Managing Asbestos in Ireland

by

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DISSERTATION DECLARATION

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This thesis is submitted in part fulfilment of the HETAC requirements for the award of Master of Science in Environmental, Health and Safety Management. It is entirely my own work and has not been submitted to any other university or higher education institution, or for any other academic award. Where use has been made of the work of other people, it has been fully acknowledged and fully referenced.

Signature: Tara McNally

Tara McNally

Sept 2005

DEDICATION

This work is dedicated to my parents, whose love, support and encouragement has always inspired me to do my best.

ABSTRACT

Asbestos-containing materials were widely used in the past especially in the construction industry, where they were incorporated into numerous buildings, being used in roofing materials, insulation and fire protection.

The discovery of the negative health impacts caused by the inhalation of asbestos fibres led to the banning of the processing, manufacturing and new use of asbestos-containing products. However a significant amount of these products are still *in situ* in buildings built or refurbished between the 1950's and 1980's.

This study looks at how asbestos is managed in Ireland. Taking into consideration the impacts of asbestos on health and safety and on the environment.

Through the course of this study it was identified that there is a need for new regulations to be implemented in Ireland, requiring the development of an Asbestos Registry in all non-domestic premises. The Asbestos Register will require the identification of all asbestos present in the building, thus reducing the possibility of accidental exposures to asbestos fibres during maintenance, servicing, refurbishment, or demolition work.

There is also a requirement for people to be better educated about asbestos especially those in the construction sector, whose occupations and day-to-day activities could bring them into contact with asbestos-containing materials.

Due to the significant quantities of asbestos still remaining throughout Ireland, more landfill sites are required for the disposal of this material, thus reducing Ireland's dependency on other countries to dispose of its waste.

By establishing partnerships and clear pathways of communication amongst the competent authorities that are responsible for monitoring various aspects of asbestos, it will ensure a more efficient management of asbestos during its life cycle from identification on site to disposal.

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1. INTRODUCTION

Asbestos is a common name used to describe a number of very similar fibrous minerals. The most common types being Chrysotile, Crocidolite and Amosite, otherwise known as White, Blue and Brown Asbestos respectively. Natural deposits of asbestos minerals have been mined extensively since the beginning of the 20th century, especially in Russia and Canada.

Asbestos fibres are unique in that they are resistant to heat, fire and chemical attack, are flexible and very strong. It is these properties and more, that made asbestos an ideal component in thousands of different products worldwide. These products ranged from domestic appliances (ironing board covers, hair driers); to construction products (asbestos cement, pipes, roofing tiles); fire protection (insulation board, fire blankets); and textiles (ropes, theatre curtains). Asbestos was seen to be a 'magical mineral', a 'white gold' and at one stage was even addressed as 'Lady Asbestos', that was until the negative effects of this so-called 'magical mineral' were discovered.

After its extensive mining and processing and its installation in thousands of different buildings throughout the world, knowledge of the negative aspects of asbestos began to emerge, especially in relation to its effects on health. It transpired that people who were in contact with asbestos dust were beginning to develop various forms of respiratory cancers. It was further realised that the inhalation of asbestos fibres can cause health complications in the form of asbestos-related diseases, Asbestosis, Mesothelioma, and Lung Cancer. Soon after the realisation of its impacts on health the use of asbestos began to dwindle and over time its importation, processing and use have been prohibited in Ireland.

However, just because the use of asbestos and products containing asbestos were banned, does not mean that asbestos is no longer around. Over the years asbestos was used in so many different ways that there are still thousands of tonnes of the material still in place throughout the country. When undisturbed and in good condition, these materials are perfectly safe and can remain *in situ* until they reach the end of their serviceable life. But when people unknowingly come across these products, they can unintentionally disturb or damage the asbestos-containing materials and cause the asbestos fibres to be released. Proper identification and management of all asbestos-containing materials can greatly reduce the number of

people who come into contact with these materials, therefore preventing any unintentional damage occurring to the asbestos-containing materials.

Past activities not only exposed people to asbestos fibres but also released them into the environment. Past activities (processing and manufacturing), uses (the wearing down of automobile break linings), the weathering of asbestos cement products, (roofing tiles and water pipes) and bad removal, handling and disposal practices have all contributed to the release of asbestos fibres into the atmosphere. However, the introduction of these fibres has had little if any effect on the overall environment. The presence of asbestos fibres in the atmosphere does not impact on the quality of water or soil, but it does impact on the quality of air. The presence of asbestos in air poses a threat to health. The minute size of asbestos fibres allows them to be easily suspended in the air and transported great distances from the initial source. Due to the resistant nature of asbestos and its inability to be broken down, it can remain in the environment indefinitely or until it is trapped in a medium that it cannot be released from.

In Ireland asbestos is highly regulated under its own specific legislation and under more general legislation. Legislation specific to asbestos is comprised of the (Protection of Workers) (Exposure to Asbestos) Regulations, 1989 to 2000. These pieces of legislation outline the strict measures and precautions that must be followed in relation to asbestos in a place of work. The more general pieces of legislation include the Safety, Health and Welfare at Work Act, 1989, the Waste Management Act, 1996 and their subsequent regulations. The responsibilities of employers in protecting the health and safety of employees and the proper transportation and disposal methods for waste are outlined in these pieces of legislation respectively.

The objectives of this research is to look at asbestos and how it is managed in Ireland, taking into account its impact on health and safety and on the environment, as well as the legislation that regulates it. The shortfalls in relation to asbestos management in Ireland are addressed and recommendations on how they should be rectified are identified.

2. ASBESTOS AND ITS USES

2.1 HISTORY OF ASBESTOS

Knowledge of asbestos and the various ways in which it can be used have been around for hundreds, even thousands of years. Back in ancient times asbestos was used in a variety of different ways. It is believed that the Greeks named it according to one of its most impressive assets. Asbestos is a Greek word meaning "inextinguishable" or "indestructible" (www.heritageresearch.com). The Greeks and Romans are believed to have been one of the first civilisations to discover the numerous benefits of asbestos as well as its negative impacts on human health. However, the negative impacts were ignored in favour of the benefits that these unique products brought to society due to its exceptional characteristics. It is believed that asbestos was used in the past for the wicks of candles that were to continuously burn, in the cloth of funeral dresses for the cremation of kings and in Charlemagne's tablecloth which, according to legend he threw into the fire to clean. Descriptions of asbestos, its unique characteristics as well as its negative impacts date back to Strabo the Greek geographer, the Roman naturalists Pliny the Elder, and from the travels of Marco Polo.

The Greek geographer Strabo and the Roman naturalist Pliny the Elder both mentioned a sickness of the lungs in the slaves who wove the asbestos into cloth. Although they noticed this sickness in those who worked with asbestos, they were in such awe of asbestos's magical properties that they ignored this (www.mesoinfo.com).

Asbestos was also used circa 2,000 - 3,000 BC in Egypt to wrap embalmed pharaohs and in Finland to strengthen clay pots. In the Middle Ages it was used as insulation in suits of armour (www.heritageresearch.com). The use of asbestos seemed to decline after this and did not re-emerge until the 1700's, but it did not become as popular again until the late 1800's and during the industrial revolution.

The modern asbestos industry began in 1880 when large Chrysotile deposits in Canada and the USSR were mined (www.heritageresearch.com).

There are no natural asbestos deposits large enough in Ireland to mine, therefore asbestos had to be imported into Ireland either in its raw fibre form or as a

component of pre-made products. Production with the raw form of asbestos minerals was mainly carried out by 'Tegral Ltd.', an Irish based company that incorporated the benefits of asbestos minerals into their roofing products, such as roofing slates and tiles.

2.2 ASBESTOS MINERALOGY

Asbestos is a term given to a group of naturally occurring fibrous minerals, which have crystallised to form long thin fibres and fibre bundles. Asbestos is divided up into two main groups of fibrous minerals that make up what is commonly classified as asbestos; they are the Serpentine group and the Amphibole group of minerals. The Serpentine group have a sheet structure, while the Amphibole group is made up of a double chain structure.

Chrysotile commonly known as white asbestos is a member of the serpentine group. Belonging to the amphibole group are amosite, crocidolite, anthophyllite, tremolite and actinolite. Amosite commonly referred to as brown asbestos and crocidolite known as blue asbestos, are the two most significant of the amphibole minerals.

Serpentines are hydrous magnesium silicates that occur in three polymorphs: antigorite, lizardite and chrysotile. Chrysotile is the only fibrous member. Chrysotile fibres may range from 10 to 12cm in length and are composed of two layers of chemicals: a brucite layer and a tetrahedral layer. Chrysotile is a serpentine that has formed from ultrabasic (>90% magnesium content) igneous rocks (Mason & Thompson, 2002). Due to the presence of the two layers, chrysotile fibres tend to curl into hollow tubes.

Amphiboles are silicates of calcium, magnesium, iron, sodium, and aluminium. Amphibole fibres tend to be straight and splintery (Mason & Thompson, 2002).

Silicate minerals are classified by the number and arrangement of silicate tetrahedral in the repeating units in the crystal lattice. Chrysotile is classified as a sheet of silicate and other types of asbestos are chain silicates (HSE, 2005).

Table 2.1 Composition of Asbestos Minerals (HSE, 2005)

ASBESTOS VARIETY	NOMINAL COMPOSITION
Serpentine group of minerals	
Chrysotile (white)	$Mg_3(Si_2O_5)(OH)_4$
Amphobile group of minerals	
Crocidolite (blue)	$Na_2.Fe_2^{3+}(Si_8O_{22})(OH)_2$
Amosite (brown)	$(Fe^{2+},Mg)_7(Si_8O_{22})(OH)_2$
Anthrophilite	$(Mg,Fe^{2+})_7(Si_8O_{22})(OH)_2$
Actinolite	$Ca_2(Fe^{2+},Mg)_5(Si_8O_{22})(OH)_2$
Tremolite	$Ca_2Mg_5(Si_8O_{22})(OH)_2$

2.3 MINING OF ASBESTOS MINERALS

Asbestos is a term used to describe a group of similar fibrous minerals that occur naturally in nature. Since people have discovered the valuable diverse properties of these fibres, they have been mined extensively wherever they occur in sufficient quantities to sustain mining projects.

Asbestos minerals occur in thin parallel veins generally between 1mm and 5cm thick within other rocks. The fibres run from top to bottom of the vein. The rock containing the asbestos mineral is normally dug from open cast quarries and is progressively crushed and milled to release the fibres. The asbestos fibres are then washed or blown from crushed rock and collected on screens (Diberardinis, 1947-). More recently, an alternative method of mining was developed in order to reduce fibre air emissions. This method uses bulldozers and scrapers (rather than blasting) to remove the ore from the pit. The ore is watered down to prevent air dispersion of the fibres and is crushed, sized and screened while wet. After being dewatered the fibres are pelletised, dried and prepared for shipment either as pellets or further processed to yield open fibres (ATSDR, 2001). The production and use of asbestos has declined greatly over the years due to increased knowledge and evidence of the health hazards associated with the mineral and the growing bans on its production and use in numerous countries. According to the ATSDR (2001), the production volume of asbestos mines in the United States has decreased substantially from a

peak of over 299 million pounds (equivalent to 136,000 metric tonnes) in the late 1960's and early 1970's to approximately 13.2 million pounds (equivalent to 6,000 metric tonnes) in 1999. There still continues to be extensive sales and use of asbestos in South and Central America, Asia and Africa.

World production was estimated as 1.9 million metric tonnes in 1996. The leading producers in decreasing order of production volumes were Russia, Canada, China, Brazil, Zimbabwe and Kazakhstan (Table 2.2). Nearly all the asbestos produced worldwide is chrysotile; over 99% of asbestos used in the U.S. has been chrysotile (ASTDR, 2001).

Table 2.2 Quantities of Asbestos produced in 2000 (LaDou, 2004)

Country	Tons
Russia	752,000
China	350,000
Canada	320,000
Brazil	209,000
Kazakhstan	179,000
Zimbabwe	152,000
Greece	32,000
South Africa	19,000
India	15,000
Swaziland	13,000
United States	5,000
Iran	2,000
Other countries	2,000
Total	**2,050,000**

Asbestos mining has never occurred in Ireland due to the lack of significant quantities of natural asbestos deposits. However, asbestos does occur naturally in Ireland. The Geological Survey of Ireland has recorded 18 asbestos deposits throughout Ireland (Poole, G. Pers. Comm.). The locations of these deposits can be seen in Figure 2.1.

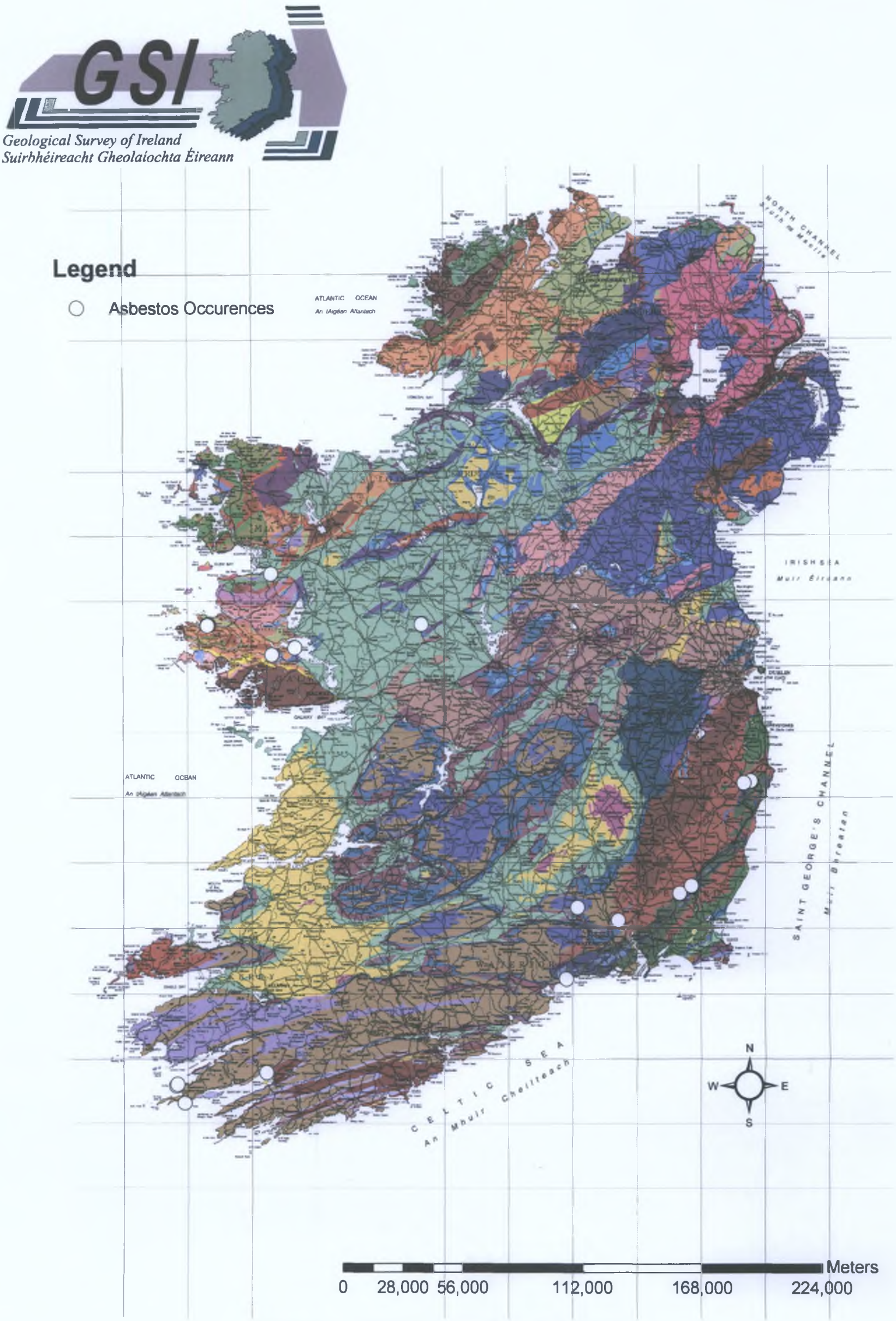


Figure 2.1 Natural Asbestos Deposits in Ireland

2.4 PROPERTIES OF ASBESTOS

Tweedale (2000) states how asbestos was described as one of the most 'marvellous productions' of inorganic nature -'a physical paradox' - that combined the properties of rock and silk and could be spun into strands that weighted less than an ounce in a hundred yards.

Over the years asbestos was seen to be an ideal material due to it numerous beneficial chemical and physical properties, such as its;

- flexibility,
- fine fibres,
- high tensile strength,
- incombustibility,
- low thermal conductivity,
- electrical resistance,
- resistance to chemical attack,
- insolubility in water,
- resistance to evaporation and
- robustness.

Due to these extraordinary properties asbestos minerals have been used in over 3000 product applications in numerous industries. Asbestos minerals have been incorporated in a wide range of applications from building products (roofing, insulation, cement, fire-proofing), to domestic appliances (oven gloves, ironing board covers) and to the automobile industry (break pads, linings, clutch facings, gaskets). Asbestos has been known to provide protection against fire, corrosion, cold, alkalis, electricity, noise, energy loss, vibration, salt water, frost, dust and vermin.

The individual asbestos minerals have unique properties, which means that they are better suited to certain applications over other types of non-asbestos minerals. Whether it is to provide extra strength in cement or fire resistance to materials, these special qualities make them ideal for different situations and products.

Tweedale (2000) proclaims that Chrysotile (white) asbestos has been the most predominant asbestos mineral used, accounting for 95% of the worlds' production. Chrysotile's fine silky soft fibres, excellent flexibility and toughness as well as its supremacy to heat resistance make it ideal for spinning into heat resistant materials. However, it is subject to attack by strong acids. Over the years it has mainly been used in asbestos textiles and asbestos cement.

Crocidolite (blue) asbestos is harsh, reasonably resistant to heat and to very strong acids. It has mainly been used in asbestos textiles and spray (Tweedale, 2000).

Amosite (brown) asbestos is coarse with straight fibres and is usually brittle. It is heat resistant and is mainly used in preformed slab-type thermal insulation and spray application (Tweedale, 2000).

2.5 USES OF ASBESTOS

Records of asbestos use go back as far as 4,500 BC, however its use as a commercial product did not take off until the 1880's. The peak usage of asbestos occurred between the 1960s and 1970s.

Asbestos was seldom used on its own as pure asbestos fibres but rather was combined with other products to add strength and stability or fire resistance to them. In most of its applications, asbestos was used either as a bonding agent mixed with other products (Portland cement, plastics, or resins) or it was woven into textile (Mason & Thompson, 2002). Asbestos can be found in materials from a few percent up to 90% depending on the material in question. Asbestos fibres are divided up into spinning and non-spinning fibres. The spinning fibres are longer and are the most valuable because they can be woven into cloth. Non-spinning fibres have shorter lengths and are less valuable (Mason & Thompson, 2002). Table 2.3 outlines some of asbestos products with the type and approximate quantity of asbestos fibre incorporated in the materials.

Table 2.3 Asbestos Fibre Usage (Byrne, 1989)

Product	Asbestos Type	Approximate Content
Asbestos Cement Products	Chrysotile	10 – 15 %
Fire resistant insulation boards	Amosite	20 – 30%
Sprayed insulation	All Types	12 – 100%
Friction materials	Mainly Chrysotile	7.5 – 70%
Textile products	Chrysotile	65 – 100%
Floor coverings	Chrysotile	5 – 10%
Fillers & Reinforcements – seals, mastics, adhesives, special paints	All Types	25 – 98%

The main categories of asbestos use have been in buildings, in numerous different applications mainly due to their varying properties. Asbestos can be found in buildings in four main categories: insulation, fireproofmg, soundproofing, and in building products. A list of asbestos containing products is given in Appendix I.

2.6 QUANTITIES OF ASBESTOS-CONTAINING MATERIALS IN IRELAND

The exact values for the amount of raw asbestos or asbestos-containing materials (ACMs) that have been imported into Ireland over the years is unclear but an estimation can be obtained from the records held by the Central Statistics Office (CSO), (Comber, H. Pres. Comm.). From these records it is estimated that over 689,019 tonnes of asbestos-containing materials were imported into Ireland between 1948 and 2004. An estimated 429,193 tonnes has been exported from Ireland for the years 1963, 1964 and 1974 to 2004. No figures are available for asbestos exports between 1964 and 1974. Taking this into consideration there still remains a significant amount of asbestos still in Ireland. The exact volume of asbestos products still *in situ* throughout Ireland is unclear because of the extent of illegal

removal and disposal activities that have taken place throughout the years and the amount of asbestos waste properly disposed in licensed landfill sites in Ireland.

