of commencement of asbestos exposure (if known),
- Medical history of employee,
- Occupational history of employee,
- Results of asbestos sampling which relates to the employee's exposure,
- Results of clinical examination and significance of results, and
- Details of any action taken by the responsible medical practitioner concerned following the results of a health assessment.

The medical records of each employee must be maintained by the appropriate responsible medical practitioner for forty years after the last assessment is recorded in the medical record.

An employee or his/her employer may apply to the Authority within twenty-eight days of a health assessment if either is aggrieved by the

outcome of the assessment. For the purposes of this requirement, contact should be made with the **Occupational Health Unit** of the Health and Safety Authority. The Authority will designate a person, i.e. medical practitioner, under Section 63 of the Act to conduct an appropriate review of the case.

Employees can request, upon reasonable notice to their responsible medical practitioner, access to their individual medical record.

A responsible medical practitioner or his/her personal representative may have to transfer individual records (e.g. in case of retirement or cessation of trading) to another responsible medical practitioner. Where a dispute or a difficulty arises, the Authority shall decide upon the most appropriate action.

Where an undertaking (i.e. a business, e.g. asbestos removal company) ceases to trade, the employer must also contact the Authority (via its

appointed responsible medical practitioner) and confirm arrangements for the retention of individual medical records.

Occupational health registers

Employers must establish and maintain an occupational health register for all employees who undertake asbestos work activities which are not subject to exemptions under Regulation 5 (b).

The occupational health register should ideally be kept indefinitely, but in any event for a minimum of forty years following the end of an individual's exposure.

It should be kept in a safe place and should contain information as set out under Schedule 6 of the Asbestos Regulations.

Table 18

Contents of an Occupational Health Register

- Name and address of registered business,
- Address of asbestos site location,
- Brief description of asbestos activity, e.g. removal of 10 m² of AIB ceiling tiles,
- Nature and duration of work activity,
- Level of exposure (without RPE protection factor) e.g. 4 f/ml,
- Name and address of each employee,
- Dates/times of each assessment,
- Name of assessor,
- Details of the nature of each assessment of the risk of exposure to asbestos,
- Details on tests and examinations of RPE and unique identifiers for individual RPE devices,
- Dates and results of any air monitoring,
 - Personal sampling – name and job description of person monitored,
 - Static sampling – location of static samples,
 - Length of sampling times in each case,
 - Results and interpretations of the results of such sampling, and
- Any recommendation from the registered medical practitioner, e.g. fit to work, unfit or fit with restrictions.

The occupational health register must not contain any medically confidential information.

The occupational health register must be made available upon reasonable notice to an employee or his/her representative. However, the identity of other employees must not be disclosed. The occupational health register must also be made available to an HSA inspector or person designated under Section 63 of the Act when requested.

Where an undertaking (i.e. a business, e.g. asbestos removal company) ceases to trade, the employer or his representative (e.g. liquidator) must contact the Health and Safety Authority and ensure that the occupational health register is made available to the Authority.

For the purposes of this requirement, contact should be made with the Occupational Health Unit of the Health and Safety Authority.

Health surveillance for those who undertake air monitoring and materials sampling of ACMs

Based on written risk assessment, the exemptions described in Section 5 may apply to work activities where air monitoring and collection of samples is taking place to ascertain whether a specific material contains asbestos.

Employers of analysts/surveyors or self-employed analysts/surveyors must conduct a written risk assessment for their exposure to determine if air monitoring/survey activities will produce low and sporadic exposures and in any event be below the exposure limit value.

Analysts entering enclosures during removal or remedial work to conduct visual inspections and clearance air monitoring should be aware that fibre concentrations in air can exceed (and in some cases well exceed) the exposure limit value, especially where dust disturbance activities are carried out as part of their work, e.g. brushing, where poor standards of fine cleaning have occurred following removal of AIB, thermal insulation etc. Analysts may also, on occasion, be inadvertently exposed without RPE

to 'asbestos leaks' which may exceed the exposure limit value, as a result of enclosure breaches. The exemption for health surveillance and retention of health records would not apply in these circumstances. Notification to the Authority would not be required, as related works would have been notified by the relevant specialist asbestos contractor.

Those involved in **obtaining material samples from ACMs** (bulk sampling) to ascertain asbestos content must also conduct written risk assessments and develop written plans of work. If sampling procedures are followed in accordance with best practice, it is very unlikely that exposures will exceed the exposure limit value. However, the exposure limit value may be exceeded in certain circumstances, e.g. entering and disturbing contaminated roof spaces, ducts or risers. Therefore, the exemption for health surveillance and retention of health records would not apply in the circumstances described.

It is recommended that health surveillance in accordance with the Regulations be made available to analysts and surveyors.

Asbestosis and mesothelioma register

The Health and Safety Authority is required under the Asbestos Regulations to maintain an **asbestos and mesothelioma register**.

Where a responsible medical practitioner becomes aware of an asbestosis case or mesothelioma, this must be reported to the Authority in writing and the person designated under Section 63 of the Act will process the correspondence and record an entry.

For the purposes of this requirement, contact should be made with the **Occupational Health Unit** of the Health and Safety Authority.

Section 16: Notification to the Health and Safety Authority

Regulation 11 of the 2006 Asbestos Regulations requires an employer, based on written risk assessment, to submit a notification in writing to the Health and Safety Authority under certain circumstances.

Notification is required where the planned asbestos-related work activity will expose, or could possibly expose, workers to a concentration of asbestos fibres in air in excess of the exposure limit value of 0.1 fibres per cm³ and/or where the work activity does not meet the criteria set out in regulation 5 (b), i.e. short duration maintenance works with non-friable ACMs, removal of non-degraded bonded materials without deterioration, and encapsulation or sealing of non-friable ACMs in good condition (See Section 11).

An employer must submit a written notification, accompanied by the site-specific plan of work (otherwise referred to as the method statement) to the Health and Safety Authority **14 days before commencing any work**. Notification of friable ACM removal will normally be submitted by the asbestos removal contractor who is involved in the planned asbestos-related work activity.

Notification can be made using the Authority's notification form, available in the 'Licensing & Notifications' webpage at www.hsa.ie or by other equivalent means. Notifications and the plan of work/method statement for the proposed works may be submitted as follows:

- By email to asbestos.notif@hsa.ie, or
- In writing to the Health and Safety Authority, Occupational Hygiene Unit, The Metropolitan Building, James Joyce Street, Dublin 1.

If using other means of notification than the Authority's notification form, all of the information as detailed in Schedule 3 of the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006, must be included in the notification. This information is a legal requirement. In the event of incomplete information being submitted, the fourteen-day notification period will not commence until all information has been received by the Authority.

Where there is a material change in the nature of the work to which the original notification relates which results in the original notification no longer being valid – e.g. the work ceases before the planned date, the original work process is altered etc. – the employer must inform the Authority in writing and submit a new notification in writing for the work activity along with the reasons for the new notification.

Employers must keep copies of all notifications and plans of work submitted to the Authority.



The form is titled 'NOTIFICATION FORM TO BE USED FOR ANY WORK INVOLVING ASBESTOS' and is issued by the Health and Safety Authority (HSA). It includes instructions on when to submit the form (14 days prior to the start of work) and where to submit it (to the HSA or the Occupational Hygiene Unit). The form contains several sections for completion:

For office use		
ENR No.	EP/ENR No.	ENR Ref.

