**EXPLANATORY MEMORANDUM TO**

**THE CONTROL OF ASBESTOS REGULATIONS 2006**

**2006 No. 2739**

**1.** This explanatory memorandum has been prepared by the Department for Work and Pensions and is laid before Parliament by Command of Her Majesty.

This memorandum contains information for the Joint Committee on Statutory Instruments.

## 2. Description

2.1. The Control of Asbestos Regulations 2006 (the "Asbestos Regulations") further strengthens requirements to protect workers and others likely to be exposed to asbestos fibres arising from work with materials containing asbestos. They are also expected to reduce potential future deaths from asbestos related diseases. Most of the duties are placed on employers; for example, to assess work which could expose employees to asbestos fibres and have measures in place to prevent or reduce such exposure. But there are duties on others, such as the duty placed on those in control of non-domestic premises to manage asbestos in those premises. The Regulations also prohibit the import, supply and use of materials containing asbestos.

## 3. Matters of special interest to the Joint Committee on Statutory Instruments

3.1. The Committees will want to note regulation 3(3) in particular. This provides a specific power for the Health and Safety Commission (HSC) to approve a short-term, peak exposure limit beyond which the derogation in regulation 3(2) will not apply. This has been included to clarify when the derogation contained in Article 3(3) of Directive 2003/18/EC (implemented through regulation 3(2)) applies and to address concerns raised by stakeholders.

3.2. The policy background to this, together with another widely debated issue (the removal of most work with textured decorative coatings containing asbestos, from the licensing regime), is covered in section 7 of this Explanatory Memorandum. Further details of how the Asbestos Regulations implement Directive 2003/18/EC are set out in the attached Transposition Note (Annex 2).

## 4. Legislative Background

4.1. The Asbestos Regulations are made under the Health and Safety at Work etc Act 1974. They are needed primarily in order to implement Directive 2003/18/EC which amended Council Directive 83/477/EEC (the 'Asbestos Worker Protection Directive – or AWPD). The main aim of the amending Directive is to change the necessary protective measures to increase protection for workers who are now most at risk from exposure to asbestos fibres. These are workers involved in the removal of asbestos containing materials and in the maintenance or servicing of buildings which may contain such materials. The Asbestos Regulations also incorporate changes which establish a more risk-based approach to determining the scope of the requirements - in particular, the application of the licensing requirements.

4.2. In making these changes, the opportunity has been taken to simplify the legislative framework by revoking and replacing three sets of Regulations:

i) The Control of Asbestos at Work Regulations 2002;

ii) The Asbestos (Licensing) Regulations 1983 (as amended); and

iii) The Asbestos (Prohibitions) Regulations 1992 (as amended).

4.3. The Asbestos Regulations carry forward from these earlier Regulations provisions which implemented requirements of other Council Directives insofar as they relate to asbestos – namely, 76/769/EEC which set out restrictions on the marketing and use of dangerous substances and preparations, 90/394/EEC on the risks related to carcinogens at work and 98/24/EC on the protection of workers from the risks related to chemical agents.

## 5. Extent

5.1. This instrument applies to Great Britain.

## 6. European Convention on Human Rights

6.1. As the instrument is subject to negative resolution procedure and does not amend primary legislation, no statement is required.

## 7. Policy Background

Size and Nature of Problem

7.1. Asbestos is a naturally occurring mineral and was used extensively for about 150 years. It was versatile, plentiful and ideal as a fireproofing and insulation material and, as a result, was used for many different purposes before the hazards it posed were fully understood. Although the importation, supply and use of asbestos have now been banned (for blue and brown asbestos from 1985; for white asbestos from 1999) and much of the material has been removed, it is still present in a large number of buildings. In 2002, it was estimated that about half a million non-domestic premises still contained some form of asbestos.

7.2. All forms of asbestos are category 1 human carcinogens, although blue and brown forms (crocidolite and amosite - amphiboles) are considered to be more hazardous than white asbestos (chrysotile). Inhalation of asbestos fibres can cause three main fatal diseases: mesothelioma (a cancer of the lining of the lung), lung cancer and asbestosis. In 2004, there were 1969 deaths from mesothelioma attributed to asbestos exposure and 100 deaths recorded due to asbestosis. The number of people who die of lung cancer attributable to exposure to asbestos is unclear as it is indistinguishable from lung cancer attributed to other causes (eg smoking). But it is estimated that there is about one asbestos-related death due to lung cancer for each death from mesothelioma. This brings the estimate for those dying from asbestos related diseases to around 4000.

7.3. There is usually a long delay of anything between 15 to 60 years from first exposure to asbestos fibres, to the onset of asbestos related disease – the average being around 35 years. The great majority of those dying now were therefore exposed to asbestos between the 1960s and the 1970s when asbestos was less well regulated than today and widely used in industry. Since then, the prohibition on import, supply and use of asbestos and improved working conditions has

virtually eliminated the risks for many workers such as dockers, asbestos product manufacturers and railway workers. However, building and maintenance workers are still at significant risk as they may be unknowingly exposed to asbestos containing materials which remain in place in buildings.

Policy objectives

7.4. The main policy objectives of the Asbestos Regulations are further to strengthen the protection given to those who might be exposed to asbestos fibres while establishing a more risk-based approach to determining the scope of the more onerous requirements. These are achieved by:

i) Implementing Directive 2003/18/EC which amended Council Directive 83/477/EEC on the protection of workers from the risks related to exposure to asbestos at work (the 'Asbestos Worker Protection Directive – or AWPD);

ii) Removing most work with textured decorative coatings containing asbestos (TCs) from the licensing regime (TCs are patterned or stippled coatings used for decoration and to cover cracks or other unevenness on walls and ceilings); and

iii) Simplifying the pre-existing legal framework by carrying forward provisions contained in three sets of Regulations (see paragraph 4.1) into one set of Regulations and replacing the three previous Approved Codes of Practice with two.

*Implementation of Directive 2003/18/EC*

7.5. Directive 2003/18/EC sets minimum health and safety standards. Its aim is to provide further protection for those working with materials containing asbestos over and above that already provided for in the original AWPD.

7.6. Some of the amendments introduced by Directive 2003/18/EC had already been implemented through provisions in the existing Regulations. However, a number of other amendments needed to be implemented – in particular to:

i) Establish a single control limit of 0.1 fibres per cubic centimetre ($f/cm^3$) to replace the current dual limit – one of 0.3 $f/cm^3$ for Chrysotile (White Asbestos), the other of 0.2 $f/cm^3$ for Amphiboles (Blue and Brown Asbestos);

ii) Require a new, more accurate method by which to measure compliance with the new control limit – the 1997 World Health Organisation (WHO) recommended method;

iii) Establish mandatory, detailed training requirements for those exposed or liable to be exposed to asbestos at work; and

iv) Replace a provision which disapplies certain requirements (notification, medical surveillance and medical records) when exposure falls below "limit values", with a provision which disapplies the same requirements when exposure is "sporadic and of low intensity" (Article 3(3) of the amended AWPD).

7.7. The Transposition Note (Annex 2) sets out in more detail how all the provisions of AWPD have been transposed into the Asbestos Regulations and highlights in particular how the amendments introduced by Directive 2003/18/EC have been implemented.

7.8. When HSC consulted on the proposed Regulations, there was substantial support for most of these changes and how they had been implemented in the Asbestos Regulations. It was recognised that the changes would tighten the controls on working with materials containing asbestos and could have a significant impact in reducing potential future deaths from asbestos related diseases.

7.9. The Regulatory Impact Assessment (RIA - see Annex 1) estimates that the introduction of the new control limit alone is expected to prevent around 40 deaths among asbestos workers as a result of exposures over the next 50 years. The imposition of detailed mandatory training will provide a firmer basis for ensuring that employers equip their employees with a better understanding of the risks to health of working with asbestos containing materials and the work practices and equipment necessary to protect themselves and others. Overall, the Regulations, including those provisions brought forward from the previous Regulations, are expected to prevent around 6500 occupational deaths from exposures over the next 50 years. Other than the new control limit, it is not possible to identify separately the contribution made by each of the new requirements because they mesh together with those of the existing requirements.

7.10. Concerns were raised over the implementation of the Article 3(3) during consultation. Article 3(3) provides for a derogation in relation to work where:

i) exposure to asbestos fibres is "sporadic and of low intensity";

ii) it is clear from the risk assessment that the control limit will not be breached; and

iii) the work comes within one of four described categories.

7.11. There were two basic concerns in relation to this. The first was that the phrase "sporadic and of low intensity" was not clear enough to know whether or not the derogation might apply. The second concern arose from the description in Article 3(3) of the categories of work to which the derogation applies. These include:

i) short non-continuous maintenance activities in which only non-friable materials are handled; and

ii) removal without deterioration of non-degraded materials in which the asbestos fibres are firmly linked in a matrix.

When HSC consulted it deliberately omitted the words "non-friable" and removal "without deterioration of non-degraded" materials from regulation 3(2) (which implements Article 3(3)) because these phrases created legal uncertainty over whether or not the derogation applied. The concern raised was that regulation 3(2) did not therefore fully implement Article 3(3).

7.12. Despite these concerns, the way in which the "sporadic and low intensity" derogation has been implemented in regulation 3(2) is justified in terms of the clarity it provides. What is key in deciding whether or not exposure is sporadic and of low intensity is the nature and degree of exposure to airborne asbestos fibres rather than the precise detail of how that exposure may arise. The words "non-friable" and "without deterioration of non-degraded" are understood to relate to the potential release of asbestos fibres arising from the condition of the materials being worked with.

7.13. However, to achieve further clarity (particularly in relation to the phrase "sporadic and low intensity"), regulation 3(3) has been added. This provides for HSC to approve a peak exposure limit beyond which exposure would not be considered to be sporadic and of low intensity. HSC have agreed to approve such a limit for all types of asbestos of 0.6 f/cm$^3$ in the air measured over a ten-minute period. This is equivalent to the current short-term exposure level for the most hazardous forms of asbestos in previous Asbestos Regulations. But some stakeholders remain concerned and the Committees should be aware that the approach taken to implementing this Article is currently the subject of correspondence between the European Commission and the Health and Safety Executive.

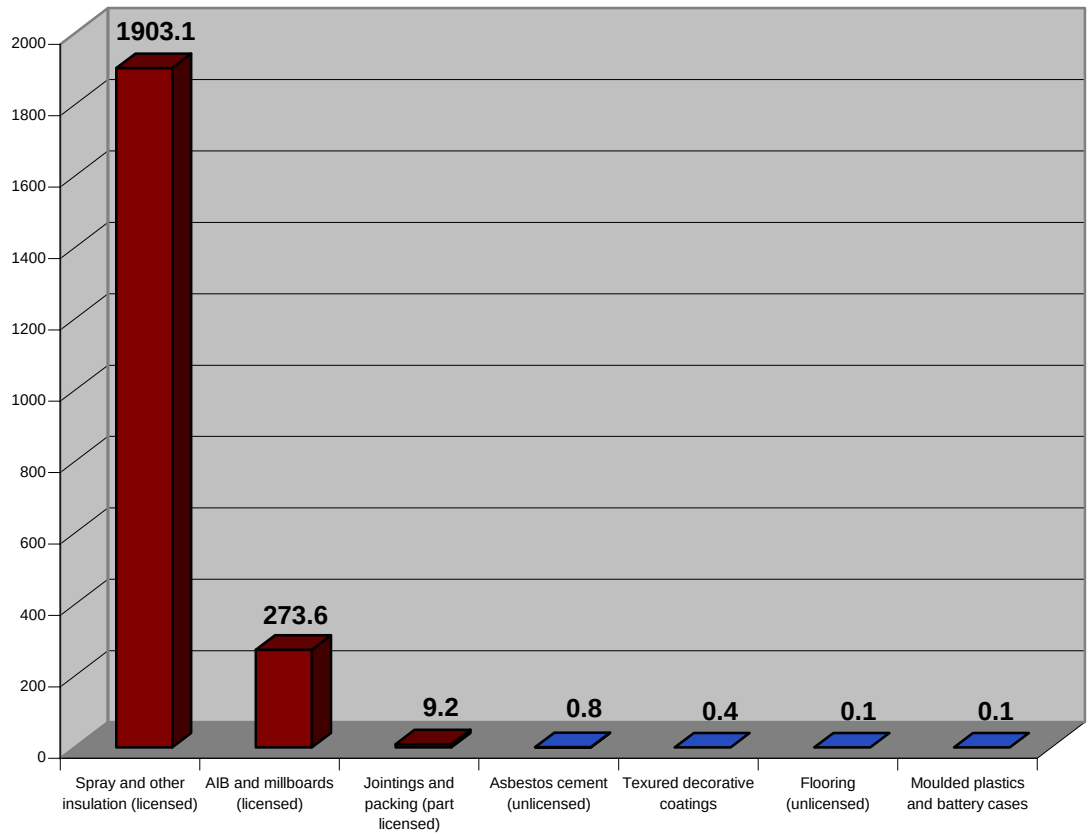
*Removal of most work with TCs from the licensing regime*

7.14. The licensing regime was established in the UK in 1983 before AWPD was implemented and goes beyond the requirements of AWPD. It currently requires employers to be licensed when working with specified materials (such as asbestos insulating board) where the risk of exposure to asbestos fibres was considered to be high. In order to be licensed, firms need to be able to demonstrate to HSE a good understanding of the legal requirements, a high level of management/supervisory competency, as well as show they have the necessary equipment, medical certification and that their employees have received the appropriate training.

7.15. Under the current Regulations, the licensing regime also applies to work with textured decorative coatings containing asbestos (TCs). However, results of more recent research undertaken on the levels of fibres released and the risks arising from working with TCs showed that such risks are much lower than previously thought. They are much lower than the risks arising from other materials subject to the licensing regime. They are also lower than work with materials which have never been subject to the licensing regime (such as asbestos cement).

7.16. Figure 1 presents the different levels of risk graphically. This shows that if work is undertaken with limited controls and no respiratory protective equipment (RPE) (ie a worst case scenario), the calculated annual risk of death from working for forty years with licensed materials (i.e. sprayed asbestos; other asbestos insulation; asbestos insulating board; and millboards) is 2176.7 per million workers (1903.1 + 273.6). In comparison, the calculated annual risk of death from working with TCs is only 0.4 per million workers and from asbestos cement is 0.8 per million workers. Even in this worst-case scenario, with continuous peak level exposures and without the use of RPE, it is calculated that there would be no expected deaths resulting from the exposure of workers to asbestos fibres resulting from a change in licensed status for TCs. Further detail on this can be found in Annex A to the RIA.

**Figure 1: Comparison of asbestos product groups (annual risk of death per million based on 10% of time actively removing ACMs from age 20 for 40 years with limited controls and no RPE)**




7.17. HSC therefore consulted on a proposal that the application of the licensing requirements would be more risk-based - one which would have the effect of removing most work with TCs from the licensing regime. This is in line with overall policy on health and safety that the level of regulation should be proportionate with the level of risk. It also means that the effort to maintain compliance can be focussed on the main areas of risk.

7.18. This change raised concerns during HSC's consultation that it would lead to a reduction in the level of protection for workers. There were also concerns that the earlier research had been done using proper controlled removal techniques (wetting of the materials and air extraction). The concern was that if non-licensed workers were to carry out removal of TCs they would be less likely to use these techniques. Further research was undertaken in response to these concerns. This assessed exposure arising from work carried out without using the proper controls but still found low exposures.

7.19. The Regulations therefore adopt the risk-based approach. They do this by using the same mechanism that disapplies certain requirements of the amended AWPD (Article 3(3) – see paragraphs 3.1 and 7.10-7.13). As well as provisions such as notification, regulation 3(2) also

disapplies the licensing requirements (regulation 8) from work which is likely to be "sporadic and of low intensity". Almost all work with TCs is likely to be "sporadic and of low intensity" and the draft ACoP advises that most work with TCs would, as a result, no longer require a licence. However, this does not mean that work with TCs is not subject to controls. Such work still has to be done by trained workers, in a way that reduces exposures to asbestos fibres as low as reasonably practicable below the control limit and with all other necessary controls such as the use of suitable RPE- as detailed in the Regulations. The Approved Codes of Practice and other guidance which will be published (see paragraph 7.22 below) will provide full details on how work with TCs will need to be carried out to comply with the Regulations.

*Simplification of regulatory framework*

7.20. The consolidation of three sets of Regulations (see paragraph 4.2.) simplifies the regulatory framework. This should help dutyholders comply with the requirements.

Consultation

7.21. During consultation on the proposed Regulations, there was substantial interest in the proposals. Over 500 different individuals or organisations responded to the Consultative Document issued by HSC in October 2005. There was substantial support for the majority of the proposed changes. However, as described above, two issues raised concerns: the implementation of Article 3(3) and the removal of work with TCs from the licensing regime. A summary of the results of consultation is contained in the attached Regulatory Impact Assessment. More detail can be found on the Health and Safety Executive's (HSE) website at www.hse.gov.uk/asbestos/issues.htm.

Guidance

7.22. The Asbestos Regulations will be supplemented by two Approved Code of Practices (copies of both will be placed in the House Libraries and will be available from HSE Books):

i) one covering the duty in regulation 4 which requires those who have control of non-domestic premises to identify whether asbestos is present and, if so, put into action a plan to ensure that anyone who might be exposed to asbestos fibres is protected;

ii) the other covering all other requirements

7.23. In addition, the existing suite of guidance is being reviewed and revised in the light of the Asbestos Regulations and the ongoing work of the HSE's Disease Reduction Programme. This will include guides for Licensed Contractors and Analysts (already published), a revised Asbestos Essentials (providing full, practical guidance for those carrying out non-licensed work) which will also be freely available on HSE's website. HSE has also developed an asbestos portal on their website.

## 8. Impact

8.1. A final Regulatory Impact Assessment is attached at Annex 1.

**9. Contact** Kevin Walkin at the Health and Safety Executive, Tel: 020 7717 6298 or email: kevin.walkin@hse.gsi.gov.uk, can answer any queries regarding this instrument.

# AMENDMENTS TO THE CONTROL OF ASBESTOS AT WORK AND ASBESTOS (LICENSING) REGULATIONS

## 1. REGULATORY IMPACT ASSESSMENT

1.1.1. This is a final RIA for the Control of Asbestos Regulations 2006 (the 'Asbestos Regulations'). The partial RIA (alongside the proposed regulations) was subject to consultation which has not resulted in changes to the proposals which require substantial changes to the partial RIA. The results of consultation together with details of changes made post-consultation are appended at Annex C.

## 2. PURPOSE AND INTENDED EFFECT

### 2.1. Issue

2.1.1. This document examines the impact of implementing the amendments to the Asbestos Worker Protection Directive (AWPD amendments). These amendments (Council Directive 2003/18/EC which amends Council Directive 83/477/EEC) were adopted on 27 March 2003. This RIA also examines other amendments to current asbestos legislation. The Asbestos Regulations, which now incorporate these amendments, will mainly affect those at work who may be exposed to asbestos fibres and in particular those involved in asbestos removal, and maintenance and demolition in buildings which contain asbestos materials.

### 2.2. Objectives

2.2.1. The objective of the amendments included in the Asbestos Regulations and Approved Codes of Practice (ACoPs) is to further reduce the risk of future exposure to asbestos by fully implementing the AWPD amendments and making some adjustments to clarify and simplify existing asbestos legislation.

2.2.2. The purpose of the AWPD amendments is to refocus measures on those who are now most at risk, in particular workers who remove asbestos and maintenance workers who may disturb asbestos during their work.

2.2.3. The AWPD amendments intended to reduce asbestos exposure, are; a single lower Control Limit which worker exposure must not exceed, simplification of the limits regime, a strengthened emphasis on worker training, a greater focus on protecting maintenance workers and encouraging a risk-based approach to asbestos controls rather than the current, materials-based approach.

2.2.4. In addition the opportunity was taken to simplify and clarify the regulatory framework by combining these sets of Regulations and amending the licensing and notification regulations to create a consistent, risk-based system of control. This removes the requirement to use licensed asbestos removal contractors in specific cases where the risk assessment does not justify it. The Asbestos Regulations also now require those carrying out site clearance to be accredited to encourage higher standards of site clearance following asbestos removal.

## 2.3. Background

2.3.1. Asbestos has been responsible for more occupationally induced deaths than any other single cause. Since asbestos can result in death 15-60 years after exposure, the current mortality rate, which is expected to rise until around 2011-2015, is largely determined by the level of exposure before the introduction in the 1980s of modern and more stringent asbestos legislation. Nevertheless, the current risk of exposure to asbestos remains significant.

2.3.2. Prior to the introduction of the Asbestos Regulations, the exposure of workers to asbestos was controlled by three sets of Regulations:

2.3.2.1. **Control of Asbestos at Work Regulations 2002**[1] (CAW) came into effect in 1987 and were amended in 1999 and 2002. They applied to any work in which asbestos is encountered, whether intentionally or not. Some particular regulations were triggered only if exposure was liable to exceed an action level.

2.3.2.2. **The Asbestos (Licensing) Regulations 1983**[2] (ASLIC) as amended in 1998. The Regulations generally banned work with asbestos insulation or asbestos coating or asbestos insulating board, unless carried out by an organisation holding a licence granted by HSE. The regulations allowed the enforcing authorities (HSE inspectors and local authority inspectors) to identify and monitor closely work with the asbestos materials that pose the greatest risk to people's health.