It is predicted that any building built or refurbished before the late 1980's has a high probability of containing some sort of asbestos-containing material. According to records held by the Irish Government, 453,740 houses were built in Ireland between 1950 and 1980 (O'Reilly, E. Pers. Comm.). In Ireland a ban was placed on the spraying of asbestos onto any surface under the European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989. An additional ban was placed on the use of low-density asbestos materials in 1993 under the European Communities (Protection of Workers) (Exposure to Asbestos)(Amendment) Regulations, 1993 and it was not until 2000, that a stricter ban was placed on all products containing any type of asbestos mineral, under the European Communities (Dangerous Substances and Preparations) (Marketing and Use) Regulations, 2000. These bans were to be implemented over a phased basis until January 2005 when all placing on the market and use if asbestos fibres and of products containing asbestos fibres were to be completely prohibited.

According to the Health and Safety Executive's 'Working with Asbestos in Buildings' (HSE, 2001*d*) asbestos is likely to be in a building if it was built or refurbished between 1950 and 1980 and particularly if it also has a steel frame and/or it has boilers with thermal insulation. In England, asbestos has been the subject of gradual voluntary and formal bans since 1969 (HSE, 2002).

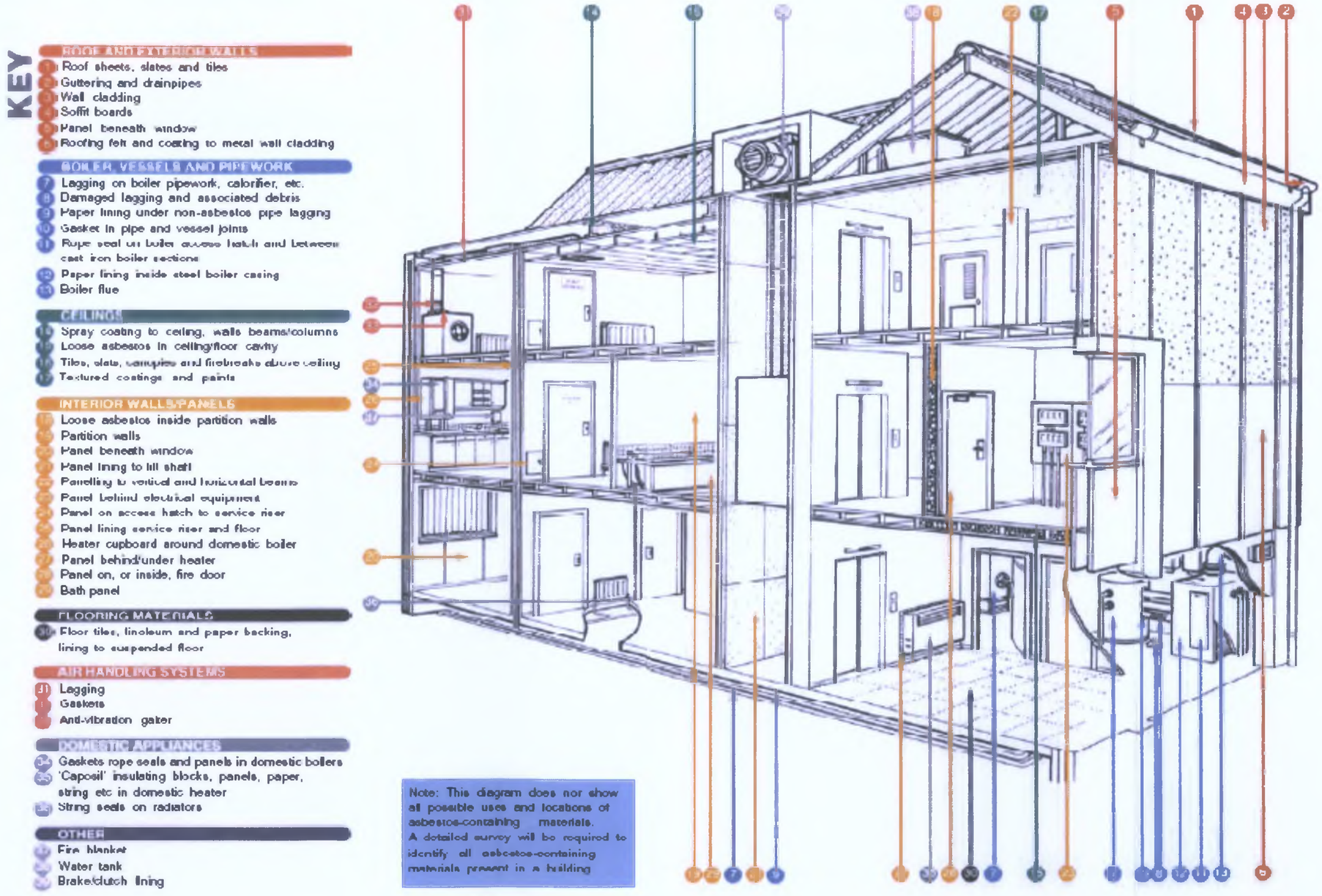


Figure 2.2 Building with typical locations of asbestos-containing materials (HSE, 2001 *b*)

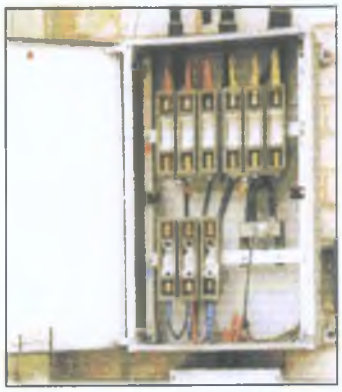
Asbestos fire blanket

Gasket material adhering to a pipe flange

Asbestos-containing vinyl floor tiles

Asbestos cement vertical cladding

Asbestos cement external flue, rainwater gutter and profile roofing sheets



Asbestos tape flash guards in a fuse box

Figure 2.3 Some examples of asbestos-containing materials

2.7 ASBESTOS SUBSTITUTES

Since the banning of asbestos production and asbestos products in so many countries, there has been a continual strive for substitutes to this versatile material. To-date no single substitute is as versatile and as cost effective as asbestos. The National Occupational Health and Safety Commission in Australia (2002) suggests that, when considering alternative materials, account should be taken of all health risks associated with the manufacture, use, transport, storage and disposal of the alternatives proposed.

Non-asbestos friction materials are currently being used in automobile disc brake pads and substitutes have been developed for drum brake linings. Substitutes include fibres made of carbon, steel, cellulose, ceramics, glass, wollastonite and organic fibres made from aramid, polyethylene, polypropylene and polytetrafluoroethylene (ASTDR, 2001). According to the HSE (2003), several types of non-asbestos fibres have been substituted for asbestos and have been developed for use in a wide range of products. The main non-asbestos fibres in current use are polyvinyl alcohol (PVA), aramid and cellulose. Corrugated polyvinylchloride (PVC) and steel sheeting have become very popular alternatives to asbestos cement sheets.

Table 2.4 Some examples of modern substitutes to asbestos fibres in products (HSE, 2003)

Use	Substitute fibres
Asbestos cement - *profiled sheet* - *slates*	PVA and Cellulose
Friction materials	Aramid and glass fibres
Gaskets and seals - *Gaskets* - *Packings* - *Braided packings* - *Valve stem seals*	 Aramid fibre and expanded graphite Aramid and acrylic fibres, graphite and polytetrafluoroethylene (PTFE) Carbon fibres and PTFE Aramid fibres and graphite
Composites	Aramid, glass, synthetic and carbon fibres
Textiles	Aramid and synthetic fibres

3. HEALTH AND SAFETY ISSUES RELATING TO ASBESTOS

3.1 ASBESTOS-RELATED DISEASES

Asbestos' mineral structures allow them to be easily split into small fibres making them an ideal component in many products. However, this ability to divide does not stop after processing. The asbestos fibres are able to continue to divide into smaller fibres. As the fibres continue to split up into smaller and smaller fibres, they can become a hazard to health. Due to their minute size these fibres can easily become air borne if released into the atmosphere. Once in the atmosphere, unknowing victims can effortlessly inhale the miniscule fibres. Their microscopic size means that the tiny fibres can reach deep into the respiratory system where they cause most damage.

According to the Diberardinis (1947-), the fibres that are deemed to be the most significant as far as the health risk is concerned are those that may be inhaled and deposited in the alveolar region of the lung. These are called respirable fibres.

Tweedale (2000) states that not all inhaled asbestos dust is harmful; many particles are caught by the body's natural defence mechanisms (the mucous linings of the noise and throat which trap the foreign particles and causes them to be coughed out or swallowed.) However, the body's defences are largely ineffective with the finest asbestos fibres and once inhaled they can penetrate deep into the most sensitive areas of the lungs – the respiratory bronchioles, alveolar ducts and alveoli – where they can trigger pathological reactions.

The fibres that are not expelled from the respiratory system accumulate in the lungs causing scarring and inflammation. These reactions affect the normal function of the lungs and can lead to asbestos-related diseases.

The extent of the risk associated with exposure to asbestos dust can be determined from a number of different factors. These factors include the dose (how much dust exposed to); the duration (length of time exposed to the fibres); the fibre type (mineral form and size distribution); and how contact with the asbestos dust occurred. Each of these factors can lead to different types of asbestos-related diseases occurring.

There are also some beliefs that exposure to asbestos can cause gastro-intestinal cancers. However after carrying out a review on the adverse effects of asbestos on health, Doll & Peto (1985) concluded that there are no grounds for believing that gastro-intestinal cancers are particularly likely to be caused by asbestos exposure.

Knowledge about asbestos-related diseases has been around for years. The symptoms of what is now known as asbestos-related disease first appeared around 1906 but it was not until the late 1920s that any steps were taken to protect the workforce in the rapidly expanding industries (Byrne, 1989). However, even with this knowledge there are no known permanent cures for asbestos-related diseases to date.

The three diseases most commonly associated with asbestos exposure are; Asbestosis, Mesothelioma and Asbestos related Lung Cancer.

3.1.1 Asbestosis

Asbestosis is a respiratory disease caused by inhaling asbestos fibres. Inhaling asbestos fibers can cause scar tissue (fibrosis) to form inside the lung. Scarred lung tissue does not expand and contract normally (http://www.nlm.nih.gov/medlineplus). This results in the normal lung function being restricted. The more scar tissue (fibrosis) built up the more restricted the movement of the lungs become and therefore the more difficult it is for the victim to breath.

The severity of asbestosis depends both on the amount of asbestos to which the individual has been exposed and the length of time since exposure first began (Doll & Peto, 1985). Manifestation of asbestosis rarely occurs within 10 years after exposure and more often does not appear within 20 years or more.

3.1.2 Mesothelioma

Mesothelioma is a cancerous tumor of the pleura (lining of the lung and chest cavity) or peritoneum (lining of the abdomen) that is almost always caused by sustained exposure to asbestos (http://www.nlm.nih.gov/medlineplus). Doll & Peto (1985) in their review of the health effects of exposure to asbestos state that the delay between first exposure and effect is longer for mesothelioma than for most other cancers; it is seldom less than 15 years, and possibly never less than 10 years. The hazard of exposure to asbestos fibres appears to be more strongly dependent on the type of asbestos.

3.1.3 Lung Cancer

Lung Cancer is caused by damage to cells in the lungs. This damage causes a change in the reproductive characteristics of the cells, which as in most cancers, results in a tumour. Lung cancer is a malignant tumour that invades and obstructs the lung's air passages (ATSDR, 2004). Individual lung cancers that are caused by asbestos are unfortunately, indistinguishable from those that are caused by cigarette smoking or by most of the other agents, which together with asbestos are responsible for making lung cancer the commonest type of cancer to cause death in the population as a whole (Doll & Peto, 1985). Cigarette smoking greatly increases the likelihood of a person developing lung cancer as the result of asbestos exposure (ATSDR, 2004).

Exposures to asbestos fibres have also been known to cause Pleural Plaques. These are small areas of scarring on the lining of the lungs (pleura). Pleural plaques are discrete fibrous or partially calcified thickened areas, which arise from the surface of the parietal pleura. Pleural plaques do not become malignant or normally cause impaired lung function (Diberardinis, 1947-).

3.1.4 Reported Asbestos Related Diseases

In Ireland the National Cancer Registry of Ireland maintains a registry of cancer cases that occur throughout Ireland. The organisation was established in 1991 and began to keep a registry of cancer cases since January 1994. Since 1991 there have been 177 cases of diagnosed Mesothelioma reported in Ireland. A break down of these figures can be seen in Table 3.5 and is illustrated in Figure 3.4. The National Cancer Registry of Ireland has no records of asbestosis cases being diagnosed in Ireland since 1991. Consideration must also be given to the fact that there is a possibility that not all asbestos related diseases that occurred in Ireland were reported.

Table 3.5 Number of cases of Mesothelioma in Irish males and females over various age groups between 1994 and 2003.

	Female						Male						
Age / Year	0-19	20-39	40-59	60-80	>80	Female total	0-19	20-39	40-59	60-80	>80	Male total	All
1994	0	0	1	0	0	1	1	0	0	6	1	8	9
1995	0	1	2	0	0	3	0	0	7	6	2	15	18
1996	0	0	0	0	0	0	0	1	5	8	1	15	15
1997	0	0	3	1	0	4	0	0	8	13	0	21	25
1998	0	0	1	0	0	1	1	0	3	8	0	12	13
1999	0	1	1	5	0	7	0	0	3	5	3	11	18
2000	0	0	2	3	0	5	0	0	5	9	0	14	19
2001	0	1	0	1	0	2	0	0	4	14	1	19	21
2002	0	0	0	1	0	1	1	0	4	9	0	14	15
2003	0	0	1	3	0	4	1	0	5	14	0	20	24
All	0	3	11	14	0	28	4	1	44	92	8	149	177

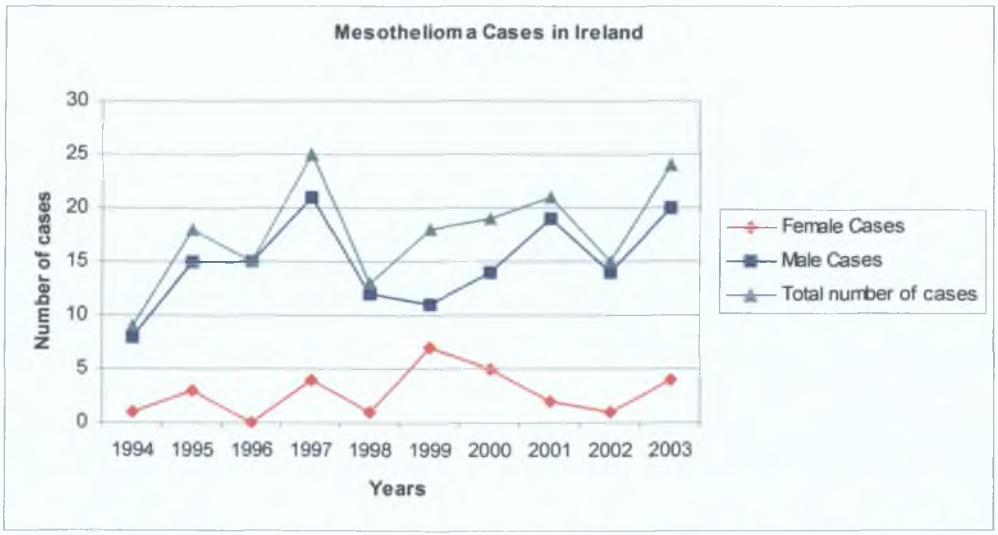


Figure 3.4 Trend in the occurrence of Mesothelioma cases in Ireland between 1994 and 2003.

According to a study carried out by the HSE, Mesothelioma Occupational Statistics, male and female deaths in people aged 16 – 74 in Great Britain between 1980 – 2000 (excluding 1981) in the UK, the number of deaths due to Mesothelioma has increased almost threefold between 1980 and 2000, from 2,317 in 1980-85 (excluding 1981) to 6,475 in 1996-2000.

There were roughly 1848 deaths from Mesothelioma in Great Britain in 2001. It is estimated that there are between 1 and 2 cases of lung cancer each year attributable to asbestos for every mesothelioma case. There were estimated to be at least 160 deaths from asbestosis in the year 2001 (www.hse.gov.uk/statistics 22/03/2004). The HSE predicts that the number of Mesothelioma deaths in Great Britain will peak between 1,950 and 2,450 sometime between 2011 and 2015.

3.2 RISK EVALUATION

Asbestos and asbestos-containing products have been installed in a wide range of different locations throughout the years, such as in schools, public buildings, offices, factories, farms and houses. The presence and extent of asbestos-containing materials in some premises is not known, therefore a survey of the premises should be carried out in order to identify any materials that contain asbestos fibres. The identification of these materials helps the occupiers to take the appropriate measures to ensure the health and safety of the occupants is maintained.

The Health and Safety Executive (HSE) in their 'Methods for the Determination of Hazardous Substances, MDHS 100'(HSE, 2001), outline three different types of surveys that can be carried out in a premises'. The type of survey that should be carried out depends on the aim and purpose for which it is to be used. The choice of surveys are,

- Type 1: Location and assessment survey (presumptive survey). This type of survey involves determining the location and extent of any suspected asbestos-containing materials (ACMs) in the premises and evaluates their condition. No sampling or analysis for asbestos is carried out at this stage.

- Type 2: Standard sampling, identification, and assessment survey (sampling survey). The purpose and procedures used in this survey are the same as for Type 1, except that representative samples are collected and analysed to confirm whether or not asbestos is present and if so determine what type of asbestos it is.

- Type 3: Full access sampling and identification survey (pre-demolition/major refurbishment surveys). This type of survey is used to locate and describe all asbestos-containing materials in the building. It may involve some destructive inspection for the hard to reach areas. This survey is intended to identify all the asbestos-containing materials to be removed from the building prior to demolition or major refurbishment. This type of survey does not assess the condition of the asbestos.

3.2.1 Degree of Risk

If analysis of material samples confirms the presence of asbestos, the potential exposure of persons entering the building or other structure should be evaluated. Many factors associated with the condition and composition of the material need to be assessed in this process (NOHSC, 2002).

The level of risk associated with asbestos containing materials varies from location to location. A number of factors need to be taken into consideration when determining the degree of risk associated with the asbestos containing materials in question. These factors include:

- Location
- Surface Treatment
- Damage Potential
- Condition
- Friability
- Composition

- Location: this looks at whether the asbestos-containing material is inside or outside a building and if air movements such as air conditioning and heat affect it. The location can help determine the level of damage possible from erosion, the likelihood of disturbance, how often people come into contact with it and ultimately its potential to be damaged. For example if the asbestos-containing material is located in an isolated room that is never used then the risk is not as high as it would be if it were located in a regularly occupied room.

- Surface Treatment: this relates to whether or not there is a seal over the asbestos source i.e. a skin or jacket, painted with a sealant or no effective cover. The potential for damaged is reduced if there is a seal around the asbestos preventing it from releasing fibres.

- Damage Potential: this is related to the location of the asbestos-containing material and how easily it could be damaged i.e. if it is located in a public building, or in a private dwelling or if it is situated in an area/building that is used regularly and the asbestos-containing material is in a condition that could easily release fibres.

- Condition: this covers the condition of the asbestos-containing material. Whether it is cracked, punctured, broken or seriously damaged. This relates to the materials potential to release asbestos fibres.

- Friability: this is the ability and ease at which the material can release fibres into the air, e.g. broken insulation pipe has a high friability while cement sheeting has a low friability.

- Composition: this is addressed as low, medium or high, reflecting the types of asbestos present. Chrysotile is considered to be less hazardous than Amosite or Crocidolite. It also relates to the percentage of asbestos used to make up the material in question. The number of fibres found in a sample determines this.

When assessing the degree of risk associated with an asbestos-containing material, none of these factors can be looked at individually, but must be considered together. For example, it is more important to address an issue where a piece of insulation on the back of a door that is regularly knocked against and slightly damaged rather than deal with a badly damaged piece of insulation that is located in an unoccupied room. The risk to people's health due to them coming into contact with asbestos-containing materials is largely dependent on the friability of the fibres in the product. The more friable the product the greater the chance of an individual or individuals becoming exposed to the asbestos fibres, which can ultimately lead to asbestos related diseases.

3.2.2 Who is at risk?

Anyone who comes into contact with damaged or deteriorated asbestos or materials containing asbestos may be at risk from inhaling asbestos fibres that are being released into the air.

People who are involved in the building trade are mostly the victims of exposure to asbestos fibres and the subsequent asbestos related diseases. The building trade puts people in situations where they are exposed to asbestos fibres due to the type of work they do, the environment in which they work and the materials they encounter in their day-to-day activities or because work involving asbestos is being carried out near them. General work activities such as drilling, cutting, sanding and sawing into different fabrics and materials have the potential to expose these individuals to asbestos fibres, if the proper precautions are not taken. Some of the trades in which people may become exposed to asbestos fibres is given in Table 3.6.