For Notifier to complete:

Date of Notification:	Click here to enter a date	
Name of Notifier:	Address: (usual place of business)	
Telephone:		
Name of Client:	Removal Contractor contact details:	
Contact details of Client:	(a) Name of person dealing with removal works:	
	(b) Telephone No. of contact person	

Waivers

Occasionally, on request, a waiver of the fourteen-day notification period may be applied for from the Authority, which will consider the reasons for the waiver request. In general a waiver will only be considered when it is justifiably related to an emergency, an incident requiring emergency remediation or the need to make safe a site or workplace, where the demand of normal activity in the premises is essential and cannot be delayed beyond the essential need to do the asbestos work. Such urgent works may only commence once the Authority has formally granted the waiver of the notification period in writing.

It should be noted that well planned, risk assessed and properly surveyed work should not require a request for a waiver. Ideally waiver requests should occur infrequently and generally result from accidents or dangerous occurrences which require urgent remedial action to be undertaken that could not be anticipated or foreseen.

All waiver requests must be sent with:

- Notification form
- A suitable and sufficient Plan of Work
- Written confirmation or evidence from the contractor and/or client to support the waiver request

Notifiable work activities

The following table provides a non-exhaustive guide to the types of work activities, based on a written risk assessment by a competent person, that should be notified to the HSA under Regulation 11.

Table 19

Non-exhaustive list of notifiable work activities

Activity	Comment
Removal or encapsulation of asbestos spray, lagging and AIB materials	These ACMs are very friable when disturbed and strict controls are required. This also includes external AIB soffits.
Removal of asbestos cement corrugated or flat panels where materials are in a degraded state	For asbestos cement roofs/panels with a score ≥ 11 using the asbestos cement algorithm in section 6, and where the extent of the ACM is greater than 10 m ² . These works would not comply with regulation 5 (b).
Cleaning asbestos cement roofs > 10 m ²	This work can give risk to elevated fibre levels
Overcladding of asbestos cement roofs	This work normally requires pre-environmental cleans and disturbance of ACMs, leading to elevated fibre levels.
Encapsulation of asbestos cement roofs with a chemical-based solution	These works normally require a surface pre-clean (elevated fibre levels) and involve significant contact time on fragile roofs.
Remediation of fire-damaged asbestos cement	Exposure to the heat of a fire can cause the cement content of asbestos cement roofing, cladding etc. to violently rupture, discharging asbestos fibres into the atmosphere and spreading debris over a wide area.
Removal of textured coating from concrete substrates	This involves deterioration of the textured coating during removal and does not comply with regulation 5 (b).
Removal of asbestos-containing floor tiles and/or adhesive where significant disturbance is unavoidable	This generally involves deterioration of the floor tiles during removal and aggressive removal of bitumen adhesive. This work does not comply with regulation 5 (b).
Dismantling of boilers containing or suspected to contain ACMs	These works generally involve deterioration of the ACMs during removal or present contaminated dust scenarios.

Table 19 (continued)

Non-exhaustive list of notifiable work activities

Activity	Comment
Removal of CAF/rope gaskets	These works generally involve deterioration of the materials during removal. However a once-off notification can be submitted covering a period of one year where work is an infrequent repetitive task
Removal of vinyl flooring with asbestos backing	These works generally involve deterioration of the materials during removal.
Removal of soil contaminated with friable ACMs or damaged non-friable materials	Works with friable materials must be carried out by a specialist asbestos contractor.
Changing HEPA filters on negative pressure units under controlled conditions	This should only be carried out by a trained competent person. A once-off notification can be submitted covering a period of one year.

Non-notifiable work activities

The following table provides a non-exhaustive guide to the types of work activities, based on a written risk assessment by a competent person, that would not be deemed notifiable to the Authority under regulation 11 of the Asbestos Regulations. Notification may be required under the Construction Regulations 2013 depending on the scope of the works e.g. exceeds 30 days.

Table 20

Examples of non-notifiable work activities

Activity	Comment
Removal of encased asbestos insulating board without disturbance, e.g. AIB core within solid doors, AIB within durasteel panels or window units	This work must be carried out by a specialist asbestos contractor.
Maintenance and encapsulation activities involving lower risk asbestos work activities	Full details and parameters are provided in Section 11 of these guidelines
Work with non-degraded ACMs that are firmly bonded in a matrix which can be removed without deterioration	Full details and parameters are provided in Section 11 of these guidelines
Air monitoring, control and collection of samples to ascertain whether a specific material contains asbestos	
Removal of equipment containing internal ACMs without disturbance of those ACMs	

Section 17: Management and disposal of ACMs

Disposal, storage and packaging advice for lower risk work with ACMs

When the removal work is completed, the surface of the working area and any equipment used should be wiped down with appropriate cleaning rags soaked in water. A contaminated rag should never be re-soaked as this will contaminate the water. Tape may be useful for removing small dust deposits.

Any asbestos waste, debris or contaminated material (including cleaning rags and tape) should be placed into a suitable, UN-approved red bag which contains the appropriate asbestos warning label, and then sealed with duct tape. The red bag should then be wiped clean before being carefully placed into a suitable, approved clear asbestos bag which should then also be sealed.

If the asbestos waste, debris or other material cannot fit into a red waste bag, it must be double-wrapped in two layers of strong (1,000 gauge) polythene. A red asbestos waste bag or printed label (with the same information as the bag) should be securely attached to indicate that it is asbestos waste.

Where bagged or wrapped waste is stored temporarily, it must be placed in a dedicated lockable skip or suitable controlled compound. Care should be taken to ensure that any temporary storage location is not in an area where the waste may be exposed to vandalism. Waste should be stored for the minimum period feasible on-site. Collection, transport and disposal of asbestos waste should only be undertaken by an authorised waste collection permit holder and waste should be sent to an appropriately authorised facility for disposal.

Disposal, storage and packaging advice for specialist contractors and large scale removal of asbestos cement

Asbestos waste, debris or material considered to be contaminated with asbestos fibres should be placed directly into suitable UN-approved bags and or wrapped in 1,000 gauge polythene as

described in further detail below. This includes all enclosure building materials (such as timber and sheeting) and any items that have been present and unprotected inside contaminated areas and cannot, or will not, be cleaned (including tools and equipment).

It also includes all disposable PPE used in the enclosure, transit and waste routes, and disposable or discarded items used in cleaning and decontamination, such as clothes and towels. Waste water from the buckets in the airlocks should be discarded through the filtered drainage system in the shower of the DCU.

Solid waste should be double bagged using suitable UN-approved packaging. This should include a red inner bag which contains the appropriate asbestos warning label, and a clear outer bag. **The following protocol should be followed for bagging (or wrapping) waste:**

- Ensure the waste material has been dampened down (in the case of AIB) or is wet (a doughy consistency for lagging materials),
- Place the waste carefully into a red waste bag and seal with strong tape,
- In the inner stage of the bag lock (or airlock if no bag lock) the bag should be wiped down and transferred to the middle stage,
- In the middle stage the red bag should be placed in a clear asbestos waste bag, which should then be sealed and wiped down in a similar manner, and
- The double-bagged waste should then be collected from the outer stage and transferred to the lockable waste skip or a suitable secure wastecomound.

If wrapping a large object, e.g. asbestos cement which cannot fit into the asbestos waste bags, the item should be managed as follows:

- Intact sheeting should be double-wrapped in heavy gauge polythene (minimum 1,000 gauge) and generously and securely sealed with good quality tape (preferably 75 mm duct tape), and



banded to standard heavy duty four way pallets (1,200 mm x 1,000 mm with supports all round underneath). When sheets are longer than 2 m a minimum of two pallets shall be used to support the load,

- A maximum of one tonne shall be placed in each package,
- A general rule of thumb is 25 sheets = 1,000 kg,
- The maximum dimensions of a pallet with sheeting is 4,000 mm x 1,000 mm x 700 mm,
- The maximum length accepted is 4,000 mm,
- All pallets of sheeting shall be level on top for stacking purposes, and
- All packages shall be labelled with asbestos 'a' labels on at least two sides.