2.3.2.3. **The Asbestos (Prohibitions) Regulations 1992**[3] as amended in 1999. The 1992 Regulations prohibited the importation, supply and use of the amphibole family of asbestos (including crocidolite and amosite) and products containing them and included a list of products containing chrysotile asbestos. The 1999 amendments prohibited the importation, supply and use of chrysotile asbestos, and of most products containing it.

2.3.3. In 1995 new research identified maintenance workers as the group most at risk from exposure to asbestos. As a consequence, in 1998 the UK amended the Control of Asbestos at Work (CAW) Regulations 1987 to make it clear that they applied to this high-risk group.

2.3.4. HSC had previously consulted on a range of measures to enhance protection for those working with, or affected by, asbestos containing materials. On 21 May 2004 the duty to manage asbestos in non-domestic premises came into force (regulation 4 of the Control of Asbestos at Work Regulations 2002). It requires those who own, occupy, manage or have responsibilities for non-domestic premises (including commercial buildings and the common areas of residential property) to proactively identify asbestos containing material (ACM), assess its condition and manage the risk arising from it. Information about the location and conditions of ACM must be made available to anyone who may be exposed to asbestos.

[1] Control of Asbestos at Work Regulations 2002 SI N$^{o}$ 2675
[2] Asbestos (Licensing) Regulations 1983 SI N$^{o}$ 1649 as amended in 1998 SI N$^{o}$ 3233
[3] Asbestos (Prohibitions) Regulations 1992 SI N$^{o}$ 3068 as amended in 1999 SI N$^{o}$ 2373 and in 2003 SI N$^{o}$ 1889

2.3.5. During its Presidency in April 1998, the UK was instrumental in negotiating an agreed set of Council conclusions (98/C 142/01) inviting the EC to prepare a second amendment to the Asbestos Worker Protection Directive.

2.3.6. The UK played a key role in the development of the AWPD amendments and the Directive was finally adopted on 18 February 2003. It should have been transposed into UK legislation by 15 April 2006. The final form of the amending Directive is generally in line with the UK negotiating position.

2.3.7. Full compliance with the duty to manage, together with the requirements in the AWPD amendments, e.g. clearer training specifications and a tighter control limit, will help to eliminate risks from exposure to asbestos.

## 2.4. Risk assessment

2.4.1. Asbestos exposure had been investigated in detail as part of the earlier HSE proposals for a duty to identify and manage the presence of asbestos in workplace premises. Human health risks can be considered in two groups; occupational exposure from workers disturbing asbestos containing materials (ACMs) and exposure to other individuals including members of the public, who may be affected by the presence of disturbed or degraded asbestos in the buildings they work in or inhabit.

2.4.2. The investigation mentioned above highlighted that workers were at risk from asbestos exposure when working with asbestos-containing materials (ACMs) either inadvertently or without proper controls in place. A review by the Health and Safety Laboratory (HSL) on exposure levels, summarised in Annex A, suggests that maintenance workers encounter situations where the revised Control Limit could be exceeded up to 20% of the time they work with ACMs. The changes implemented are intended to reduce asbestos exposure by increasing awareness of both the presence and risks of ACMs and ensuring proper controls are in place when working with them.

2.4.3. This earlier investigation indicated that, from a baseline year of 2000, approximately 7,800 individuals would go on to develop a fatal asbestos related disease over the next one hundred years, as a result of exposure over the next fifty years. This figure is based on current levels of exposure, but allows for the routine demolition of buildings over time. Of these deaths around 4,500 would be as a result of occupational exposure, around 2,000 would be as a result of indirect, or work-related, exposure and 1,300 would be as a result of domestic exposure. Details of how these figures were estimated are contained in Annex B.

2.4.4. To calculate the monetary value of these deaths, HSE applied the current Department for Transport value of risk reduction to each fatality (£1.3 million in 2003 values), discounting at 3.5% per year in line with HM Treasury guidance, uprating by 2% to allow for an assumption about constant marginal valuation of health with respect to changes in income, and doubling the figure to allow for a particular aversion to carcinogens[4]. Using this method the benefits of a total elimination of current risk (7,800 deaths) are calculated as having a present value of at least £8.4 billion, of which some £7.0 billion will be due to occupational exposure (6,500 deaths).

[4] This practice is mentioned in the Green Book.

2.4.5. HSE conducted further analysis on the risks to licensed asbestos removal workers, the highest exposure group, who form a small subset of the above occupationally exposed workers. The details of this analysis are contained in Annex A. HSE estimates that the number of licensed workers who will go on to die over the next 100 years as a result of current levels of exposure over the next 50 years is 87[5]. Numerous assumptions were made in the estimation of this figure, and HSE therefore suggested that applying an uncertainty factor of two is appropriate. This yields a range of between 44 and 174 fatalities. Converted into monetary terms, this gives a present value of between £51 million and £204 million. This is included within the totals mentioned in paragraph 2.4.3, above.

2.4.6. Proper risk control can only result from a full package of measures of which this Directive is one part, designed to reduce exposure, (through the lowering of the Control Limit, for example) and encourage increased compliance (for instance, with training). The full package also includes the new duty to manage asbestos requirements, which came into force in 2004.

## 3. OPTIONS

### Table 1

| | |
|---|---|
| **Option 1 - Do nothing** | |
| Para 3.3.1 | Retain current Regulations and ACoPs without amendment |
| Para 3.3.3 | Retain two Control Limits, two Action Levels and two short term exposure limits |
| **Option 2 - Implement the AWPD Amendments substantially as adopted** | |
| Para 3.4.1 | Most amendments will have no significant impact |
| Para 3.4.2 | Action levels replaced by concept of 'sporadic and low intensity' |
| Para 3.4.3 | Requirements to minimise worker exposure to asbestos |
| Para 3.4.6 | Introduction of WHO fibre counting method |
| Para 3.4.8 | Explicit requirement that employers provide appropriate training |
| Para 3.4.12 | Requirement of evidence of ability to do asbestos work |
| Para 3.4.13 | Control Limit of 0.1 fibres per $cm^3$ over 8-hour TWA |
| **Option 3 - Implement the Control Limit with minor amendments to take account of current GB practice** | |
| Para 3.5.1 | Control Limit of 0.1 fibres per $cm^3$ over 4-hour TWA |
| **Option 4 - Changes to the regulatory regime** | |
| Para 3.7.1 | Combine Prohibitions Regulations, CAW and ASLIC to form a single set of Regulations |
| Para 3.7.5 | A risk-based approach to define what is exempt from licensing |
| Para 3.7.7 | Employers on their own premises require a licence |
| Para 3.7.8 | Change to 1 – 3 year licences |
| Para 3.7.11 | ACoP requires DCU maintenance record on site |
| **Option 5 - Four-stage site clearance certification for reoccupation** | |
| Para 3.8.1 | Bring Regulations into line with accreditation scheme requiring ISO 17025. |

[5] The baseline for these estimates is in fact 2004, whereas, as previously mentioned, the baseline year for the headline figures is 2000. However, the difference that this creates for the purposes of comparison is very slight, and is due purely to an assumption about the rate at which buildings containing asbestos are demolished.

3.1.1. The options considered, summarised in Table 1, above, relate to changes to pre-existing Regulations and ACoPs [6] that are necessary to implement the AWPD amendments.

3.1.2. The options considered also included some regulatory simplification, amendments to the current licensing regime and an alignment of accreditation requirements for site clearance with changes in ACoPs introduced in 2002.

3.1.3. The AWPD amendments have been implemented as detailed in Option 2 with the modification detailed in Option 3. In most cases this has require little, if any, change to the existing Regulations as many of the requirements introduced by the amending Directive were already contained within the pre-existing asbestos Regulations or in the associated ACoPs.

3.1.4. As the final form of the amending Directive was generally in line with the UK negotiating position, It was not considered appropriate to propose under-implementation of any of the AWPD amendment Articles.

3.1.5. The Asbestos Regulations also introduce changes to existing Regulations and ACoPs as detailed in Options 4 and 5. Option 1 was not considered feasible.

## 3.2. Implementation of Amendments to the Asbestos Worker Protection Directive

## 3.3. Option 1 – Do Nothing

3.3.1. The first option considered was to retain the pre-existing Regulations and ACoPs without amendment as being sufficient to implement the AWPD amendments. Many of the requirements introduced by the AWPD amendments were already substantially implemented either in current Asbestos Regulations or, more often, in ACoPs. However, there were some requirements in the AWPD amendments that were not currently included either in Regulations or in ACoPs. Also, including the requirements of a Directive in ACoPs rather than Regulations is, in many cases, likely to lead to under-implementation of the Directive and will probably give rise to infraction proceedings, as the requirements would not be legally binding.

3.3.2. As well as under-implementation of the AWPD amendments, leaving the Regulations and ACoPs unchanged would not accord with the UK policy and negotiating position during the development of the amending Directive in Europe, which was to strengthen the current legislative requirements for those who may be exposed to asbestos fibres at work. In particular, the UK supported a single Control Limit of 0.1 f/cm$^3$ for all types of asbestos; a strengthening of the requirements to protect workers who may otherwise be unknowingly exposed to asbestos; and the introduction of the World Health Organisation's (WHO) method for the determination of asbestos fibres in air.

3.3.3. The 'do nothing' option would include the retention of two Control Limits, two Action Levels and two Short Term Exposure Limits (STELs) that were in CAW. The Directive replaces Action Levels with the concept of 'sporadic and low Intensity exposure' (see paragraph 3.4.2). The Directive does not include

[6] Work with Asbestos Insulation, Asbestos Coating and Asbestos Insulating Board (L28), Work with Asbestos which does not normally require a Licence (L27) and the Management of Asbestos in Non-Domestic Premises (L127)

short term exposure limits (STELs) and the UK did not include them in its negotiating position.

3.3.4. Given the above, HSE considered that the do nothing option was not feasible for those requirements of AWPD where changes to legislation were required in order to properly implement the amendments to the Directive.

### 3.4. Option 2 - Implement the AWPD Amendments substantially as adopted

3.4.1. Implementation of the requirements of the AWPD amendments substantially as adopted was identified as the preferred option for most of the requirements of the amending Directive. The final form of the AWPD amendments was generally in line with the UK negotiating position and the UK policy of continuing to reduce the risk from exposure to asbestos that remains in buildings and elsewhere to as low as is reasonably practicable. However, issues involving significant changes to the legal requirements are outlined here.

3.4.2. **Action levels replaced by 'sporadic and low intensity'** - In place of the Action Levels previously detailed in Article 3.3 of the Directive, a new concept of 'sporadic and low intensity' exposure has been introduced. Where certain types of work fit within this definition, some requirements of the AWPD are waived (i.e. to notify the HSE and to have medical surveillance). The types of work concerned include: short, non-continuous maintenance activities; removal of materials where asbestos is firmly linked into the matrix; encapsulation of asbestos-containing materials; air monitoring and control, and the collection of samples. This requirement of the AWPD amendments has been implemented substantially using the wording of the Directive in the Regulations, and by providing authoritative guidance in the ACoP. This affects a number of issues, the following changes are notable:

3.4.2.1. Textured decorative coatings containing asbestos (TCs) – The sporadic and low intensity definition maintains the status quo for most work with asbestos, however research undertaken by the Health and Safety Laboratory (HSL) indicates that most work with TCs gives rise to only very sporadic and low intensity exposure to asbestos fibres. Work with these types of materials was within the scope of the ASLIC but this is no longer the case and work with TCs no longer needs to be undertaken by a licensed contractor; to be notified; or the maintenance of medical records. It should be noted that licensing is a requirement in Great Britain but not in AWPD.

3.4.2.2. Removal of Action Levels – These set an exposure limit for asbestos fibres over a three-month period. Earlier requirements in CAW triggered by Action Levels have been amended accordingly. These include:

i. Notification of work with asbestos - work which requires an asbestos licence must be notified to the relevant enforcing authority a minimum of 14 days before work commences.

ii. Medical Surveillance and Records – previously, where the action level was exceeded, medical surveillance was undertaken and health records maintained for all workers. This has been amended to require these measures in all cases unless the work is sporadic and

low intensity as defined. There are ancillary licence holders (mainly scaffolding companies) and supervisory licence holders whose workers are not currently required to have medicals and who will be caught by this requirement as they do not fall within the categories that may be exempt.

3.4.3. **Minimising worker exposure** - Article 6 of AWPD details requirements to minimise worker exposure to asbestos. Most of the Article required no change or only technical changes to regulations. However, Article 6 states that for all activities where workers may be exposed to asbestos, exposure must be reduced to a minimum and in any case below the Control Limit. The earlier Regulations simply required employers to reduce exposure to as low as is reasonably practicable but this has been amended to more closely align with the wording included in the COSHH (Amendment) Regulations 2004[7] which lays out principles of good practice for the control of exposure to substances hazardous to health.

3.4.4. Prior to the Asbestos regulations a STEL was used to reinforce and support high standards of control such as wearing respiratory protective equipment (RPE). A limit for peak exposures has been maintained, otherwise it could be argued that RPE is not legally required as long as exposure does not exceed 2.4 f/cm$^3$ over 10 minutes (the equivalent of the proposed Control Limit over 4 hours). The ACoP specifies that it is always reasonably practicable to reduce exposure below a level of 0.6 f/cm$^3$ (the previous STEL for amphibole asbestos in CAW).

3.4.5. As COSHH already applied in so far as CAW did not, these amendments will simplify the regulatory regime and impose no additional regulatory burden. In practice this is unlikely to significantly change working practices as it is designed to ensure that the current requirement for employers to continue to minimise exposure even after they have reached the Control Limit is fully implemented, rather than new working methods adopted.

3.4.6. **World Health Organisation (WHO) method of fibre counting** - A revised Article 7 details the requirements for measurement of asbestos fibres in air and the introduction of the World Health Organisation (WHO) method of fibre counting. Some of its clauses were already in UK Regulations and required no change. Others have been implemented substantially as per the Directive. However, only one has had any impact on the RIA:

3.4.7. Article 7(6) introduces the WHO method of fibre counting. This has been implemented by deleting Annex 1 in CAW and specifying use of the WHO method in Regulations. Analytical laboratories are required to transfer to this counting method and some training for staff will be necessary to ensure proficiency in the new system. Sampling was required to be carried out using the European Reference Method (ERM). Under the ERM method, fibres are discounted if they touch particles that are greater than 3 microns in width, but under the WHO method, these fibres are not discounted. The amount by which WHO methods result in greater fibre counts compared to the ERM method is dependent on the amount of other particulate matter associated with the asbestos. This varies between no difference and approximately 1.4

[7] The Control of Substances Hazardous to Health (Amendment) Regulations 2004 SI N$^o$ 3386

for site clearance sampling. The effect for sampling originating from maintenance work is unknown.

3.4.8. **Training** - Article 12a introduces an explicit requirement that employers shall provide appropriate training for all workers who are, or who are likely to be, exposed to asbestos-containing dust. The article goes on to specify that the training must enable workers to acquire the necessary knowledge and skills with regard to a range of specific issues. Regulation 9 of CAW placed the same basic general requirement on employers i.e. that all workers liable to be exposed to asbestos should be provided with adequate information, instruction and training.

3.4.9. Both the Directive and CAW required appropriate training for all workers who are or are liable to be exposed to asbestos, not just those whose work requires them to disturb asbestos-containing materials directly. In most cases this was asbestos awareness training.

3.4.10. Although CAW went on to detail a range of general 'training' issues aimed at safeguarding employees, the list fell significantly short of the training requirements listed within the AWPD amendments. This level of detail was previously contained within the ACoP supporting CAW.

3.4.11. In the Asbestos regulations, however the training issues, as detailed in the Directive, have been moved from ACoP into the Regulations. This does not change the existing requirements for training and is not expected to change current good practice.

3.4.12. **Evidence of ability to carry out asbestos work** - Article 12b introduces a new requirement that prior to carrying out asbestos demolition and removal activities firms are to demonstrate their ability to carry out such work. The evidence is to be established in accordance with national laws and/or practice.

i. For licensable work the 'ability' requirements associated with the asbestos licensing application process meet the needs of this requirement.

ii. For 'non-licensable' work no comparable assessment of the 'ability' of firms carrying out this work was in place in legislation. However, CAW required that a Plan of Work should be prepared prior to any work being undertaken with asbestos. This has been carried forward into the Asbestos Regulations. The detailed information required for inclusion within the Plan of Work provides adequate indication of a firm's understanding of the work to be undertaken and their ability to do so.

3.4.13. **Control Limit of 0.1 fibres per $cm^3$ as an 8-hour time weighted average** - Article 8 amends the Directive to introduce a single Control Limit (maximum concentration of asbestos fibres in air to which a worker may be exposed) for all asbestos types and also lowers the Limit. In AWPD this new Control Limit is 0.1 $f/cm^3$ over 8 hours. This reduces the limit for amphibole asbestos (Blue

asbestos, brown asbestos etc) from 0.2 f/ml and for chrysotile (white asbestos) from 0.3 f/ml[8].

3.4.14. HSE's negotiation position was to reduce the Control Limit and to introduce a single limit. These two elements have been implemented as per the Directive – except as detailed below in Option 3.

### 3.5. Option 3 – Implement the Control Limit with minor amendments to take account of current GB practice

3.5.1. **Control Limit of 0.1 fibres per $cm^3$ as a 4-hour time weighted average** - The revised Control Limit has been implemented substantially as per the AWPD amendments. However, in line with the UK negotiating position and to reflect normal working practice in this country, the Control Limit of 0.1 f/$cm^3$ is required to be measured over a time weighted average (TWA) of 4 hours rather than 8 hours.

3.5.2. Where workers are dealing with high levels of fibre in air normal working practice is to wear RPE and in these circumstances UK workers tend to do 4- to 6-hour shifts, rather than the longer, 8-hour shifts of other construction-type workers. Article 10(3) of the AWPD amendments requires that where protective breathing equipment is necessary it shall be kept to a strict minimum and that physical and climatological conditions are taken into consideration. The shorter working shift is in line with this requirement.

3.5.3. The eight-hour TWA proposed in the AWPD amendments is outdated and is a carry- over from regulation necessary in the asbestos manufacturing industry. Patterns of work have changed and it is unlikely that the majority of asbestos workers will be exposed to asbestos for an eight-hour period. Consequently, use of an eight-hour TWA would allow higher exposures in the normal work period (4-6 hours) and still achieve compliance with the limit. Keeping the TWA of 4 hours prevents the possibility of doubling the limit to 0.2 f/$cm^3$ over a 4-hour shift, but still complies with the Directive if the asbestos in air is measured over an 8-hour working period.

3.5.4. The UK negotiating position was that the Control Limit should be measured over a 4-hour TWA and not the 8-hour period adopted in AWPD. This requirement of the Directive has been implemented exactly as adopted (see Option 2, paragraph 3.4.13, above) except that the Asbestos regulations maintains the 4-hr TWA.

### 3.6. Options 4 and 5 – Amendments to improve the current regulatory regime not resulting from implementation of the Directive

3.6.1. While revising the asbestos regulations the opportunity has been taken to take account of AWPD amendments, to simplify the current legislative structure and to bring accreditation requirements in line with earlier changes to ACoPs now that appropriate accreditation schemes have been developed.

[8] The Control Limits in CAW are described in terms of millilitres (ml). AWPD uses $cm^3$ for the new Control Limit. In practice these are the same measure.

### 3.7. Option 4 - changes to the regulatory regime imposing no significant changes

3.7.1. **Regulatory simplification** - The requirements of the Prohibitions Regulations, CAW and ASLIC have been combined to form a single set of Regulations.

3.7.2. The asbestos licensing regime has been in existence since 1983; before the CAW Regulations came into force. Its separation from CAW was therefore historical. In certain areas the two sets of Regulations duplicated requirements, for example in the requirement to notify. Combining the Regulations simplifies the current asbestos regulatory regime. The simplification will be particularly noticeable where it is not immediately clear whether a job requires licensing (ASLIC), notification (CAW and ASLIC) or in some cases neither of these. Bringing the Prohibitions Regulations into the Asbestos Regulations also avoids some duplication of definitions and simplifies the overall regime. A single set of Regulations should make the legislation easier to understand and therefore easier to comply with.

3.7.3. This change will not affect the number of organisations that are licensable and should have no significant impact on working practices.

3.7.4. **Licensing** - The licensing regime required that employers or self-employed persons held a licence to work with asbestos insulation, asbestos coating or asbestos insulating board unless certain exemptions applied such as work of short duration (defined as 1 hour for one worker and 2 hours for all employees on that job in any seven days). Companies working with other types of ACMs did not need a licence.

3.7.5. A risk-based approach has now been adopted to define what comes within the definition of sporadic and low intensity for worker exposure (see paragraph 3.4.2, above) and that defines which work will be exempt from the requirement to have a licence. The requirement to have a licence will now be based on whether the worker exposure will be sporadic and low intensity. For most work with asbestos this maintains the status quo.

3.7.6. This approach simplifies and clarifies the Asbestos Regulations by aligning when a licence is needed with the requirement to notify work as per AWPD amendments. The intention is that all work that must be notified to HSE will need to be carried out by a licensed contractor and work that comes within the definition of ‘sporadic and low intensity exposure’ and therefore does not require notification will also not require a licence. With two exceptions (see paragraphs 3.4.2.1, above and 3.7.7, below) there is not a significant change in the types of work that require a licence and those that do not.