Table 3.6 People most at risk from being exposed to asbestos fibers due to their occupation

▪ Builders	▪ Gas service engineers
▪ Demolition contractors	▪ Heating & ventilation Engineers
▪ Plumbers	▪ Carpet fitters and fitters of other floor finishes
▪ Carpenters	▪ Maintenance staff, including contract staff & caretakers
▪ Electricians	▪ Roofing contractors
▪ Shop fitters	▪ Gas service engineers
▪ Joiners	▪ Cleaners
▪ Computer installers	▪ Plasterers
▪ Cabling installers	▪ Painters & decorators
▪ Fire & burglar alarm installers	▪ DIY Enthusiasts
▪ Telecommunications engineers	▪ Other trades that need to gain access to roof voids, under-panelling and similar 'hidden' areas

3.3 MEASUREMENT OF ASBESTOS FIBRES

3.3.1 Air Sampling

Measurement of asbestos fibres involves air sampling and then analysis of the collected sample. Air sampling involves drawing a known flow rate of air through a filter for a measured time so that airborne particles are collected. The filter is then prepared for micorscopic examination. A known fraction of the filtered deposit is examined using an X 500 magnification phase contrast microscopy to count all fibres seen (particles >5μm long, <3μm wide and a length to width [aspect ratio] of >3:1) in a known number of graticule areas. The calculated total number of fibres collected on the filter, is divided by the volume of air sampled to determine the fibre concentration in terms of fibre per milliliter of air (f/ml) (HSE, 2005).

Points to follow when carrying out Air Sampling

- Air samples are taken from within the breathing zone of the individual workers, preferable within 200 mm of the noise and mouth of the individual.
- The filter holder should point downwards and be fixed to the lapel, hood or shoulder of the workers.
- Membrane filters made from mixed esters of cellulose or cellulose nitrate, with a pore size of between 0.8 and 1.2 micrometers are used. The filter should have a diameter of 25mm with printed grids. The printed grids are on the sampling side of the filter where the particles are collected.
- An open-faced filter holder, fitted with a cylindrical cowl that reaches between 33 and 44mm in front of the filter and which exposes a circular area of at least 20mm in diameter is used. The coweled filter holder protects the filter and ensures a uniform deposit.
- The air sample is taken with a small portable pump that draws in air at a rate of 1.0 litre per minute ±5%. The pump must give a smooth airflow and be capable of maintaining the flow rate during the sampling period.
- Personal sampling pumps must be light, portable and capable of being fitted to a belt. Static sampling pumps should be positioned with the sampling head between 1 – 2 metres above ground level.
- Ideal fibre loading on the filters is within 100 and 400 fibres/mm^2.

(HSE, 2005).

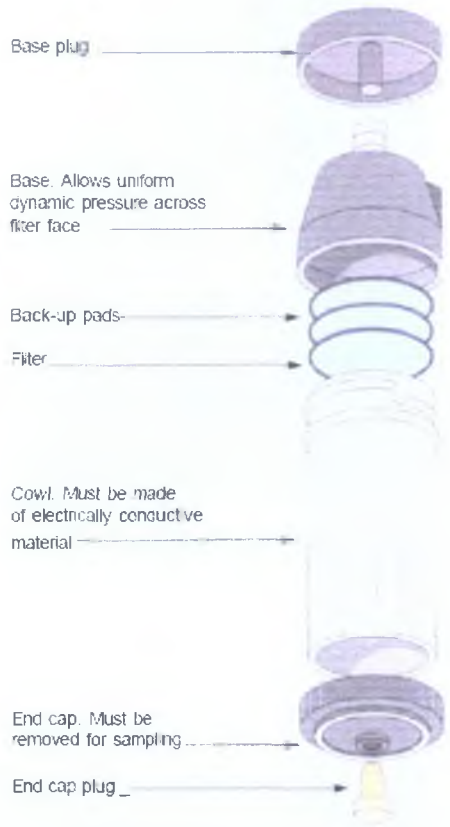


Figure 3.5 Exploded view of a personal sampling head (HSE, 2005)

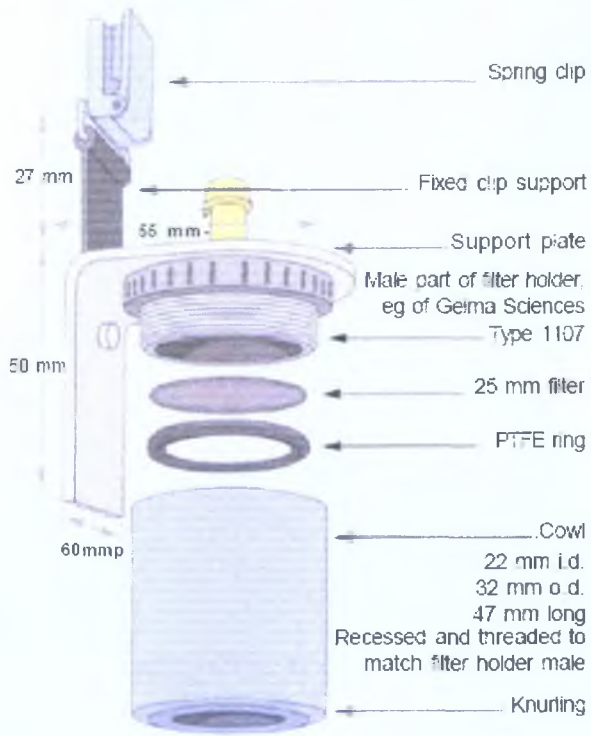


Figure 3.6 Exploded view of a sampling head with a metal cowl (HSE, 2005)

3.3.2 Calculation of Asbestos Fibres

The calculation of asbestos fibers is applied when the quantity of asbestos fibres present in the air is to be determined. This is accomplished by taking a sample of the air from the area in question and calculating the number of asbestos fibres obtained in the sample, thereby determining the quantity of asbestos fibres present in the air. The calculation of the quantity of asbestos fibres present in an air sample is achieved by carrying out the following procedures.

- Once air sampling has been carried out the filters are removed from the sampling head and placed on a microscope slide. The filter is made transparent using the acetone-triacetin method and covered with a glass coverslip.
- Acetone and glycerol triacetate ('triacetin') are used for filter clearance.
    - The principle is that condensing acetone vapour collapses the filter pores, adhering the filter to the glass slide and turning it into a transparent plastic film with any asbestos fibres contained close to the upper surface. Triacetin is used to provide the interface between the collapsed filter and coverslip (HSE, 2005).
- A binocular microscope with Koehler illumination and a Walton-Beckett circular graticule are used to count the asbestos fibres.
- Only fibres with a length of more than 5 micrometers and a length to breadth ratio greater than 3 to 1 are counted.
- Graticule areas counted are chosen at random.
- 100 fibres are to be counted which means a minimum of 20 graticule areas are examined, or 100 graticule areas are examined.
- The mean number of fibres per graticule is calculated by dividing the number of fibres counted by the number of graticule areas examined.

$$*\text{Concentration in air} = \frac{(\text{number per graticule area} \times \text{exposed area of filter})}{(\text{graticule area} \times \text{volume of air collected}).}$$

*(European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989)

Examples of countable and non-countable fibres can be seen in Appendix II.

3.3.3 Frequency of Air Sampling for Asbestos

- At any work place where there is a likelihood of exposure to asbestos occurring, the air at the place of work is sampled as a general rule, at least every three months, and whenever a technical change has been introduced to the area.
- The frequency of sampling may be reduced to once a year, where

(i) there has been no significant change in conditions at the work place, and

(ii) the result of two proceeding measurement has not exceeded half of the limit values set according to the European Communities (Protection of Workers) (Exposure to Asbestos) (Amendment) Regulations, 1993. The limit values for the concentration of asbestos fibres in the air at a place of work when measured or calculated in relation to an eight-hour reference period shall be- (a) for chrysotile – 0.6 fibres per millimetre of air, (b) for all other forms of asbestos either alone or in mixtures – 0.3 fibres per millimetre of air.

- The duration of sampling must be sufficient so as to provide a representative sample for exposure over an eight-hour reference period (a typical full workday).

3.3.4 Qualitative Identification of Asbestos Fibers

Qualitative identification is used to identify the type of asbestos fibre present. According to the Health and Safety Executive's (2001*b*) MDHS 100, the most widely used laboratory method for identifying asbestos fibres is by a low magnification stereomicroscope examination followed by polarised light microscopy (PLM). This method involves shining polarised light through the asbestos samples in order to identify the type of fibres present.

Before PLM can be used to identify the type of asbestos fibre present, a series of procedures are applied. Firstly the entire sample is examined by eye in the laboratory to describe the type of material or product present and to establish whether or not visible fibres are present. The appearance, colour and texture of the sample and any presumed fibre types are recorded. The sample is then treated to release fibres from any matrix that may be present and to remove any fine particles adhering

to the fibres. Dilute acetic acid (e.g. 50%) or cold hydrochloric acid (e.g. 10%) may be used to treat the sample.

A stereo microscope is used for initial examination. The stereo microscope is used to detect small fibre bundles or individual fibres and to assess the proportion of fibres present and provisionally assign fibre types based on their appearance. Generally asbestos is recognised by the fineness of its fibres, which are often present in closely packed bundles of fibrils that will divide along their length when pressure is applied on them. This can be achieved using a probe or tweezers.

The stereo microscope is used to identify the physical properties of the sample which when known will aid in the selection of the most appropriate Refractive Index (RI) mounting liquid to be used. Each asbestos fibre type has its own unique properties. By identifying the properties of the sample it will help to determine the most probable asbestos fibre present and thus the most appropriate RI to be used for PLM (Table 3.7). The properties examined include

- Morphology
- Colour and pleochroism
- Birefringence
- Extinction characteristics
- Sign of elongation
- RI assessment.

Table 3.7 **Physical properties identified using a stereomicroscope to determine the choice of RI liquid for PLM identification of asbestos fibre type (HSE, 2005)**

Physical property/appearance						
Colour	Colourless/white	Colourless/white to grey brown			Greenish-grey deep blue	
Texture	Soft with bundles of sinuous fibres	Soft or harsh; may appear as easily visible parallel fibre bundles			Straight fibres easy to handle	
Appearance	Flexible fibres which cling to tweezers	Straight fibres easy to handle			Straight fibres easy to handle	
Lustre	Silky	Vitreous	Vitreous	Vitreous	Vitreous	Metallic (dark & highly reflective)
Tensile strength	High	High	Medium	Low	Low	High
Tenacity	Flexible	Flexible	Flexible	Flexible	Flexible	Flexible
Elasticity	Inelastic	Elastic	Elastic	Elastic	Elastic	Elastic
Tentative asbestos type	Chrysotile	Amosite	Anthophyllte	Tremolite	Actinolite	Crocidolite
RI liquid for test	1:550	1:670	1:605	1:605	1:640	1:700

Identification of asbestos fibres is achieved by comparing the recorded observations on the fibres selected for analysis (and mounted in the appropriate RI liquid) against the properties of asbestos reference standards.

The RI of an asbestos fibre is assessed by mounting the clean separated fibre in a liquid of known RI and orienting it either parallel or perpendicular to the polariser vibration direction. When the RI of the liquid and the fibre RI are equal, match point is achieved. Dispersion staining is then used to observe the colour effects displayed when using white light. Dispersion is a term used to describe the variation in RI with the wavelength of light. The colour effects displayed are compared to reference standards held by the HSE to identify the type of asbestos fibre present. Examples of asbestos reference samples viewed by polarized light microscopy are given in Figure 3.7.

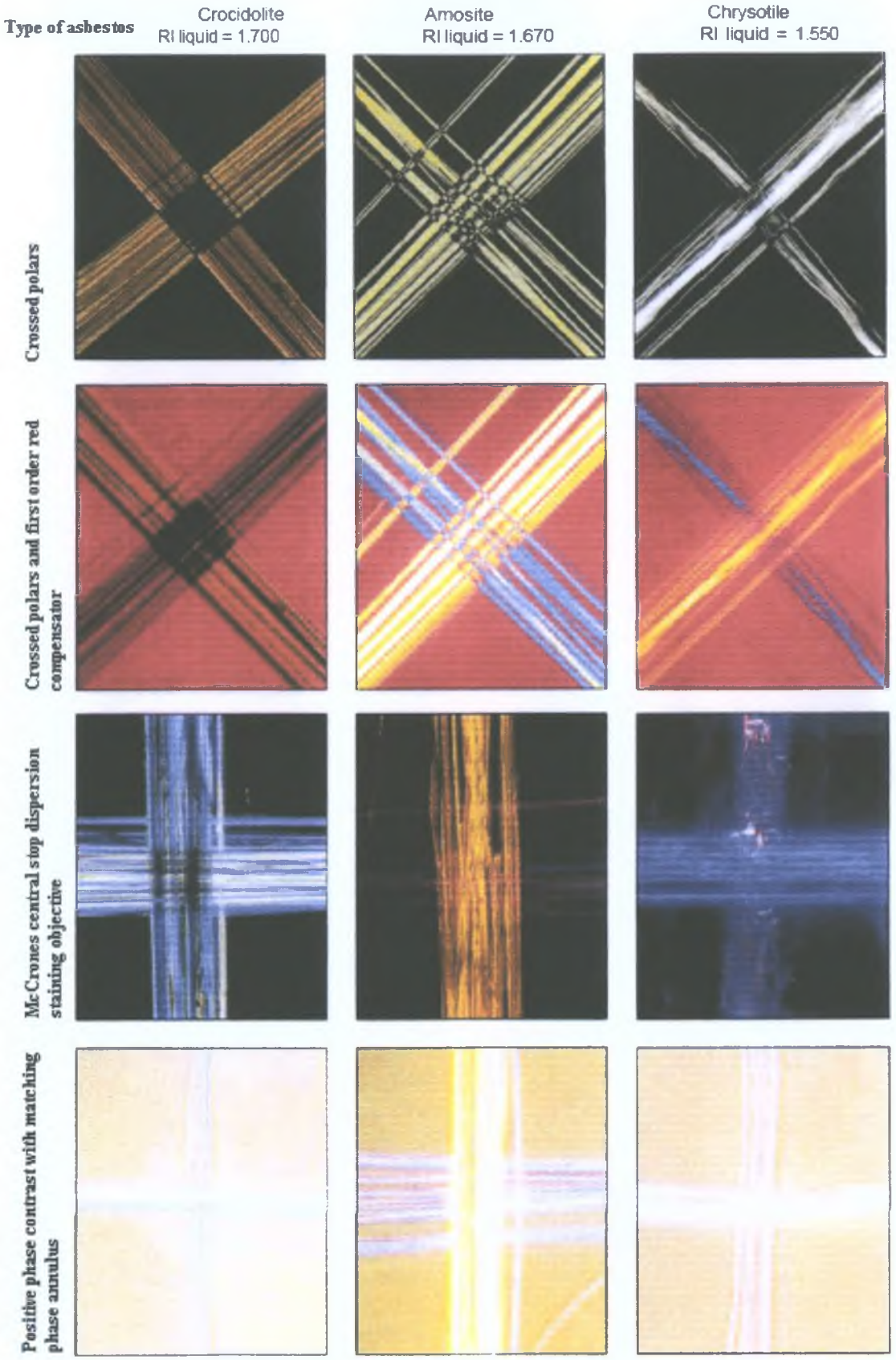


Figure 3.7.1 Asbestos Reference Samples Viewed by Polarised Light Microscopy (HSE, 2005)

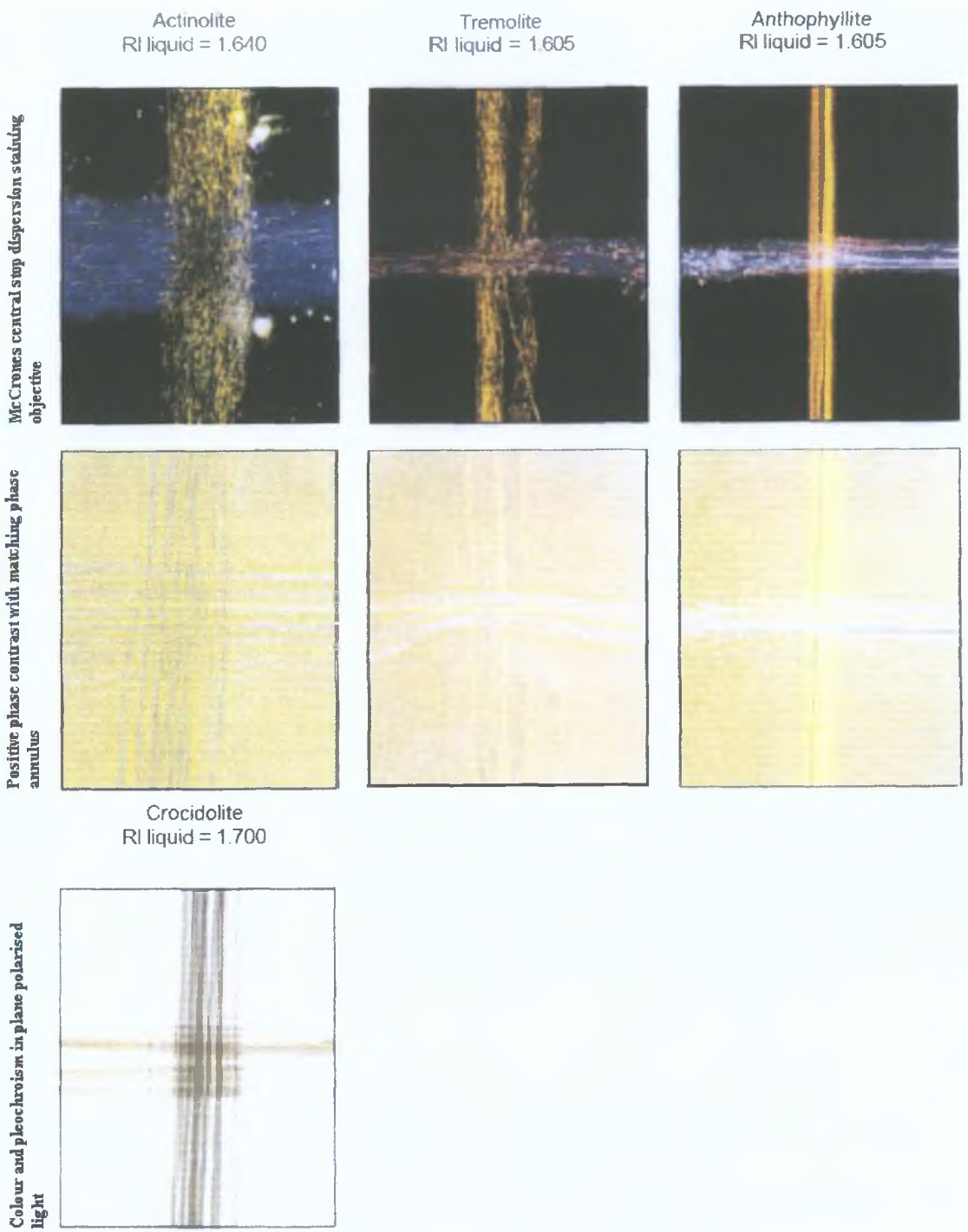


Figure 3.7.2 Asbestos Reference Samples Viewed by Polarised Light Microscopy (HSE, 2005)

3.3.5 Accredited Laboratories in Ireland.

As of May 2005, there is one laboratory accredited in Ireland to analyse asbestos fibres. McAllister Devereux Keating Ltd, Chemical Testing (Asbestos) Laboratory received accreditation from the Irish National Accreditation Board (INAB) to carryout asbestos fibre counting. The scope of their accreditation is for chemical testing of workplace environmental hazards for asbestos fibre counting. The type of tests they are accredited to carry out is fibre counting in terms of measurement of airborne asbestos, between the range of measurement 0.010 – 100f/ml of air. Analysis is to be carried out in accordance with the HSE (1995) standard specifications of MDHS 39/4: November 1995 Membrane filter method using Phase Contrast Microscopy (PCM).

3.4 PROTECTION AGAINST EXPOSURE TO ASBESTOS

The dangers associated with exposure to asbestos fibres are well known; the more asbestos fibres inhaled by an individual the greater the risk to their health. However there are situations where people cannot avoid coming into contact with asbestos-containing materials and ultimately asbestos fibres. Numerous preventative measures have been developed to help reduce the risk to exposure, but there are occasions where these methods are not sufficient at reducing the concentrations of asbestos fibres to a sufficiently low concentration. This is especially true for removal techniques where asbestos containing material are disturbed and ultimately asbestos fibres are released. In such cases proper personal protective equipment (PPE) and proper respiratory protective equipment (RPE) must be worn. It is essential that all equipment that is worn for protection fits the individual properly and is capable of carrying out the task that it is proposed to do (sufficient to prevent exposure to expected or measured concentrations of asbestos fibres).