For slates and broken sheeting:

Slates and broken sheeting should be placed in UN-approved "Flexible Intermediate Bulk Container" (FIBCs).



- The FIBC shall be goose necked, tied and taped,
- All packages shall be labelled with asbestos 'a' labels on at least two sides,
- Contents should not exceed the maximum permissible weight located at the end of the UN code on the FIBC,
- FIBCs should be kept clean and free from any outerdebris, and
- Outer packaging should be free of rubbing or tearing damage.

Where bagged or wrapped waste is stored temporarily, it must be kept in an appropriately locked compound, skip, or, where this is not practicable, in a suitable locked vehicle. Care should be taken to ensure that any temporary storage location is not susceptible to vandalism

or close to an area considered to be sensitive, e.g. a school playground. Where temporary storage of asbestos-containing waste bags is required on-site (only where it is not reasonably practicable to transfer waste bags directly to a suitable waste skip) this should be in a dedicated locked room. Appropriate asbestos warning signs should be erected and every exposed surface of the room should be smooth and impervious so as to allow thorough cleaning after the bags have been removed. This can usually be achieved by lining the area with polythene sheeting.



A sealed bulkhead to segregate passengers from waste must be provided in vehicles used to transport asbestos waste. Tools and other equipment should also be segregated to prevent bags being ruptured during transit.

Movement of asbestos waste within Ireland and abroad

The collection, transport and disposal of asbestos are covered by the provisions of the Waste Management Act as amended.

Prior to any removal work, as part of developing the plan of work, a suitable facility for disposal should be identified. The collection, transport and disposal of asbestos waste should only be undertaken by a waste collection permit holder and waste should be sent to an appropriately authorised facility. These facilities accept asbestos-containing waste and then arrange to have the waste disposed of at an appropriate facility abroad. Details of appropriate hazardous waste transfer stations are available from the Environmental Protection Agency (EPA).

Any hauliers or contractors used to transport asbestos waste must be authorised under the **Waste Management (Collection Permit) Regulations, 2007, (S.I. No. 820 of 2007)** and have a valid waste collection permit to collect this type of asbestos waste. Prior to any removal work, selection of a haulier who has a **Waste Collection Permit** which covers the local authority area and includes the relevant EWC code is critical. On the 1st of February 2012, Offaly County Council was designated as the Nominated Authority for the processing of all new Waste Collection Permit applications.

The movement of hazardous waste within the state is subject to a **notification procedure**. The **European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations, 2011 (No. 324/2011)** were introduced to streamline the administration of legislation on the movement or shipments of hazardous waste exclusively within Ireland. In line with the system of control for shipments of waste from Ireland, the Regulations provide for the designation of **Dublin City Council (DCC)**, with effect from 1st July 2011, as the sole competent authority responsible for supervising and controlling internal shipments of hazardous waste in accordance with Article 33 of the Waste Shipments Regulation (EC) No. 1013/2006.

The Regulations apply to the collection, transport and transfer of hazardous waste exclusively within the state and set out the duties and responsibilities of producers, consignors, carriers, collectors, holders and consignees in such matters. DCC has established an online electronic system (**Waste Transfer Form**) for the supervision and control of shipments of hazardous waste within the state. The electronic system replaces the previous paper-based **C1 system**. For further information, contact Dublin City Council (National TFS [transfrontier shipment] Office) at 01 222 4402/4522 or email nationaltfs@dublincity.ie

Asbestos waste is exported abroad and disposed of through landfill. The **transfrontier shipment** of asbestos waste is subject to control procedures under EU and national legislation. All transfrontier shipments of waste originating in any local authority area must be notified to

and through Dublin City Council at the **National TFS Office**.

Asbestos is also subject to dangerous goods transport regulations. It is therefore important that advice be sought from a competent person, e.g. a dangerous goods safety adviser. The European Communities (Carriage of dangerous goods by road and use of transportable pressure equipment) Regulations, 2011 (S.I. No. 349 of 2011) provides the legal framework under which all dangerous goods, including asbestos, may be transported by road. Further guidance on this legislation and a guidance note on ADR Special Provision 168 are available on the Authority's ADR webpages at www.hsa.ie.



Disposal of materials containing asbestos, other than in an approved manner, will result in prosecution under the Waste Management Act, as amended, of those found responsible for such activity.

For further information on collection, transport and disposal of waste asbestos, contact should be made with Health and Safety Authority, Dublin City Council and/or the Environmental Protection Agency.

Section 18: References and further information

References

A comprehensive guide to managing asbestos in premises. Health and Safety Guidance HSG 227 HSE Books (2002) ISBN 978-0-7176-2381-5

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 – A guide issued by the Senior Labour Inspectors Committee (SLIC) – A non-binding guide to best practice. European Commission (2006)

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Asbestos: The analysts' guide for sampling, analysis and clearance procedures. Health and Safety Guidance HSG 248 HSE Books (2005) ISBN 978-0-7176-2875-2

Asbestos: The licensed contractors' guide. Health and Safety Guidance HSG 247 HSE Books (2006) ISBN 978-0-7176-2874-4

Asbestos: The survey guide. HSG 264 HSE Books (2012) ISBN 978-0-7176-6385-9

BS EN ISO/IEC 17020:2012 *Conformity assessment. Requirements for the operation of various types of bodies performing inspection.* British Standards Institution

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Campopiano A. et al 'Risk assessment of the decay of asbestos cement roofs.' *The Annals of Occupational Hygiene* (2009) 53 (6): 627–638

Determination of airborne fibre number concentrations: A recommended method, by phase-contrast optical microscopy (membrane filter method). World Health Organisation (1997) ISBN 92-4-154496-1

Guide to Implementing an Effective Respiratory Protective Device Program Irish Standard EN 529 Respiratory Protective Devices: Recommendations for selection, use, care and maintenance. (2005) www.nsai.ie

Hodgson, J.T. and Darnton A. 'The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure.' *The Annals of Occupational Hygiene* (2000) 44 (8): 565–601.

Introduction to Asbestos Essentials. Health and Safety Guidance HSG 213 HSE Books (2001) ISBN 978-0-7176-1901-6

Personal exposure during work with asbestos. Health and Safety Laboratory IR/L/MF/00/15

HSA Guidance

Further relevant guidance for asbestos work activities e.g. construction related guidance, confined spaces, working at heights and roof work codes of practice are available on the Health and Safety Authority's publications webpages at www.hsa.ie.

Useful contacts

The HSA is not responsible for, and cannot guarantee the accuracy of, information on sites that it does not manage, nor should the inclusion of a hyperlink be taken to mean endorsement by the HSA of the site to which it points.