3.7.7. Employers using their own workers on their own premises will no longer be exempt from the licensing requirements. The exemption from the requirement to hold a licence originated from the time when there was still some manufacturing and use of materials containing asbestos, but this is no longer the case. The new requirement to hold an HSE asbestos licence will have little impact as the only companies that are likely to be affected will be those that maintain equipment used by the asbestos removal companies. HSE records suggest that this amounts to only around 6 firms. Employers who do use their own employees on their own premises to work on licensable ACMs were

previously required to notify HSE of the work. HSE has not received any such notifications in the last two years.

3.7.8. **Asbestos licence time limits** - Change to allow a variation and maximum time limit on a licence to remove asbestos.

3.7.9. Regulation 4(2)(a) of ASLIC allowed a licence to be "with or without a limit of time". Regulation 4(3)(b) not only allowed HSE "to vary the terms of the licence" but also "imposed a limit of time where none had been imposed" and allows for that time limit to be varied or removed.

3.7.10. It is impractical to allow an indefinite time limit and common practice is that licences are issued for one to three years. Changing the Regulations to reflect this would have meant that the requirement to "impose a limit of time where none had been imposed" would no longer be necessary. In practice it has never been necessary to remove a time limit. To reflect current practice the Asbestos Regulations allow a maximum licence time limit of three years and to allow for that limit to be varied if necessary.

3.7.11. **Documentation on site** - Amendment of the ACoP to require certain documentation to be kept on site by a licensed contractor.

3.7.12. In addition to the documentation that was required by CAW the new ACoP dealing with work with asbestos requires that licensed contractors also keep on site a daily record of maintenance of the de-contamination unit (DCU). The DCU is necessary to allow asbestos removal workers to remove all traces of asbestos from themselves when they have finished work. In order to prevent exposure to asbestos fibres, it is vital that the DCU is working properly and is clean.

3.7.13. In practice many companies already have this information and documentation on site as they currently comply with HSE guidance (ALG memo 5/03). Those involved with the work, including inspectors, need to know that the DCU is being properly maintained.

### 3.8. Option 5 - Four-stage site clearance certification for reoccupation

3.8.1. The Asbestos Regulations introduce a requirement that those issuing clearance certificates for reoccupation, meet the relevant accreditation requirements of ISO 17025.

3.8.2. In 2002, HSE introduced into ACoP significant changes to the role and function of laboratories carrying out clearance certification after asbestos removal. Previous practice had been for a laboratory to carry out a two-stage clearance certification at the completion of the asbestos removal process. However, concern about both the quality of service provided by laboratories and the scope of the clearance process caused HSE to introduce changes to deal with these problems. Regulation 19 of CAW 2002 addressed the issue of quality of service through a new requirement that those undertaking measurement of asbestos fibres in air meet the standard required in ISO 17025.

3.8.3. The issue of the scope of the clearance certification process was addressed in ACoP requiring that removal of asbestos material be followed where

appropriate by a fuller, four-stage process of site clearance certification to ensure that the whole site is thoroughly clean.

3.8.4. However, HSE had concerns that some parts of the 4-stage clearance certification procedure were not covered by current accreditation arrangements, and that this could undermine the overall clearance process.

3.8.5. To address these problems, HSE worked with UKAS to develop a credible assessment and accreditation regime for the full four-stage process, which was completed in 2004. Accreditation commenced in December 2005.

3.8.6. Regulation 20 of the Asbestos Regulations requires that labs contracted to issue clearance certificates be accredited to the ISO standard for all four stages of the process.

## 4. INFORMATION SOURCES AND BACKGROUND ASSUMPTIONS

4.1.1. Much of the information in this Regulatory Impact Assessment is derived from two previous RIAs; for the Control of Asbestos at Work Regulations 2002 (which included the new Duty to Manage) and for the negotiation stage of the amendments to the European Asbestos Worker Protection Directive.

4.1.2. Some information on licensed asbestos work is gathered through the notification system and this has provided details on numbers of companies, numbers of workers, amount of work done and the types of materials worked on.

4.1.3. The definition of ‘sporadic and low intensity’ work, effectively taking work with TCs out of the requirements to notify HSE and to hold a licence, will have an impact on the cost and working methods used for removal. For information on this impact HSE discussed this issue with representatives of both the Federation of Master Builders and the Association of British Insurers. Estimates from both sources were used in the development of the Costs section, below. Both sources provided estimates of cost to the client of removing a textured decorative coated ceiling in three situations:

4.1.3.1. where the coating contained asbestos and was a licensed material;

4.1.3.2. where the material contained no asbestos; and

4.1.3.3. where it contained asbestos, but the material was not licensable due to the reduced level of risk.

4.1.4. In the development of the proposals to require accreditation for analysts undertaking 4-stage clearance certification, work undertaken by the United Kingdom Accreditation Service was considered.

4.1.5. For the small firms’ impact test twenty-two organisations were contacted, including 5 analysis laboratories, for their views. The Small Business Service was also consulted as part of this process.

4.1.6. The base year for calculations is 2004 and the appraisal period is 50 years. However, because of the long latency of mesothelioma and other asbestos diseases, legacy benefits will occur for another 50 years after the appraisal period as a direct result of expenditure on compliance within the appraisal period. The potential benefits from introducing the regulatory amendments are therefore measured over a 100-year period. Costs and benefits have been

discounted at the Treasury's recommended 3.5% a year. Health benefits are uprated by 2% a year to allow for the highly plausible assumption that individuals' valuations of improvements in health do not decline with increasing income (as would be implied if the an unadjusted 3.5% discount rate were applied to these benefits). Earnings are uprated by 1.8% a year to account for observed changes in real incomes over the last 30 years[9].

4.1.7. The regulatory amendments and changes that have been assessed in this RIA are numerous and diverse. Existing levels of compliance therefore vary between each option under consideration. These have been taken into account in the compliance cost calculations. For the sake of simplicity, HSE has assumed that post implementation compliance will be 100% for the majority of the regulations. In some cases there are very strong reasons to believe that this assumption is a good approximation of the likely outcome. In other cases, there is more doubt. The consequences of varying the assumption about post implementation compliance are considered later in the section on uncertainties. There are some regulations already implemented in CAW that currently do not enjoy 100% compliance, but HSE believes that insisting on greater compliance in these cases would entail a disproportionate effort for a minimal reduction in risk. Compliance is therefore assumed to be approximately equivalent to levels prior to the Asbestos Regulations coming into force. These regulations are discussed below in Option 2.

## 5. EQUITY AND FAIRNESS

5.1.1. We do not expect the regulatory changes to have differential impacts on ethnic groups, women, or those with disabilities.

### 5.2. Atypical workers

5.2.1. There appears from research findings, to be a slightly higher turnover of workers in the asbestos removal industry than in construction and maintenance generally. This will have an effect on the costs to employers of the training requirements in the Directive and this has been taken into account in the costs section dealing with training, below.

## 6. BENEFITS

### 6.1. Health and safety benefits

6.1.1. Taking a baseline year of 2000, the Risk Assessment (section 2.4, above) for this RIA revealed that, if no additional measures had been taken to control the risks posed by man-made sources of asbestos over the following 50 years, an estimated 6,500 occupationally exposed workers and 1,300 other people would have died of asbestos related diseases. This figure is based on current levels of exposure, but allows for the routine demolition of buildings over time.

6.1.2. The contribution that the Asbestos Regulations will have on reducing this risk beyond what has already been achieved since 2000 is impossible to isolate because the amendments contribute to an existing package of mutually reinforcing interventions. The British government, through the Asbestos

[9] HSE recently reviewed the accuracy of this uprating factor and concluded that there was no reason to change the figure

Regulations, continues to introduce a package of measures that seeks to control risks posed by asbestos. In May 2004, amendments to CAW placed duties on those with maintenance responsibility for commercial property to identify and manage asbestos hazards in their premises. The 2004 CAW amendments should have significantly reduced the risks to occupationally exposed workers and to other people who are subject to background exposure. Maintenance workers in particular will bear substantially lower risks because they will be much less likely to disturb asbestos inadvertently.

6.1.3. As implied in the previous paragraph, optimal risk control can only be achieved through the full package of measures within the Asbestos Regulations. The transposition of the AWPD amendments in the Asbestos Regulations contributes to the risk reduction in two ways. Firstly it drives greater compliance with earlier regulations, most critically, with training and the duty to control exposure to as low as reasonably practicable (ALARP). Secondly it lowers exposure limits. However, the degree to which the new lower Control Limit brings further risk reductions for maintenance workers is questionable. The duty to manage asbestos in commercial properties should already mean that many maintenance workers will, once informed of the presence of a substantial asbestos hazard, simply avoid the work. Others will continue to do the work (providing it is non-licensable) but will presumably take greater precautions. Furthermore, employers were already required by law to reduce exposure ALARP. The application of simple precautions lowers exposures to well below the new limit in the great majority of cases. The exposure limit therefore only serves to protect the small minority of workers who, despite taking the simple precautions, are still exposed at unacceptably high levels.

6.1.4. *Benefits to maintenance workers:* Taking these points into consideration, HSE expects that the reduction in the Control Limit will not, by itself, bring substantially greater reductions in risk to maintenance workers than those already being achieved by the duty to manage asbestos in commercial premises[10]. However, securing greater compliance with the existing duty to reduce exposure ALARP should have a substantial impact on reducing risks to maintenance workers. Quantifying this impact is not possible because of the huge impracticalities of separating the influences of the existing "duty to manage" regulations from those introduced by the Asbestos Regulations.

6.1.5. *Benefits to indirectly exposed people:* As noted in the risk assessment, an estimated 3,300 people who would have gone on to die as a result of indirect and domestic exposure to asbestos. To the extent that the Asbestos Regulations will contribute to a reduction in the amount of asbestos that is released into the air as a result of work activities, a proportion of the 3,300 lives will be saved. The number of prevented fatalities is impossible to estimate.

6.1.6. *Benefits to licensed removal workers:* HSE believes that licensed asbestos removal workers in particular will benefit from the revised Asbestos

[10] However, the duty to manage asbestos does not yet extend to residential properties. Until this happens, plumbers, electricians etc will continue to be subject to unidentified hazards in these properties. In this respect, the AWPD may mean that more such workers are able to identify and deal appropriately with the hazards they encounter.

Regulations. The size of this sector is approximately 9,000 workers. As noted in the risk assessment, 87 (uncertainty range of 44 to 174) of these workers would have been expected to die of asbestos related diseases over the next 100 years as a result of exposure that occurs over the next 50 years. HSE has estimated that 36 of these deaths would be prevented simply by the introduction of the new 0.1 f/$m^3$ Control Limit over a four hour time weighted average (details of the calculation are contained in Annex A). Given the uncertainties involved in estimating the benefits, it is reasonable to introduce an uncertainty factor of 2. This gives a minimum range of between 18 and 72 prevented fatalities as a result of implementation of AWPD. The monetary value of this range is £21 million to £84 million in present values (using the assumptions described in the risk assessment).

6.1.7. The total number of licensed removal worker lives saved by the Asbestos Regulations should be greater than the 18 to 72 range because, as argued previously, the Regulations will encourage greater compliance with existing duties to reduce exposure to levels that are as low as reasonably practicable below the control limit. The 18 to 72 range of prevented deaths can therefore be seen as a minimum impact that the Asbestos Regulations will have.

6.1.8. Theoretically, the introduction of an eight-hour TWA (as called for by the AWPD amendments) would prevent fewer fatalities because those working for less than eight hours could be exposed to slightly higher levels of asbestos and still remain within the Control Limit. This is, however, one of a package of measures. The effects of each cannot be measured separately, but if there were full compliance with the duty to control exposure ALARP then the number of workers still exposed at or above the new Control Limit over a four-hour TWA is likely to be very small.

## 7. COSTS

### 7.1. Business sectors affected

7.1.1. Assessing the number of firms affected by the Regulations is complicated. HSE has estimated that approximately 1.8 million workers will be involved, of which 37% are self-employed. Assuming that the remaining 63% are employed in firms that conform to construction sector norms for employers (average size 9.5 employees), then the average firm size across the whole group is approximately 2.3. This would mean that approximately 790,000 firms are potentially affected by the regulatory changes. In addition there will be approximately another 200 laboratories that will be affected by Option 5.

7.1.2. The main sectors affected by these proposals are licensed asbestos removal contractors (694 companies), building demolition, building maintenance and refurbishment, building services installation, analytical laboratories and asbestos removal equipment provision (including 67 licensed scaffolding companies) and maintenance companies.

### 7.2. Familiarisation Costs

7.2.1. Except for the do nothing option, all other options require dutyholders to familiarise themselves with the regulatory changes. HSE believes that the

associated costs are approximately the same regardless of the options implemented.

7.2.2. Of the estimated 790,000 firms affected by the Asbestos Regulations, 7,500 are involved in asbestos removal and demolition. HSE assumed that familiarisation will take each of these firms 4 hours to complete. Another 105,000 firms employ workers such as plumbers and electricians who are regularly exposed to asbestos in the course of their daily trades. This includes the laboratories undertaking clearance testing. HSE assumed that familiarisation will take each of these firms 2 hours. Finally, 676,000 firms employ other workers who are less frequently exposed to asbestos. HSE assumed that familiarisation will take each of these firms 0.5 hours to complete. HSE further assumed that the full economic cost of time spent on familiarisation is £20/hr[11]. In total, familiarisation is estimated to impose a one-off cost of £11.5 million in the first year of implementation.

### 7.3. Costs of Option 1 – Do nothing

7.3.1. Retaining existing Regulations and ACoPs without amendment. As noted in the "options" section, the do nothing option would probably have involved the UK in EU infraction proceedings. Without knowing how far the proceedings would run until a solution was found, HSE was unable to estimate their potential costs.

### 7.4. Costs of Option 2 – Implement the Directive amendments substantially as adopted

7.4.1. Many of the requirements arising from the implementation of AWPD have no significant impact on costs to UK industry. However, those issues involving significant costs are outlined here.

7.4.2. **Sporadic and Low Intensity Exposure** (see paragraph 3.4.2).

7.4.2.1. Removing TCs from the scope of the licensing requirements will result in a cost saving due to the reduced cost of using a non-licensed contractor to undertake the work with these materials. This is due both to the broadening of the field from which a contractor can be drawn and a relaxation of the controls required, given the lower level of risk. See paragraph 7.4.8.

7.4.2.2. Changing from Actions Levels for notification. The amended system for triggering notification and the requirement to hold an HSE licence affects the same types of work as previously. Therefore there are not expected to be significant cost implications (other than for TCs). However, there is a small but possibly significant amount of work done that is not compliant with pre-existing notification or licensing requirements under CAW and ASLIC. Costs for using licensed contractors are higher than for other building and maintenance companies and so increased compliance would bring with it some additional costs. There is uncertainty about the level of non-compliance.

[11] SOC 1121 "Production, works and maintenance managers" from NES 2003, £15.43, increased by 30% to account for non-wage labour costs.

7.4.2.3. The Asbestos Regulations have moved from Actions Levels to 'sporadic and low intensity' to determine whether medical surveillance and record keeping are necessary. Again the amended system for triggering the requirement for medicals is designed to affect the same types of work as previously. However there are 70 ancillary licence holders and 67 supervisory licence holders whose workers are not currently required to have medicals and which will be caught by this requirement. These companies employ relatively small numbers and so we estimate that between 500 and 2,000 workers will require medical surveillance that had not previously. The cost of medicals is approximately £80 and so there would be an additional cost of up to £160,000 every two years. The fifty year present value is estimated to lie between £0.5 million and £2.0 million.

7.4.3. **Minimising Worker Exposure** - In order to implement Article 6 - the requirement to minimise the asbestos exposure of workers (see paragraph 3.4.3) elements of COSHH were included in the Asbestos Regulations. COSHH already applied wherever CAW did not, so this amendment simplifies the regulatory regime and imposes no additional regulatory burden. The costs associated with this change are included below in the discussion of Option 3 for a new Control Limit and reducing exposure to as low as reasonably practicable (see paragraph 7.4.7).

7.4.4. **WHO method of fibre counting** - In order to implement Article 7(6) of AWPD the Asbestos Regulations require sampling to be conducted according to methods recommended by the WHO.

7.4.4.1. The change of fibre counting method is unlikely to affect the cost of work done, since a worker would not be able to differentiate between these possible differences in exposures in advance. In any case workers should be controlling to 'ALARP', which will bring them well below the new limit.

7.4.4.2. However, there are some costs associated with conversion to the WHO method. Training an estimated 1000 analysts in 200 labs (already expert in ERM rules) takes around 1/4 day each at an estimated cost of £75,000. The 200 labs have to recount their internal quality control slides at a further cost of £300,000. The scheme used in the UK for proficiency testing the analysts' results (Regular Inter-laboratory Counting Exchange, RICE) needs to be changed at an additional cost of approximately £50,000. The total costs of converting to WHO method is estimated at approximately £425,000.

7.4.5. **Training** - Cost implications of implementation of the training requirement in Article 12a and included in the Asbestos Regulations (see paragraphs 3.4.8 to 3.4.11) were considered within the RIA prepared as part of the negotiations on AWPD. However, it should be noted that these costs relate to increased compliance only as HSE does not intend that current best practice should change. There are no additional costs because of stricter legal requirements.

7.4.5.1. Training for all workers liable to be exposed to asbestos was already required under CAW. To implement the Directive the Asbestos Regulations specify in more detail what the training is required to include. We estimate that some 1.8 million workers are likely to disturb asbestos

during routine work activity. The major groups affected are electricians, carpenters and joiners, plumbers and heating engineers, and painters and decorators (these total around 860,000) and other construction and maintenance workers (around 500,000). Non-maintenance workers (for example surveyors and valuers, building managers and inspectors and civil engineers) account for another 500,000 workers, although we believe that their exposure would be typically very low

7.4.5.2. Training in awareness of asbestos, to the level specified in the Asbestos Regulations, was already a requirement under CAW. However, a large proportion of those exposed (around 37%) are self-employed, and HSE is aware that compliance with the requirement to undertake training in asbestos awareness in this sector is low. Training will be higher amongst employees, especially those working for larger contractors and may also be higher amongst those who encounter asbestos more frequently.

7.4.5.3. The length and detail of the training needed depends on the nature of the work. Asbestos removal workers typically require a 3-day training course. Training in controlling exposure for non-licensed asbestos work typically requires two days. General asbestos awareness training takes around half a day. However, there are various specific circumstances where the levels of training for particular workers can be tailored to their needs.

7.4.5.4. Given all these factors, we assume that of the 1.8 million workers detailed above;

i) All the 9,000 licensed removal workers already received the necessary training.

ii) 250,000 are regularly exposed to asbestos in their work and should be receiving 2-day training. We estimate that 80% of the self-employed require more training than they were currently receiving. 60% of employees require more training than they were currently receiving.

iii) Of the remaining 1.54 million remaining workers, we assume that 60% of the 500,000 non-maintenance workers were already adequately trained. The remaining 40% require a variety of levels of training. This can be averaged to half a day. Of the remaining maintenance workers, 600,000 should receive training that takes one half day and of these, two thirds require training they are not currently receiving. 60% percent of the remaining 440,000 workers are assumed to require training for an average of 2 hours (we assume these workers would need basic training in asbestos awareness).

iv) We allow a cost of £150 per day[12] to include training fees and lost output.

[12] This is justified on the basis that the full labour cost per day for a typically affected worker is likely to be about £75 (SOC 5 “Skilled trades occupation”, £7.28 per hour from NES 2003, multiplied by 1.3 to account for non wage labour costs and then multiplied by eight hours to give the full cost per day). A further £75 per day for the cost of the training does not seem unreasonable.

7.4.5.5. Both CAW and the Asbestos Regulations require refresher training regularly. This is every year for workers who are regularly exposed to asbestos. We assume that workers who receive two day initial training require two hours refresher training, while those workers who receive less than one day training require half an hour. For workers who are infrequently exposed, refresher training occurs every two years and we assume takes a quarter of an hour per worker. We also allow new training relating to an industry turnover of 10% each year.

7.4.5.6. Initial costs are £106 million**.** Present value costs over fifty years are estimated at £871 million.

7.4.5.7. It should be re-emphasised that these costs relate to increased compliance only, and do not arise because of stricter legal requirements. The costs arising from full compliance with the training requirements in CAW would have been taken into account previously, when training was first included in the Regulations in 1987 and strengthened in subsequent amendments.

7.4.6. **Implementation of Article 12b** – Article 12b requires that, for demolition and removal work (the majority of which is licensable), firms must provide evidence of ability in the field. For licensable work the 'ability' requirements associated with the asbestos licensing application process already meet the needs of this Article and there are therefore no associated costs. In regard to 'non-licensable' activities regulation 7 of CAW (which is now regulation 7 of the Asbestos Regulations) requires that a Plan of Work be prepared prior to any work being undertaken with asbestos. It is our opinion that the detailed information required for inclusion within the Plan of Work provides a strong indicator of knowledge of the requirements of the work being undertaken by the firm. Where this is in place we do not anticipate any additional costs associated with implementation of this requirement. However in the case of small, non-licensed companies levels of compliance with the requirement to draw up a plan of work are uncertain.