3.4.1 Personal Protective Equipment

Personal protective clothing is designed to protect the body. The protective clothing is required to reduce body contamination from asbestos to a minimum thus making it easier for the individual to clean up after they have carried out work involving asbestos and prevent further spread of asbestos fibres outside of the work area. Protective clothing includes a full body overall with an attached hood and without pockets. The overall should have Velcro fastenings and the cuffs at the wrists and ankles should be elasticated. The leg of the coveralls should be worn on the outside of footwear. The soles of footwear must be easily decontaminated. Additional protective clothing includes gloves, hardhats, hearing protection and eye protection.

Protective clothing can be disposable and if so is disposed of as asbestos waste after every shift. Clothing that is not disposable can only be sent to appropriately permitted laundries that are capable to dealing with such hazardous materials in the proper fashion.

Figure 3.8 Person Dressed in Full Personal Protective Equipment for Protection Against Exposure to Asbestos (www.environmentalhazards.com/asbestos/index.htm)

3.4.2 Respiratory Protective Equipment (RPE)

The main route of entry for asbestos fibres into the human body is through inhalation. Asbestos fibres that are present in the air are inhaled through the nasal passage or the mouth and pass into the respiratory system where they cause the most damage. Thus, by wearing RPE this route of entry can be prevented. However, RPE should be used as a final protective measure after all other protective measures have been applied to reduce the asbestos fibre concentrations to a minimum.

The HSE in the UK have published guidelines on how to choose, operate and maintain respiratory protective equipment suitable for work involving exposure to asbestos fibres. These guidelines are:

- Selection of Suitable Respiratory Protective Equipment for Work with Asbestos (HSE, 2003).
- The selection, use and maintenance of Respiratory Protective Equipment, a practical guide (HSG 53) (HSE, 2001*a*).
- Guidelines on various issues relating to RPE are also provided in, Asbestos: The Analysts' guide for sampling, analysis and clearance procedures (HSE, 2005).

RPE is designed to be worn in a contaminated atmosphere and to provide its wearer with a supply of air that is safe to breath (HSE, 2001*a*). There are two main types of RPE. They are:

Respirator (filtering device) – this filters or cleans contaminated air from the workplace before it is inhaled by the wearer.

Breathing Apparatus (BA) – this delivers breathable air or oxygen to the wearer from an independent source (HSE, 2001*a*).

The main factors that need to be addressed when selecting, fitting, using and maintaining RPE are as follows;

- The type of RPE chosen will depend on the work that is to be undertaken and the quantity of asbestos fibres to which the individual is expected to be exposed. It is essential that the RPE chosen is capable of filtering out the expected concentrations of asbestos fibres that the individual may encounter while carrying out their tasks.

- The RPE must fit each individual properly to ensure that no contaminated air can be inhaled due to an ill-fitting seal around the face.
- The type of RPE chosen must not restrict the breathing action of the wearer.
- When using BA, a source of clean air must be close by or incorporated into the BA, such as in an attached compressed –air cylinder.
- The type of RPE and PPE chosen must be compatible and not interfere with each other's ability to provide protection to the wearer. Where this cannot be avoided the use of integrated protection such as a powered helmet respirator rather than head/eye/respiratory protection separately should be applied.

When choosing the most suitable type of RPE to wear, a number of factors must be considered, such as: the type of work to be done, the working environment, the wearer and the air borne fibre concentrations. When using a tight fitting facemask it is essential that close contact between the workers face and the mask is achieved. This may not be possible for people who have beards, side burns, stubble growth or people wearing glasses. In such situations a different type of RPE should be provided that does not require close contact with the individuals face.

Consideration must also be given to the health of the individual worker when choosing the most suitable RPE for them. People with respiratory disorders such as asthma may have difficulty with devices that rely on lungpower to draw air into the facepiece. In such situations devices that do not impose resistance to breathing may be appropriate such as air-supplied devices.

The following are a list of various types of Respiratory Protective Equipment.

- Filtering half-mask
- Valved filtering half –mask
- Filtering half-masks without inhalation valves (BS EN 405)
- Half-mask (BS EN 140) and filter (BS EN 143)
- Full-face mask (BS EN 136) and filter (BS EN 143)
- Powered hoods and filter (BS En 146, BS EN 12941)
- Power-assisted masks and filter (BS EN 147, BS EN 12942)

Schematics of various types of Respiratory Protective Equipment can be seen in Appendix III.

PPE and RPE are designed to protect individuals who are carrying out work involving asbestos. However, when such work is being carried out and especially in the case of asbestos removal work, some form of protection needs to be provided to prevent the spread of asbestos fibres into the atmosphere. This can be achieved by erecting enclosures around the work area. Enclosures are designed to enclose the working area and to retain any asbestos fibres released within the enclosed area.

3.5 ENCLOSURES

An enclosure is a physical barrier erected around the asbestos work area. The enclosure acts to seal the area where work with asbestos containing materials takes place. This precaution minimises, as far as possible, the spreading of asbestos dust and waste that arises from the work and prevents it entering the surrounding environment. Anyone working inside an enclosure must wear suitable protective clothing and respiratory protective equipment. Before leaving the enclosure all workers must thoroughly decontaminate themselves to prevent the spread of asbestos fibres that may be present on their persons.

Wherever work is being carried out on asbestos containing material and there is a high probability that the work will produce airborne asbestos fibres in excess of the limit value specified in the European Communities (Protection of Workers)(Exposure to Asbestos)(Amendment) Regulations, 1989 to 2000 or where surface contamination occurs, the provision of an enclosure is the first priority for containing and controlling the potential risk. Work on asbestos containing materials other than asbestos cement products usually require the erection of an enclosure.

3.5.1 Design of Enclosures

The design, construction and use of enclosures is set out in Guidance Notes EH51 - Enclosures provided for work with asbestos insulation, coatings and insulation board, (HSE, 1999).

Enclosures may be designed to use part of the existing buildings or be self-supporting temporary structures built around the asbestos working areas.

The main principle behind the design of enclosures is to prevent the spread of asbestos fibres outside the working area. The enclosures need to be as small as possible yet large enough to contain the work and allow reasonable working space. Where possible materials that do not contain any asbestos containing materials should be removed from the designated area before any work begins. Where this is not possible the materials should be protected from contamination by enclosing them in a heavy-duty material such as polythene sheeting and securely sealing it to prevent contamination by asbestos fibres during removal works.

Existing walls and floors that are used as part of the enclosure must be smooth, clean and non-friable. Where this is not the case they need to be lined with an impervious material such as polythene sheeting. All windows and openings in the working area must be sealed and covered with impermeable sheeting. All spaces in walls where ducts or pipes pass through should be sealed to prevent asbestos fibres escaping the working area.

The choice of materials for the construction of an enclosure is determined by a number of factors such as the likely duration of the job, the size of the job and the location of the work. Polythene sheeting is one of the most widely used materials for enclosures as it offers a flexible, impervious and easily erected barrier. The choice of polythene sheeting needs to be of sufficient thickness to withstand the wear and tear of the job. For short-life enclosures inside buildings, sheeting of nominal 500 gauge (4 mm) thickness is suitable, but for more demanding conditions sheeting of nominal 1000 gauge (6 mm) or more may be required. All joints in the sheeting material need to be adequately sealed using adhesive tape. The most widely used method of supporting the sheeting material is by timber framework to which the sheeting material is securely attached.

3.5.2 Access Routes into Enclosures

All enclosures should have means of access for personnel, plant and the removal of asbestos waste. Openings for these purposes need to be constructed to prevent asbestos dust from escaping into the general environment. The HSE (1999) recommend that enclosures be designed with separate access routes for asbestos waste when it is being removed from the enclosures than the route used by the workers.

Access into enclosures should be through a series of air locks to prevent asbestos dust escaping from the enclosure. Air locks can be established by fixing polythene sheets across the opening into an enclosure. A vertical shaped opening is left in the middle of the sheeting. The opening is covered by another sheet that is located on the inside of the enclosure. An adequate overlap is left so that air can move inwards but outward air movement is restricted. The weighing down of the inner flap can aid in the control of air movements. The design of an air lock can be seen in Figure 3.9.

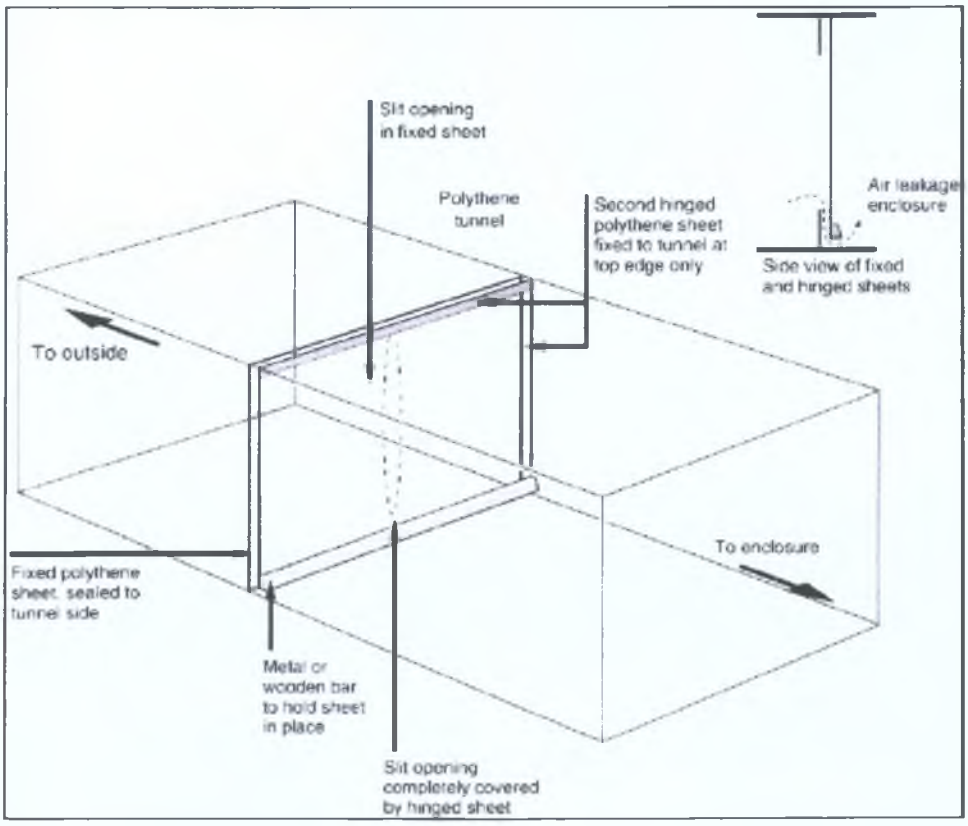


Figure 3.9 Recommended arrangements for standard closures in air locks (HSE, 1999)

3.5.3 Negative Air Pressure

Negative air pressure is maintained inside the enclosures to prevent the leak of asbestos fibres outside of the enclosure. The negative air pressure inside ensures that all leaks in the enclosure flow inwards rather than outwards. Negative pressure occurs where the air pressure inside the enclosure is slightly below the atmospheric pressure. This is achieved by the use of a mechanical extraction ventilation system. The mechanical extraction ventilation system draws air out of the enclosure through a designated extraction system. The extract ventilation system filters the removed air trapping all asbestos fibres before the air is released into the atmosphere. Filtration occurs using a high efficiency particulate absolute (HEPA) filter capable of trapping at least 99.97% of particulates (asbestos fibres) greater than 0.3 micrometers in mass median aerodynamic equivalent diameter (HSE, 1999). When negative air pressure has been properly achieved, the air lock flaps should be slightly lifted by the airflow through the enclosure and the enclosure walls (sheeting material) should bow inwards.

Additional testing to ensure the integrity of an enclosure can be achieved by using a smoke generator inside the sealed enclosure before the extract ventilation system is turned on. If smoke escapes the enclosure it indicates that there is a leak and proper remedial measures can be applied to rectify the problem. Once the integrity of the enclosure is assured the asbestos removal work may commence. Air monitoring for asbestos fibres should be regularly carried out outside the enclosure while work is in progress to check for leaks, on the effectiveness of the entry and exit airlocks and the efficiency of the air extraction/filtration system.

3.5.4 Cleaning and Dismantling

On completion of the asbestos removal work, the area inside the enclosure must be thoroughly cleaned using low-dust generating techniques such as wet removal methods (damp cloths) and the use of appropriate equipment (BS 5415 Type 'H' vacuum cleaners with HEPA filters). The cleaning should include the inside surfaces of the enclosure, all plant from which asbestos was removed and all equipment which was used inside the enclosure. A visual inspection of the enclosure is then

carried out to ensure it has been properly cleaned and that no debris remains. Disturbance techniques such as brushing or vigorous dusting of surfaces should be carried out during this inspection to ensure that the area has been cleaned sufficiently and that no debris remains in the area that could expose workers or members of the public in the future.

Air monitoring within the enclosure is carried out as a final reassurance that all asbestos fibres have been removed from the area. According to the HSE Guidance Notes EH 10, Asbestos – exposure limits and measurement of airborne dust concentrations (HSE, 2001*c*) a value of 0.01 fibres/ml for a sample of air taken from an enclosure is classified as the 'clearance indicator' threshold. Once this limit has been obtained within an enclosure it is considered adequately cleaned for dismantling.

The materials used in the construction of the enclosure may have become contaminated with asbestos fibres during the removal work and may need to be disposed of as asbestos waste unless they can be effectively cleaned or sealed.

3.5.5 Special Enclosures

There are some asbestos removal works where normal enclosures are not practical, these can include pipe-work, occupied areas or in areas at a high level. In such cases different types of techniques can be applied, such as the 'Glovebag' technique. This method can be applied for the removal of small amounts of friable asbestos containing materials from ducts, short piping runs, valves, joints, elbows and other non-planar surfaces in a contained work area. The 'Glovebag' is a manufactured or fabricated device consisting of a plastic bag (typically constructed from a 6 mm transparent regulate plastic), two attached inward projecting long-sleeved rubber gloves, one inward projecting water wand sleeve, an internal tool pouch, and an attached labelled receptacle for asbestos waste. The 'Glovebag is installed in such a manner that it surrounds the object or the area to be decontaminated and contains all asbestos fibres during the removal process.

3.5.6 Decontamination

Due to the nature of the work that is carried out during the removal processes, there is a high probability that workers will become contaminated with asbestos. Therefore they must go through a thorough decontamination procedure to ensure that all asbestos fibres are removed from their persons, their PPE and their RPE. Decontamination prevents the further spread of asbestos fibres and unnecessary contamination and therefore must be carried out on leaving the enclosure.

Decontamination is a form of meticulous cleaning of the worker, their PPE and RPE. Cleaning is carried out using a type 'H' vacuum cleaner, water, wet sponges and wipes in a specially designed hygiene facility attached to the enclosure. PPE, RPE and footwear are vacuumed. RPE is then wiped down with a damp cloth or wipe. Coveralls are removed carefully and placed in a waste bag. Where significant contamination has occurred it may be necessary for the worker to shower to ensure all asbestos is removed. The worker should remain wearing their RPE until complete decontamination has been achieved.

Hygiene facilities should, where practicable be positioned close to the work area with an intervening space or tunnel and a one-stage air lock, constructed of polythene sheeting, connecting the hygiene facility with the stripping enclosure (HSE, 2005). Figure 3.10 shows a typical hygiene facility.

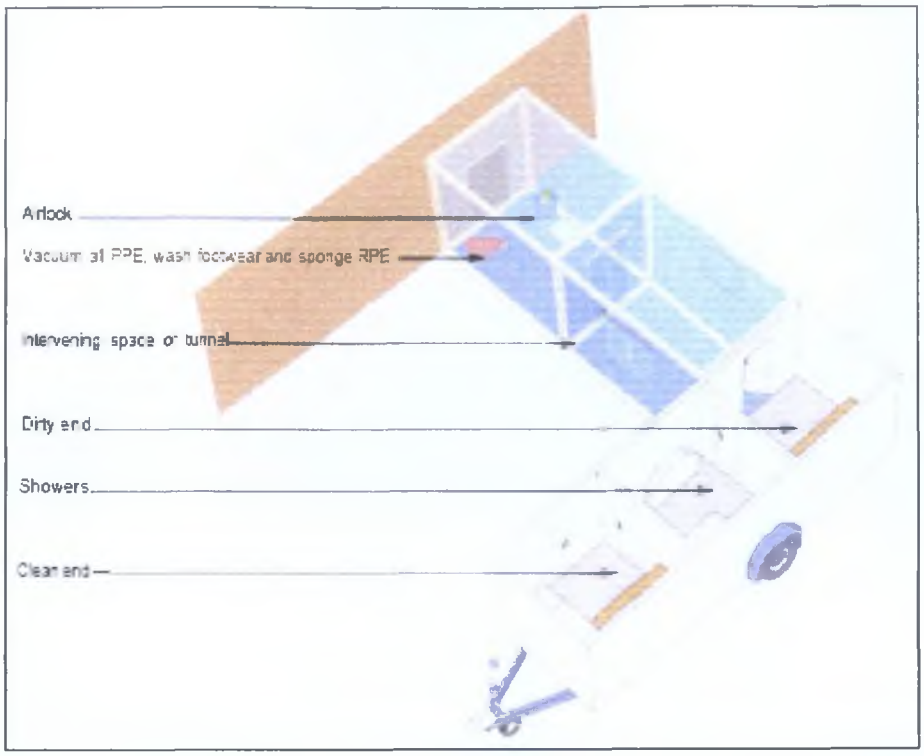


Figure 3.10 Mobile hygiene facility connected directly to an enclosure, (HSE, 2005).

3.6 HEALTH AND SAFETY LEGISLATION GOVERNING ASBESTOS

3.6.1 Safety Health and Welfare at Work Act, 1989 (S.I. No 7 of 1989)

The 1989 Act outlines the duties of all employers to ensure the safety health and welfare of their employees is protected. These duties include providing safe means of access and egress from work, safe work systems, the appropriate training, information and supervision necessary to protect all employees, to name but a few. The general duties of employees and contractors are also detailed in the Act. Under the Act there is a requirement for employers to prepare a safety statement outlining how the safety, health and welfare of employees is to be maintained and how all hazards on site are to be identified and their subsequent risks assessed and controlled.

3.6.2 Safety Health and Welfare at Work (General Applications) Regulations, 1993 (S.I. No. 44 of 1993)

The General Application Regulations 1993 provide more detail on issues that must be addressed by employers. The nine Principles of Prevention outline what all employers must take account of when providing for the safety and health protection of all employees. Details of emergency duties, risk assessments and training to be provided by employers are also outlined in these Regulations.

Ireland has brought into force pieces of legislation that specifically deal with the protection of workers and members of the public from being exposed to asbestos fibres. They are known as the European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989 to 2000.

3.6.3 European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989. (S.I. No. 34 of 1989)

These regulations apply to any activity that could result in workers becoming exposed to or have the potential to be exposed to asbestos fibres. It also places a prohibition on the spraying in any form of all types of asbestos.

These regulations set out the duties of all employers in relation to the potential exposure of their workforce to asbestos fibres. The regulations establish the precautionary measures that must be taken such as, the development of a Plan of Work, which must be submitted in writing to the Minister's appointed relevant body (the Health and Safety Authority) 28 days before any work involving asbestos can commence. Personal Protective Equipment (PPE) must be provided to all employees who may come into contact with asbestos or asbestos-containing materials during the course of their work activities. A standard notification form to be submitted to the HSA of work intended to be carried out involving asbestos is given in Appendix IV.

The action level values and limit values for the concentration of asbestos fibres in the air, that must not be exceeded, are set out in these regulations. These values for asbestos fibres were made more stringent in the E.C (Protection of Workers)

(Exposure to Asbestos) (Amendment) Regulations, 1993. If any of these values are exceeded then certain mitigation measures must be followed such as identifying why the breach of the set values occurred, setting up remedial action as soon as possible and stopping all work in the area until adequate steps have been taken to protect the workers. All areas where set limit values for the concentration of asbestos fibres in the air may be exceeded must be defined and explicit signs erected detailing this information to individuals in the vicinity.

The information, instruction and training to be provided to each employee who may come into contact with asbestos or ACMs during the course of their employment is defined under the European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989, as well as the appropriate Personal Protective Equipment to be supplied to the workers free of charge. Also under these regulations, the general powers of inspectors are outlined, along with the penalties associated with offences under the regulations.

3.6.4 European Communities (Protection of Workers) (Exposure to Asbestos) (Amendment) Regulations, 1993. (S.I. No. 276 of 1993)

These regulations were developed to amend a few regulations stated in the European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989. More stringent action levels and limit values were established by the amendment.

Action levels are the maximum concentration of asbestos fibres a person can be exposed to without needing health surveillance, protective clothing and hygiene facilities. It allows small jobs with low and short exposure times to be done without having to meet all asbestos regulations.