Organisation	Website address
Irish National Accreditation Board	http://www.inab.ie/
Asbestos Removal Contractors Association (Ireland)	http://www.arca.ie
Irish Association of Demolition Contractors	http://cif.ie/market-sectors/alliance-of-specialist-contractors-association/
Occupational Hygiene Society of Ireland	http://www.ohireland.org/
British Occupational Hygiene society	http://www.bohs.org/
Health and Safety Laboratory (UK)	http://www.hsl.gov.uk/
Health and Safety Executive (UK)	http://www.hse.gov.uk/
Irish Faculty of Occupational Medicine	http://www.rcpi.ie
Mesothelioma UK	http://www.mesothelioma.uk.com/

Appendix 1: Photographic examples of ACMs



Asbestos spray coating to metal corrugated roof



Asbestos spray coating to underside of asbestos cement corrugated roof



Asbestos loose lagging under floorboards, disturbed by plumbers



Asbestos spray coating to Rolled steel joist



Thermal insulation to calorifier



Thermal insulation to boiler



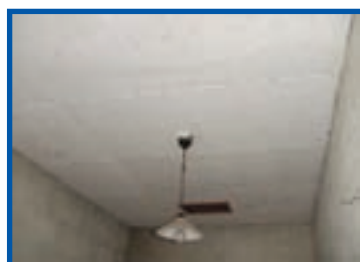
Composite asbestos lagging to pipework in very poor condition



Composite asbestos lagging to pipework in very poor condition



Sectional asbestos lagging on pipework



Asbestos insulating board (AIB) ceiling panels



Damaged AIB ceiling panels



Broken AIB

Appendix 1: Photographic examples of ACMs



AIB fire stop over door



AIB lining to dumb waiter shaft



AIB ceiling panels in lift motor room



AIB to fuse panel door



Perforated AIB ceiling panels with minor damage at light fitting



Chrysotile rope to asbestos cement flue pipe



Chrysotile flash guards in old fuse box



Chrysotile fire blanket



Chrysotile rope to metal boiler flue



Chrysotile rope seals in glazing units

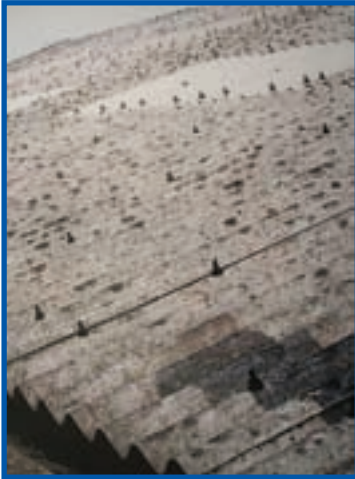


Chrysotile rope lagging to pipework



Chrysotile rope seals to flanges of ductwork

Appendix 1: Photographic examples of ACMs



Asbestos cement corrugated roofing



Asbestos cement barge boards and downpipe



Asbestos cement ceiling panels



Asbestos cement flat profile roof tiles



Asbestos cement water tank in attic



Asbestos cement water main



Asbestos cement flue pipe



Asbestos cement wall panels in hot press



Asbestos cement wall panels



Exposed chrysotile-based compressed asbestos gasket to flange



Compressed asbestos gaskets to pipework flanges



Compressed asbestos gaskets



Asbestos-containing shires lynx toilet cisterns



Galbestos - asbestos bitumen layer to metal corrugated sheeting



Chrysotile backing to linoleum floor covering



Chrysotile-based floor tiles and chrysotile containing adhesive



Chrysotile-containing bitumen pad to underside of sink

Appendix 2: Asbestos cement – specific guidance

The following guidance must be read in conjunction with Section 11 on lower risk work with ACMs, i.e. advice on working methods, visual inspections and other relevant sections of these guidelines regarding plans of work (POW) for lower risk work, PPE requirements, training etc.

The Health and Safety Authority's codes of practice for roof work and working at heights must also be consulted for some asbestos cement work activities described here in Appendix 2.

Drilling holes in asbestos cement (and/or other tightly bonded materials)

This task should only be considered after the performance of a risk assessment. Ideally tasks which have the potential to release asbestos fibres from a bound matrix (for example, drilling) should not be undertaken unless all possible alternative methods have proven not to be possible. The methodology as outlined can be used where holes have to be drilled in asbestos cement, floor tiles, decorative coatings, asbestos-containing bitumen products and other materials containing asbestos which is tightly bonded in a matrix.

Cover the point to be drilled (including rear area, if accessible) with tape to prevent edges crumbling. If cable or pipework is to be passed through the drilled hole ensure that the hole is made slightly bigger to prevent abrasion. Cover the entry and exit points (if accessible) with a generous amount of thick paste (for example, wallpaper paste). Drill through the paste. Use wet rags to clean off paste and debris generated (including surfaces at the rear, if accessible). Seal cut edges with appropriate sealant. If a cable is to be passed through, insert a sleeve to protect the inner edge of the hole. Use wet rags to clean equipment, surfaces and segregated area.

Cleaning debris from guttering on an asbestos cement roof

This task refers to situations where debris containing asbestos needs to be removed from guttering (which may or may not be made of asbestos) on an asbestos cement roof.

Erect an access work platform appropriate to the task. Mix water and detergent. Using a watering can or garden-type spray, pour the water into the gutter but avoid over-wetting as this will create slurry. Remove the debris using a scoop or trowel. Wet the material or debris again if dry material is uncovered. Repeat this process as many times as is necessary during the task. Place the debris immediately and directly into the assigned asbestos waste container. Use wet rags to clean equipment, assess work platform etc.

Removal of asbestos cement debris

This task refers to situations where there is contamination from asbestos-damaged cement and includes decontamination work following the rupture of asbestos cement cladding in a fire.

(Note: This task is not for use when cleaning debris from damaged asbestos lagging, coating, insulating board etc.)

Using a garden-type spray, dampen the debris. Pick up larger pieces of debris and place immediately and directly into a designated asbestos waste container. In smaller or awkward areas, use wet rags to wipe contaminated surfaces clean. For larger areas, e.g. following the rupturing of asbestos cement in a fire, it is not always practical to wipe all surfaces, so cleaning may need to be restricted to obvious contamination in occupied areas, e.g. windows. If the contaminated surface is rough, keep the asbestos debris damp and scrape it into the designated asbestos waste container. Tape can be pressed onto dust deposits to pick them up. If necessary, based on risk assessment, repair the asbestos cement following recommended safe practices.

Repairing damaged asbestos cement

This task refers to situations where, based on risk assessment, it is considered necessary to repair damaged asbestos cement. (Note: This method must not be used for repair of other types of asbestos-containing materials, e.g. AIB, lagging etc.)

If the asbestos cement is badly damaged with holes etc., based on risk assessment, it should be removed in accordance with recommended safe practices and procedures as outlined in these guidelines. Dampen any debris using a garden-type spray. Clean up debris and dampened loose material and dispose of immediately and directly into a designated asbestos waste container. Paint damaged areas of asbestos cement (see below). Alternatively, protect asbestos cement by attaching a non-asbestos panel over the asbestos cement and clearly marking its location on site plans or designs of the building or structure, so that it can be managed and assessed regarding the potential release of fibres over time.

Painting asbestos cement sheets

This task relates to situations where asbestos cement is in good condition and requires painting. Care must be taken when performing this task and workers should be trained for the task.

NEVER prepare surfaces by sanding. If lichen or other growths are present, remove using the recommended practices and procedures outlined in this Appendix. Before starting the task, check the asbestos cement for damage (and, if necessary, repair) and assess the risk to the workers fully. Wipe dusty surfaces with a wet cloth. It is recommended that a low-pressure spray be used to apply the paint. If this is not possible the paint may be applied lightly using a roller or brush to avoid abrasion or damage. Spray the paint on the surface using a sweeping movement. Do not concentrate on one area as this can cause damage to the surface. Paint both sides of the sheet.