7.4.7. **Implementing the Control Limit as adopted** - The EU specified limit is 0.1 f/cm$^3$ over an eight-hour TWA. The UK had two Control Limits (for amphiboles and for chrysotile asbestos) measured over a 4-hour period. It is generally thought that an eight-hour TWA is unhelpful for the reasons given in Option 3 (section 3.5). To that extent, the AWPD limit represents a relaxation in terms of the time period, but a tightening in terms of the Control Limit for all types of asbestos.

7.4.7.1. The consideration of a Control Limit cannot be addressed in isolation. The Control Limit sets a maximum exposure limit beyond which anyone working with asbestos should not be exposed. However, Article 6 of the AWPD amendments requires that any exposure of workers to dust must be reduced to a minimum. The Asbestos Regulations interpret this as being reduced to as low as reasonably practicable (ALARP). The number of workers exposed at the Control Limit should be very few as it will normally be reasonably practicable to reduce exposure considerably below this. The same is true for the proposed non-regulatory peak for short-term work of 0.6 f/cm$^3$. As it is already a statutory requirement to reduce exposure to ALARP, most of the costs associated with the new

Control Limit are as a result of increased compliance with this duty to reduce exposure rather than the Control Limit itself. The costs of meeting the new Control Limit and reducing exposure to as low as reasonably practicable are considered in turn for maintenance workers and for licensed asbestos removal workers, below.

Maintenance workers

7.4.7.2. HSE's consideration of training costs suggests that approximately 400,000, mainly maintenance, workers encounter situations where the new Control Limit could be exceeded if work progressed without adequate controls. HSE believes that this level of risk justifies the training proposed in the training costs section. However, the frequency with which maintenance workers will encounter these situations is thought to be low. A review conducted by HSL on exposure levels by type of material (summarised in Annex B) suggested that maintenance workers will encounter situations where the proposed limit could be exceeded in less than a fifth of the time they are working with ACMs (which itself is only a proportion of the overall time worked).

7.4.7.3. The information about the type and location of ACMs provided to maintenance workers in 2002 as a result of the duty to manage Asbestos amendments to CAW, together with increased level of awareness among maintenance workers through increased compliance with training requirements[13], mean that maintenance workers are more likely to be aware of the materials they are dealing with. When presented with an ACM hazard, the workers have two options under the risk-based approach required by the Asbestos Regulations. They can continue with the work over a prescribed short duration and implementing sensible measures to minimise exposure, or, if these conditions cannot be met, the option would be for the work to cease either completely or until a licensed contractor has removed the hazard[14].

7.4.7.4. Given the above, HSE to believe that the number of occasions that maintenance workers will have to take action to reduce their exposure levels to below the Control Limit (as opposed to the occasions where they simply avoid the hazard completely) are likely to be very few. Therefore the costs to maintenance workers of controlling to the Control Limit are thought to be negligible.

7.4.7.5. The AWPD calls for exposure to be reduced to "a minimum" below the exposure limit. HSE judges that this criterion is satisfied providing that dutyholders take sensible precautions of the type that are already set out in HSE's "Asbestos Essentials" guidance. HSE assumes that these simple methods can be adopted relatively costlessly. However, if the risk of exposure is still relatively high, then further control can be achieved by temporary encapsulation, or the provision of respiratory protective equipment (RPE) to a higher standard.

[13] Training will be particularly important when plumbers, electricians etc are working in domestic premises, where "duty to manage" regulations do not currently apply.

[14] The involvement of a licensed contractor would of course increase costs. However, a provision was made for this likelihood when calculating compliance costs for the "duty to manage" amendments to CAW. The costs have therefore already been estimated and deliberated as part of the previous regulatory process.

7.4.7.6. The majority of workers will use a mixture of controls, with the effect that work with ACMs will typically take longer than otherwise. The level of control will be related to the level of exposure, and the nature of the work.

7.4.7.7. For workers who encounter asbestos on a regular basis, HSE assumes that applying sensible precautions takes 10% longer than would otherwise be the case. For the average worker currently exposed above the Control Limit, we estimate that they spend around 7% of their time (18 working days) working with ACMs. The additional time spent on these jobs would therefore be approximately 1.8 days, at a cost of around £135 per worker each year[15]. In some cases, simple equipment might have to be purchased. HSE therefore suggests that total costs would amount to £150 per worker year.

7.4.7.8. HSE believes that there are approximately 850,000 workers who are regularly exposed to asbestos[16]. However a proportion of these workers will already be taking the necessary sensible precautions. This proportion will have grown because the Duty to Manage requirements will have increased awareness. For these reasons, HSE assumes that only an additional 20% to 30% (200,000 to 300,000 workers) will have to start taking extra precautions. Beyond this time, the number of relevant workers falls by the proportion of buildings containing ACM demolished each year, as asbestos is routinely removed before demolition (averaged at 2% per annum).

7.4.7.9. For the 440,000 infrequently exposed workers we allow a nominal cost of £10 per year for the extra time that might be spent on the 1 or 2 jobs per year that they may encounter asbestos. Again, the number of workers these cost apply to are substantially reduced because of the requirements of the Duty to Manage. These costs are also estimated to decline at the rate of demolition of buildings containing asbestos.

7.4.7.10. The total present value of these costs over 50 years is estimated to be between £0.62 billion to £0.92 billion. The annualised cost is between £17 million and £25 million. As already indicated, most of this relates to increased compliance with pre-existing legislation.

Licensed removal workers

7.4.7.11. Licensed removal workers will, for some of their work, need to take action to reduce their exposure to below the new Control Limit. In many cases this will simply involve greater adherence to simple measures. In a small number of cases where this provides insufficient control, the use of powered respirators may be necessary.

7.4.7.12. In cases where simple control measures are adequate, HSE assumes that the main cost is a 5% loss of labour productivity. HSE further assumes that simple measures are required between 20% and 30% of the total working time. Applied to the 9000 workers who are believed to work in the

[15] This is justified on the basis that the full labour cost per day for a typically affected worker is likely to be about £75 (SOC 5 "Skilled trades occupation", £7.28 per hour from NES 2003, multiplied by 1.3 to account for non wage labour costs and then multiplied by eight hours to give the full cost per day).

[16] This includes the 250,000 who encounter situations where the control limit might be exceeded and the 600,000 who regularly encounter asbestos, but in contexts where the control limit is unlikely to be exceeded.

industry (refer to Annex B) and costed at approximately £17,000 per year[17], HSE's assumptions imply a first year cost of between £1.5 million and £2.2 million. This initial cost is assumed to decline by 2% per annum as the demolition of buildings containing asbestos reduces the demand for licensed removal workers. The 50 year present value of these costs is between £35 million and £52 million, and the annualised cost is between £1.0 million and £1.4 million.

7.4.7.13. To cope with situations where simple measures produce inadequate control, some firms will purchase powered respirators. HSE assumes that only 5% to 10% of the 500 active licensed removal firms in Britain[18] will purchase the necessary extra equipment. This is because HSE expects only a small number of firms to specialise in the more complicated types of removal (where extreme caution is required). Furthermore, some firms may already have the necessary equipment. The total fixed investment in equipment is as follows:

**Table 2**

| | Cost | Lifetime (yrs) |
|---|---|---|
| Breathing apparatus set (x2) | £500 | 10 |
| Compressor and air filtration unit | £5,000 | 30 |
| Compressed air receiver | £2,000 | 30 |

7.4.7.14. Additionally there will be annual maintenance, repair and running expenses of approximately £3,000. Assuming each of the 25 to 50 firms each purchase one set of equipment, the fifty year present value of these costs is between £2 million and £6 million, while the annualised cost is between £0.2 million and £0.5 million.

7.4.7.15. Total costs that licensed removal firms will bear in reducing exposure to below the new Control Limit are estimated to have a 50 year present value of between £37 million and £59 million, and an annualised cost of between £1.1 million and £1.9 million. Again, much of this cost will be due to increased compliance with existing requirements.

### 7.4.8. Savings due to the removal of textured decorative coatings from the licensing regime

7.4.8.1. Indicative estimated costs of removing TCs at present suggest that a day's work would normally be charged at between £900 and £2,000 for removing a textured ceiling coating containing asbestos, whereas the same amount of work to remove the material if there was no asbestos present would cost the client £200 to £900. When such coatings contain some asbestos, precautions under the Asbestos Regulations are still be necessary (such as preventing the release of asbestos fibres and containment to prevent spread), and in many cases air testing after the job is finished to confirm clearance will still be undertaken. The comparative cost under these conditions is estimated to be approximately £500 -

[17] This is justified on the basis that the full labour cost per year for a typically affected worker is likely to be about £17000 (SOC 5 "Skilled trades occupation", £76 per day multiplied by 220 working days).
[18] Based on HSE's database of licensed removal firms)

£1,300. The total number of textured decorative coating jobs notified to HSE (as part of licensing requirements) over the 3-year period May 2001 to April 2004 was 15,297. This was the equivalent of approximately 64,217 job-days (the number of days decorative coating removal work that took place over that period).

7.4.8.2. Article 12(2) of the AWPD amendments states that ACMs should be removed before a building is demolished except where the risk is greater than leaving the ACMs in place. It is expected, given the low level of risk from this material, that amount of removal of TCs before demolition will be significantly reduced. Estimates from HSE's notification database suggest that there are approximately 50 jobs of this sort averaging 10 days each per year.

7.4.8.3. Assuming that the number of jobs, and therefore job days, decreases by 2% a year (as the stock of decorative coating ceilings etc declines), the total fifty year present value of cost savings to the economy is between £206 million and £365 million[19]. The first year saving is a minimum of £8.6 million.

7.4.8.4. HSE anticipates approximately 5,000 less notifications per year as a result of removing TCs from the requirement to notify. On the basis that this costs £10 per notification, this would reduce costs by approximately £50,000 in the first year. The fifty year present value is £1.2 million.

7.4.9. The following table summarises the combined costs and savings of Option 2- Implement the Directive amendments substantially as adopted:

**Table 3**

| **Option 2: Compliance Costs and Savings** | | | |
|---|---|---|---|
| | **Present value £ million** | **First year £ million** | **Annualised £ million** |
| ***Administration costs*** | | | |
| Familiarisation | 11.6 | 11.6 | - |
| Conversion to WHO counting method | 0.4 | 0.4 | - |
| Medical surveillance | 0.5 to 2.0 | 0.0 to 0.2 | 0.0 to 0.1 |
| ***Policy costs*** | | | |
| Training (increased compliance only) | 871 | 106 | 25 |
| Cost of control maintenance workers | 616 to 923 | 26 to 40 | 17 to 25 |
| Cost of control licensed workers | 37 to 59 | 2 to 3 | 1 to 2 |
| ***Subtotal Compliance costs*** | ***1,536 to 1,865*** | ***146 to 160*** | ***43 to 52*** |
| ***Compliance savings*** | | | |
| Reclassification of TCs as non-licensable | 207 to 366 | 9 to 16 | 6 to 10 |
| **NET TOTAL** | **1,170 to 1,658** | **130 to 151** | **33 to 46** |

[19] The figures assume an average real increase in costs of 1.8% a year, in line with expected increases in the real earning rates.

### 7.5. Option 3 – Implement the Control Limit with minor amendments to take account of current GB practice

7.5.1. As noted above, the AWPD's eight-hour TWA is not appropriate to British work practices. The Control Limit has therefore been set at 0.1 f/cm$^3$ over a four-hour TWA period. Although in theory this represents a tightening of the limit, the reality is that very few British workers who come into contact with asbestos are exposed for a full eight-hour period at or around 0.1 f/cm$^3$. This means that the compliance costs that would apply to a limit set in terms of a four-hour TWA are negligibly larger than the costs for an eight-hour limit.

7.5.2. Therefore the compliance costs and savings of option 3, over and above those of option 2, are negligible.

### 7.6. Option 4 - changes to the regulatory regime imposing no significant changes

7.6.1. **Regulatory simplification** - There are not expected to be any significant costs to industry incurred as a result of regulatory simplification by combining the Prohibitions, CAW and ASLIC Regulations.

7.6.2. **Licensing** - The risk based approach to notification, to which licensing is now aligned, whilst changing the detail of how it is decided whether a licence is needed, does not significantly change which work must be undertaken by a licensed contractor, with the exception of work with TCs, detailed separately (see paragraph 7.4.2). The costs to the industry other than this are insignificant.

7.6.3. One consequence of aligning licensing with notification together with the move to a concept of 'sporadic and low intensity' work, is that those undertaking work with asbestos on their own premises using their own employees will need to be licensed (at present they only need to notify HSE of the work). However, HSE estimated that less than 10 companies will be affected and need to apply for a licence, therefore the costs are insignificant.

7.6.4. **Asbestos licence time limits** - Allowing a variation and a maximum time limit on a licence – this change reflects current practice and will therefore not have any cost implications for businesses.

7.6.5. **Documentation on site** - Additional documentation required to be kept on site by licensed contractors – this requirement refers to daily maintenance checks of the DCU, and most contractors already have the documentation. The requirement is simply that the documentation is kept on site, which reflects current practice for most contractors and so has negligible cost implications.

### 7.7. Option 5 – Four-stage site clearance certification for reoccupation

7.7.1. There will be no significant cost directly attributed to requiring extended accreditation in regulation to incorporate the requirements of the four-stage clearance process introduced in 2002 through CAW.

7.7.2. Some 50% of those laboratories already accredited to the 'two-stage' process have applied to UKAS for extension of scope at an initial cost of £1000, and with an additional annual cost of £700. It is anticipated that the majority of the

remaining accredited laboratories will seek extension prior to the coming into force of the new Asbestos Regulations.

### 7.8. Compliance costs for a 'typical' business of Option 2

7.8.1. HSE has identified two types of typical business that would be affected by the proposals. The first is a maintenance contractor employing ten workers, four of whom are electricians and plumbers who are likely to encounter licensed asbestos materials. The remaining six workers encounter non-licensable asbestos. The control measures that all ten workers apply relate only to the type of simple precautions set out in "Asbestos Essentials" measures. The following estimated costs apply:

**Table 4**

| | 50 yr present value | First year cost | Annualised cost |
|---|---|---|---|
| Familiarisation | £40 | £40 | - |
| Training | £4,863 | £590 | £138 |
| Costs of control | £7,159 | £307 | £197 |
| Total | £12,061 | £937 | £335 |

7.8.2. The second type of firm employs eight licensed asbestos removal workers. The firm chooses not to purchase specialised powered respirator equipment. The following estimated costs apply:

**Table 5**

| | 50 yr present value | First year cost | Annualised cost |
|---|---|---|---|
| Familiarisation | £80 | £80 | - |
| Training | - | - | - |
| Costs of control | £46,647 | £1,999 | £1,281 |
| Total | £46,727 | £2,079 | £1,281 |

### 7.9. Total compliance costs to business

**Table 6**

| **Compliance Costs and Savings** | | | |
|---|---|---|---|
| | **Present value £ million** | **First year £ million** | **Annualised £ million** |
| **Option 2 (see Table 3, p 31 for detailed breakdown)** | **1,170 to 1,658** | **130 to 151** | **33 to 46** |
| **Option 3** | negligible incremental costs over option 2 | | |
| **Option 4** | negligible | | |
| **Option 5** | negligible | | |

7.9.1. Table 6 gives the estimated compliance costs and savings for Options 2, 3, 4 and 5. Option 2 amounts to implementing the AWPD substantially as adopted. Under the current evidence and assumptions, all other options do not add to compliance costs. Some options, particularly those associated with regulatory simplification, may lead to marginal cost savings, although these are impossible to estimate.

### 7.10. Costs to HSE

7.10.1. HSE are not expecting incremental costs as a result of implementing these amendments.

### 7.11. Environmental impacts

7.11.1. None of the changes required as a result of the introduction of the Asbestos Regulations are designed to affect the levels of asbestos removal taking place or the rate at which asbestos is removed in the future. HSE will continue to advise that where asbestos is in good condition and is unlikely to be disturbed, it is better to leave it in place and manage the risk, than to remove it.

7.11.2. As levels of removal are likely to be unchanged, levels of disposal are also expected to be unaffected and therefore there will not be any significant additional environmental impact due to these amendments.

### 7.12. Total costs to society

7.12.1. HSE has been unable to identify any significant incremental costs to non-business stakeholders. Consequently, the total costs to society and the total costs to industry are, for all practical purposes, the same.

## 8. SMALL FIRMS' IMPACT TEST

8.1.1. A total of 25 small firms were contacted initially by telephone. They were each then sent an e-mail, which included a questionnaire on the relevant issues that were considered might have an impact on their business along with some background information on the changes being proposed. Thirteen of the companies responded. A breakdown of the types of companies contacted, number of employees and the demographic details are contained in the table below.

**Table 7**

| Type of company | Number contacted | Number of responses | Number of employees | Regions |
|---|---|---|---|---|
| Construction/demolition | 8 | 4 | Less than 50 | North West, South East, South West and Eastern |
| Licensed asbestos removal contractors | 12 | 5 | Less than 50 | North West, North East, South West, South East, London, Wales, Northern Home Counties |
| Laboratories | 5 | 4 | One company less than 50 employees, 4 companies up to 250 employees | Scotland, Home Counties, Greater London, Yorkshire and North East. |

8.1.2. The firms were asked to consider the likely impact the following proposals might have on their businesses.

8.1.2.1. A single control limit of 0.1 f/ml over 4 hours for all types of asbestos (relevant to all the types of companies);

8.1.2.2. the possible withdrawal of STELs (relevant to all the types of companies);

8.1.2.3. removal of requirement for those working with textured decorative coatings containing asbestos to be licensed (relevant to all the types of companies);

8.1.2.4. before commencement of demolition/maintenance work employers to take all necessary steps to identify ACMs (relevant to all the types of companies);

8.1.2.5. the Regulations to require appropriate training for all workers likely to be exposed to ACMS (relevant to building/demolition contractors and licensed contractors);

8.1.2.6. the removal of the requirement to have a licence in order to work with asbestos materials if using own employees on own premises (relevant to building/demolition contractors);

8.1.2.7. simplification of the Regulations so that notification, the requirement for medicals and licensing will be aligned (relevant to licensed contractors);

8.1.2.8. analysts to be accredited for the full 4 stage site clearance certification process; (relevant to licensed contractors and laboratories);

8.1.2.9. fibre counting to be carried out in accordance with the 1997 WHO recommended method (relevant to laboratories only).

## 8.2. Results of the impact test

8.2.1. The results indicated that the small firms who took part in the test felt there would be very little impact on them as a result of the proposed options.

8.2.2. In terms of the groups, those from construction/demolition recognised that a number of the proposals were already in Regulation or ACoP. They considered that they would probably experience an increase in business and that a 'level playing field' would be created as a result of the requirement to identify presumed ACMs prior to demolition/maintenance work. Two of the companies thought however, that new Regulations would probably increase their costs.

8.2.3. Licensed contractors considered that there would not be an increase in costs from the majority of the options. However, they all considered that they would experience a reduction in business TCs were removed from the requirement to have a licence.

8.2.4. The contacts from the Laboratories considered that "a single control limit would make the situation clearer". The main change for laboratories is the move to the WHO fibre counting method. This was not seen as a significant burden on their business as they were already familiar with the procedure. It was nevertheless acknowledged that there would be a minor cost implication for retraining. Two of the laboratories had some reservations about the withdrawal of STELs and considered that in place of them, something should be included in guidance on sampling for short time intervals.

**8.2.5.** On the basis of this assessment, HSE believes that the Asbestos Regulations will not impose a substantially disproportionate burden on small business. The Small Business Service (SBS) has been consulted and agree with HSE's view that a number of these requirements are already in existence (either in existing Regulation or ACoP) and they believe that the Regulations should not be too onerous on small firms.

## 9. COMPETITION ASSESSMENT

9.1.1. The Regulations affect many diverse industrial sectors. Measuring the potential impact on competition in the numerous affected markets is difficult. In these circumstances, the Office of Fair Trading recommends selecting markets with a high degree of supplier concentration, as adverse competition impacts are more likely to occur in such markets. In the present case, the asbestos removal market is of primary concern. The competition assessment also looks at the potential competition effects of the regulations on the market of asbestos specialist equipment.

9.1.2. The market for licensed asbestos removal is composed of approximately 500 active companies[20], employing around 9000 workers[21]. Despite the relatively large number of incumbents in the market, a number of specific requirements

[20] Figure estimated by HSE experts.

[21] The figure is derived from the number of medical examinations, which asbestos workers are required to have every two years. According to HSE's Employment Medical Statistics Unit, there were around 4903 medical examinations for asbestos workers in 2001 and 4798 in 2002. Furthermore, among those workers being examined, a proportion of these have it before the end of the two years and another work for less than two years. Please see Annex B for further details.

limits competition and tends to create regional markets. One of the main restrictions concerns the stocking and disposal of asbestos wastes. Firms are required to dispose of wastes only at specialist specific sites. This reduces firms' ability to operate throughout Britain, thus reducing the scope for geographical substitution. The relatively small number of waste disposal facilities further reinforces this fragmentation effect. This has lead to high levels of clustering of companies in some areas.