The more stringent action level values set under the 1993 Regulations were;

(a) for chrysotile-

(i) 0.2 fibres per millilitre of air in relation to an eight hour reference period, or

(ii) a cumulative exposure of 12 fibre-days per millilitre of air over a period of three months;

(b) for all other forms of asbestos either alone or in mixtures (including mixtures containing chrysotile)-

(i) 0.1 fibres per millilitre of air in relation to an eight hour reference period, or

(ii) a cumulative exposure of 6 fibre-days per millilitre of air over a period of three months.

Fibre-days relates to the total number of fibres a worker can be exposed to over a period of three months.

The limit values are the maximum concentration of asbestos fibres that a worker can be exposed to over an eight-hour period, (a normal work day).

The new limit values for the concentration of asbestos fibres in the air when measured or calculated shall not exceed-

(a) for chrysotile — 0.6 fibres per millilitre of air,

(b) for all other forms of asbestos either alone or in a mixture (including mixtures containing chrysotile — 0.3 fibres per millilitre of air.

These regulations ban the use of low-density asbestos materials and require a comprehensive plan with specific details to be devised before any demolition work involving asbestos can take place.

3.6.5 European Communities (Protection of Workers) (Exposure to Asbestos) (Amendment) Regulations, 2000. (S.I. No. 74 of 2000)

These regulations amend the two previous regulations, European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989 and Amendment Regulations, 1993. In these regulations more specific details must be given in the Plan of Work for any activities that involve the removal of asbestos or asbestos-containing materials (ACMs) from any structure. The regulations give details such as the measures needed to ensure health and safety of workers, specifics as to how the asbestos will be removed, specific Personal Protective Equipment to be worn by workers and other preventative measures, the nature and duration of the work and the specific location of the work, etc. This Plan of Work is submitted to the Health and Safety Authority for approval. The Health and Safety Authority checks the plan and makes recommendations where they feel necessary and once satisfied that the proper procedures are being followed and the appropriate protective measures are being taken, they issue approval for the work to commence. Penalties were increased from £1,000 to £1,500 and records from the occupational health register and from medical records must now be kept for a minimum of 40 years instead of 30 years.

4. ENVIRONMENTAL ISSUES RELATING TO ASBESTOS

4.1 ENVIRONMENTAL SIGNIFICANCE OF ASBESTOS

The problems associated with asbestos are more occupationally related than environmentally. Asbestos has been classed as a hazardous material due to its ability to cause cancer. Because of this asbestos has to be handled in a specific manner and subsequently disposed of in a particular way, so as not to release the fibres into the environment where people can be exposed. The main impact asbestos has on the environment is in relation to air quality and how air containing asbestos fibres can be harmful to people's health.

Asbestos fibres do not evaporate into the air or dissolve in water and are not able to move through soil (ASTDR, 2001). They are generally not broken down to other compounds in the environment and will remain virtually unchanged over long periods. Past activities have lead to the accumulation of significant quantities of asbestos fibres in the environment.

Industrial use of the minerals over the twenty-first century, in addition to natural erosion of rocks containing asbestos, has led to a widespread dispersion of asbestos fibres throughout the atmosphere, hydrosphere and the soils of many areas (Meyers, 1989).

Although asbestos is neither volatile nor soluble, small fibres or clumps of fibres may occur in suspension in both air and water. These fibres are very stable and do not undergo significant degradation in the environment. Large fibres are removed from air and water by gravitational settling at a rate dependent upon their size, but small fibres may remain suspended for long periods of time (ASTDR, 2003).

4.1.1 Air

The medium in which asbestos fibres are most likely to occur in is air. Asbestos can break up into tiny fibres, which are easily transported by the air. The smaller the fibres the longer they are likely to stay suspended in the air and therefore get transported further until they settle out onto the soil or a surface, or are inhaled by humans or animals. The length of time the fibres are suspended in the air is

proportional to their size. The distance the fibres can be transported can also vary. According to the ASTDR (2001) asbestos originating from the weathering of natural deposits of asbestos-bearing rock is found in the air and has been deposited in ice cores dating back to 1750.

The appearance of asbestos fibres in the air can be due to a number of different factors, both natural (erosion) and man influenced. The occurrence of asbestos fibres in the air from natural erosion is minimal compared to the levels released from man-induced processes such as mining, manufacturing, processing and the disturbance of asbestos containing materials. It is these activities that are the main causes of asbestos being released into the environment. Another source of airborne asbestos fibres was from vehicles. In the past asbestos materials were extensively used in clutches and breaks on cars and vans. This activity has been stopped due to the vast release of asbestos fibres into the atmosphere from the wearing down of the asbestos material.

Exposure to asbestos fibres in the environment in Ireland due to natural processes such as weathering from natural deposits is unlikely or minute in scale due to the small amount of asbestos minerals deposits naturally occurring in Ireland. According to the Geological Survey of Ireland there are only 18 recorded natural asbestos deposits in Ireland (Figure 2.1). It can also be presumed that the chances of individuals being exposed to asbestos fibres from natural sources in Ireland would be very rare. The asbestos minerals deposits recorded in Ireland have very small quantities of asbestos present and because of this, it would not cause any significant levels of natural exposure. No man-induced activities involving milling, processing or manufacturing of asbestos materials occurs in Ireland anymore and therefore are no longer a source of asbestos fibre release. The current activities that could cause the release of asbestos fibres into the air are from badly damaged asbestos containing materials, improper removal work, inappropriate work on products containing asbestos, or improper transportation and/or disposal methods.

4.1.2 Water

Asbestos is released to water from a number of sources, including erosion of natural deposits and waste piles, corrosion from asbestos-cement pipes, and disintegration of asbestos roofing materials with subsequent transport via rainwater into cisterns, sewers, etc. (ASTDR, 2001). The fibres can become incorporated in water due to erosion from asbestos-cement whether it is in the form of pipes or roofing materials. Heavy flows of water over these aged materials can gather some loosened asbestos fibres, however the quantity would not be of major environmental significance. The distance the asbestos fibres are transported again depends on their size. The smaller the fibres, the longer they are able to stay in suspension and therefore get transported further.

In Ireland, contamination of water by asbestos fibres from natural deposits is not a problem due to the small number of asbestos deposits in Ireland. If contamination of water from natural asbestos deposits was to occur, it is isolated to the area where the small natural deposit is located.

4.1.3 Soil

Asbestos fibres are immobile in soil and therefore wherever they settle out or are placed is usually where they remain. The contamination of soil by natural deposits of asbestos in Ireland is minimal and restricted to the area where the deposit originates. However, improper disposal activities in the past, and even today, can lead to soil being contaminated with asbestos fibres. Asbestos products that get broken up in removal practices or during the disposal activity can cause the release of asbestos fibres. Nevertheless, this is not of major concern in relation to environmental pollution and soil contamination, as the asbestos fibres are immobile in the soil and therefore are unable to move within the soils structure of its own accord. This is why care and concern needs to be applied in areas where disposal of asbestos has occurred in the past. The main concern would be related to improper and sometimes illegal disposal of asbestos containing products that are unknown to people who carry out earth moving works. This can led to the exposure of unknowing workers and individuals to asbestos fibres released into the air.

4.2 ASBESTOS AS A HAZARDOUS WASTE

Asbestos is classified as a hazardous waste because (a) it is listed as a constituent of a waste that renders that waste hazardous under Annex II of Council Directive 91/689/EEC {asbestos (dusts & fibres)} and (b) Asbestos possesses one of the hazardous constituents specified under Annex III of the same Directive; {'Carcinogenic`: substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence}.

In 2002, the Environmental Protection Agency in Ireland adopted a list classifying all waste types both hazardous and non-hazardous wastes. This list is known as the European Waste Catalogue and Hazardous Waste List, (EWC/HWL) (EPA, 2002). The waste classifications in this list were initially taken from Commission Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EC on waste and from Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste. By combining these two lists the European Waste Catalogue and Hazardous Waste List (EWC/HWL) was formed. This joint list is a consistent waste classification system used across the EU. Amendments have been made to the list over recent years, but a comprehensive list detailing all types of waste categorised under the EWC/HWL came into force on 1st January 2002. Within the list different types of wastes are given individual EWC codes which aids in their identification.

Within the newly published European Waste Catalogue and Hazardous Waste List asbestos is mentioned on numerous occasions with specific EWC codes distinguishing each type of waste. Such as

EWC 06 07 01*	waste containing asbestos from electrolysis
EWC 06 13 04*	waste from asbestos processing
EWC 10 13 09*	wastes from asbestos-cement manufacture containing asbestos
EWC 15 01 11*	metallic packaging containing a dangerous solid porous matrix (for example asbestos) including empty pressure containers
EWC 16 01 11*	break pads containing asbestos
EWC 16 02 12*	discarded equipment containing free asbestos
EWC 17 06 01*	insulation materials containing asbestos
EWC 17 06 05*	construction materials containing asbestos

Any waste marked with an asterisk (*) is considered as a hazardous waste pursuant to Directive 91/689/EEC on hazardous waste and subject to the provisions of that Directive unless Article 1 (5) of that Directive applies.

Of these wastes the two most relevant are EWC 17 06 01 and EWC 17 06 05. That is because people, especially when carrying out maintenance, refurbishment and construction work are most likely to encounter insulation materials containing asbestos and construction materials containing asbestos.

Asbestos waste is governed under the Waste Management (Hazardous Waste) Regulations, 1998. These regulations prohibit the release of asbestos dust or fibres during the transportation of waste containing asbestos materials. Any person who transports waste containing asbestos must ensure that no asbestos fibres or dust are released to the environment. An onus is placed on any person who carries out an activity involving asbestos to ensure that they use the best available technology not exceeding excessive cost (BATNEEC) and where appropriate recover or treats the waste.

4.2.1 Movement of Asbestos Waste

As asbestos is classified as a hazardous waste, its movement within the country requires proper documentation and trace-ability in accordance with the Waste Management (Movement of Hazardous Waste) Regulations, 1998. This comes in the form of consignment notes (C1 forms). The aim of consignment notes is to be able, through documentary evidence, to trace the movement of all waste within Ireland. Consignment notes are obtained from local authorities in whose area the asbestos originates. The note is serial numbered, comprises three sections and has five copies that are carbon copiable. Each party who handles the waste, the consignor (producer of the waste), the carrier (person who transports the waste) and the consignee (person who receives the waste) fill out the appropriate sections relevant to them. The local authority in whose area the waste originated receives a copy of the completed consignment note, as does the local authority in whose area the asbestos waste is to be disposed. The consignor, carrier and consignee all keep a copy of the consignment note for their own records. A consignment note must accompany every consignment of asbestos waste that is moved within Ireland. A copy of a consignment form is presented in Appendix V.

Asbestos waste can only be transported by waste collection permit holders authorised under the Waste Management (Collection Permit) Regulations 2001, to collect asbestos waste within a specific waste functional area, as prescribed by the Waste Management (Planning) Regulations, 1997.

Local authorities (County Councils and County Borough Corporations) under section 34(1) of the Waste Management Act 1996, are responsible for the permitting of and supervision of companies that collect waste on a commercial basis. There are approximately 11 companies throughout Ireland permitted to collect asbestos waste, some of them hold more than one permit. A detailed list of these companies and the areas where they hold permits for the collection of asbestos waste is given in Appendix VI.

Hazardous waste that is exported from Ireland is governed by the Waste Management (Transfrontier Shipment of Waste) Regulations, 1998. This system runs on the same basis as the movement of hazardous waste within Ireland, which is to ensure trace-ability of the hazardous waste. There is an additional requirement for persons exporting waste from Ireland to obtain an insurance bond in respect of the consignment. The persons exporting waste from Ireland must notify and acquire a written agreement of permission, from all the competent authorities whose areas the waste will pass through while being transported to its final destination. The system uses TFS certificates for consignment notes. The appropriate parties who come into contact with the hazardous waste as it is being transported fill out the certificates. The consignor must receive written documentation clarifying that the waste was received and properly disposed of by the consignee. The Environmental Protection Agency is the competent body over the transit of shipments of hazardous wastes through Ireland and the import of hazardous waste into Ireland. A copy of a TFS certificate is given in Appendix V.

4.2.2 Disposal of Asbestos Waste

The hazardous nature of asbestos means that it must be disposed of with great care. Due to its unique properties the best way of disposing of asbestos is by burial. The acceptance and disposal methods applied to asbestos waste at licensed landfill sites must be in accordance with Council Decision 2003/33/EC on the criteria and procedures for accepting waste at landfills and Council Directive 1999/31/EC on the landfill of waste. According to these pieces of legislation, before burial can occur the asbestos waste must first be double wrapped in 1000 gauge polythene plastic and labelled accordingly. Precautions should be applied to ensure the sacks are not punctured during the course of disposal. Burial must take place under a minimum of 2 meters of cover and occur 2 meters from the nearest edge of the disposal site. If there is any risk that the asbestos fibres may migrate from the disposal site they must be encapsulated in cement or other matrix.

Within Ireland only construction materials containing asbestos, EWC 17 06 05, can be buried in landfill sites licensed by the Environmental Protection Agency, other types of asbestos waste are exported to other countries for disposal, mainly Germany via hazardous waste transfer stations, also licensed by the EPA. Records of locations where asbestos was buried must be kept on file in the landfill offices for future reference to ensure that the buried asbestos waste is not accidentally disturbed and fibres released due to activities on site such as drilling or digging. The hazardous waste transfer stations must keep records of all shipments of hazardous waste that passes through their facility.

Currently there are three waste disposal facilities and three hazardous waste transfer stations licensed by the Environmental Protection Agency that can accept asbestos waste in Ireland.

Table 4.8 Facilities licensed by the EPA to accept construction materials containing asbestos (EWC 17-06-05*).

Waste Facility	Waste Licence Register Number
Cork City Council, Kinsale Road Landfill, South City Link Road, Cork.	12 - 2
KTK Landfill Limited, Kilcullen, Co. Kildare	81 - 2
Cork County Council, Derryconnell Landfill, Cork	89 - 1
Hazardous Waste Transfer Stations	
Sorundon Limited t/a Irish Environmental Services, Naas Road, Dublin 12.	40-1
Eco-Safe Systems Limited, Ballyfermot, Dublin 10.	54 - 2
AVR-Safeway Ltd., Corrin, Fermoy, Co. Cork.	50 - 1

On average Derryconnell Landfill accepts approximately 10 tonnes of asbestos waste on an annual basis, with 10.44 tonnes being accepted in 2003. The type of asbestos containing material accepted at the landfill is cement bound asbestos waste, which are brought in by either small time builders, residents in West Cork or from County Council operations. The cost of disposing cement bound asbestos materials at Derryconnell landfill site in 2004 was €240 per tonne.

Kinsale Road Landfill operated by Cork City Council accepts construction materials containing asbestos EWC 17 06 05 waste that originates in the Cork City Area only. Asbestos waste that comes under the classification of EWC 17 06 05 is accepted from domestic homes once it complies with the requirements of the landfill's waste licence. There is a once off nominal charge of €75 to people who wish to dispose from domestic residences, once the individuals deliver the asbestos waste in the correct manner (double wrapped in polythene plastic and labelled indicating the contents is asbestos) to the landfill. For commercial companies wishing to dispose of asbestos waste, it must also comply with the requirements of the waste licence of the landfill (comply with the classification of EWC 17 06 05) and there is a charge of €615 per tonne. Records of construction materials containing asbestos waste EWC 17 06 05, disposed of at Kinsale Road Landfill only date back to 2002, with a total weight of 288.26 tonnes of commercial asbestos buried within the landfill site between 2002 and 2004. Prior to this there was no weight bridge present and

therefore the exact quantity of asbestos waste disposed of within the landfill site is unknown.

KTK Landfill is licensed to accept up to 3,000 tonnes per year of waste construction materials containing asbestos, EWC 17 06 05. During the period 2000 to 2003 (inclusive) a total of 8,555 tonnes of bonded asbestos was disposed of at KTK Landfill. Asbestos waste from construction and demolition activities is accepted on site at a charge of €335 per tonne. Asbestos is only accepted for disposal from contractors who have the appropriate waste collection permits.

4.3 ENVIRONMENTAL LEGISLATION GOVERNING ASBESTOS

4.3.1 Council Directive of 19 March 1987 on the Prevention and Reduction of Environmental Pollution by Asbestos (87/217/EEC)

This Directive sets out measures to ensure that asbestos emissions into the air, asbestos discharges into the aquatic environment and solid asbestos waste are, as far as reasonably practicable, reduced at source and prevented. Emission limits values of 0.1 mg/m^3 of air were set for the concentration of asbestos to be emitted into the atmosphere. A requirement was placed on the recycling of all aqueous effluent arising from the manufacture of asbestos cement. Where recycling could not be carried out, steps are to be taken to ensure the disposed liquid containing asbestos does not cause pollution to the aquatic environment from discharges or to other environments such as air. A limit value of 30 grams of total suspended matter per m^3 was place on the aqueous effluent to be discharged.

Also under the Directive stipulations were set where during the course of the transport and deposition of waste containing asbestos, that no asbestos fibres were to be released into the air and that any liquids that may contain asbestos were not to be spilt. Where waste-containing asbestos was to be landfilled, at sites licensed for this purpose, the waste was to be treated, packaged or covered so that the release of

asbestos particles into the environment was prevented. Records of the burial locations were to be kept.

This Council Directive made a provision for all member states to implement more stringent requirements where they felt necessary. This led to the transposition of the Council Directive of March 1987 on the prevention and reduction of environmental pollution by asbestos (87/217/EEC) into Irish law under three separate pieces of legislation, each specifically dealing with air, waste and water respectively. These Regulations were

- The European Communities (Asbestos Waste) Regulations, 1990, amended in 1994. These regulations have subsequently been revoked by the Waste Management (Hazardous Waste) Regulations, 1998.
- European Communities (Control of Water Pollution by Asbestos) Regulations, 1990.
- Air Pollution Act, 1987 (Emission Limit Value for Asbestos) Regulations, 1990.

These regulations may no longer be relevant as they apply any plant that handles over 100 kilograms of raw asbestos per year in relation to the manufacture and processing of asbestos. Such activities have been prohibited in Ireland under the European Communities (Dangerous Substances and Preparations) (Marketing and Use) Regulations, 2000.

4.3.2 European Communities (Dangerous Substances and Preparations)(Marketing and Use) Regulations, 2000. (S.I. No. 107 of 2000)

Prohibitions on the placing of certain asbestos fibres and products containing these fibres on the market and their use is outlined in these regulations, as well as the future dates that the same prohibition will come into force on specific products that are exempt from the initial veto date. For example, there is a prohibition date of

April 2000, of placing on the market or using crocidolite, amosite, anthophyllite, actinolite tremolite and chrysotile fibres or products containing these fibres. However there is an extended period before the ban on certain products containing chrysotile fibres, i.e. compressed asbestos fibre gaskets for use with saturated steam and superheated steam were exempt until 1st January 2001 and any component of an aeroplane or helicopter necessary for its safe operation were exempt until the 1st January 2004 and products exempt from the ban until the 1st January 2005 are personal protective clothing for protection against the handling of material at a temperature of 500°C or more. A detailed list of the products and their subsequent prohibition dates is provided in Appendix VII.

4.3.3 Control of Asbestos at Work Regulations, 2002(S.I. 2002 No. 2675)

In the UK a recent piece of legislation, Control of Asbestos at Work Regulations, 2002 has been implemented. This piece of legislation sets the action level values and limit values at a 4-hour exposure time frame, (compared to the Irish 8 hour exposure). These limit values set under these regulations are

(a) for chrysotile -

(i) 0.3 fibres per millilitre of air averaged over a continuous period of 4 hours,

(ii) 0.9 fibres per millilitre of air averaged over a continuous period of 10 minutes;

(b) for any other form of asbestos either alone or in mixtures including mixtures of chrysotile with any other form of asbestos -

(i) 0.2 fibres per millilitre of air averaged over a continuous period of 4 hours,

(ii) 0.6 fibres per millilitre of air averaged over a continuous period of 10 minutes;

Other provisions set under these regulations include, no work that has the potential to expose workers to asbestos can commence without first identifying the type of asbestos present. A risk assessment must be carried out and the protective measures

needed to protect the health and safety of workers must be established and implemented before any work involving asbestos can begin. A written plan of work is required to be prepared detailing how the work involving asbestos or asbestos-containing materials is to be carried out. The employer must notify the enforcing authority in writing 14 days before commencing work involving asbestos or asbestos containing materials. Employers must ensure that proper training is given to their entire workforce who are or are likely to be exposed to asbestos. Every employer must prevent the exposure of his or her employees to asbestos as far as practically possible with the use of suitable control measures.

As from the 1st of May 2004 there is a responsibility placed on the duty holder of a premises (that is anyone who is responsible for the maintenance and/or repair of non-domestic premises) to manage asbestos in their premises. This will involve carrying out an assessment of the premises to establish whether or not asbestos is present. Records of the assessment must be kept in the form of an Asbestos Register. All asbestos must be identified and the risks associated with the presence of the asbestos determined. Once this has been achieved a management plan can then be developed to show how the duty holder plans to manage the asbestos in the future.