Removal of asbestos cement products such as flues and tanks

This task relates to situations where asbestos cement products such as flues, water tanks etc. must be removed from areas such as attics or lofts. If these asbestos cement products are covered or sheathed in asbestos insulating board this task and associated procedures cannot be used. It is important, therefore, to initially survey and clearly identify the type of asbestos material concerned. If, following a risk assessment, such asbestos cement products should be identified as redundant, i.e. no longer needed or used, and a conclusion is reached that they will not, by virtue of their presence and location, interfere with any other work and are assessed to be in good condition, then it is best practice to label and note their location rather than undertake removal works. If those products are left in situ the location should be marked on the asbestos register and the products should be assessed to ensure that they remain in good condition and undisturbed.

If the asbestos cement product is in an area such as an attic, board out an area which can be worked on which is large enough to prevent contamination of adjacent attic insulation. Use 1,000 gauge polythene sheeting, secured with duct tape, to cover any surface within the segregated area which could become contaminated.

Where possible minimise breakage of asbestos cement. Every effort should be made to try to remove the asbestos cement product intact or whole, strengthening damaged areas or sections with duct tape as required. In order to remove the product intact, where possible, the supports should be unscrewed. If this is not possible, ensure that the asbestos cement is adequately dampened. Wrap the asbestos cement fully in 1,000 gauge polythene before breaking. Using a hammer, carefully break the asbestos cement product into pieces small enough for removal. It is not necessary, nor recommended, that the breaking process should continue to a stage of producing dust and minute pieces. The need to break the product relates to the effort required to release or remove the product. The larger the

pieces the less dusty the residue generated. All debris must be placed immediately and directly into designated asbestos waste containers. Larger items such as flues, which cannot be placed in such containers because of their shape and size, must be double-wrapped in 1,000 gauge polythene and affixed with appropriate asbestos warning stickers or labels. Use wet rags to clean equipment and the segregated area.

Asbestos roof overcladding

Asbestos roof overcladding is an alternative to removing an asbestos cement roof. However, such an option presents its own inherent hazards and risks and must be managed accordingly. The Health and Safety Authority requires this type of work to be notified (see Section 16) as it involves significant disturbance of the asbestos materials and dust generation.

It is recommended that a check for contamination on top of existing steel beams and purlins is carried out before any work commences to establish a 'pre work' agreed condition. A plan of work as described in Section 14 must be developed and must take into consideration:

- Access and fire risks precautions to be taken,
- Expected exposure using controls specified,
- How the release of fibres from the materials will be controlled,
- How fibre and debris will be prevented from spreading to occupied areas, especially areas below the roof,
- How areas which may have become contaminated with asbestos, particularly areas below the roof, are to be thoroughly cleaned as necessary when work is complete,
- How debris will be prevented from contaminating the unoccupied areas, and
- What protective clothing and respirators are to be worn.

The recommended method for fixing the overcladding sheets is using a self-drilling tapping screw rather than a hook or J-bolt.

Specific controls will vary with the nature of the job, but for most overcladding jobs you will need:

- Equipment described in 'drilling holes in asbestos cement' advice above,
- Visqueen – to cover surfaces that are likely to become contaminated, e.g. crash decks and the area of flooring or roof space beneath the exterior roof sheets (Note: Visqueen can create a slip hazard. It will not usually be necessary to visqueen boards used to access the roof.),
- Signs and barriers to segregate the area to keep out unauthorised persons, including areas beneath the roof,
- Fine water spray to dampen down areas prior to working on them,
- FFP3 respirators that have been face-fit tested on the individual,
- Suitable coveralls with a hood (Note: These should be Type 5, Category 3.),
- Asbestos waste bags in which to place any debris arising from drilling, and a suitable means of sealing them, and
- Somewhere to take off potentially contaminated coveralls (Note: While the use of vacuum cleaners with HEPA filters, and readily cleanable footwear, such as wellington boots, is normally recommended, these are considered impracticable and potentially unsafe when working on a roof.).

All visible debris should be cleaned up and disposed of as special waste. Make sure that any changes are noted in the asbestos management plan for the premises so that future contractors can be alerted to the presence of asbestos.

If it is a job to which the Construction Regulations apply, information about residual asbestos must be placed in the safety file.

Cleaning weathered asbestos cement

Long-term weathering of external asbestos cement products such as corrugated sheeting can result in the release of quantities of fibrous debris which can accumulate in areas such as

drainage gutters, on roofs and on other surfaces exposed to the dust. Because this accumulated material can be dry in nature these areas should be cleaned out before any work commences, where reasonably practicable, keeping the debris wet. The wet debris can be removed, placed in a suitable container and disposed of as asbestos waste. Any remaining residues can be removed using a low-dust technique such as wiping with damp cloths which should then be disposed of as asbestos waste.

After years of use the external surface of asbestos cement may become covered in lichen, algae or moss. For aesthetic reasons, or before application of surface coatings, you may need to remove these growths. Great care must be taken when cleaning weathered asbestos cement. Moss and lichen growth is normal and, while it may not be attractive, this growth is not detrimental to the material. Consideration must be given before performing this task as to whether or not it is absolutely necessary, as this activity can result in the release of, and exposure to, asbestos fibres. Operators also must consider the fact that this work may need to be carried out at a height, with the associated risk of falls. Therefore, the system of work must be planned to perform the task safely. The following techniques have been known to be used:

- High-pressure water jetting,
- Remote cleaning, and
- Cleaning with surface biocides.

The practice of dry scraping or wire brushing is not recommended; this can lead to high exposures to asbestos fibres and should be avoided.

As with all asbestos-related work activities, access to the work area should be restricted using notices, warning tape etc. prior to commencement of work.

High-pressure water jetting

High-pressure water jetting is a technique which has been used in the past. As well as the risk of driving debris between the overlaps of the roof covering, causing the roof to leak, there are

several other health and safety problems associated with this method, e.g. the jet can cause serious injury.

There have been several examples of untrained personnel carrying out this work without the proper precautions and supervision. This has resulted in exposure of the operators (and others not involved in the work) to asbestos fibres, and in gross contamination of buildings and surrounding areas. Subsequent clean-up operations have proved very expensive.

Due to the range of problems associated with this method of cleaning, it is not recommended and other, safer methods should be used.

Remote cleaning

Remotely operated units are available with enclosed rotary cleaning heads which use high-pressure jets and brushes to clean asbestos cement roof sheets. This system has the advantage of the operator being remote from the immediate cleaning area, thus reducing the potential risk of exposure to asbestos. However, provision still needs to be made to collect the resulting slurry. The manufacturer's operating instructions should be followed closely and the equipment should only be operated by workers who have received specific training and are properly supervised. Operators must take great care, as they may need to carry out the work at a high level, with the associated risk of falls.

Cleaning with surface biocides

There is a range of approved biocide products which can be used to kill plant material growing on asbestos cement surfaces. However, if considering the use of biocides, an assessment must be performed to select the most appropriate biocide and to ensure that it does not in any other way increase the potential for exposure to asbestos fibres. Advice should be sought as to the best biocide for the intended work. Some biocides can irritate the skin, so workers should wear protective gloves. Care should be taken to note and follow any safety-

and health-related information available, such as the label on the biocide container or in its associated safety data sheet (SDS). Specific information relating to biocides can also be obtained from the Pesticides Control Service, Department of Agriculture and Food Laboratories, Backweston Campus, Youngs' Cross, Celbridge, County Kildare. For further information see www.pcs.agriculture.gov.ie

Products containing salts of dichlorophenol, o-phenylphenol or benzalkonium chloride (quaternary ammonium salts) will kill plant material. These products cause no damage to asbestos cement if they are used at the recommended concentrations during non-frosty conditions. The biocides should be applied as low-pressure sprays or washes only.