9.1.3. The Asbestos Regulations are expected to affect the structure of the licensed asbestos removal market by modifying the licensing regime. On the one hand, employers using their own employees on their own premises will no longer be exempt from the licensing requirements. On the other hand, the licensing regime will no longer be required for undertaking removal of TCs. The overall likely effect will be to encourage new firms to enter the market, exploiting the opportunity of carrying asbestos removal work without the need for a licence. However, this might have some adverse effect on licensed firms, for whom removal of TCs accounts for a substantial part of their activity[22]. In terms of costs, new entrants carrying asbestos removal of TCs are unlikely to benefit from significantly lower set up and ongoing costs for not having to comply with the licensing regime. Firms will still be subject to minimum requirements[23] that would prevent suppliers, new non-licensed companies in particular, from providing low quality services. It must finally be noted that asbestos removal processes are well established and the market would not be classified as one experiencing rapid technological change. Overall, the Asbestos Regulations are therefore unlikely to have an adverse effect on competition in the asbestos removal market.

9.1.4. The market for asbestos specialist equipment is fairly concentrated. HSE estimates that there are only 6 companies in Great Britain[24]. These companies supply and maintain respiratory protective equipment and various other equipment to reduce asbestos exposure.

9.1.5. The Asbestos Regulations only affect the market indirectly. The Asbestos Regulations require that, while protective breathing equipment should normally be used, maximum precautions should be taken to limit the release of asbestos fibres. These requirements are likely to create pressures on the demand for specialist equipment. This is however unlikely to have an adverse impact on the market structure, as all firms tend to provide the same range of product. The Asbestos Regulations would not have any differential impact on existing specialist equipment providers compared to new companies that might want to enter the market. The production processes are not experiencing great changes over time and the market would not be classified as one experiencing rapid technological change. Finally, the Regulations will not impose specific requirements on products, thus not reducing specialist equipment suppliers' production choices. For specialist equipment providers, the impact of the Asbestos Regulations is unlikely to produce any adverse effect on competition.

[22] According to HSE experts, the removal of textured and decorative coatings accounts for 15% of licensed removal jobs, and about 9% of licensed removal job-days. Source HSL. For more details please see Annex B.
[23] Under the new regulations, HSE will check the ability of non-licensed companies to carry out asbestos removal work through the scrutiny of companies' "Plan of work".
[24] Source: Health Unit, HSE.

## 10. BALANCE OF COSTS AND BENEFITS

10.1.1. The table below presents a summary of quantified and unquantified information on costs and benefits. This represents option 2 as options 3, 4 and 5 do not add significantly to costs. Importantly, although total quantified benefits and costs have been reported, a direct comparison between the two would be spurious because there are substantial benefits that are unquantifiable. These benefits and costs mainly arise from the effect the transposition and implementation of the AWPD will have on increasing compliance with pre-existing Regulations. In particular, better compliance with training and the requirement to control exposure as low as reasonably practicable should have a major positive impact on the prevention of fatalities.

**Table 8**

| **Summary of costs and benefits over 50 years** | | |
|---|---|---|
| | Costs | Benefits |
| | **Present value £ million** | **Present value £ million** |
| Familiarisation | 11.6 t | |
| Health surveillance | 0.5 o 2.0 | Substantial health benefits through encouragement of greater compliance with existing regulations |
| Conversion to WHO counting method | 0.4 | |
| Training | 871 | |
| Cost of control maintenance workers | 616 to 923 | |
| Cost of control licensed workers | 37 to 59 | 21 To 84 |
| Reclassification of textured coatings | (206) to (365) | |
| Removal of notification for textured coatings | 1.2 | |
| **NET TOTAL** | **1,171 to 1,659** | ***(21) To (84)*** |

A reasonable comparison can however be made between costs and benefits in the context of licensed workers. The estimates in the table are reasonably comprehensive, and suggest that costs and benefits are probably in balance with each other[25]. In any case, costs are very unlikely to be grossly disproportionate to benefits.

### 10.2 Uncertainties

10.2.1. Most uncertainties have been incorporated into the analysis through the use of ranges. However, HSE made the initial assumption that, in most cases, compliance with the Asbestos Regulations would be 100%. Of course, in absolute terms, this is very unlikely but there are reasons to believe that compliance in many cases will be high, not least because of HSE's on-going programme of awareness raising (running since late 2001) will promote the pre-existing and new requirements. Lingering uncertainty over compliance is unlikely to change judgements about the balance

[25] Note that the benefits are a minimum. As noted in the benefits section, compliance with the AWPD and existing British regulations will bring exposure down significantly below the exposure limit, thereby leading to a substantially greater number of prevented fatalities.

between costs and benefits. The vast majority of costs have a direct impact on the primary policy objective (the reduction of ill health) and there is no reason to believe that there is not a direct relationship between the costs and the benefits.

## 11. IMPLEMENTATION AND ENFORCEMENT

11.1.1. The objective of the proposed amendments to asbestos Regulations and Approved Codes of Practice (ACoPs) is to further reduce the risk of future exposure to asbestos by fully implementing the amendments to AWPD and clarifying and simplifying existing asbestos regulation. Further detail is given in paras 2.2.2 – 2.2.4.

11.1.2. This package seeks to reduce the levels of asbestos-related disesase in the working population. However, because of the long latency period between first exposure and onset of disease – typically 15 to 60 years – it is expected that deaths related to past exposure will not peak until sometime in the period 2011 to 2015. Statistical information on deaths from asbestos related diseases are reviewed annually.

11.1.3. Guidance on the revised regulations will be published on HSE's website and printed versions of the ACoPs which support the regulations are due to be published in October. In particular, additional guidance on sporadic and low intensity and on the removal of TCs will be provided.

11.1.4. A communication campaign which starts in September 2006 is designed to raise awareness of the risks of working with asbestos amonst the higher risk groups of workers – plumbing, heating and ventillation engineeer - and raise awateness with other maintenance worker groups and broader dutyholder audiences.

11.1.5. HSE are also undertaking a campaign promoting an awareness of and compliance with the Duty to Manage Asbestos and this is increasing broader awareness of the Regulations. This campaign, started in 2001 is intended to continue until 2007.

11.1.6. Compliance with the regulations will be through the enforcing authorities of the Health and Safety at Work etc Act 1974 (HSE and Local Authority enforcment staff). HSE will use the "Enforcement Management Model" (EMM)[(26)] to guide action when the regulations have not been complied with. The EMM is a robust framework designed to help inspectors make enforcement decisions in line with HSE's Enforcement policy Statement. The model aims to promote:

- enforcement consistency;
- prortionality and targeting by confirmig the risk based criteria against which decisions are made; and
- transparency and accountability in the decision making process.

11.1.7. The need for the training of HSE and Local Authority enforcement staff will be considered and delivered where appropriate. In support of this appropriate inspection support material will be prepared for circulation to enforcement staff

11.1.8. The process for dealing with licence revocation will be revised to introduce a modified system, which can be used where appropriate. Under the modified procedure if a contractor meets the criteria for revocation but it is foreseeable that they can quickly take steps to achieve and maintain the necessary

standard for holding a licence, then, subject to a satisfactory re-assessment, the licence can be reissued promptly. When this is not the case the existing procedures for revocation will continue to apply.

## 12. ARRANGEMENTS FOR MONITORING AND EVALUATION

12.1.1The Asbestos Regulations will be subject to formal review at the same time as the AWPD is reviewed by the EC. The implementing regulations and guidance will be monitored by HSE through its regular meetings with stakeholders from the asbestos industry and by inspectors as part of their normal enforcement activity.

## 13. RECOMMENDATIONS

13.1.1. It is proposed that options 2, 3, 4 and 5 are substantially implemented, as was set out in the Consultation Document and as outlined above, with minor changes to make explicit the definition of “sporadic and low intensity exposure”. Option 2 is recommended as the final form of the AWPD amendments were generally in line with the UK negotiating position. However, in line with the UK negotiating position and to reflect normal working practice in this country, Option 3 is also recommended which would mean that that the Control Limit of 0.1 f/cm$^3$ would be measured over a time weighted average (TWA) of 4 hours rather than 8 hours. Option 4 is recommended as it would simplify the current legislative structure and the licensing regime without imposing additional costs and Option 5 brings accreditation requirements into line with earlier changes to ACoPs without imposing additional costs.

13.1.2. Option 1, do nothing, is not recommended as there are some requirements in the AWPD amendments that are not currently included either in Regulations or in ACoPs. Not implementing requirements of a Directive or including these requirements in ACoPs rather than Regulations is likely to lead to under-implementation of the Directive and will probably give rise to infraction proceedings.

13.1.3. Table 8 gives a summary of the costs and benefits. HSE believes that the costs and benefits of the proposals remain within the ranges set out in the RIA.

**Ministerial Declaration**

I have read the Regulatory Impact Assessment and I am satisfied that the benefits justify the costs.

Signed: *Philip Hunt*

LORD PHILIP HUNT OF KINGS HEATH OBE

Signed by the responsible Minister

Date: 12th October 2006

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**ANNEX 1**
**RIA**

## SUMMARY OF RISK ASSESSMENT FOR THE ASBESTOS REGULATIONS 2006

### Introduction

1. This paper provides a summary and update to the risk assessment undertaken for the new Control of Asbestos Regulations 2006 (Asbestos Regulations). The main risk assessment (annex D (A)) was published in Consultative Document CD205[26] as part of the proposals for revised asbestos regulations and an approved code of practice and has therefore been subject to public scrutiny and comment. Of the comments received[27] few issues have been raised on the risk estimate itself, other than the risk associated with the proposal that most work with decorative textured coatings (TCs) containing chrysotile asbestos will no longer require a licence. This has been subject to a great deal of debate and as well as stakeholder meetings, two meetings were held by the British Occupational Hygiene Society London region on this issue. The available science[28] [29] was also reviewed by the Health and Safety Commission's (HSC) WATCH committee.[30] HSC also asked for additional research and reviews to be carried out.[31] [32] [33] [34] [35] This paper summarises the risks and considers any changes to the expected benefits arising from the consultation.

2. The Asbestos Regulations are designed to implement EU Directive 2003/18/EC (AWPD amendments) which made a number of further amendments to Council Directive 83/477/EEC "On the protection of workers from the risks related to exposure to asbestos at work".[36] The amendments

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[26] HSL risk assessment, as published in Annex D (A) of CD205 - http://www.hse.gov.uk/consult/condocs/cd205.htm

[27] HSC Paper HSC/06/56 Annex 6 - Results of consultation, HSC meeting 25/07/06 - http://www.hse.gov.uk/aboutus/hsc/meetings/index.htm

[28] WATCH meeting 2006/01 held on 01/02/06 see annex 1 – An Investigation into the airborne fibre releases during the removal of textured coating from Domestic Premises - HSL/2005/32 - http://www.hse.gov.uk/aboutus/hsc/iacs/acts/index.htm#watch

[29] WATCH meeting 2006/01 held on 01/02/06 see annex 2 - Airborne fibre concentration during the removal of asbestos containing textured decorative plasters and paints and the risk to workers - Report Number IFS/05/13 - http://www.hse.gov.uk/aboutus/hsc/iacs/acts/index.htm#watch

[30] WATCH meeting 2006/01 held on 01/02/06 see minutes - http://www.hse.gov.uk/aboutus/hsc/iacs/acts/index.htm#watch

[31] WATCH meeting 2006/01 held on 01/02/06 Annex 6 - http://www.hse.gov.uk/aboutus/hsc/iacs/acts/index.htm#watch

[32] HSC 06/55 Comparison of risks from different materials containing asbestos, paper given at the HSC meeting 04/07/06 - http://www.hse.gov.uk/aboutus/hsc/meetings/index.htm

[33] HSC 06/55a Risk from asbestos, paper given at the HSC meeting 04/07/06 - http://www.hse.gov.uk/aboutus/hsc/meetings/index.htm

[34] HSC 05/103 Annex G, Consultees list for CAR, paper given at the HSC meeting 11/10/05 - http://www.hse.gov.uk/aboutus/hsc/meetings/index.htm

[35] HSC 05/103 Annex J, The scientific case, paper given at the HSC meeting 11/10/05. http://www.hse.gov.uk/aboutus/hsc/meetings/index.htm

[36] EU Directive 2003/18/EC Protection of workers from the risks related to exposure to asbestos at work, amending Council Directive 83/477/EEC. OJEU, L97/48 (15/04/03).

that act to further avoid and/or reduce the airborne asbestos fibre exposure to workers will also reduce the risk and the number of asbestos related deaths.

3. Several of the important requirements introduced by AWPD amendments have already been implemented and sometimes exceeded by the existing GB asbestos regulations. Examples of this are the new requirement in article 12 to notify competent authorities and the new article10A to identify presumed asbestos containing materials. Notification along with a much more comprehensive system of licensing was introduced into GB legislation by the Asbestos (Licensing) Regulations 1983.[37] The requirement to identify asbestos containing materials was also present in asbestos regulations for many years but was made into a specific duty to manage the asbestos in commercial buildings in the Control of Asbestos at Work Regulations 2002 (CAW).[38]

4. This means that the bulk of the reduced risk (or lives saved) introduced by the AWPD amendments have already been accrued by previous GB asbestos legislation. An example of this is the duty to manage, whose implementation in 2002 was estimated to avoid some 4,500 deaths arising from occupational exposures (mainly to maintenance and general building workers) to airborne asbestos fibres over the next 50 years.[39]

5. The only change still to be implemented in GB legislation that will specifically reduce the risk to workers is the lowering of the Control Limit (currently 0.3 f/cm$^3$ for chrysotile and 0.2 f/cm$^3$ for other types of regulated asbestos) to 0.1 f/cm$^3$ for all types of regulated asbestos. Other changes such as increased levels of training will help to increase awareness and the level of compliance. However, as risk and regulatory impact assessments (RIAs) are usually based on full compliance, such changes do not give further benefits in the RIA.

## Effect of a reduced control limit

6. The impact of the reduced control limit was assessed for two populations of workers: those engaged in licensed asbestos work and those engaged in other (unlicensed) asbestos work. The two groups have substantially different risks. The lifetime risk from asbestos is based on the duration and level of the airborne fibre exposure, the age at first exposure and most importantly the type of asbestos to which exposure occurs. Table 1 gives a summary of the expected airborne concentrations for work with different product groups of asbestos, based on the available data for good practice (where controlled wet removal was applied) and also for where only limited or no dust suppression

[37] Asbestos (Licensing) Regulations 1983 SI 1983/1649 The Stationary Office 1983 ISBN 011 037649 8 as amended by the Asbestos (Licensing) Regulations 1998 SI 1998/3233 The Stationary Office ISBN 0 11 080279 9.

[38] CAW (2002) Control of Asbestos at Work Regulations 2002, SI 2002/2675, The Stationary Office, ISBN 0 7176 2382 3.

[39] CD176 Amendments of the Control of Asbestos at Work Regulations 1987 and ACoP Regulatory Impact Assessment, HSE, 2002.

had been applied (but other controls were present). Figure 1 summarises the types of asbestos encountered in each group.

## Table 1: Average exposure to airborne asbestos fibres by product group (arranged by increasing airborne fibre release)

| Product group | Controlled wet removal / good practice (f/ml) | Limited controls / dry removal (f/ml) |
|---|---|---|
| Moulded plastics & battery cases (U) | 0.001 | 0.01 |
| Flooring (U) | 0.01 | 0.05 |
| Asbestos cement (U) | 0.02 | 0.08 |
| Fillers and reinforcements in a flexible matrix (incl. TCs) (P) | 0.02 | 0.08 |
| Jointings and packing (P) | 0.05 | 0.2 |
| AIB and millboard (L) | 0.41 | 15 |
| Spray and other insulation products (L) | 14.4 | 358 |
| U = unlicensed work can take place, L = A licensed contractor is required, P = Some specific products in the group require a licensed contractor. | | |

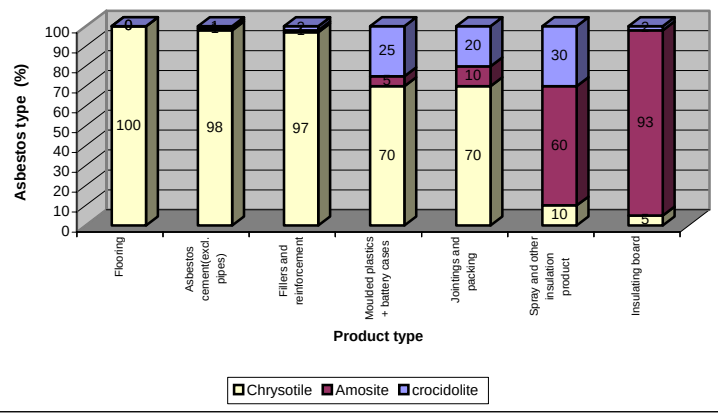
7. Compliance with the control limit would make it unlikely that any lung fibrosis (asbestosis) will occur. The risk of lung cancer and mesothelioma are however very dependent on asbestos type and the approximate relative risk to humans is given in table 2.

## Table 2: Approximate relative risk from exposure to different asbestos types (after Hodgson and Darnton (HD), 2000)

| Type of asbestos | Lung cancer | Mesothelioma |
|---|---|---|
| Chrysotile (white) | 1 | 1 |
| Amosite (brown) | 10 | 100 |
| Crocidolite (blue) | 50 | 500 |

8. The risk is therefore critically dependent on the types of asbestos that workers are likely to be exposed to, as well as the average level of exposure. To put the risks from unlicensed and licensed work into context in a further paper to HSC the calculated lifetime risk using a 40-year exposure were calculated, see figure 2.

**Fig 1: Estimated mix of asbestos types in main product groups**



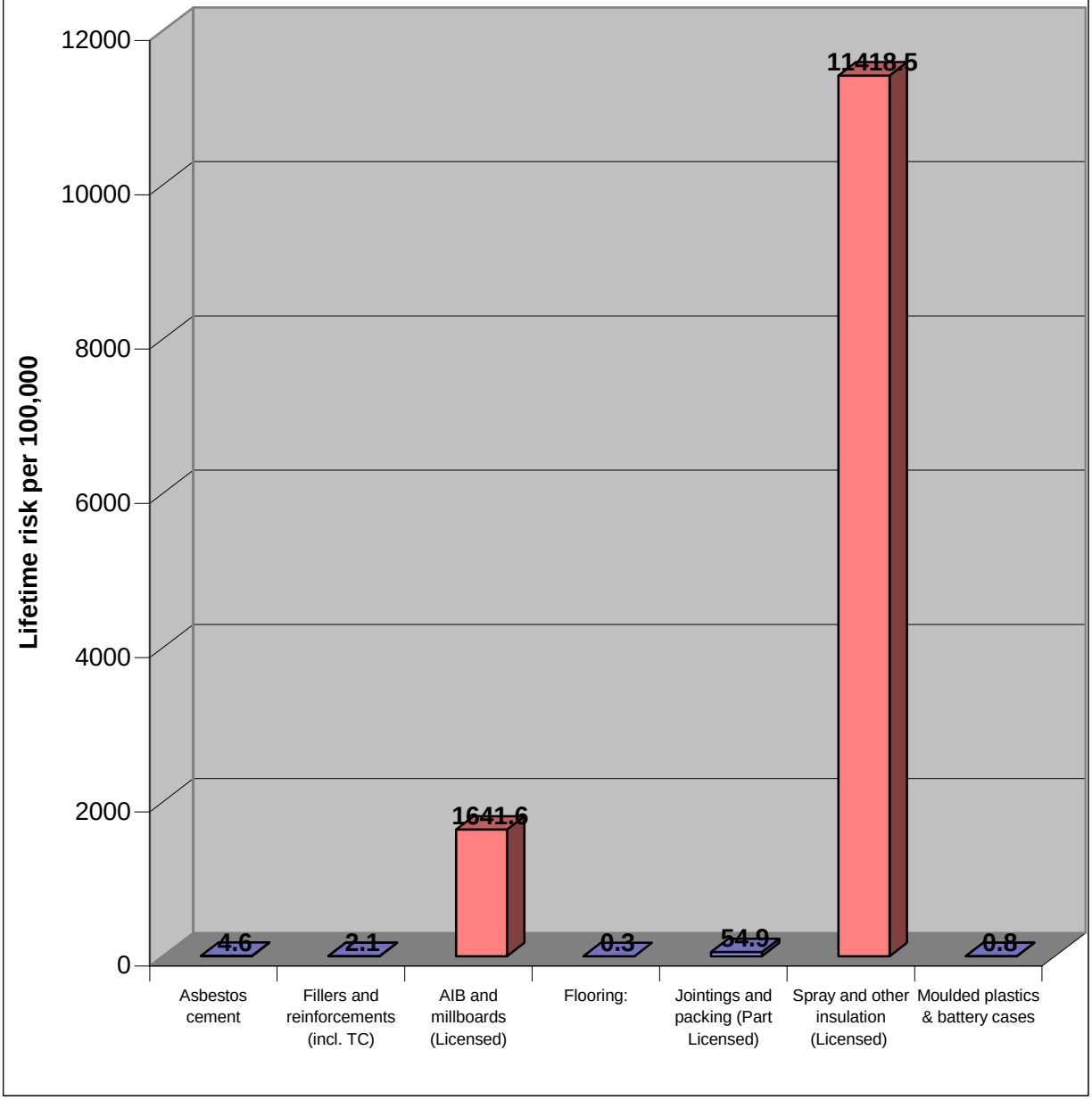
9. Two particular issues that were contested during the consultation[40] were the estimated duration of employment and the age at first exposure for workers involved in licensed removal work. The evidence available at the time was based on the number of biannual medicals recorded for each worker and the age at the time of the first recorded medical The average values based on data from 1987–2004 was 3.1 years and the average age of the workers undergoing their first medical was 32. However, the number of medicals does not give a precise measurement of how long a worker was exposed and the age data was skewed, with considerable numbers of younger workers than the average. In order to avoid any underestimate an average duration of 5 years was assumed from the age 20 for the risk calculations. A review of ~ 1000 workers undertaken by one of the industry associations claimed their workers spent longer in employment (mean 7.3 years) than medical records showed and that their current workforce was younger (average 28.8) than the average of 32 years at the time of the first medical. As medical are mandatory for all workers involved in licensed removal the difference can only be due to misreporting by doctors or the absence of a valid medical examination taking place. A further examination of the medical records[41] confirmed the estimates used in the original risk assessment would not underestimate the risk and that the duration of exposure was actually decreasing for newer workers. In a later risk assessment (Annex E (ii) of CD205) for textured coatings[42] a 5-year period of exposure was used but as there was no evidence on the demographics of unlicensed workers an average of 30 at the time of first exposure was used.