4.3.4 Directive 2003/18/EC of the European Parliament and of the Council amending Council Directive 83/477/EEC on the protection of workers from the risks related to exposure to asbestos at work

The amendments introduced more focus on the protection of workers who remove asbestos and on workers who accidentally come across asbestos while carrying out their normal everyday duties, such as servicing and maintenance. More responsibilities are placed on employers to ensure that their workforces are not exposed to asbestos fibres and if they are that they are provided with the proper personal protective equipment until the problem has been rectified. There is a requirement for the identification of all presumed asbestos containing materials before any demolition or maintenance work can take place. The ability of a workforce in this field must be proven before any work involving asbestos and asbestos containing materials can occur. Employers also have a duty to provide

appropriate training to all workers who are, or are likely to be, exposed to asbestos dusts. The amendment also reduces the limit value for occupational exposure to asbestos fibres to 0.1 fibres per cm^3 as a time-weighted average. Any activities that expose workers to asbestos, to include the manufacturing and processing of asbestos products or products containing asbestos, are prohibited, except where these activities involve the treatment and disposal of products from demolition and asbestos removal.

All Member States of the European Union must bring into force the appropriate regulations so as to meet these amendments by the 15th April 2006. Some Member States have already implemented the necessary provisions.

5. DISCUSSION

While there is a legal requirement in Ireland to submit a detailed plan to the HSA on work involving asbestos, there is no requirement for occupiers of premises to be aware whether or not asbestos is present in their buildings. A plan is required only where it is known that asbestos will be encountered while carrying out certain working activities. The necessity of such a plan is not required where the presence of asbestos is unknown, i.e. there is no requirement under Irish legislation to identify whether or not asbestos is present before commencing work such as general maintenance work and refurbishment work. These activities have a very high probability of encountering and disturbing asbestos-containing materials that may be present within a building.

Under the European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989 to 2000, there is only a requirement to develop a plan of work where any demolition work or other work that will involve the removal of asbestos and or asbestos-containing materials is to take place.

This issue has been addressed under English legislation by the implementation of the 'Control of Asbestos at Work Regulations, 2002'. This legislation places a duty on all owners and occupiers of non-domestic premises to identify all asbestos within their premises, in terms of the type, condition and location of the asbestos and to keep up-to-date records of this information. These records are known as an 'Asbestos Register' and are to be consulted before any maintenance, servicing, refurbishment or demolition work is carried out within the building. By consulting the records it will ensure that no asbestos-containing materials are unintentionally disturbed without first having the proper precautionary procedures in place. The implementation of such a procedure ensures that building and maintenance workers are not unknowingly exposed to asbestos, thus preventing the development of asbestos related diseases in the future.

A similar system requiring the development of a register of the locations of asbestos present within non-domestic premises needs to be established in Ireland.

The new EU Directive 2003/18/EC on the protection of workers from risks related to exposure to asbestos at work must be implemented by all member states no later than 15th April 2006. Although Ireland has implemented most of the articles laid out in the

Directive through the European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989 to 2000, the provision of Article 10a has not yet been implemented into Irish Law. Article 10a requires that "Before beginning demolition or maintenance work, employers shall take, if appropriate by obtaining information from the owners of the premises, all necessary steps to identify presumed asbestos-containing materials. If there is any doubt about the presence of asbestos in a material or construction, the applicable provisions of this Directive shall be observed". While there is a requirement to identify all asbestos present before any demolition work commences, to date there is no requirement in Ireland to identify all asbestos-containing materials before commencing general maintenance, servicing or refurbishment work. Essentially this means that the development and maintenance of an Asbestos Register needs to be established for all non-domestic premises in Ireland.

By introducing new regulations in Ireland requiring all owners and occupiers of non-domestic premises to develop an 'Asbestos Register', similar to that in the UK, it will result in fewer people being exposed to asbestos fibres in the future and it will ensure that Ireland is in compliance with the Council Directive 2003/18/EC.

Even though Ireland has adopted most EU legislation with regard to asbestos, it has failed to put in place the Approved Codes of Practice and Guidelines needed to comply with this legislation. The only publication issued by the HSA is a small booklet 'Safety with Asbestos', which briefly mentions topics such as what asbestos is, where it is most likely to be found, some precautionary measures to be applied should asbestos be encountered, the limit values associated with exposure to asbestos fibres, the responsibilities of employers and the legislation governing asbestos in Ireland. This publication does not provide enough detailed information for construction workers or trades people, the professions most likely to encounter asbestos while carrying out their daily working duties.

In contrast, the UK has issued numerous Guidelines and Approved Codes of Practices covering a wide range of areas relating to asbestos. To-date, Ireland has been utilising the guidelines and approved codes of practices published by the HSE in the UK. However, this system is inadequate in Ireland as the guidelines and approved codes of practices must be obtained from the HSE in the UK and are not

available in Ireland. This lack of availability will hinder awareness of the proper procedures and techniques that should be applied when dealing with asbestos. Similar guidance notes and approved codes of practice should be produced and be made available by the HSA.

Greater knowledge about asbestos and the hazards associated with this material needs to be conveyed to the general public in Ireland, as well as to the working sectors who could encounter asbestos and asbestos-containing materials while carrying out their working activities. By making the general public more aware of asbestos, they will have a greater understanding of the importance in identifying, managing, handling, removing and disposing of asbestos and asbestos-containing materials in the proper manner. This can be achieved through an advertising campaign to include posters, leaflets, advertisements and information centers located in hardware shops and facilities that will be frequented by professionals and non-professionals who may be carrying out maintenance or DIY work on their premises or at their place of work.

In France at the end of 1999, an initiative was undertaken to develop a national network of asbestos information centres. The main objective of the action was to provide construction workers and craftsmen, engineers, occupational physicians and health inspectors with practical information for the maintenance and service of sites containing asbestos with the purpose of preventing fibre exposure. The information was relayed in the form of leaflets, posters, video-tapes, CD-ROM, lectures and seminars. Information stands were set up both on permanent and temporary basis in various regions throughout the country in areas that were easily accessible by numerous people, at events where those most interested in these issues could be found and in outlets for the purchase of construction materials for professionals and non-professionals. The project was carried out over a three-year period and is believed to have been a success with an estimated 160,000 people reached and informed about asbestos.

A similar initiative should be established in Ireland to ensure a greater number of people are made aware of asbestos, the hazards associated with it and why it is so essential that the proper procedures be carried out in the vicinity of this hazardous material. Having detailed knowledge and understanding of asbestos will also

encourage the public to ensure that they avail of the services of registered contractors who have the knowledge, skills, resources and training to properly remove, handle and dispose of asbestos and asbestos-containing materials in the appropriate manner. The HSA in conjunction with the Construction Federation of Ireland are currently establishing a register of competent contractors in Ireland who have the appropriate knowledge, experience, skills, resources and qualifications to deal with asbestos.

Asbestos awareness should be incorporated into the syllabus of third level construction-related courses and apprenticeship trade courses as these are the professions most likely to encounter asbestos and asbestos-containing materials during the course of their working lives. By integrating asbestos awareness in the training of these professions a wide range of people from different occupations ranging from engineers, interior designers and architects to plumbers, electricians, carpenters and roof contractors are made aware of asbestos and the need to identify whether or not it is present in the area where they are working.

The FÁS Safe Pass Training course is another area where asbestos awareness can be relayed to numerous people whose work could lead them to encounter asbestos or asbestos-containing materials. The FÁS Safe Pass Training Course is designed to ensure people involved in the construction sector are aware of safety issues relating to everyday activities that are carried out on construction sites, therefore this is another ideal medium to relay asbestos awareness information to people involved in the construction sector. The syllabus for Safe Pass Training should be re-examined to include asbestos awareness, thus when people who may be unaware of asbestos are receiving renewal training for the Safe Pass course, they can be informed of the hazards associated with asbestos and asbestos-containing materials and the precautionary measures that should be applied if such a material is encountered. Renewal training will also remind people of the serious issues relating to asbestos.

The more people made aware of asbestos and its associated hazards the greater the likelihood of preventing unknown exposure to asbestos fibres in the future, thus preventing the number of asbestos related diseases developing and affecting people in later life.

The prohibition of placing on the market and the use of asbestos fibres and products containing asbestos fibres has been in effect in Ireland since 1st January 2005 in accordance with the European Communities (Dangerous Substances and Preparations) (Marketing and Use) Regulations, 2000. This prohibition is a means of preventing the continued use of this hazardous material and thus prevents the continued generation of this material as a waste in the future, in accordance with the Waste Management Hierarchy.

Because of the hazardous nature of asbestos and the prohibition on the use of asbestos fibres and asbestos products, these materials cannot be reused or recycled, therefore the only option available for asbestos waste is disposal. However, only construction waste containing asbestos, EWC 17 06 05, that is bonded asbestos cement products such as flat or corrugated sheeting and molded cement products such as water tanks, external rainwater pipes, asbestos cement slates, guttering and flue pipes, can currently be disposed in Ireland in designated landfill sites. The remaining more hazardous loose asbestos and asbestos-containing materials such as insulation boards, lagging and sprayed asbestos must be exported for disposal.

Designated landfill sites are landfill sites that have been licensed by the EPA to accept construction waste containing asbestos, EWC 17 06 05. The landfill accepts the asbestos waste and buries it in specifically designated cells within the landfill site. To-date, there are only three landfill sites in Ireland licensed by the EPA to accept construction waste containing asbestos, EWC 17 06 05. Both Kinsale Road Landfill and Derryconnell Landfill only accept construction waste containing asbestos that is generated in their respective areas. KTK Landfill in County Kildare only accepts construction material containing asbestos waste (EWC 17 06 05) from appropriately permitted contractors. This means that there is only one landfill site in Ireland to accept construction material containing asbestos from the remaining 25 counties in the Republic of Ireland. This is inadequate and needs to be addressed in the near future before KTK Landfill runs out of space and the only option available in Ireland will be to face excessive costs in exporting the asbestos waste for disposal. By licensing more landfills throughout Ireland that have designated cells where construction materials containing asbestos waste can dispose, it will aid Ireland in its waste management in accordance with the 'proximity principle', reducing the amount of waste being exported abroad for disposal.

According to the figures held by the Central Statistics Office (CSO) on the quantities of asbestos imported into Ireland and exported over the years, there is approximately 259,826 tonnes of asbestos remaining in Ireland. However, this figure does not take into consideration the amount of asbestos that has been disposed in licensed landfill sites in Ireland or through illegal means such as burial in unknown locations. Taking these points into consideration, a significant amount of asbestos still remains in the country. The licensing of more landfill sites in Ireland to accept asbestos waste will ensure that the proper facilities and capacity is available to properly handle the significant amount of asbestos still remaining in the country, should new EU legislation come into force requiring all EU Member States to deal with the waste they generate on their own territory.

Different competent authorities are responsible for governing different areas relating to asbestos, be it the removal, movement or disposal of asbestos and asbestos-containing materials. The HSA are responsible for ensuring the removal of asbestos is carried out in a proper safe manner. Local Authorities are responsible for ensuring the trace-ability of asbestos waste and that only competent contractors who have the appropriate collection permits issued by the Local Authorities transport asbestos waste. The EPA is accountable for ensuring that all asbestos waste is disposed of in the correct manner, be it in licensed landfill sites in Ireland or exported to other countries for disposal. The EPA must also ensure the trace-ability of all movements of asbestos waste within Ireland and out of Ireland to ensure the waste was disposed of in proper licensed facilities.

By better communication being established between these organisations, it could further ensure that all activities involved with asbestos are carried out in the correct manner. For example, on receipt of notification from contractors who intend to carry out work involving asbestos, the HSA could inform the Local Authority in whose area the work will be carried out. If the Local Authority does not receive an application for a C1 form to transport the asbestos waste from the site in question, an investigation into the whereabouts of the asbestos waste could be carried out. By informing the EPA of the same information, the EPA would then be aware of the intended arrival of the asbestos waste at one of their licensed landfill facilities or licensed hazardous waste transfer stations. If the waste does not arrive at any of these locations, the EPA could then carry out an investigation into its whereabouts. Further

to this, if it was discovered that the waste was illegally transported and/or dumped, then with the sharing of this information amongst the competent authorities, prosecution of the guilty parties could be carried out.

Similarly, where a contractor applies to a Local Authority for a C1 form to transport asbestos waste, the Local Authority in question could then inform the HSA of the application. The HSA would then check that notification of the intention to carry out this work was submitted to them. Where the HSA discovers that no notification was submitted to them, an investigation could then take place to ensure that the removal of the asbestos was carried out in the proper manner and that no asbestos fibres remained at the site further exposing people. Following such an investigation legal proceeding could be taken against the contractor by the HSA.

Such a system would ensure the proper management of asbestos once it has been identified on site. It would also further impose the responsibilities of the producer of the waste to inform the relevant organisations and to ensure that the asbestos is removed, transported and disposed in the correct manner in compliance with current legislation.

6. CONCLUSION

- New Regulations are required in Ireland placing an onus on owners and occupiers of non-domestic premises to identify all asbestos and asbestos-containing materials that are present within buildings and to establish an asbestos register. By identifying all asbestos present it will reduce the likelihood of exposure to asbestos fibres occurring in the future.

- Ireland needs to develop its own set of guidelines and approved codes of practices that are relevant to Irish legislation and are easily accessible.

- Asbestos awareness needs to be increased amongst people, especially those in the building sectors. This can be achieved by incorporating asbestos awareness training as part of apprenticeship training of trade sectors and in the curriculum of third level construction related courses as these are the professions most likely to encountering asbestos while carrying out their work activities. The re-examination of the FÁS Safe Pass Training syllabus to include asbestos awareness will ensure general labours are also informed of asbestos.

- More landfill sites in Ireland need to be licenced to accept asbestos waste, due to the significant amount still remaining in the country.

- Better communication needs to be established between the organisations that are responsible for the monitoring of asbestos throughout the country, be it the removal, transportation or disposal of asbestos. By improving the communication between these organisations it will ensure the proper management of asbestos once it has been identified on site, until it is disposed of.

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APPENDIX I

List of Asbestos-Containing Products

TYPICAL ASBESTOS-CONTAINING PRODUCTS

Sprayed Coatings		
Typical Application (Use)	Type and Content of Asbestos	Comments
Fire Protection of structural elements e.g. steel frame, floor slabs, particularly in areas of high fire Risk e.g. boilers rooms, underground car parks. Thermal insulation, soundproofing, anti-condensation.	All types but mainly crocidolite and amosite, up to 80% asbestos.	Banned in 1989. Extremely high potential for fibre release.

Lagging		
Typical Application (Use)	Type and Content of Asbestos	Comments
Pipe insulation, boiler insulation, calorifers insulation, pre-formed pipe insulation.	All types of asbestos used, may find mixtures. Content can vary up to 100% in the case of asbestos blankets, rope.	Unlikely to be found in buildings after 1980. High potential for fibre release if disturbed or in poor condition.

Millboard and Paper Products		
Typical Application (Use)	Type and Content of Asbestos	Comments
Heat insulation and fire protection, As part of roofing felts and vinyl floor tiles. Facings to laminate board to give fire resistance.	All types of asbestos used in older products, chrysotile used in 'newer' applications, anything up to 100%.	Use to wrap wiring where susceptible to heat damage. As backing on bitumen felts. Can release fibres when abraded or handled in a rough manner.

Textured Coatings and Paints		
Typical Application (Use)	Type and Content of Asbestos	Comments
Coating on walls and ceiling plaster.	3-5% asbestos, mainly chrysotile.	High potential for fibre release when old coatings are rubbed down. Materials must not be removed dry.

Asbestos Cement Products		
Typical Application (Use)	Type and Content of Asbestos	Comments
Roof sheeting and tiles, wall cladding, tiles and slates, promenade tiles, toilet cisterns and water tanks, boiler and incinerator flue pipes, soil pipes, water pipes, rain water goods (down pipes, gutters), window boxes, window sills, ventilators.	Asbestos (all types) Crocidolite used in pipes. 10 – 15% asbestos bound in a normal Portland cement or calcium silicate matrix. Roof sheeting may contain all three types.	Very widely used, Asbestos fibres are tightly bound and require abrasion or rough handling to be released. Fragile material, very serious risk of falling through roof.

Mastics, sealants, putty, adhesives		
Typical Application (Use)	Type and Content of Asbestos	Comments
For sealing products with extreme heat, such as boilers and incinerators.	Up to 2%.	Potential for fibre release during sanding of hardened material. Avoid use of power tools.

Tubes, pipes and fittings of asbestos-cement	
Typical Application (Use)	Type and Content of Asbestos
For plumbing, ducting and pipe insulation.	Asbestos fibres, flakes or powder.

Yarn and thread; cords and string; woven or knotted fabric of asbestos. Paper, millboard and felt of asbestos; compressed asbestos fibre jointing	
Typical Application (Use)	Type and Content of Asbestos
Clothing, clothing accessories, footwear and headgear	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate.

Compressed asbestos fibre jointing, in sheets or rolls.
For use in civil aircraft.

Friction material and articles thereof	
Typical Application (Use)	Type and Content of Asbestos
Sheets, rolls, strips, segments, discs, washers and pads, for clutches and brakes	A mixture of asbestos fibres

Asbestos plastic & Bitumen products	
Typical Application (Use)	Comments
Roofing felt, damp-proof course, bakelite (asbestos as filler), felt covering as weather protection to external pipe insulation, acoustic/anti-condensation pads for sink.	used between the 1940's and 1975

Asbestos Insulation Board	
Typical Application (Use)	Comments
Fire Protection – partitions, structural column casings, fire doors, firebreaks, service duct covers, suspended ceilings. Thermal insulation – component in prefabricated system built walls, Acoustic absorbers/ Insulation (peg board) –telephone booths, cinemas and auditoriums.	Used between the 1950's and 1975.

Asbestos Insulation	
Typical Application (Use)	Comments
Thermal Insulation to pipes, vessels and boilers of heating, hot water and steam powered systems.	Used between 1900 and 1975.

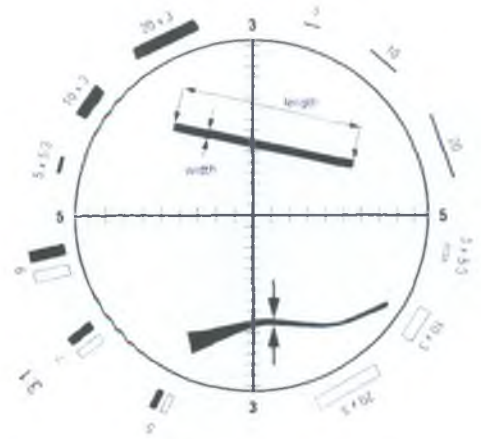
Asbestos Sprayed Coating	
Typical Application (Use)	Comments
Fire protection of structural elements e.g. steel frame, floor slabs, particularly in areas of high fire risk e.g. boiler rooms, underground car parks.	Used between 1960 and 1975.