Once the biocide has been applied, time must be allowed for the moss and algae to die. This process may take several days. Once moss and algae are dead they can be removed with water, using gentle scraping. All debris should be treated as asbestos waste and placed directly into an asbestos waste container. Dead lichen crusts and ivy roots are unlikely to be removed so easily and these are probably better left where they are. The roots of mosses may well hold loosened asbestos fibres; therefore, efforts to remove them could, in fact, increase the risk of exposure to asbestos fibres and actually cause damage to the integrity of the roof sheeting, so it is important to assess these possibilities before commencing the task.

This method is preferable to the use of gentle wet brushing alone for moss and algae because the pesticide product will first loosen the moss and algae's hold on the asbestos cement, making removal easier. However, operators need to take great care as they may have to carry out the work at a high level, with the associated risk of falls.

Cleaning an asbestos cement roof

Due to the nature and fragility of an asbestos cement roof, the difficulties associated with access and the possibility of something going wrong and leading to possible exposure to

asbestos fibres, this cleaning work should be performed only by specialist roof cleaning contractors. These contractors will have specialist cleaning machines for the specific task. The technique creates a lot of slurry which must not enter the building and should be collected for disposal. Gaps and other possible points of entry for the slurry should be sealed using polythene sheeting secured with duct tape. However, care must be taken during this sealing procedure, as it is dangerous to seal over exhaust vents from heating units in use. The downpipes should be disconnected to allow the slurry generated to be diverted directly to a collection and filtration system. Any solid waste and/or debris should be kept wet and disposed of in designated asbestos waste containers. Clean water should then be used to flush out the slurry collection system.

Removal and demolition of asbestos cement sheeting

Dismantling and demolishing buildings which are roofed or clad with asbestos cement sheeting presents particular problems, especially if the buildings are old and crumbling. Many asbestos cement products, such as roof sheets, cladding, drainpipes and gutters, are located at a height and therefore present a risk of falls. Asbestos cement is a fragile material, and people must not walk on it as it cannot be relied on to support a person's weight. It is important to emphasise that falls from and through fragile roofs are of major concern and are a factor in deaths in construction work annually. Precautions to prevent such accidents must be given priority and should be considered at the stage of preparing the risk assessment for a job.



In order to minimise exposure and control the spread of asbestos fibres, consider the following general precautions:

- Where reasonably practicable, remove the asbestos before the rest of the structure is demolished,
- Where possible, avoid breaking or cutting the sheets. Should there be broken pieces or debris, these should be kept damp and should be hand-picked and bagged without delay,
- Keep the material dampened when working on it, taking particular care regarding the overlap of sheets. Consideration should be given to applying a PVA emulsion, which may be more effective than water (with a wetting agent) in minimising fibre release. PVA can be applied and allowed to dry on asbestos cement roofing prior to its removal as an alternative method to prevent slip hazards,
- Use hand bolt cutters to release sheets. Avoid the use of power tools which generate fine dust,
- Check for debris in the fasteners or bolt holes and clean with wet rags,
- Where possible, lower the material, intact, onto a clean, hard surface. Do not use rubble chutes,
- Where mobile elevated work platforms (MEWPs) are used, consideration must be taken regarding the weight of the sheets with respect to the load capacity or load bearing of the MEWP used for the task,
- Once lowered to the ground, sheets should be double-wrapped in heavy (1,000) gauge polythene and stacked in a safe and secure place for disposal as soon as possible (in accordance with local rules),
- Waste and debris must be removed from the site as soon as possible to prevent it being crushed underfoot or by moving vehicles,
- Do not bulldoze broken asbestos cement or sheets into piles or use mechanical means to break asbestos cement materials,

- Do not sweep asbestos cement debris, and
- Dispose of the waste and debris safely and promptly.

Manual dismantling methods

If asbestos cement sheets are in good condition and it is reasonably practicable to produce a safe system of work and provide safe access, they should be taken down whole. Roof sheets should preferably be removed from underneath (cutting the bolts manually with croppers) using MEWPs such as scissor lifts or cherry pickers to gain access.

The sheets should not be dropped or damaged. Fixings should be carefully removed using bolt cutters. Operators may require suitable PPE, including RPE, based on the outcome of the risk assessment performed by a competent person(s). Once the sheets have been removed and wrapped, intact, in polythene sheeting, they should be placed in an appropriate enclosed container for safe disposal in accordance with the relevant legislation.

Remote dismantling methods

If the sheets are disintegrating, or the risk of falls is too great, or the building is in a dangerous state of collapse, remote demolition techniques such as deliberate controlled collapse should be considered, based on the outcome of a risk assessment performed by a competent person(s). Remote demolition will give rise to low exposures for the equipment operators and those who subsequently load the waste into lorries for disposal.

When remote techniques are used, the work area must be continually sprayed with water to suppress the spread of dust which may contain asbestos fibres. The roof sheeting should be broken into the building in a controlled manner, onto the floor or hard standing, e.g. by using excavators fitted with suitable demolition attachments. This area should be clear of other materials before work commences, where

possible, given the outcome of the risk assessment and the condition of the building. The system of work should be designed to minimise breakage of sheets. Before work commences, and while loading the broken sheeting into lorries, you should keep it damp by spraying with water. Where possible, debris, broken pieces and sheets should be bagged or wrapped in polythene. The lorries should be securely covered or sealed over to prevent the asbestos waste drying out on its way to disposal.

To members of the public, the remote method can appear noisy, dusty and uncontrolled. They are often concerned about demolition of this type when they know or suspect that the building was roofed or clad with asbestos cement. In order to alleviate concerns about this type of work, contractors should:

- Keep the neighbours informed about the work,
- Carry out background air sampling at the perimeter of the site, and
- Clearly cordon off the work, erect warning signs and prevent unauthorised access to the demarcated work area.

Asbestos cement in fires

Asbestos fibres can change their mineral structure following prolonged exposure to heat. But research has shown that in fires, only the outer layers of the material containing asbestos cement are altered, with the interior often remaining unaffected. This means that there will still be hazardous asbestos fibres present in debris and ash.

Exposure to the heat of a fire can cause the cement content of asbestos cement roofing, cladding etc. to violently rupture, discharging asbestos fibres into the atmosphere and spreading debris over a wide area. Fire can also weaken the binding matrix in asbestos cement, resulting in fibres being released more easily if the solid debris or ash from the fire is disturbed. The emergency services, building occupants and contractors involved in remedial work will be most susceptible to exposure following a fire.

Before taking any remedial action, the types of asbestos-containing materials present in the building should be determined. The risk from debris and ash containing only asbestos cement will be low, as long as a number of simple precautions are taken when decontaminating the area:

- The contaminated area should be cordoned off and warning notices posted,
- Only essential personnel should enter the cordoned-off area,
- Personnel should wear suitable PPE, including RPE,
- Disturbance of ash and debris should be kept to a minimum,
- The debris should be carefully dampened down, avoiding over-wetting (to prevent the build-up and spread of slurried material), and carefully removed, e.g. by shovelling, and
- Larger pieces of debris should be picked up by hand and placed in heavy gauge polythene bags (made secure and appropriately labelled).

Where other materials containing asbestos cement, such as asbestos insulation, asbestos coating, or AIB, are present in the building, more stringent precautions will be required and the remedial work must be carried out by a specialist asbestos abatement contractor.

Refer to Section 11 of these guidelines for further information and note that work with fire damaged asbestos cement would not normally avail of exemptions (notification to HSA, health surveillance and retention of health records) under the Asbestos regulations.