[40] WATCH meeting 2006/01 held on 01/02/06 see Annex 6 - http://www.hse.gov.uk/aboutus/hsc/iacs/acts/index.htm#watch

[41] Asbestos Workers Database: Summary Statistics - HSL report ESS/2006/01.

[42] Quantitative Risk Assessment for Asbestos Removal Workers - HSL internal report IR/L/IF/05-01.

**Figure 2: Lifetime risk per 100,000 based on 10% of time spent actively removing ACMs from age 20 for 40 years with limited controls: no RPE.**



**Reduction in lifetime excess deaths from a 0.1 f/ml control limit**

10. The estimated number of worker regularly exposed to asbestos over the next 50 years includes:

- 145,000 licensed asbestos removal workers;
- 50,000 demolition workers;
- 500,000 general building workers;
- and 1,200,000 maintenance workers.

11. The calculated reduction in lifetime excess deaths due to the lowering of the control limit was:

- 36 licensed asbestos removal workers, if RPE is worn and 2372 if no RPE is worn or effective controls applied;
- 1 unlicensed asbestos removal worker if RPE is worn and between 3-6 if no RPE is worn;
- 0 from maintenance workers

12. The reason for the low number of deaths from unlicensed work, is that the exposure levels are already mostly below the proposed Control Limit and that their exposure takes place over a relatively small proportion of their work. Even when higher asbestos exposure occurs, the duty to manage means that it is likely that some RPE is worn and controls are applied so there will be only a limited chance that the new Control Limit will be exceeded by demolition and general workers who are compliant with the new Regulations. The lives saved from maintenance workers was assumed to be 0, partly because the significant benefit from the introducing the duty to manage had resulted in the avoidance of some 4,500 asbestos related deaths and partly due to the requirement in article 3 that short non-continuous maintenance activities must not exceed the exposure (control) limit for asbestos. Further refinement of the definition of sporadic and low intensity exposure in article 3 during consultation has resulted in the adoption of an upper exposure limit of 0.6 f/cm$^3$ over 10 minutes, as well as a 0.1 f/cm$^3$ four hour Control Limit. This will further limit the chance of a significant exposure above the Control Limit.

13. Clearly, the largest benefit from the reduced controlled limit is for the licensed asbestos removal workers and the robustness of the estimated reduction of 36 asbestos related deaths is important for the regulatory impact assessment, as well as the risk assessment. This was recognized during the risk assessment in CD205 but it was felt that only the best estimate should be used in the risk assessment and the effect of the many variables should be dealt with in a separate report. Although, it was noted that the HD model itself was the greatest source of imprecision giving approximately an order of magnitude spread for the minimum and maximum estimates. The actual values derived by further independent detailed analysis, confirmed the main source of the variability and that the calculated best estimate was 36. The

variability ranged from a minimum of 4 to a maximum of 148. This is a larger range than the factor of 2 (18 – 72) assumed in the regulatory impact assessment (RIA).[43]

14. The variability for non-licensed work was also investigated. As most of the predicted deaths were due to work with asbestos cement the variability for all types of workers was from a minimum of <1 to a maximum of 30 deaths for a 30-year exposure from age 20. However, the expected number of deaths avoided by introduction of a lower Control Limit is likely to be towards the low end of this range.

15. Therefore the best estimate of lifetime excess deaths avoided remains the same but the maximum estimate is possibly twice as high as estimated in the RIA but the minimum estimate is substantially lower.

## Effect of the removal of textured decorative coatings containing asbestos from the licensing regulations.

16. A further literature review, site sampling[44] and laboratory based testing[45] was carried out at HSC's request. These all confirmed the original data and risk assessment that the peak level of potential airborne exposures to chrysotile asbestos during work with TCs is below the new Control Limit. There was much debate on this issue but the HSL data and estimates for worker exposure and risk have been accepted as valid by WATCH. Average exposure levels would, however, be much lower than these peak levels. The risk from TCs based on a 40 year exposure with 10% of the time spent actively removing textured coatings without RPE was calculated in terms of the annual risk of death in order to compare this with other risks to enable HSC to assess when licensing for TCs is necessary. Figure 3 shows the annual risk of death for current licensed asbestos materials (in red) compared to asbestos cement and other unlicensed materials.

17. The importance of a risk based approach means that the effort to maintain compliance can be focused on the main risk areas such as licensed work. The significance of this can be seen in Figure 3. If work is undertaken with limited controls and no RPE, the calculated annual risk of death from working for 40 years with licensed materials (i.e. sprayed asbestos; other asbestos insulation; asbestos insulating board; and millboards) is 2176.7 per million workers (1903.1 + 273.6). In comparison, the calculated annual risk of death from working with TCs is only 0.4 per million and from asbestos cement is 0.8 per million. It can be seen that the calculated annual risk from TCs is less

[43] Para 6.1.6 of Annex D Regulator Impact Assessment, as published in Consultative Document CD205 - www.hse.gov.uk/consult/CD205.

[44] Tests To Simulate Airborne Fibre Concentrations Released When Disturbing Dust And Debris From Chrysotile Containing Textured Decorative Coatings - HSL report IF/2006/02.

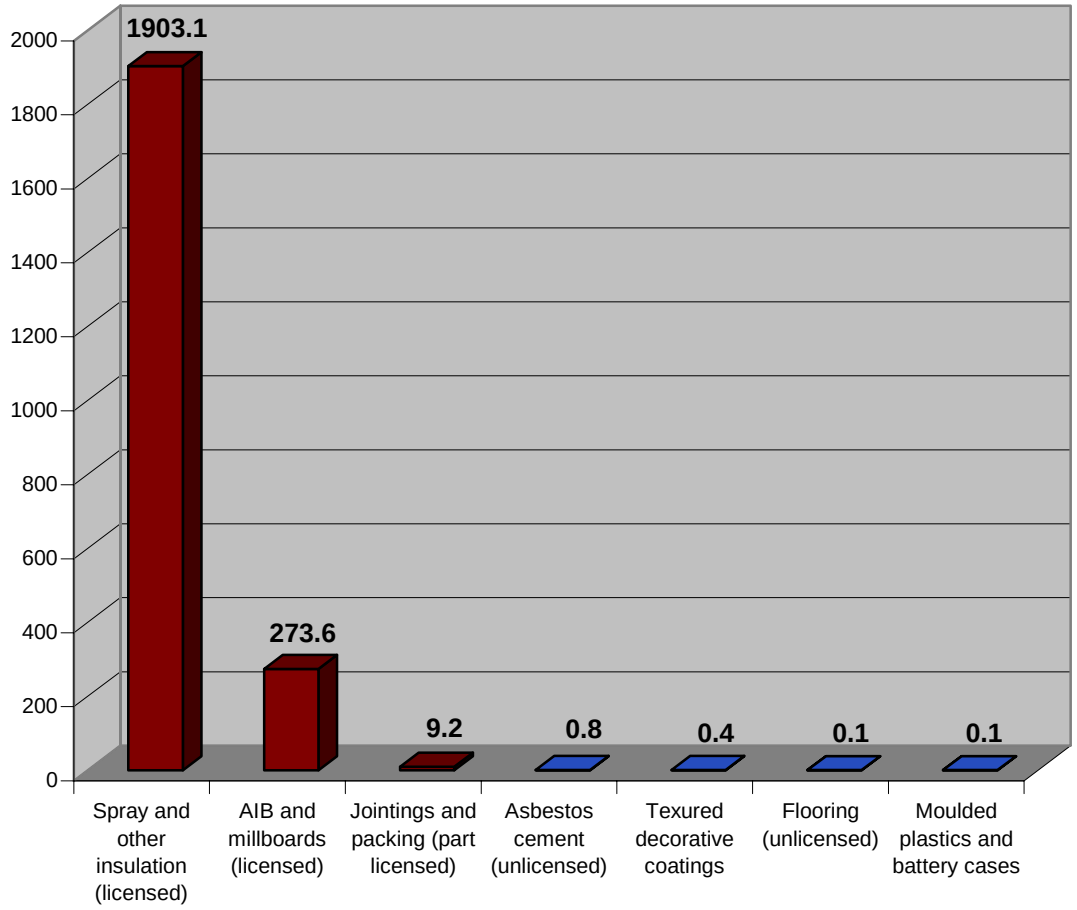
[45] Summary Report On Additional Work Carried Out On The Monitoring Of Chrysotile Containing Textured Decorative Coatings - HSL/2006/19.

than that from asbestos cement which is not licensed. From the amount of work on TCs currently notified to HSE each year, it has been calculated that only around 2290 workers could work for 10% of their time for 40 years with TCs. The lifetime risk of a death among those workers would be 0.055. Even in a worst-case scenario with continuous peak level exposures and without the use of RPE it is calculated that there would be no expected deaths resulting from the exposure of workers to asbestos fibres resulting from a change in licensed status for TCs.

18. The risk assessment also indicates that if the estimated 145,000 asbestos workers are employed for 5 years from age 20 working with currently licensed asbestos materials (a much more likely scenario), it would result in an estimated total of 4777 excess deaths from exposure over the next 50 years if there was no compliance with the Regulations. Again, none of these expected deaths would arise as a result of working with TCs.

19. Concerns have also been expressed that sites will not be left clean and may continue to expose the inhabitants to airborne chrysotile fibres. Given that the first requirement at all removal sites is that they are visibly clean of debris and dust, it is difficult to see that if airborne concentrations during active removal of TCs will not exceed the Control Limit, the small amount of irregular disturbance to any non-visible debris is unlikely to give rise to a significant background exposure or lifetime risk to the inhabitants. Simulations of releases from disturbance of textured coating debris and dust confirmed that if left visibly clean the airborne fibre exposure is minimal and at background levels.

**Figure 3: Comparison of asbestos product groups (annual risk of death per million based on 10% of time actively removing ACMs from age 20 for 40 years with limited controls and no RPE)**



**ANNEX 1**
**RIA ANNEX A**

# REGULATORY IMPACT ASSESSMENT ANNEX B: HSL RISK ASSESSMENT

## Introduction

1. The European Union classifies all forms of asbestos as category 1 carcinogens. It has long been accepted that the risk from exposure to amphiboles (amosite and crocidolite) exceeds that from exposure to chrysotile. Nevertheless HSC's policy (and that of the European Union) has been that exposure to all forms of asbestos should be prevented, or exposure minimised where prevention is not reasonably practicable.

2. The main human health effects associated with occupational exposure to asbestos are fibrosis (asbestosis), lung cancer and mesothelioma. Evidence that asbestos is associated with an increased risk of cancer at other sites is inconclusive. The rate of asbestos related diseases in the UK has been predicted to increase and high levels of incidence are found among maintenance workers (Peto et al. 1995).

3. Health risks can be divided into two main groups, namely workers disturbing asbestos containing materials (ACMs) and other individuals, including members of the public, who may be affected by these work activities or the presence of disturbed or degraded asbestos within buildings they inhabit or visit. The first group, workers disturbing ACMs can be subdivided into a number of sub-groups:

    - Primary manufacturing of ACMs;
    - Secondary manufacture and use of ACMs;
    - Installation of ACM products;
    - Maintenance and repair of ACMs;
    - Removal / demolition of ACMs

4. Since late 1999, except for a very few products, all manufacturing and installation of ACMs has ceased and maintenance, repair, removal and demolition of existing ACMs are the main activities of concern. This was reflected by the introduction of an explicit duty to manage ACMs in building in the updated Control of Asbestos at Work Regulations 2002 (CAW).

5. Overall it was previously estimated (in CD159) that the following amounts of asbestos were installed into the UK:

    - Approximately some 50,000 tonnes of crocidolite, mainly in the form of textile, thermal and spray insulation:

- Approximately some 500,000 tonnes of amosite, mainly in the form of asbestos insulating board, thermal and spray insulation:

- Approximately some 2.7 million tonnes of chrysotile, mainly in the form of cement products (and minor amounts of textiles).

6. The previous estimate in 1999 (CD159) was that about a quarter of the asbestos products installed had been removed and that the majority of the remaining material would be removed over a 50 year period. It would be consistent with this to estimate that about one third of the installed asbestos has now been removed. However, this is an overall estimate and the amounts removed will vary for particular products.

**Main changes to risk of UK workers from the amended EU directive**

7. The EU directive 2003/18/EC (AWPD amendments) makes a number of amendments to Council Directive 83/477/EEC "On the protection of workers from the risks related to exposure to asbestos at work", that will have implications on the risks to workers. The main changes in the directive that will have a direct influence on the risk to workers are those, which will either avoid further exposure to current groups of workers, or those that will reduce current exposures still further. As several of the changes in the EU Directive are already in place in the current UK regulations (CAW and the Asbestos (Licensing) Regulations 1987 (ASLIC)), it is necessary to evaluate the effect of the EU amendments with regard to both the additional risk reduction to the current UK Regulations and the risk reduction that may already be in place. As full compliance is normally assumed when making risk estimates, it is also necessary to determine which measures increase the compliance rather than introducing further reductions in risk.

8. For instance, the current duty to manage (regulation 4 in CAW) and regulation 5 of CAW already enact most of the new measures in Article 10A of the AWPD amendments, which introduce measure to avoid exposure of maintenance and other workers. "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."

9. However, the requirement in Article 12a that "Employers shall provide appropriate training for all workers who are, or are likely to be, exposed to asbestos containing dust," will result in increased awareness and hence compliance but in itself does not directly introduce any new reduction in risk or the number of asbestos related deaths. For example, with increased awareness training any suspected damaged or deteriorated asbestos will be more likely to be brought to the attention of the employer and result in increased compliance.

Similarly, maintenance workers will be less likely to unknowingly disturb or clean up the deteriorated asbestos material.

10. The main amendment that will result in lower exposure is the reduction of the control limits to 0.1 f/cm$^3$ for all types of regulated asbestos in Article 8 in conjunction with the revised Article 6 (exposure must be reduced to a minimum and in any case below the limit value). The effects of this reduction are also magnified by a change in Article 7, which introduces the use of the WHO method for the assessment of airborne fibre exposure as it will increase the numbers of fibres counted in the analysis. The changes to Articles 7 and 8, will have a direct impact on licensed asbestos removal workers who regularly work in an environment where the control limit is approached and exceeded and will lead to the use of increased controls.

11. Other demolition workers who work with unlicensed materials may also find that they have to introduce further controls to ensure they comply with the lower control limits. Unlicensed maintenance workers will also be affected but at present as they are limited to 1 hour of work with materials for which a licence is required per week, the lower control limits are unlikely to make a significant difference to their exposure compared with the benefits of avoiding unknown and hence uncontrolled exposures. Also, with better management of the asbestos in buildings and increased training of maintenance workers, it is much less likely that unlicensed maintenance workers will be working on materials for which a licence is required in the future. However changes introduced to comply with Article 3 and in particular the new concept of “sporadic and low intensity work” may result in changes to the types of work carried out by demolition and maintenance workers and hence a change to their risks.

12. The previous RIA for the new Duty to Manage Asbestos (in CD176) gave a detailed assessment of the best estimate of annual mortality for all workers likely to be exposed to asbestos into the future. After correcting for demolition of existing asbestos containing buildings (average of 2% per annum), this gave a total of 7,800 deaths arising from exposure to asbestos over the next fifty years (if no further action other than routine demolition is undertaken). Given the lag between exposure and death (an additional 50 years after exposure) deaths will continue to occur up to the end of this century. The average number of deaths is 78 in each future year, and the peak number is 158, which is predicted to occur in the year 2058. The figure of 7,800 excluded deaths related to purely environmental exposures (~1,200). The number of occupational exposure deaths avoided was estimated at 58% of 7,800, or 4,500, with around 2,000 as a result of indirect, or work-related, exposure. The remaining 1,300 deaths would be as a result of domestic exposure, most of which are not covered by CAW (or the amended Directive).

13. The baseline year for this estimate was 2000 but as the Duty to manage only came into force in 2004 and the EU directive is to be implemented less than two years later, the risks and actual numbers of deaths predicted are essentially the

same and the risk estimate has not been updated. The previously published figure of 4,500 has therefore been taken as the baseline of avoidable deaths. The modeling process for these risks were fully discussed and published in CD176. The principles used for the modeling are briefly outlined below before describing in detail the modeling process used for the additional reductions due to measures other than for Article 10A.

**Modelling past and present risk for all workers**

14. Due to the long lag times between exposure and the onset of disease (15 – 60 years), many of the current UK asbestos-related deaths are in workers who were exposed to high airborne asbestos fibre levels during the manufacture and installation of asbestos products. The importation of asbestos into the UK (figure 1) is therefore a good predictor of the likely disease rates to these groups of workers and has been used to model the expected levels of UK disease. The quantitative epidemiological dose-response models used for risk assessment are based on the exposures and disease rates found among various cohorts of asbestos production and manufacturing workers. These have been reviewed and described by Hodgson and Darnton (2000) and the outcomes have been used to model future rates of asbestos related lung cancer and mesothelioma to maintenance, repair and removal workers.

15. The approach taken for previous risk estimates (CD159 & CD176) to estimate potential lives saved involved the following steps:

Step 1. Model the link between exposure and mesothelioma deaths at the population level.
Step 2. Estimate current exposure levels.
Step 3. Calibrate the risk generated by estimated current levels to the exposure index in population model
Step 4. Estimate how this current level of population exposure would change over the next 50 years if no additional control action was taken
Step 5. Use the model derived in Step 1 to predict the number of deaths over the next century which would be produced by the future exposure profile estimated in Step 4.
Step 6. Partition these assumed deaths into those due to asbestos in commercial buildings and those in domestic buildings.

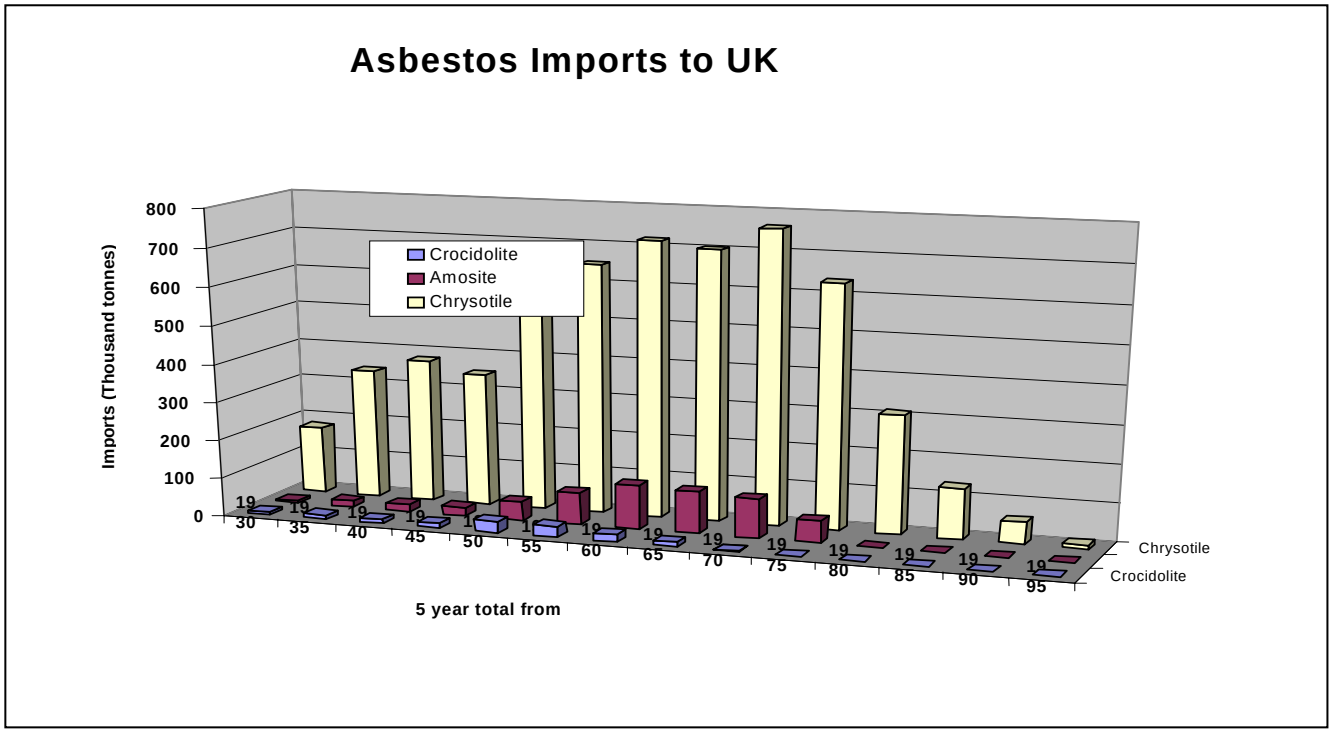



Figure 1: Asbestos imports into the UK

**Step 1: Modelling the link between exposure and mesothelioma deaths at the population level.**

16. The basic approach here has been to infer the past track of asbestos exposure from year to year from the detailed pattern of male mesotheliomas by age and year (the data is single years, and single years of age to age 89). This approach assumes that the population's total exposure to asbestos can be summarised in each year by a single number and that the relationship between this summarised exposure index and future deaths from mesothelioma will take the same form as is widely assumed for the relationship between asbestos exposure and mesothelioma risk at the individual level:

$$r = CD(t-10)^k$$

17. Here, r is mesothelioma risk at time t; D is cumulative exposure; t is time in years since exposure and C and k are parameters to be estimated. The value estimated for k is 2.6, in the middle of the range expected 2 - 3. The maximum year for exposure is estimated at 1967, with a very steep (but poorly determined) reduction in exposure after this date. When expressed at the population level further factors need to be built into the equation to reflect the age distribution of exposure. This included terms to model a possible trend in the completeness of diagnosis, and of clearance of asbestos fibres from the lung.