Domestic Appliances
Ironing board covers, hair driers, oven gloves

APPENDIX II

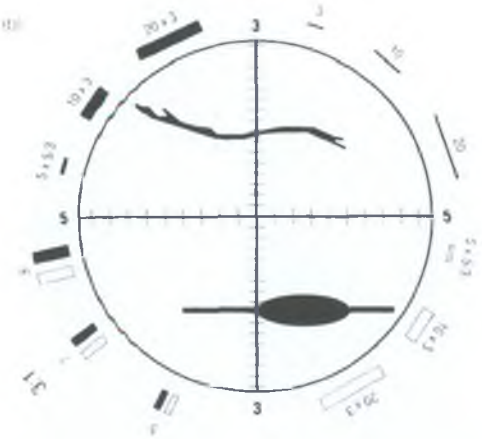
Examples of Countable and Non-Countable Asbestos Fibres (HSE, 2005)

Examples of fibre counting rules for single fibres



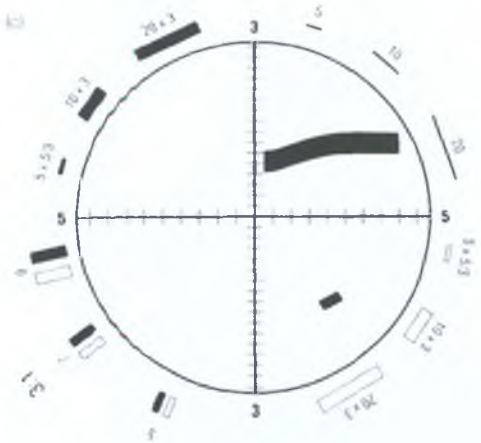
1 fibre; meets length, width and aspect ration criteria

1 fibre; the width being measured at the 'average' point



1 fibre

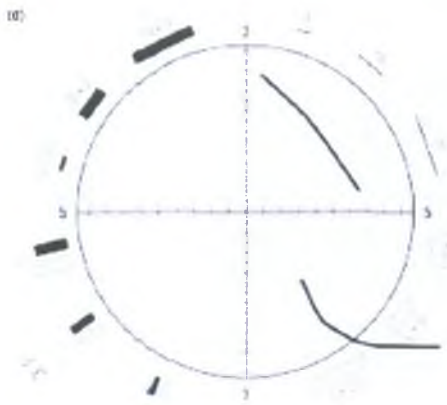
1 fibre; ignore the particle or 'bulb' of resin when estimating the width



0 fibres; width too large

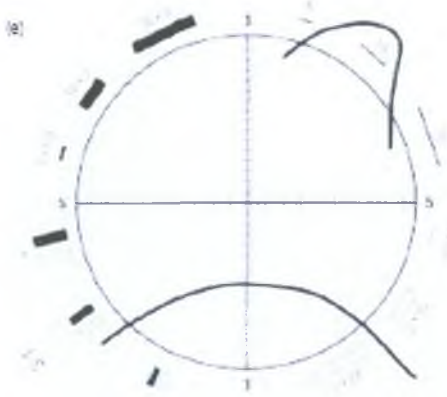
0 fibres; aspect ratio is less than 3:1

Examples of fibre counting rules: for fibres within graticule area and split fibres



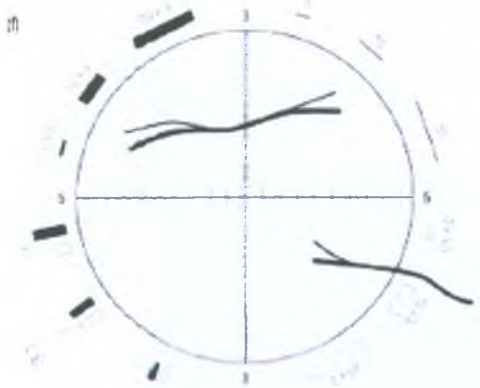
1 fibre; entire fibre in field

½ fibre; 1 end in field



1 fibre; both ends in field

0 fibres; no ends in field



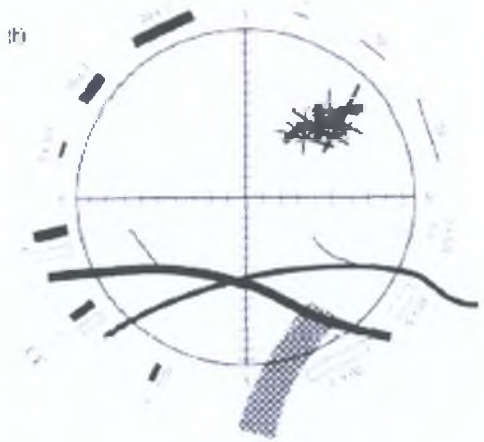
1 fibre; split ends part of fibre

½ fibre; 2 fibre ends split, count as 1 end

Examples of fibre counting rules for grouped fibres

2 fibres

3 fibres



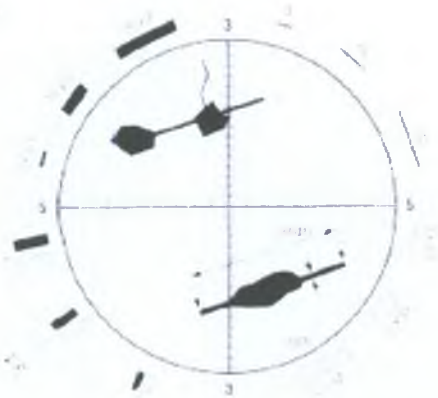
0 fibres

0 fibres

Example of fibre counting rules for
fibres in contact with other particles

1 fibre

½ fibre

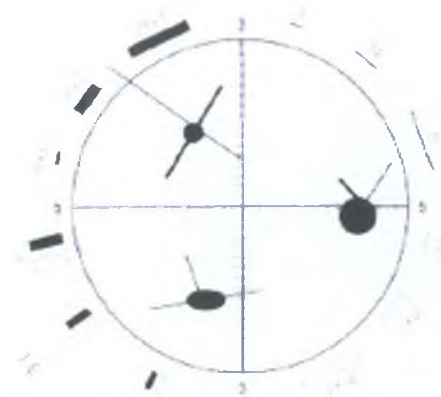


2 fibres

1 fibre

0 fibres

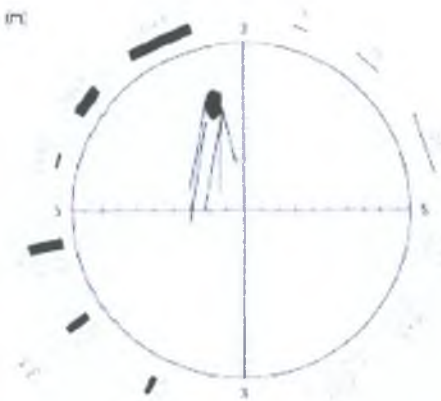
Examples of fibre counting rules for fibres in contact with other particles



1 ½ fibres

2 fibres

2 fibres



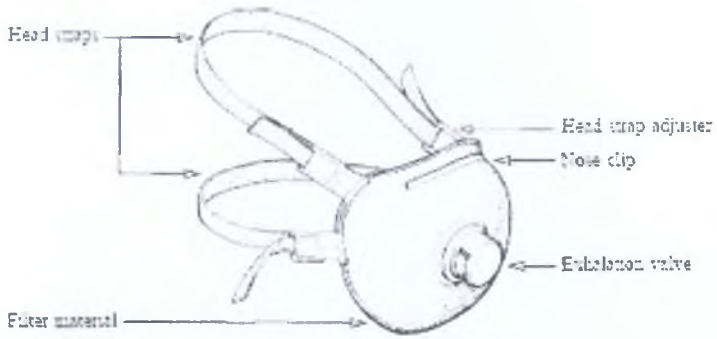
5 fibres

(HSE, 2005)

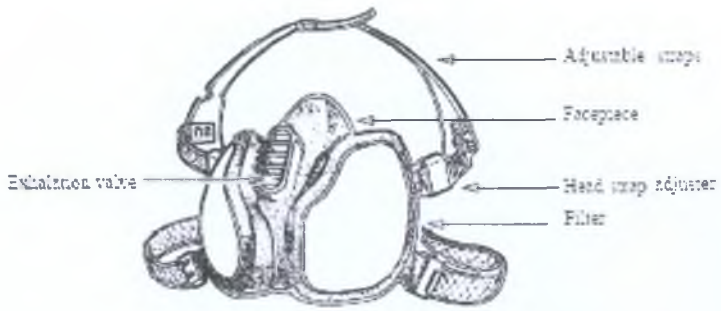
APPENDIX III

Schematics of Various Types of Respiratory Protective Equipment (HSE, 2001*a*)

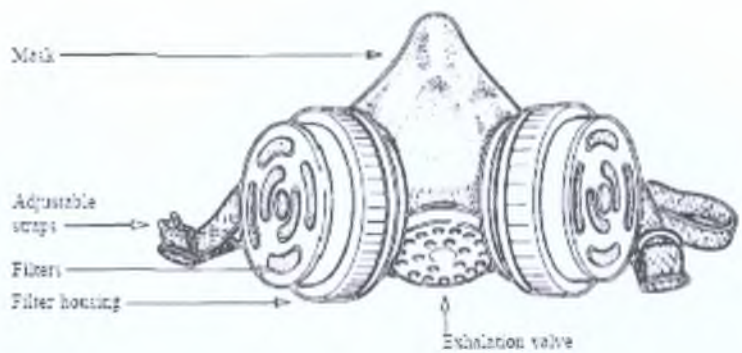
Schematics of various types of Respiratory Protective Equipment



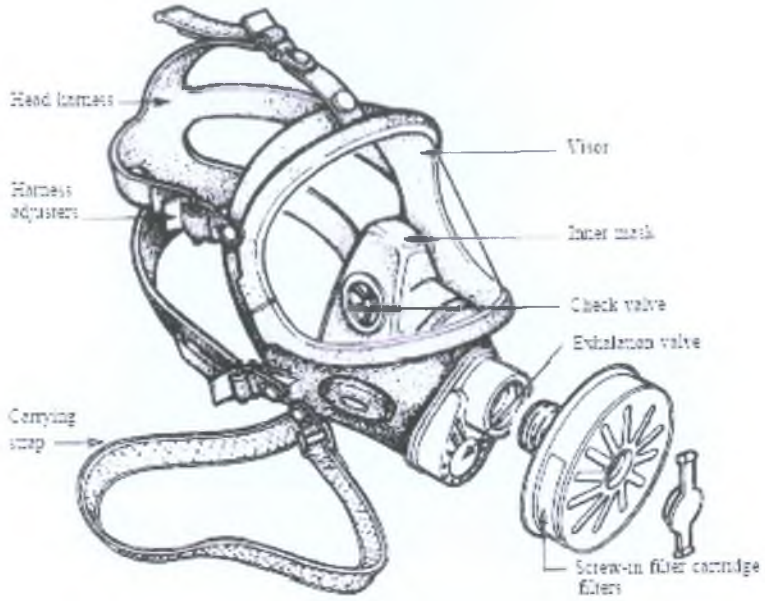
Filtering half mask



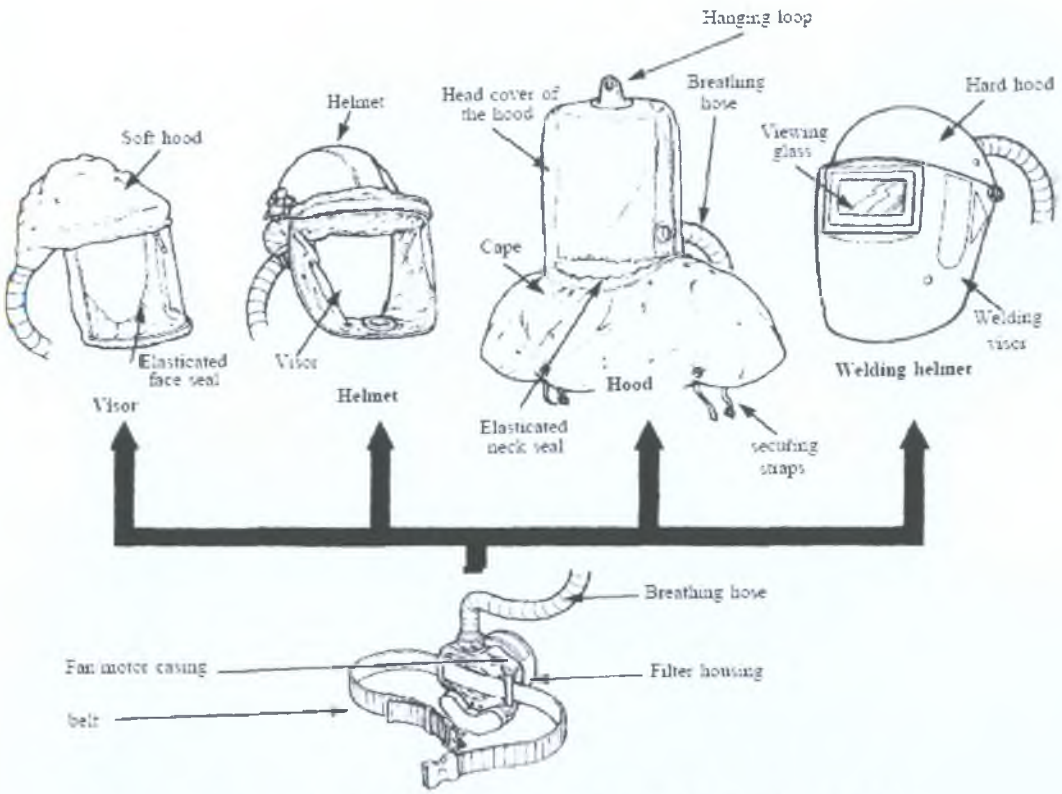
Valved filtering half mask



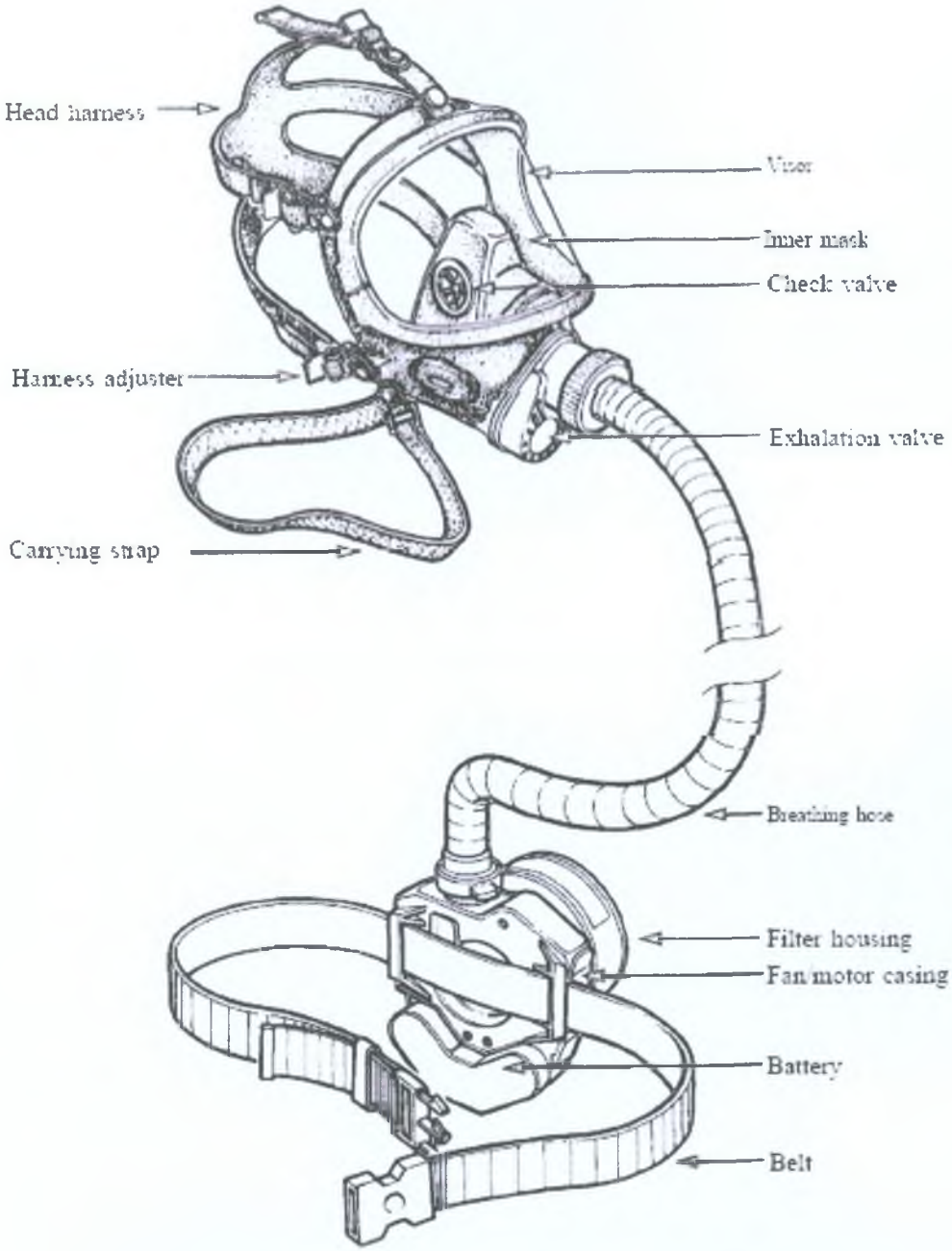
Half mask reusable with filters



Full-face mask



Powered respirators incorporating helmets, hoods, etc.



Power-assisted respirator incorporating a full face mask.

APPENDIX IV

Notification Form for Work to be carried out Involving Asbestos

Health & Safety Authority

NOTIFICATION FORM TO BE USED FOR ANY WORK INVOLVING ASBESTOS

in compliance with EC (Protection of Workers) Exposure to Asbestos) Regulations, 1989-2000

(e.g. removal, repair or encapsulation of lagging, insulation or other materials containing asbestos). This form must be submitted at least 28 days prior to the start of such work to:-

Health and Safety Authority (Occupational Hygiene Unit), 10 Hogan Place, Dublin 2
(or Fax to 01-6147020)

FOR OFFICE USE

Emp. No:	POW No:	Notif No:

TO BE COMPLETED BY NOTIFIER

1.Notifier Name:	2. Date of Notification: 3. Telephone No:
4. Asbestos site:	5. Telephone No: Mobile: 6. Removal Contractor:
7. Scheduled Start Date:	Estimated Completion Date:
9. Smoke Test Date:	
10.Type and quantity of asbestos likely to be involved: (e.g. ceiling tiles, amosite pipe lagging):	
11. Asbestos process involved: (e.g. removal, repair, encapsulation/plant involved etc):	
12. Dust Suppression methods to be used: (e.g. wet stripping, shadow vacuuming):	
13. Brief descriptions of the manner in which the work is to done: (A copy of the plan of work supplied to the client must be submitted).	

Notes:

1. The plan of work, referred to in Item 13 above, is also known as the Method Statement.
2. Any request for waiver of the 28 day notification period must be accompanied by a full justification from the client company

APPENDIX V

List of Companies Permitted to Collect Asbestos Waste in Ireland (www.epa.ie)

Companies Permitted to collect asbestos waste

Name & Address of Operator	Local Authority	Application/Ref. Number	Type of Waste to be Collected
Safeway Contracting, Brandon, Tralee, Co.Kerry	Cork Co. Council	CK WMC 21/01	Industrial Waste (Asbestos bounded and non-bounded) All hazardous waste.
	Offaly Co. Council	014/OY/16/02	EWC 170601 insulation materials containing asbestos & EWC 170605 construction materials containing asbestos
	Kilkenny Co. Council	WCP/KK/089/02	C&D (Hazardous-Asbestos bonded and non bounded)
	Limerick Co. Council	WCP/LK/035/02b	EWC 170601 insulation materials containing asbestos & EWC 170605 construction materials containing asbestos
Stephen Cullen Transport & Storage Ltd., 44A Moyle Road, Dublin Industrial Estate, Glasnevin, Dublin 11	Cork Co. Council	CK WMC 64/01	Hazardous Waste (Asbestos)
	Dublin City Council	CP D142/1	EWC 170601 Insulation materials containing asbestos & EWC 170605 construction materials containing asbestos
	Limerick Co. Council	WCP/LK/126/03b	Construction & Demolition waste, EWC 170601 Insulation materials containing asbestos & EWC 170605 construction materials containing asbestos
	Meath Co. Council	WCP/MH/2003/05B	C&D wastes, EWC 1706 insulation materials & asbestos containing construction materials, EWC 170601 Insulation materials containing asbestos & EWC 170605 construction materials containing asbestos
	Offaly Co. Council	066/OY/38/02	Hazardous EWC 170601 Insulation materials containing asbestos & EWC 170605 construction materials containing asbestos, EWC 160212 discarded equipment containing free asbestos

Companies Permitted to Collect Asbestos Waste cont'd

Cape Industrial Services Ltd., Unit 44, Cookstown Ind. Estate, Tallagh, Dublin 24	Cork Co. Council	CK WMC 09/01	C&D (Asbestos waste) / Hazardous waste
	Dublin City Council	CP D27/1	EWC 170601 Insulation materials containing asbestos & EWC 170605 construction materials containing asbestos
	Kildare Co. Council	WCP/KE/9C/02b	EWC 170601 Insulation materials containing asbestos & EWC 170605 construction materials containing asbestos
	Kilkenny Co. Council	WCP/KK/028/02	Asbetsos insulating & cement sheeting,
	Limerick Co. Council	WCP/LK/011/02b	EWC 170601 Insulation materials containing asbestos EWC 170605 construction materials containing asbestos
	Meath Co. Council	WCP/MH/2001/14b	EWC 170601 Insulation materials containing asbestos EWC 170605 construction materials containing asbestos
	Offaly Co. Council	007/OY/35/02	EWC 170601 Insulation materials containing asbestos EWC 170605 construction materials containing asbestos
Surundon Ltd.t/a Irish Environmental Services Ltd, Naas Rd., Dublin 12	Cork Co. Council	CK WMC 93/01	Asbestos
D Mc Sweeney & Sons (Cork) Ltd. t/a McSweeney Plant Hire	Cork Co. Council	CK WMC 155/03	Construction & demolition Hazardous waste (asbestos sheeting)
Kennedy Environmental Ltd., Six Cross Business Pk., Kilbarry Co. Waterford	Kildare Co. Council	WCP/KE/121C/03b	EWC 170601 friable asbestos (thermal insulation) EWC 170605 non-friable asbestos (cement based products)
	Kilkenny Co. Council	WCP/KK/111/02	C&D (hazardous asbestos waste)

Companies Permitted to Collect Asbestos Waste cont'd

Chieftain Environmental Services, Unit 10 Balbriggan Business Park, Co. Dublin	Dublin City Council	CP D52/1	EWC 170601 Insulation materials containing asbestos, EWC 170605 construction materials containing asbestos, waste containing asbestos
	Kildare Co. Council	WCP/KE/49C/02b	EWC 170601 Inculation materials containing asbestos, EWC 170605 construction material containing asbestos
	Kilkenny Co. Council	WCP/KK/011/02	Domestic (asbestos waste) hazardous/Industrial (asbestos waste) hazardous/Commercial (asbestos waste) Hazardous/ C&D (asbestos waste)
	Limerick Co. Council	WCP/LK/034/02b	EWC 170601 insulation materials containing asbestos, EWC 170605 construction material containing asbestos
	Meath Co. Council	WCP/MH/2001/26B	Insulation materials containing asbestos, Construction material containing asbestos
R&M Willich Industrial Services, Clondalkin Ind. Estate, Dublin 22	Dublin City Council	CP D39/1	EWC 170601 insulation materials containing asbestos, EWC 170605 construction material containing asbestos
	Limerick Co. Council	WCP/LK/036/02b	EWC 170601 insulation materials containing asbestos, EWC 170605 construction material containing asbestos
	Meath Co. Council	WCP/MH/2004/25B	EWC 170601 insulation materials containing asbestos, EWC 170605 construction material containing asbestos
	Offaly Co. Council	231/OY/147/04	EWC 17 06 05 construction materials containing asbestos
Harrington Precast Concrete Ltd., Baldoyle Ind. Estate, Dublin 13	Dublin City Council	CP D388/3	Construction materials containing asbestos including bonded asbestos cement
Mr Andrew Thornton, Tralee, Co. Kerry	Limerick Co. Council	WCP/LK/055/02b	EWC 170605 construction materials containing asbestos
Celtic Forwarding Ltd., Malborough Street, Dublin 1	Wicklow Co. Council	WCP/WW/76/03A	Hazardous – mixed waste/solvent/asbestos

APPENDIX VI

Asbestos Waste Transfer Documentation

WASTE MANAGEMENT (MOVEMENT OF HAZARDOUS WASTE) REGULATIONS, 1998

orm C.1. Consignment Note for consignments of hazardous waste transported within the State (NOT to be used for transhipment into or out of the State)

[redacted]

ART A (to be completed by the consignor)

Name and address of consignor[1]: .....