Asbestos cement water mains

Work on AC pipework may involve removing sections of pipework for replacement or tapping existing AC pipes to connect new services.

A machine should excavate to expose AC pipes. Hand-excavate areas under pipes where cuts/breaks are planned. Excavation operations should be carefully executed so that pipe damage does not occur prior to removal.

AC coupling removal may be accomplished by gradually splitting the coupling lengthwise using a chisel and hammer. After the top of the coupling has been split, a crowbar or similar tool should be used as a lever to split the bottom of the coupling. **KEEP MATERIAL WET AT ALL TIMES.**

Pressure or 'wet' tapping for service connections is performed in the trench while the pipe is under pressure. The equipment (manual driven) is affixed to the pipe by means of a chain yoke. A combination boring-and-inserting bar drills and taps the pipe wall and inserts a corporation stop or pipe plug. The pressure chamber, which protects against water leakage, also catches the asbestos-cement chips, so this is essentially a dust-free operation. To minimise (1) the fouling of valves, regulators, meters, and other equipment with chips and (2) unnecessary addition of asbestos to drinking water, provisions should be made for downstream flushing or use of tapping equipment with positive purge or 'blow-off' features. **KEEP MATERIAL WET AT ALL TIMES.**

The **Environmental Protection Agency** should be contacted directly if on-site burial of AC pipes or pipe bursting techniques is proposed in the plan of work.



Appendix 3: Other ACMs – specific guidance

This section provides further guidance on working with particular ACMs. Information on risk assessment, plans of work, selection of appropriate PPE/RPE etc. is provided elsewhere in these guidelines and must be consulted.

Removing asbestos-contaminated soil

Asbestos-contaminated soil is comprised of non-attached pieces of asbestos cement products and other material containing asbestos uncovered in soil during other work activities. Contamination can be detected during building and road construction and excavation, waste disposal, damage following a severe weather event such as a hail storm, weathering over time or when asbestos is poorly handled or damaged during removal.



A risk assessment by an independent competent person should determine the most appropriate control measures and remediation strategies.

Asbestos-contaminated soil is also subject to requirements of other regulatory agencies such as the EPA and local authorities.

Removal of asbestos from contaminated soil will require a specialist asbestos contractor for any friable asbestos to be removed

For all asbestos removal requiring a specialist asbestos contractor, an air monitoring program must be implemented by an independent analyst to ensure that the control measures do not release airborne asbestos fibres. When all visible asbestos has been removed and the

airmonitoring program indicates that the level of respirable asbestos fibres does not exceed 0.01 f/cm³ (10% of the exposure limit value), the independent analyst must complete the clearance certificate.

All asbestos and any contaminated soil removed must be disposed of as asbestos waste.

Immediate action

If the soil is suspected to contain asbestos, the person who manages or controls the workplace must assume that the soil contains asbestos and cease work immediately. A competent person should take samples of the material for analysis to confirm or refute that assumption.

If confirmed, the person who manages or controls the workplace must ensure that control measures are implemented to minimise the release of airborne asbestos. The control measures include:

- Preparation of an asbestos management plan for the site,
- Setting the boundaries of the contamination as determined by an competent person,
- Ensuring that there is minimal disturbance of the contaminated soil until the asbestos management procedures have been implemented,
- Isolating and securing the removal work site using signs and barriers,
- Controlling dust with dust suppression techniques (such as water and wetting agents),
- Providing PPE based on the level of contamination and the control measures implemented,
- Sampling and/or air monitoring,
- Providing education and training for workers about hazards and safe work practices to minimise airborne dust exposure, and
- Implementing decontamination procedures for the workers and the equipment.

Removal of vinyl floor tiles and adhesive

Vinyl floor tiles and bitumen adhesive should be managed in situ, if in good condition. If floor tiles are damaged and must be removed, it is recommended to leave and manage the bitumen in situ by screeding over it prior to installation of new flooring. Precautions will be needed for any future disturbance e.g. installing pipework, chasing floors etc.

Where the removal of vinyl floor tiles and associated bitumen adhesive is required, the following procedure should be followed:

Place a scraper in the joint between tiles and gently lift, minimising breakage. Spray atomised water during tile lifting periods. Tiles with attached bitumen should be appropriately bagged. All upstanding floor tile adhesive should be scraped and removed, as far as reasonably practicable, and disposed of as asbestos waste. Sanding or scrubbing floors is prohibited due to increased dust levels (containing both asbestos fibres and respirable crystalline silica).

Where complete removal of bitumen, e.g. where adhesive may interfere with new floor bonding agent, a specialised diamond-headed floor grinder with attached H-Type vacuums should be considered. Such work should only be carried out by specialist asbestos contractors as there is a risk of exposure during the emptying of the vacuum equipment.

As the methods above do not give rise to dust, an enclosure under negative pressure is not required. However, non-work items should be sheeted over with polythene and a **two-stage airlock** with primary decontamination facilities e.g. water, sponge and H-Type vacuum, should be installed.

Removal of textured coatings

Some textured coatings applied to plasterboard can be cut out in sections, and therefore can be removed with minimal deterioration. However, textured coatings applied to concrete substrates will require chemical and mechanical removal.



Such coatings should be removed using penetrating stripping fluid or gel, or a steam generator. It must not be removed by sanding, grinding etc.

For both scenarios above, an enclosure under negative pressure is generally not required but may be necessary where there are large volumes of textured coatings on concrete substrates and the work area is adjacent to occupied areas.

Where an enclosure is not required, non-work items should be sheeted over with polythene and a **two-stage airlock** with primary decontamination facilities, e.g. water, sponge and H-Type vacuum, should be installed.

Appendix 4: Other analytical methods and water absorption test protocol

Transmission electron microscopy (TEM)

Indirect TEM Identifies elementary chemical composition and crystalline structure and counts the fibres. It is possible to examine objects with a diameter of $< 0.01 \mu\text{m}$. It can also count fibres with a length $> 0.5 \mu\text{m}$. The sampling may take a long time (if the filter is overloaded, it will only be possible to analyse one section). It is possible to lose fibres or change their dimension distribution during the preparation process.

Complex and extremely costly method, both as an investment and for operating.

Direct TEM identifies elementary chemical composition and crystalline structure and counts the fibres. It is possible to examine objects with a diameter $< 0.01 \mu\text{m}$. It also counts fibres $> 0.5 \mu\text{m}$ in length.

The aerosol is not disturbed during the observation. The preparation is tricky to perform. Requires an optimal load of the deposit on the filter. Complex and extremely costly method, both as an investment and for operating.

With the current atmospheric measurement conditions (8-hour individual sampling at a maximum flow of 4 l/min), the limit of the analytical quantification is 0.0025 f/ml.

Scanning electron microscopy (SEM)

Counts the fibres and determines the elementary chemical composition. The preparation is less restrictive than with TEM. The filter is read directly. The chemical analysis alone does not specifically identify the fibres. Resolution problems for asbestos fibres with a diameter $< 0.2 \mu\text{m}$ (same resolution as PCM). Less sensitive than TEM. The limit of analytical quantification is higher than for TEM.

Water absorption test

Should be carried out on a suitable sample (i.e. a minimum of 3 cm x 3 cm or 9 cm²) which is free of any adhering material (partially painted samples can be used but may need longer to absorb water).

All asbestos materials should be handled inside a suitable extraction or recirculating air cabinet fitted with high-efficiency filters, or sealed in a suitable container. The following steps should be followed:

(a) Remove the sample of asbestos from packaging/container and either dry for a minimum of twelve hours at 50–110 °C or until the difference between two consecutive weights made at an interval of not less than one hour, is less than 1% of the mean of the two measurements.