18. The estimates of relative exposure potential at different ages imply that exposure is concentrated on the age group 20 to 49 and that it is occupation,

especially male occupation, that provide the main source of exposures. A non-clearance model was adopted as the basis for predictions.

19. A large (and increasing) proportion of the predicted future deaths are at ages 80 and above. This is driven both by the form of the model, and by the increasing survival to older ages in the population. Although the mesothelioma model used here fits observed mortality in occupational cohort studies quite well, it can reasonably be doubted whether the risk of mesothelioma increases indefinitely with time after exposure. The few occupational cohorts with very long follow-up all show eventual falls in mesothelioma rate. For this reason previous risk assessments have truncated their predictions at age 80. Clearly this is an approximation since there will be at least some deaths at ages 80 and over. Therefore, the population model fitted here has included deaths up to age 89. There is some indication that the fit is less satisfactory at ages 80 and over. For the purposes of mortality prediction we will limit these to deaths below age 80, though we note that this is likely to be an under estimate. The true value will lie somewhere between this total and the total predicted including deaths to age 89.

20. Comparison of the estimated track of exposure with the figures for imports of asbestos of various types suggests that the amphibole component of imports was a much more important determinant of mesothelioma mortality than that of chrysotile. Figure 2 shows the profile of asbestos imports along with the fitted exposure index. None of the import series reflect the exposure index profile very closely, but the timing of the fall in exposure corresponds quite closely with that for amosite imports. Chrysotile imports did not fall until about ten years later. If chrysotile was a major determinant of mesothelioma mortality, the fitted exposure index might be expected to show a later fall.

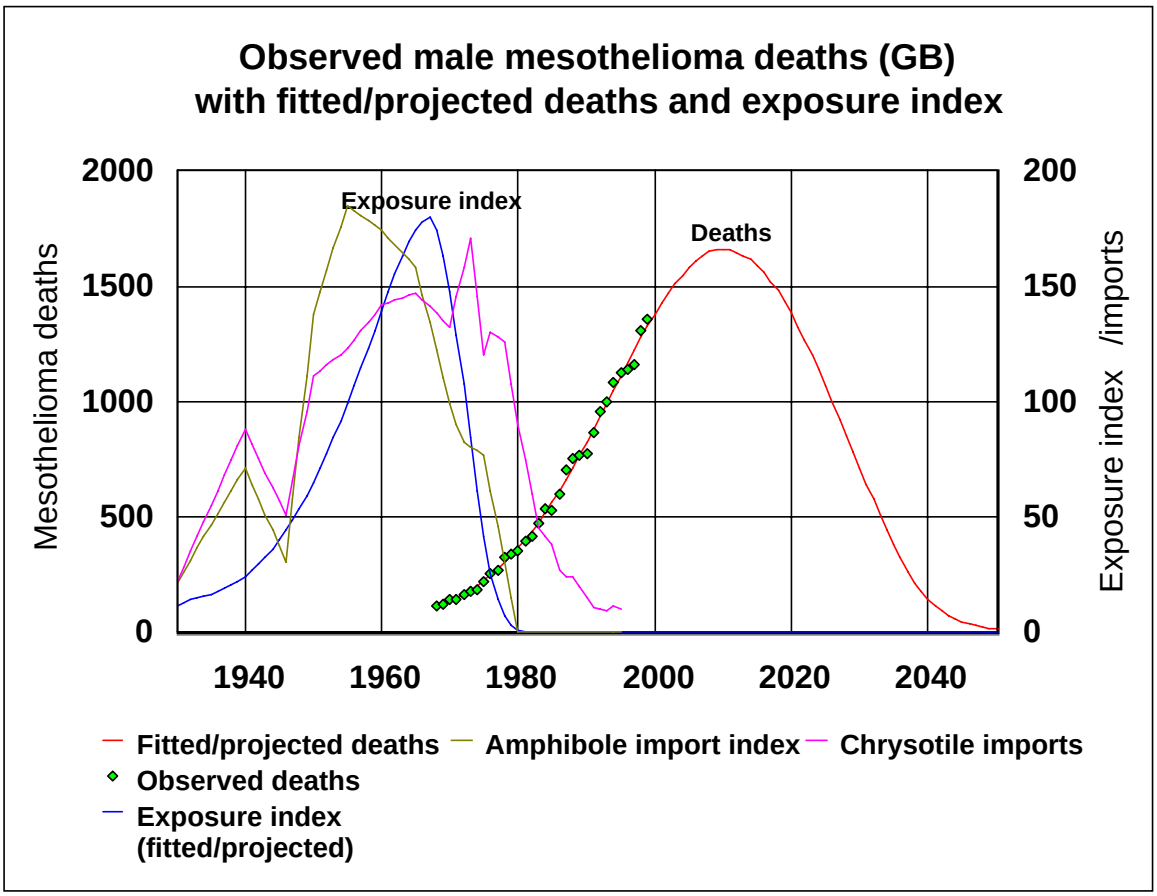



Figure 2: Comparison of fitted exposure index with import volumes

*Estimating the fall in previous exposure levels*

21. If the rate of decline in the 10 years following the implied exposure peak had continued, exposure levels would have fallen to essentially trivial levels well before the year 2000. But there is no real basis for assuming this rate of decline will have continued. Its main driver will have been the rapid reduction in initial processing of imported fibre into asbestos products and their installation. Once exposure has fallen to the level generated by continued routine building maintenance and demolition (and asbestos removal), the rate of total population exposure would be expected to be fairly constant. We have no good measurement-based evidence for knowing what this level is but for the purposes of projecting mortality levels in the future the current and future path of exposure is the crucial assumption.

**Step 2: Current exposure to asbestos**

22. Table 1 shows the exposure distributions and numbers exposed in the broad occupational categories described above on a typical working day. In order to calculate the level of risk this exposure pattern presents in relation to historic

exposures, we estimate the annual level of deaths that would eventually be generated by the long-term continuation of this exposure pattern. Over an extended period of time the same individuals would not experience the same exposure level from day to day. Furthermore, a given individual would not be expected to spend their entire working lifetime within the same job category.

23. In order to model the sharing of exposure over time, and the flow of individuals through these job categories over a working lifetime, we assume a turnover factor for each of the three highest exposure job categories. For example, we assume that over a working lifetime (40 years) 10 times as many people will at some time work in a demolition or asbestos removal job than are involved in these jobs on a given current day. (This is consistent with data on individuals having statutory asbestos medicals as asbestos removal workers over the past 14 years). Smaller (5-fold and 2.5-fold) working lifetime turnover factors are assumed for the larger, less specialised categories of maintenance worker and other building work respectively. These estimates are based on the Labour Force Survey, which provides estimates of time with current employer, and also on whether the respondent's occupation has changed over the last year. However, for our purposes, this is complicated by the fact that individuals may move between both employers, and also detailed occupation, but still be exposed to asbestos.

24. The working lifetime exposure distribution for the group of individuals who have *ever* worked as a demolition or asbestos removal worker will not be the same as that for this group of workers on a given day, but will depend on what other job categories these individuals have occupied over their working life. For these calculations we have assumed that workers in demolition and asbestos removal at some time in their working life are drawn from the "other building work" distribution. In other words this group is formed by adding to the numbers for demolition/removal on a given day a proportion of the "other building work" drawn pro-rata from the exposure distribution of that group. The average exposure in the resulting group is consequently a weighted average of the demolition/removal and other building groups for a given day.

Table 1 **Occupational exposure distributions assumed**

| Exposure distributions on a given current day | | | | | | Average daily exposure distribution in working lifetime pools (taking account of turnover) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Exposure level (f/ml) | Asbestos removal/ demolition | Regularly exposured maintenance | Other building jobs | Other occupations | Total | Asbestos removal/ demolition | Regularly exposured maintenance | Other building jobs | Other occupations | Total |
| 10 | 9 | 120 | 8 | 0 | 137 | 9 | 120 | 7 | 0 | 137 |
| 5 | 17 | 241 | 77 | 0 | 335 | 25 | 241 | 70 | 0 | 335 |
| 1 | 170 | 2,406 | 774 | 13 | 3,363 | 247 | 2,406 | 699 | 11 | 3,363 |
| 0.5 | 510 | 7,217 | 7,742 | 131 | 15,599 | 1,275 | 7,221 | 6,989 | 114 | 15,599 |
| 0.1 | 1,700 | 24,055 | 38,708 | 1,310 | 65,772 | 5,525 | 24,103 | 35,006 | 1,138 | 65,772 |
| 0.05 | 3,400 | 48,110 | 77,415 | 13,097 | 142,023 | 11,050 | 48,591 | 71,003 | 11,378 | 142,023 |
| 0.01 | 3,390 | 48,110 | 154,831 | 523,883 | 730,214 | 18,690 | 67,354 | 189,040 | 455,130 | 730,214 |
| 0.001 | 3,400 | 48,110 | 557,390 | 2,095,531 | 2,704,432 | 58,480 | 125,087 | 700,347 | 1,820,518 | 2,704,432 |
| 0.0001 | 2,705 | 38,127 | 556,531 | 11,772,814 | 12,370,176 | 57,700 | 470,585 | 1,614,117 | 10,227,775 | 12,370,176 |
| 0.00001 | 1,700 | 24,055 | 154,831 | 11,787,364 | 11,967,950 | 17,000 | 457,047 | 1,253,487 | 10,240,416 | 11,967,950 |
| total | 17,000 | 240,551 | 1,548,306 | 26,194,143 | 28,000,000 | 170,000 | 1,202,755 | 3,870,765 | 22,756,480 | 28,000,000 |
| mean level | 0.057 | 0.057 | 0.010 | 0.00036 | 0.0014 | 0.014 | 0.012 | 0.0037 | 0.00036 | 0.0014 |
| ..with lowest two levels set to zero | 0.057 | 0.057 | 0.010 | 0.00031 | 0.0014 | 0.014 | 0.012 | 0.0037 | 0.00031 | 0.0014 |
| turnover | 10 | 5 | 2.5 | | | | | | | |

25. In a similar way, the extra individuals in the "ever maintenance" and "ever other building" groups are drawn from the "other occupations" group. The resulting numbers and exposure distributions are shown in the last four columns of table 1.

26. Within each group it is assumed that all individuals have an equivalent probability of days at each exposure level. The predicted asbestos related mortality is accordingly calculated assuming a working lifetime (age 20 to age 60) exposure at the group average using the risk factors suggested by Hodgson and Darnton (2000).

27. A further set of assumptions has to be made about the proportions of the different fibre types in the assumed exposure. Most of the fibre in asbestos products was chrysotile, but the kinds of product into which chrysotile was incorporated, and the location of these products in buildings implies that the proportion of fibres in exposures that are likely to be generated is much more heavily weighted towards the amphibole fibres than would at first seem likely. One basis for assessing the likely proportions is to assume a "release factor" to reflect the different probability that fibres of a particular type will be released. We believe that the release factor for the amphibole fibres is at least ten times that of chrysotile. Applying these factors to the amounts of the three fibre types which were imported in the 1960s (the peak period for imports) implies exposure proportions of around 10:60:30 for blue, and brown and white asbestos respectively. This is broadly in line with the limited air monitoring evidence available. The difficulty of using direct evidence of air monitoring is that this is only done in situations where exposure to asbestos is known to be taking place, or to be likely to take place. It cannot be taken to be representative of the exposures that will occur in situations where this is not known.

28. Our best model assumes the above proportions for the proportions of the three fibre types in airborne exposure, with variants 15:50:35 and 5:50:45. The central pattern of fibre mix together with the exposure distributions shown in figure 3 imply a long term annual total of 93 mesothelioma deaths (based on overall death rates of the 1970s), of which 71 will be men. This is assuming that all the highest exposure individuals are male and the rest of the exposed population is divided in equal proportions of male and female.

**Step 3: Calibration of risk generated by estimated current levels to exposure index in population model**

29. The next stage in the procedure is to calibrate the risk generated by the exposure outline above by estimated current levels to exposure index in the population model. The predictions of annual mortality levels generated by applying the risk factors from Hodgson and Darnton relate to deaths before age 80, and to a population subject to the overall death rates of the 1970s.

30. To determine what constant level of the exposure index in the projection models corresponds to this predicted annual death rate from mesothelioma, we have to find the constant exposure level within the model which predicts the appropriate number of male mesothelioma deaths at ages up to 80 in the

1970s. The improvements in survival to the ages where mesothelioma death rates are highest between the 1970s and now (and the further improvements which are expected in the future) mean that the predicted annual total generated by a constant exposure rises over time. To generate 71 annual male deaths from mesothelioma in the 1970s from a constant exposure level in the projection model, the exposure index needs to be set at 4.2% of the peak.

**Step 4: Estimating how this current level of population exposure would change over the next 50 years if no additional control action was taken.**

31. Taking exposure at 4.2% of the peak value as our assumed present level, we next estimate its future path to fall in proportion to the predicted demolition rate of the generation of buildings with high probability of containing asbestos materials. Existing regulations will apply on demolition, but the benefits of any asbestos management programme cease at this point. Data from the Valuation Office suggested an average building life of fifty years. We had therefore previously reduced both the costs and benefits attributable to the proposals by 2% each year.

32. This figure is based on the median age of commercial buildings (around fifty years). The demolition rate for the cohort of older buildings containing asbestos will rise on a yearly basis, as these buildings reach the end of their lives. We therefore apply a demolition rate of 1% of current stock a year currently, rising to 4% by the end of the period, and giving an average of around 2%. The effect of this change is to slightly increase benefits, since commercial buildings (and therefore the on-going benefits from establishing a management system) last longer from the present. The effect is through discounting, rather than any change in the average demolition rate.

33. We are now in a position to estimate future mortality from asbestos, in the absence of any further action (or increased compliance with existing regulation) other than routine demolition.

**Step 5: Estimation of the total number of future deaths in all sectors (step 5 in the modelling procedure)**

34. Taking the best estimate annual mortality into the future, and correcting for demolition, leads to a total of 7,800 deaths arising from exposure to asbestos over the next fifty years, if no further action other than routine demolition is undertaken.

35. Given the lag between exposure and death, these deaths continue to occur up to the end of this century. The average number of deaths is 78 in each future year, and the peak number is 158, which is predicted to occur in the year 2058. The profile of mortality is shown in graphical form in fig 3.

36. These estimates include both deaths from lung cancer and also deaths to women. The numbers of lung cancer cases prevented in the future is more questionable than for the mesotheliomas. The uncertainties underlying this calculation are also considerable, particularly those associated with the risk

factors at these - generally - low levels of exposure. By varying the key input assumptions: the risk factors taken from Hodgson and Darnton (2000), the fibre mix assumption, the size of the regularly exposed maintenance group and the turnover of individuals through exposure groups. The possible range in risk factors has a five-fold upward and eightfold downward impact on the estimated mortality levels, while the other assumptions introduce less than a twofold in total uncertainty. There are (at least) two additional sources of uncertainty. The typical levels of exposure we are now considering are at the low end of the intensity scale, and it is at least arguable (HSE's recent review of fibre toxicology has advanced this position) that there is a threshold for asbestos related lung cancers. In any case, the interaction between smoking levels and asbestos exposure, and the fact that the prevalence of smoking has fallen considerably over recent years, means that the number of lung cancers per mesothelioma is likely to be lower in the future than it has been in the past.

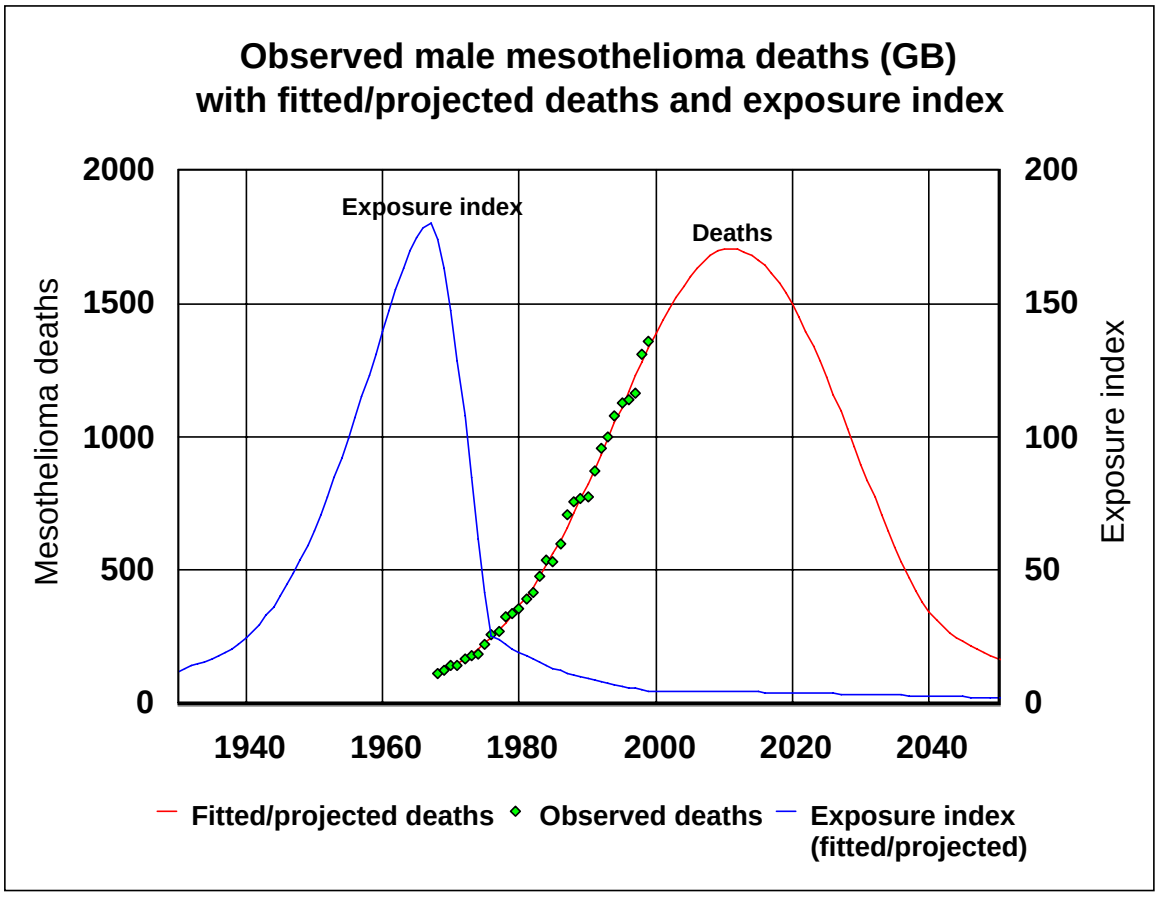



Figure 3: Best estimate of Fitted/Projected deaths

37. The projection modeling applies to male deaths only (due to the relative lack of data for female deaths), but the risk assessment from current exposures also generates predicted numbers of female deaths which can then be used to uprate the predicted male deaths from the production model pro rata. The uprating factor for the best model is 31%, which varies depending on whether `background exposure' is included.

## Step 6: Apportioning total deaths between commercial and residential premises

38. The final step in the modelling procedure is to apportion this future mortality between commercial and residential premises. In order to calculate this, we require our mortality estimates split between the different exposed groups. The number of deaths that would occur in the different exposed groups, given the exposures and other assumptions in our risk model is given in table 2.

**Table 2: Predicted annual deaths by exposed groups (for constant exposure, and 1970s life table)**

| Exposed groups | Number of deaths | | |
|---|---|---|---|
| | Mesothelioma | Lung cancer | Total |
| Removal/demolition | 3 | 1 | 4 |
| Regularly exposed building workers | 27 | 4 | 31 |
| Other building workers | 20 | 5 | 25 |
| Rest of working population | 25 | 1 | 26 |
| Domestic exposure (aged 20+) | 5 | 0 | 5 |
| Domestic exposure (aged <20) | 13 | 0 | 13 |
| Total | 93 | 11 | 104 |

39. The model used to provide our best estimate attributes 58% of total risk to be from occupational exposure to maintenance and building workers. The other 42% of the total risk is attributable to the background exposure of the people working/living in buildings containing asbestos. Of this 42%, the model attributes 17% of total risk to residents in all housing types, with the remaining 25% attributable mainly to background exposure in commercial buildings.