..... Tel: ..... Fax: .....

Name and chemical composition of waste* .....

.....

European Waste Catalogue/Hazardous Waste List Description(s) and Code(s)[2]: .....

Origin of waste (name and address of producer, if different from 1.) .....

.....

Process(es) that waste originates from: .....

.....

Quantity (indicate kg or litres): .....

Size, type[3] and number of containers: .....

Physical characteristics[4]: .....

Components which are hazardous (giving concentrations in each case): .....

.....

. Hazardous properties[5] and special handling instruction (if any): .....

.....

. Name and address of consignee[6]: .....

.....

consignor, certify that the information given in Part A above is complete and correct to the best of my knowledge.

..... Date .....

ock letters) ..... on behalf of .....

eld by person signing .....

o be completed by the carrier)

carrier,[7] certify that I collected the waste described in Part A in vehicle (reg. no.) ..... at (time) ..... on (date) ..... and have been informed of the hazardous nature of the waste, as set out in that Part.

..... on behalf of .....

ock Letters) ..... Signature of consignor as witness .....

ART C (to be completed by the consignee)

. Name and address of consignee: .....

..... Tel.: ..... Fax: .....

. Waste licence number (if applicable)[8] ..... Waste permit number (if applicable)[9] .....

Certificate of registration (if applicable)[10] .....

. The waste described in Part A was delivered to me by (carrier) ..... in vehicle (reg.no.) .....

at (time) ..... on (date) ..... on behalf of (consignor) .....

. (a) The consignment was accepted: ..... (b) The consignment was rejected: .....

. If the consignment of waste was rejected, state the reason(s): .....

.....

. If the consignment of waste was accepted, state the recovery/disposal activity(ies) to which it will be subject and provide code number and description of the technology involved[11]

.....

. I, the consignee, certify that the information given in Part C above is complete and correct to the best of my knowledge.

gned ..... Date .....

me (block letters) ..... on behalf of .....

sition held by person signing .....

full description may be attached on separate page

otnotes [1] to [11] see relevant definitions and lists in the "Instructions for completion of Consignment notes for Hazardous Waste".

RRIER'S COPY - to be given to the carrier of the waste, after completion of PART C by the consignee, and retained by the carrier.

EUROPEAN COMMUNITY (a)

TRANSFRONTIER MOVEMENT OF WASTE
Notification Form

COPY FOR: The Authority issuing the acknowledgement

1. Notifier/exporter (name, address) and registration N° where applicable:

Tel.: Fax:
Contact person:

2. Consignee (name, address) and registration N° where applicable:

Tel.: Fax:
Contact person:

7. Intended carrier(s)* (name, address) and registration N° where applicable:

Tel.: Fax:
Contact person: * (attach list if more than one)

10. Waste generator/producer (name and address):

Tel.: Fax:
Contact person:
Process and location of generation:*
* (attach details if necessary)

3. **Notification concerning** (1): N° I E

A (i) Single movement ☐ B (i) Disposal (no recovery) ☐
(ii) General notification (multiple movements) ☐ (ii) Recovery operation ☐

C* Pre-authorized recovery facility ☐ yes ☐ no

* (Only to be completed if B (ii) applies)

4. Total intended number of shipments

5. Total intended quantity (b) kg / liters

6. First shipment not before:
Departure of last shipment not after:

8. Disposal/recovery facility (name, location, address):

Tel.: Fax:
Registration N° where applicable:
and limit of validity:
Contact person:

9. Code N° of disposal/recovery operation (2):
and technology employed:*
* (attach details if necessary)

11. Mode(s) of transport (2):

12. Packaging type(s) (2):

13. Name and chemical composition of the waste:

14. Physical characteristics (2):

15. **Waste identification code**
- in country of export/dispatch:
- in country of import/destination:
International Waste Identification Code (IWIC):
European Waste Catalogue (EWC)
Other (specify):

17. Y number:

18. H number (2):

16. OECD classification (1): amber ☐ red ☐ and number:
other* ☐
* (attach details)

19. UN identification number: UN class (2):
and proper shipping name:

20. Concerned countries (2), code numbers of competent authorities (where applicable), and specific points of entry and exit:

Country of export/dispatch	Transit countries			Country of import/destination

21. Customs offices of entry and/or departure (European-Community):
Entry:
Departure:

22. Number of annexes attached

23. **Notifier/exporter's declaration**: I certify that the above information is complete and correct to the best of my knowledge. I also certify that legally-enforceable written contractual obligations have been entered into and that any applicable insurance or other financial guarantees are or shall be in force covering the transfrontier movement.
Name: Signature:
Date:

FOR USE BY COMPETENT AUTHORITIES

24. TO BE COMPLETED BY COMPETENT AUTHORITY OF COUNTRY OF IMPORT/DESTINATION

Notification received on:
Acknowledgement sent on:

Name of competent authority, stamp and/or signature

25. CONSENT* TO THE MOVEMENT PROVIDED BY COMPETENT AUTHORITY
of: (name of country) on:
Name of competent authority, stamp and/or signature

Consent expires on:
Specific conditions (1) ☐ No ☐ Yes, **see block 26 overleaf**
* (not required for amber list wastes under OECD Decision)

(1) Enter X in appropriate box(es) (2) See codes on the reverse
(a) Forms also used by OECD
(b) Indicate one of the two. Competent authorities are allowed to ask for the quantity in kg only.

List of abbreviations used in the notification form

DISPOSAL/RECOVERY OPERATIONS (Block 9)

DISPOSAL (NO RECOVERY)

D1 Deposit into or onto land, (e.g., landfill, etc.)
D2 Land treatment, (e.g., biodegradation of liquid or sludgy discards in soils, etc.)
D3 Deep injection, (e.g., injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.)
D4 Surface impoundment, (e.g., placement of liquid or sludge discards into pits, ponds or lagoons, etc.)
D5 Specially engineered landfill, (e.g., placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)
D6 Release into a water body except seas/oceans
D7 Release into seas/oceans including sea-bed insertion
D8 Biological treatment not specified elsewhere in this list which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12
D9 Physico-chemical treatment not specified elsewhere in this list which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12 (e.g., evaporation, drying, calcination, etc.)
D10 Incineration on land
D11 Incineration at sea
D12 Permanent storage, (e.g., emplacement of containers in a mine, etc.)
D13 Blending or mixing prior to submission to any of the operations numbered D1 to D12
D14 Repackaging prior to submission to any of the operations numbered D1 to D12
D15 Storage pending any of the operations numbered D1 to D12

RECOVERY OPERATIONS

R1 Use as a fuel (other than in direct incineration) or other means to generate energy
R2 Solvent reclamation/regeneration
R3 Recycling/reclamation or organic substances which are not used as solvents
R4 Recycling/reclamation of metals and metal compounds
R5 Recycling/reclamation of other inorganic materials
R6 Regeneration of acids or bases
R7 Recovery of components used for pollution abatement
R8 Recovery of components from catalysts
R9 Used oil re-refining or other reuses of previously used oil
R10 Land treatment resulting in benefit to agriculture or ecological improvement
R11 Uses of residual materials obtained from any of the operations numbered R1 to R10
R12 Exchange of wastes for submission to any of the operations numbered R1 to R11
R13 Accumulation of material intended for any operation numbered R1 to R12

NOTE: Disposal ("D") operations are not relevant to the OECD Control System

MODES OF TRANSPORT (Block 11)

R = Road
T = Train/Rail
S = Sea
A = Air
W = Inland Waterways

PACKAGING TYPES (Block 12)

1. Drum
2. Wooden barrel
3. Jerrican
4. Box
5. Bag
6. Composite packaging
7. Pressure receptacle
8. Bulk
9. Other (specify)

PHYSICAL CHARACTERISTICS (Block 14)

Powdery/powder
Solid
Viscous/paste
Sludgy
5. Liquid
6. Gaseous
7 Other (specify)

H NUMBER AND UN CLASS (Blocks 18 and 19)

UN Class	H Number	Designation
1	H1	Explosive
3	H3	Inflammable liquids
4.1	H4.1	Inflammable solids
4.2	H4.2	Substances or wastes liable to spontaneous combustion
4.3	H4.3	Substances or wastes which, in contact with water, emit inflammable gases.
5.1	H5.1	Oxidizing
5.2	H5.2	Organic peroxides
6.1	H6.1	Poisonous (acute)
6.2	H6.2	Infectious substances
8	H8	Corrosives
9	H10	Liberation of toxic gases in contact with air or wat
9	H11	Toxic (delayed or chronic)
9	H12	Ecotoxic
9	H13	Capable, by any means, after disposal, of yielding another material, e.g. leachate, which possesses any of the characteristics listed above.

OECD COUNTRY CODES (Block 20)

Australia:	AU	Finland:	FI	Ireland:	IE	Netherlands:	NL	Sweden:	SE
Austria:	AT	France:	FR	Italy:	IT	New Zealand:	NZ	Switzerland:	CH
Belgium:	BE	Germany:	DE	Japan:	JP	Norway:	NO	Turkey:	TR
Canada:	CA	Greece:	GR	Luxemburg:	LU	Portugal:	PT	United Kingdom:	GB
Denmark:	DK	Iceland:	IS	Mexico:	MX	Spain:	ES	United States:	US

For other countries ISO Standard 3166 abbreviations shall be used.

26. SPECIFIC CONDITIONS ON CONSENTING TO THE MOVEMENT

THE INTERNATIONAL WASTE IDENTIFICATION CODE (IWIC - BLOCK 15), THE OECD CLASSIFICATION LISTS OF WASTES DESTINED FOR RECOVERY OPERATIONS (AMBER, RED - BLOCK 16) AND THE CATEGORIES OF WASTES SUBJECT TO CONTROL (TABLE Y - BLOCK 17), AS WELL AS MORE DETAILED INSTRUCTIONS CAN BE FOUND IN A GUIDANCE MANUAL AVAILABLE FROM OECD.

EUROPEAN COMMUNITY (a)

TRANSFRONTIER MOVEMENT OF WASTE
Movement/Tracking Form

COPY FOR:

1. Notifier/exporter (name, address) and registration N° where applicable:

Tel.: Fax:
Contact person:

2. Consignee (name, address) and registration N° where applicable:

Tel.: Fax:
Contact person:

3. Corresponding to Notification N° I E

4. Serial Number of shipment:

8. Disposal/recovery facility (name, location, address):

Tel.: Fax:
Registration N° where applicable:
and limit of validity:
Contact person:

9. Code N° of disposal/recovery operation (2):
and technology employed:

5. 1st Carrier (name, address):

Registration N°:
(where applicable)
Tel.: Fax:

6. 2nd Carrier (3) (name, address):

Registration N°:
(where applicable)
Tel.: Fax:

7. Last Carrier (name, address):

Registration N°:
(where applicable)
Tel.: Fax:

10. Identity of means of transport:

Date of transfer:

Signature of Carrier's Representative:

11. Identity of means of transport

Date of transfer:

Signature of Carrier's Representative:

12. Identity of means of transport

Date of transfer:

Signature of Carrier's Representative:

13. Name and chemical composition of the waste:

14. Physical characteristics (2):

15. **Waste identification code**

- in country of export/dispatch:
- in country of import/destination:

International Waste Identification Code (IWIC):
European Waste Catalogue (EWC):
Other (specify):

17. Actual quantity (b)

kg

liters

18. Number of packages:

16. OECD classification (1): amber ☐ red ☐ and number:
other* ☐

* (attach details)

19. UN identification number: UN class (2):
and proper shipping name:

20. Special handling instructions:

22. **Notifier/exporter's declaration**: I certify that the information in blocks 1 to 9 and 13 to 21 above is complete and correct to the best of my knowledge. I also certify that legally enforceable written contractual obligations have been entered into, that any applicable insurance or other financial guarantees are in force covering the transfrontier movement, and that *

(i) all necessary consents have been received; **or**
(ii) the shipment is directed at a recovery facility within the OECD area and no objection has been received from any of the concerned countries within the 30 day tacit consent period; **or**
(iii) the shipment is directed at a recovery facility pre-authorized for that type of waste within the OECD area; such an authorization has not been revoked, and no objection has been received from any of the concerned countries.

Name: Signature:

Date:

* (delete sentences not applicable)

21. Actual date of shipment:

TO BE COMPLETED BY CONSIGNEE / DISPOSAL / RECOVERY FACILITY

23. Shipment received by consignee on: accepted ☐ (1)
(if not disposal/recovery facility) rejected * ☐

Quantity received (b): Kg liters
Date: Name: Signature:

* (immediately contact competent authorities)

24. Shipment received at disposal/recovery facility on: accepted ☐ (1)
rejected * ☐

Quantity received (b): Kg liters
Date: Name: Signature:
Disposal/recovery to be completed by:
Method of disposal/recovery:

* (immediately contact competent authorities)

25. I certify that the disposal/recovery of the waste described above has been completed*

Date:
Name:
Signature:

* (not required by OECD control system)

(1) Enter X in appropriate box(es) (2) See codes on the reverse (3) If more than three carriers, attach information as required by blocks 6 and 11.
(a) Forms also used by OECD
(b) Indicate one of the two. Competent authorities are allowed to ask for the quantity in kg only.

List of abbreviations used in the movement/tracking form

DISPOSAL/RECOVERY OPERATIONS (Block 9)

DISPOSAL (NO RECOVERY)

D1	Deposit into or onto land, (e.g,. landfill, etc.)
D2	Land treatment, (e.g., biodegradation of liquid or sludgy discards in soils, etc.)
D3	Deep injection, (e.g,. injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.)
D4	Surface impoundment, (e.g., placement of liquid or sludge discards into pits, ponds or lagoons, etc.)
D5	Specially engineered landfill, (e.g,. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)
D6	Release into a water body except seas/oceans
D7	Release into seas/oceans including sea-bed insertion
D8	Biological treatment not specified elsewhere in this list which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12
D9	Physico-chemical treatment not specified elsewhere in this list which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12 (e.g., evaporation, drying, calcination, etc.)
D10	Incineration on land
D11	Incineration at sea
D12	Permanent storage, (e.g. emplacement of containers in a mine, etc.)
D13	Blending or mixing prior to submission to any of the operations numbered D1 to D12
D14	Repackaging prior to submission to any of the operations numbered D1 to D12
D15	Storage pending any of the operations numbered D1 to D12

NOTE Disposal ("D") operations are not relevant to the OECD Control System

RECOVERY OPERATIONS

R1	Use as a fuel (other than in direct incineration) or other means to generate energy
R2	Solvent reclamation/regeneration
R3	Recycling/reclamation of organic substances which are not used as solvents
R4	Recycling/reclamation of metals and metal compounds
R5	Recycling/reclamation of other inorganic materials
R6	Regeneration of acids or bases
R7	Recovery of components used for pollution abatement
R8	Recovery of components from catalysts
R9	Used oil re-refining or other reuses of previously used oil
R10	Land treatment resulting in benefit to agriculture or ecological improvement
R11	Uses of residual materials obtained from any of the operations numbered R1 to R10
R12	Exchange of wastes for submission to any of the operations numbered R1 to R11
R13	Accumulation of material intended for any operation numbered R1 to R12

PHYSICAL CHARACTERISTICS (Block 14)

1. Powdery/powder	5. Liquid
2. Solid	6. Gaseous
3. Viscous/paste	7. Other (specify)
4. Sludgy	

CD COUNTRY CODES (Blocks 26-27-28)

tralia:	AU	Finland:	FI	Ireland:	IE	Netherlands:	NL	Sweden:	SE
tria:	AT	France:	FR	Italy:	IT	New Zealand:	NZ	Switzerland:	CH
jium:	BE	Germany:	DE	Japan:	JP	Norway:	NO	Turkey:	TR
ada:	CA	Greece:	GR	Luxemburg:	LU	Portugal:	PT	United Kingdom:	GB
mark:	DK	Iceland:	IS	Mexico:	MX	Spain:	ES	United States:	US

other countries ISO Standard 3166 abbreviations shall be used

FOR USE OF CUSTOMS OFFICES *

COUNTRY OF EXPORT/DISPATCH OR (FOR EC) CUSTOMS OFFICE OF EXIT

The waste described overleaf has left the country/Community on:

Stamp:

Signature:

27. STAMPS OF CUSTOM OFFICES OF TRANSIT COUNTRIES

Name of country (2):		Name of country (2):	
Entry	Departure	Entry	Departure

28. COUNTRY OF IMPORT/DESTINATION

The waste described overleaf has entered the country on:

Stamp:

Signature:

Name of country (2):		Name of country (2):	
Entry	Departure	Entry	Departure

(2) See country codes above.

* Not required by OECD control system

THE INTERNATIONAL WASTE IDENTIFICATION CODE (IWIC - BLOCK 15), THE OECD CLASSIFICATION LISTS OF WASTES DESTINED FOR RECOVERY OPERATIONS (AMBER, RED - BLOCK 16) AND THE CATEGORIES OF WASTES SUBJECT TO CONTROL, AS WELL AS MORE DETAILED INSTRUCTIONS CAN BE FOUND IN A GUIDANCE MANUAL AVAILABLE FROM OECD.

APPENDIX VII

Prohibition Dates on the Placing on the Marketing and Use of Asbestos and Asbestos Containing Products

Products and the dates which signify the prohibition of placing on the market and use of products that contain asbestos fibres as stated in the EC (Dangerous Substances and Preparations)(Marketing and Use) Regulations, 2000

Prohibition date on the placing on the market and use of these fibres and of products containing these fibres intentionally added, commences from	Product
5th April 2000	Crocidolite Amosite Anthophyllite Actinolite Tremolite Chrysotile
1 January 2001	Compressed asbestos fibre gaskets for use with saturated steam, superheated steam, or with substances which if classified would be in the category of danger, corrosive, toxic, flammable, or highly flammable according to the EC (Classification, Packaging, Labelling and Notification of Dangerous Substances) Regulations, 1994.
	Any sheet which when in a dry state has a density greater than 1900 kilograms per cubic metre and is used in temperatures at or above 500°C.
1 January 2004	Any component of an aeroplane or helicopter which is necessary for its safe operation.
	Any product consisting of a mixture of asbestos with a phenol formaldehyde resin or with a cresylic formaldehyde resin used in (a) vanes of rotary vacuum pumps (b) vanes for rotary compressors (c) any bearing or its housing, or (d) split face seals of at least 150 millimetres in diameter used to prevent leakage of water from hydro-electric power generation turbines or from cooling water pumps in fossil fuel electricity generating stations
	Pre-formed joints fro sealing the doors of steam boilers and made from cloth containing asbestos and proofed with rubber or another elastomeric polymer.
1 January 2005	Personal protective clothing for protection against the handling of material at a temperature of 500°C or more