(b) Before weighing, allow time for the sample to cool and condition.

(c) If weighing outside the containment cabinet, place the sample in a suitable pre-weighed sealable container (e.g. sealable plastic bag) and weigh to the nearest 0.01 g. Calculate the dry weight of the sample by subtracting the weight of the container.

(d) After weighing, remove the sample from any container and completely immerse in water for a minimum of fifteen minutes until no more visible signs of bubbles being formed are observed.

(e) If the sample starts to disintegrate during immersion, the test should be terminated and the sample reported as a licensed asbestos material.

(f) If intact, remove the sample from the water and place it on paper towel for one minute per side (upper and lower surfaces) to remove any excess surface water.

(g) Place the sample in the pre-weighed sealable container and reweigh. Calculate the weight of the wet sample by subtracting the weight of the container.

(h) Calculate the percentage of water absorbed by the sample using the following equation: $[(\text{wet weight} - \text{dry weight}) / \text{dry weight}] \times 100$.

(i) If the percentage of water absorbed is $< 30\%$, report as an asbestos material for which a specialist contractor is not required to work on (e.g. asbestos cement). If $> 30\%$, report as an asbestos material for which a specialist contractor is required to work on (e.g. asbestos insulating board [AIB] or millboard).

Appendix 5: Template for certificate of reoccupation

Laboratory Name

INAB Logo and Accreditation Number (if relevant)

Letterhead

Address

Telephone, fax and e-mail

Certificate of Reoccupation

Certificate of Reoccupation

{# certificate number and #issue number}

Contract number:

Job number:

Reference number:

INAB accredited method(s) used and disclaimers:

(Note: methods accredited by INAB must have a disclaimer if you are reporting outside the scope of the method)

Name, address and contact information for the client			
Site address for clearance			
Areas to be assessed and brief description of works, including dates carried out			
Give attachment number if following are attached:	Drawings/pictures of the area to be assessed	Plan of work/extracts from the plan of work	Notification form
Attachment number			
Name, address and contact information for the asbestos removal contractor			

Appendix 5: Template for certificate of reoccupation

Name and contact information for asbestos removal contractor's site supervisor	
Representative who will confirm start and acknowledge outcome	
Anticipated start of the assessment	Date: Time:
Confirmed start for the assessment	Date: Time:

Stage 1 of 4: Preliminary check of site condition and job completeness

1.1 Plan of work checked to confirm areas to be assessed. (Record any problems, differences, fixed installations or ACMs to remain.)	
State yes if the following are intact and operating. Record the problem if not.	
1.2 Work areas	
1.3 Enclosures/NPU	
1.4 Hygiene facilities	
State yes if following areas and their immediate surroundings appear to be free of obvious asbestos debris and asbestos waste sacks. Record the problem if not.	
1.5 Skip area/waste route	
1.6 Transit route	
1.7 Hygiene facilities	
1.8 Enclosure/work area	

(Note: 1.8 should also be free of unnecessary equipment. If no or insufficient viewing panels are fitted, note this and continue with the assessment, as the area inside the enclosure will be covered in Section 2.2.)

Stage 1: Passed/Failed

Time:

Date:

Assessed by:

Comments:

Signature of assessor:

(If failed, strike through remaining stages and get the representative to sign the acknowledgement box at the end.)

Stage 2 of 4: Thorough visual inspection

Requirement	Yes/No	Comments
2.1 Hygiene units are free from waste, debris, dust, contaminated clothing etc.		
2.2 Airlock/baglock /enclosure is free of waste bags, materials and unnecessary equipment		
2.3 All ACMs have been completely removed from the underlying surfaces		
2.4 Interior surfaces inside the enclosure are free from debris and settled dust		

Stage 2: Passed/Failed

Time:

Date:

Assessed by:

The hygiene unit, airlock/baglock and enclosure were FREE/NOT FREE from visible asbestos waste, debris and surface dust.

Comments:

Signature of assessor:

(If failed, strike through remaining stages and get the representative to sign the acknowledgement box at the end.)

Appendix 5: Template for certificate of reoccupation

Stage 3 of 4: Clearance air monitoring inside the enclosure.

Sampling information		Yes/No	Comments/values	
3.1 All areas are dry.				
3.2 Air movers off and sealed				
3.3 No evidence of lockdown sprays				
3.4 Original floor surface uncovered				
3.5 Disturbance used (state type):				
3.6 Total time of disturbance		Minutes		
3.7 Area or volume of enclosure		m ²	m ³	
3.8 Number of air samples collected		A drawing showing the sampling positions is included as attachment #		
Results	Set 1: Fibre conc. (f/cm ³)	Set 2: Fibre conc. (f/cm ³)	Set 3: Fibre conc. (f/cm ³)	Set 4: Fibre conc. (f/cm ³)
Sample 1				
Sample 2				
Sample 3				
Sample 4				
Sample 5				
Pass/Fail				

Stage 3: Passed/Failed **Time:** **Date:** **Assessed by:**

The area is NOT CLEARED/CLEARED for the enclosure to be removed.

Test details for the air monitoring are recorded in attachment #

Comments:

Signature of assessor:

(If failed, strike through remaining stages and get the representative to sign the acknowledgement box at the end.)

Stage 4 of 4: Assessment of site for reoccupation (after the enclosure is removed)

Requirements	Yes/No	Comments
4.1 Former enclosure/work area and its immediate surrounds are free from any visible debris, asbestos sacks and waste		
4.2 Transit route and waste area is free from any asbestos debris, asbestos sacks and waste		
4.3 All ACMs in the scope of work have been removed and any known ACMs remaining are intact		

Stage 4: Passed/Failed **Time:** **Date:** **Assessed by:**

The area CAN BE/CANNOT BE reoccupied.

Comments:

Signature of assessor:

Appendix 5: Template for certificate of reoccupation

Contractor's Representative Acknowledgement:

I have been advised by _____ that the certificate of reoccupation has not been issued because the area has failed stage # _____

I have been advised by _____ that the certificate of reoccupation can be issued as the area has passed all four stages.

(Complete one of the above and strike through the other option.)

Name:

Signature:

Date:

Time:

Issue of certificate of reoccupation by the assessor:

Copies of this certificate (certificate number and issue number) **were issued with attachments # - # to the following persons:**

Name of Assessor:

Signature:

Date:

Time:

Note: A separate clearance certificate for the hygiene unit is required by the asbestos removal contractor. See section 13 of these guidelines for contents of a Hygiene Unit Clearance certificate.

Appendix 6: Priority Assessment example for an asbestos cement roof on a 1970's classroom

Priority assessment algorithm			
Assessment factor	Variable(s) selected	Score for each variable	Overall score
NORMAL OCCUPANT ACTIVITY Main type of activity in areas	Rare disturbance activity (eg. little used store room)	0	0
LIKELIHOOD OF DISTURBANCE Location	Outdoors	0	average = 1
Accessibility	Usually inaccessible or unlikely to be disturbed	0	
Extent/amount	> 50 m ²	3	
HUMAN EXPOSURE POTENTIAL Number of occupants	None	0	average = 0
Frequency of use of area	Infrequent	0	
Average time area is in use	< 1 hour	0	
MAINTENANCE ACTIVITY Type of maintenance activity	Minor disturbance (eg. possibility of contact when gaining access)	0	average = 0
Frequency of maintenance activity	ACM unlikely to be disturbed for maintenance	0	
Total priority assessment score			1
Material assessment score (supplied by surveyor)			4
Total of material and priority assessment scores			5

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