40. The DTI construction statistics gives the total value of repair and maintenance activity, broken down by a broad building type. Around 48% of repair and maintenance are conducted on commercial buildings. Of the remaining amount, 32% is conducted in private housing and 20% on public housing.

41. Private housing is known to contain far less asbestos than local authority provided housing. A generous assumption would be that private housing - on a unit by unit basis is four times less likely to contain asbestos than publicly provided housing (or equivalently a private house containing asbestos will contain one-quarter the amount of that found in local authority accommodation that contains asbestos). This together with the above figures indicates that around 7% of total risk will be in the owner occupied sector and around 29% in the local authority and rented sectors, giving a total of 35% after rounding. Some of this risk will relate to common areas of residential accommodation, which are included in these proposals. As noted below, we cannot separate these from the costs and benefits relating to rented accommodation as a whole, which are examined in a separate document.

42. The remaining 65% of total risk is that attributable to workers conducting maintenance activity on commercial buildings and also the background exposure to the occupants of such buildings. Forty percentage points of this total risk in commercial buildings is risks to workers conducting maintenance on the building. This is consistent with the fact that a higher proportion of buildings in the commercial sector contain asbestos, and where it is found it would also be more extensive than in residential accommodation. Commercial buildings thus account for the majority of occupational risk to workers conducting maintenance work.

43. Looking at background risk, the split between the commercial and residential sectors is more equal, despite the fact that asbestos is more prevalent in commercial buildings This is partly due to the longer time exposure of residents of housing compared to occupants of workplaces, and also to the higher population estimates.

44. It should be noted that the above proportions relate to *current risk.* Since our model estimates a lower demolition rate amongst the residential sector, in the future the proportion of risk in the residential sector will increase. This can be demonstrated by the fact that although the residential sector accounts for 35% of current risk, 39% of preventable deaths are estimated to occur in this sector.

45. The total number of deaths in the commercial sector is therefore estimated at 4,700 and the total number of deaths in the residential sector is estimated at 3,100. Assuming full compliance with article 10A of the new directive, most of these deaths would be avoided.

**Modelling risks and benefits from a reduced control limit**

46. The modelling approach used above for all workers, was based on estimates of the current daily exposures to the working population of 28 million, with several specific groups (see table 1) having increased exposure from direct contact and disturbance of ACMs in buildings. The numbers of workers who will be actively working with and disturbing asbestos, at or above the control limit on a daily basis is a much smaller group of ~85,000 mainly construction and maintenance workers (see table 3). The numbers of workers approaching the control limit has also been summarised.

**Table 3: Summary of previously estimated numbers of workers at or above the control limit on a daily basis**

| Exposure level (f/ml) | Asbestos removal/ demolition | Regularly exposed maintenance workers | Other building jobs | Other occupations | Total all categories | Total Maintenance & other building jobs |
|---|---|---|---|---|---|---|
| ≥ 0.1 | 2406 | 34039 | 47309 | 1454 | 85208 | 81348 |
| 0.05 | 3400 | 48110 | 77415 | 13097 | 142022 | 125525 |
| All workers | 17,000 | 240,551 | 1, 548,306 | 26,194,143 | 28,000,000 | 1,788,857 |
| Av. days of exposure/ yr. | 34 | 34 | 7.33 | 0.013 | | |

47. It can be seen that the estimates made on the numbers exposed daily will also reflect the average frequency that a worker will be exposed at or above the proposed control limit of 0.1 f/ml. The estimated number of workers exposed is based on estimates before the duty to manage (regulation 4 of CAW) came into effect in 2004. The effect of these regulations will be to substantially reduce the figures of persons exposed at or above the control limit for other building jobs and other occupations. If 100% compliance was assumed these would of course be zero. The regularly exposed maintenance workers will also be expected to greatly reduce the amount of work carried out on ACMs and particularly the types of work, which have the potential to release levels above the control limit. Increased levels of training for maintenance workers in the amended directive will also improve awareness and controls further reducing exposures.

48. Only the removal and demolition sector is likely to have increased numbers of workers who are regularly exposed above the control limit. This sector of workers is therefore looked at in closer detail. This is also the group that has the highest frequency, duration and level of amphibole asbestos exposure and the need to monitor compliance with the control limit.

**Method for estimation of the reduction of risk from the lowering of the control limit**

49. The method for estimating the reduction of risk uses the following steps:

1) derive the current arithmetic average asbestos exposure of the groups of asbestos workers who will be affected;
2) calculate their current expected lifetime risk using the HD quantitative risk assessment model with a realistic job duration and age at first exposure;
3) adjust risk parameters to allow for the use of RPE and future trends/changes etc.;
4) recalculate lifetime risks with new parameters using the HD quantitative risk assessment model.

5) Subtract the adjusted values from the current values to estimate the reduction in risk expected from those changes.
6) Express difference in terms of a benefit (e.g. the calculated numbers of asbestos related deaths avoided) and as a reduction in lifetime or annual risk.

50. The following main parameters have been assessed to estimate the exposure for three different categories of workers (Licensed asbestos removers, unlicensed demolition work and maintenance work):

- The type of activity and frequency which it is carried out;
- The types of material being disturbed or removed;
- The average concentration of airborne asbestos fibres produced by the different types of activity;

51. The lifetime risks related to the asbestos exposure are calculated using the same model derived from Hodgson and Darnton (2000) and that was used to calculate the risks for all workers above. The main inputs into the model that will affect the calculated risk are:

- The arithmetic mean exposure;
- The age first exposed and survival age;
- The frequency and duration of the exposure;
- The type of asbestos released.

52. The number of deaths calculated will also depend on the:

- The numbers of workers exposed in each category of work;
- The lag time allowed for the disease.

***Category of work***

53. The type of ACM being disturbed defines the category of work. Due to the existing ASLIC regulations, removal work can be divided into two main categories: licensed and unlicensed. Demolition of buildings should only take place after all the ACMs have been removed. Most demolition workers should therefore only be involved in controlled removal of unlicensed material, while specialist removal contractors will remove licensed materials. As article 10A of the directive has already been substantially implemented, along with improved standards, definitions and accreditation for surveying, this should strictly limit the number of sites where residual or overlooked ACMs are still present during demolition. As the UK has a well -established system of licensing, and it is only through failure to implement the regulations that demolition workers will be exposed to the addition risks from licensed materials. The relative risks

from the various types of licensed and unlicensed materials are looked at in more detail in a separate section of this RIA.

54. Although maintenance workers have been restricted to work of short duration (< 1 hour per week per person) with licensed materials, there is no limit to the amount of work they can carry out on unlicensed ACMs. However, there is usually a difference in the scale, type and amount of disturbance and sometimes the types of controls applied between small scale maintenance work and more significant refurbishment and removal work. All work with asbestos is covered by CAW, (2002) and one of two approved codes of practices (L27 & L28), with a duty to ensure airborne exposures to workers and the spread of asbestos are kept as low as reasonably practicable.

***Estimation of exposure***

*The type of activity and frequency which it is carried out*

55. The type of activity or disturbance taking place is one of the main determinants of the airborne fibre concentration. Work with asbestos should be carried out in a controlled way to minimise the release of airborne fibres. However, even after many years after the adoption of controlled wet removal a significant percentage of asbestos removal is still carried out dry. On average, with licensed materials this will produce airborne concentrations some 2 orders of magnitude higher than controlled wet removal methods. Similarly the use of energetic and dusty processes to remove asbestos (e.g. dry grit blasting and sanding, as well as the use of power tools) increase exposures and there use is discouraged. The frequency that removal work is undertaken is also a basic determinant of the annual exposure / dose. Published data and HSE's own data has been used to estimate the exposures for different types of activity with asbestos materials.

***Type and amount of material being disturbed or removed,***

56. Certain types of ACMs are licensed materials because of a perceived increased risk. There are many asbestos products but they fall into about 10 main groups of products. Five of them are defined as licensed materials (ASLIC, 1983, as amended 1998); sprays and coatings, lagging (including textile ropes), asbestos insulating board and decorative / textured coatings. Non-licensed asbestos products include: cement, bitumen, flooring and friction products, as well as, various other reinforced plastic and resin composites. The total amount of airborne asbestos released will depend on the volume / area of material that is being disturbed or removed.

***The average concentration of airborne asbestos fibres produced by the activity,***

57. The cumulative exposure (dose) is an important metric in any risk assessment. For asbestos fibres exposure has been defined in terms of the airborne concentration of regulatory fibres (in fibres per millilitre f/ml) as counted by an approved method (e.g. MDHS 39/4 until 2006). The cumulative exposure is normally expressed in f/ml.years and is the sum of many individual exposures, where each exposure will depend on a number of variables (e.g. type of ACM/s being disturbed, type of activity/disturbance, amount of material being disturbed, type of controls, duration of activity, etc.) and on the use and effectiveness of personal and respiratory protection. Often there are only a limited number of individual exposure measurements available and these are used to estimate the arithmetic mean fibre exposure concentration. The available data (see CD176) have been updated for this review.

***Modelling and calculation of lifetime risk***

58. The HD model estimates the number of lung cancers and mesotheliomas that will occur. Most of the risk is due to mesothelioma and the model is discussed in A14 and A15 is related by a power relationship to the time since first exposure. This will result in increasing numbers of asbestos related deaths in an ageing population with an increasing life expectancy.

***The arithmetic mean exposure***

59. The exposure assessment is used to calculate an arithmetic mean for input into the risk model. As discussed above this is an overall estimate made from published data and data collected by HSE. As the arithmetic mean is used a few high exposures can significantly affect the mean if limited data is available.

***The age first exposed and survival age***

60. For licensed asbestos removal work all workers are required to have a medical before starting work and the age at the first recorded medicals is given in figure 4. This is shown to have a mean age of 32.5 but significant numbers are exposed from the age 20 onwards.

61. The risk model assumes exposure up to the age of 60 so the maximum duration of exposure of 40 years is possible if age of first exposure is 20. The average survival age used to calculate the lifetime risks has been retained at 80 although there is an argument for increasing this value, as life expectancy is still increasing among the general population. Instead of further increasing the survival age, a more conservative value of 20 for the age of first exposure was used in the calculations. The increased time since first exposure increases the number of lifetime deaths.

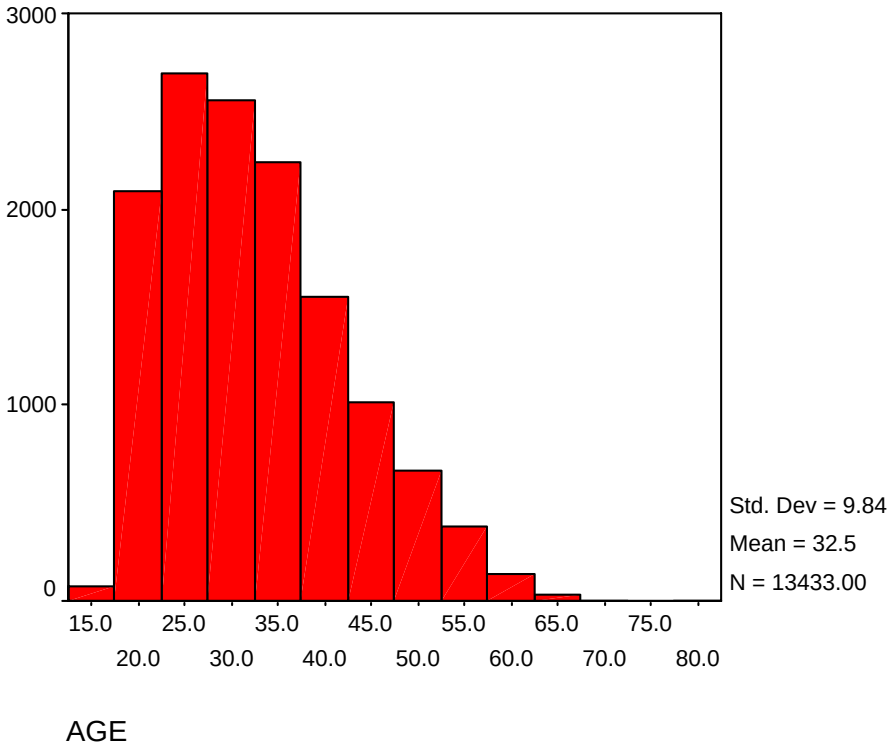



Figure 4: Age distribution for asbestos remover's first exam since 1995

***The frequency and duration of the exposure***

62. The cumulative exposure is derived from the arithmetic mean exposure x frequency of exposure x average duration of exposure. Estimates of the frequency and duration of exposure were relatively easy to make for workers in the asbestos manufacturing industries but are much more problematic for maintenance and demolition workers. However, there are data for licensed asbestos removal work. Under CAW 2002 employers are required to keep records of their employees frequency and duration of asbestos work and an estimate of their exposure. Unfortunately, there is no requirement to calculate, record or report the annual cumulative exposure for each employee, so no direct figures for individual workers are available to HSE from the employers but more general information is available from the notification and medical systems.

63. Under ASLIC, (1983) all work over exceeding 2 hours with licensed materials should be notified to HSE on an ASB 5 form along with an attached plan of work. These are usually held for 3 months by HSE regional offices before disposal but there is also a central system that records some of the data supplied on the ASB 5 notifications. This is held by the Health Unit of the Field operating division of HSE and three years of computerised records were available for analysis.

64. Information on the duration of exposure to licensed asbestos removal workers are available from the records held by the Employment Medical Statistics Unit

(EMSU) of HSE on the number of medical carried out for asbestos removal workers. These are usually 2 years apart so doubling the number of medicals gives an approximation to the length of time an average worker spends in the licensed asbestos removal industry. The current information is given in figure 5 and implies that a large turnover of workers takes place. The medical examinations data also show that the average years working per man is 3.09 but this assumes the full period is worked and is likely to be an overestimate. The majority of workers (71.5%) only have one examination, i.e. work for less than 2 years. Just over 90% of workers work for 5 years or less. So for practical purposes, the risk estimates based on 5 years exposure (shown in bold in Table 5) apply to virtually all workers.

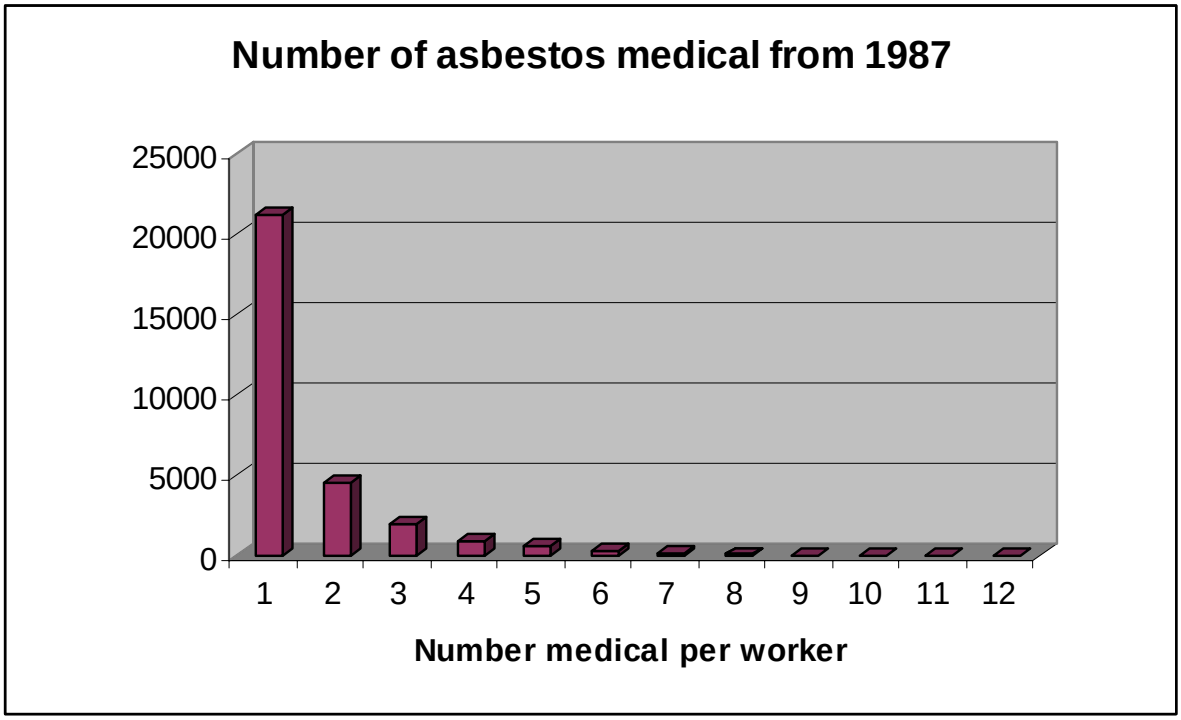



Figure 5: Numbers of asbestos medicals per worker from 1977

***The type of asbestos released.***

65. It has long been recognised in UK regulations that the type of asbestos released has different effects on the disease rates. In keeping with EU regulations the differentials in the control limits between the different types of asbestos have been reduced over the last 10 years and are due to disappear altogether in 2006. However, the more recent risk models place much greater emphasis on the type of asbestos to which the person has been exposed. For example, the Hodgson and Darnton model uses a factor of 500: 100: 1 to characterise the relative risks for mesothelioma for crocidolite, amosite and chrysotile respectively. However, the older EPA IRIS model uses a single average risk factor for all three types. As removal and maintenance worker will

receive a mixed exposure it is necessary to make assumptions on the fibre type. For the all worker model a mix of 10:60:30 crocidolite, amosite and chrysotile respectively was used for the best approach. The HD model is therefore very sensitive to assumptions and estimates about the type of asbestos to which people are exposed. Unfortunately this is not recorded on the main FOD database but are available if the plans of work held with the ASB 5 notifications for 3 months at the regional offices are inspected.

66. For unlicensed work there are no notifications so no direct information was available.

***Number of asbestos related deaths***

*The numbers of workers exposed in each category of work*

67. The number of persons exposed will determine the estimated number of asbestos related deaths. As ACMs are still present in many older buildings, the number of people potentially exposed to any asbestos due to workplace activity is large ~ 28 million (see table 1). However, the numbers of workers who will be actively working with and disturbing asbestos at or above the control limit on a daily basis is a much smaller group of ~85,000 mainly construction and maintenance workers (see table 3). The previous RIA defined regularly exposed workers as those working with ACM for more than one-tenth of their total working time. An estimate of the total size of this group of 240,000, or 13% of all building and maintenance workers, is based on a judgement of which particular trades will be most at risk from asbestos and what proportions of all workers in these trades this regularly exposed group will account for. Detailed occupational information was obtained from the Labour Force Survey. Trades falling in this group include electricians, heating engineers, fitters, and some carpenters and joiners. In addition, we tried to account for activities not identified by the standard coding, such as `cable-pulling'.

68. According to HSE / EMSU figures, there were some 4903 medical examinations for asbestos workers in 2001 and 4798 in 2002. Examinations are required every two years. The number of workers with valid medical certificates in any one year should not be more than twice the number of examinations. It is known that some workers have their medicals before the 2 years is up and that some have medicals but work for less than 2 years. It is estimated there are currently some 9,000 licensed asbestos removal workers. In the modelling for all workers a turnover of X10 was assumed (CD 176). The numbers of people which have only one medical suggest that the turnover rate may be significantly higher than 10 over a period of 50 years. The total number of commercial and public premises currently containing asbestos is estimated to be in the region of 500,000. Given the rate of demolition of 2% on average (starting at 1% and rising to 4%) about 5,000 jobs arising from demolition in current years and 10,000 per year on average are predicted. Other groups of workers were given lower turnover rates X5 for maintenance workers and X 2.5 for other construction workers.

69. The way the removal, demolition and maintenance workers perform their work and their use of appropriate precautions and controls will affect the exposure of other person and workers. Either those who are nearby during the work, or if debris and dust is left behind those workers who subsequently disturb the residual material (e.g. cleaners, other maintenance and construction workers, or other persons using the area). The previous update to the CAW (2002), which introduced a new duty to manage ACMs, were designed to reduce the chances of construction or maintenance workers unknowingly or inappropriately working with ACMs. This would also result in fewer workers working with ACMs and would also limit uncontrolled exposures to workers and bystanders.

*The lag time allowed for the disease.*

70. The model for all workers allowed for a further 50 years of exposure from the baseline year with a 50 year lag time from the end of the exposure for the disease to develop.

71. Although a significant amount of asbestos has been removed in the last 5 years the accuracy to which we can predict worker numbers will make little difference if we use the same time periods as in the previous RIA.

**Risk estimation for licensed asbestos removal workers**

***Fibre Concentration data***

72. Measurement of personal exposures to airborne fibres for licensed UK asbestos removal work on various types of ACM were available from a database compiled by HSL (Burdett and Revell, 1995 – with some further results added later). A wider data set of airborne exposures monitored from work with ACMs from literature sources has also compiled by HSL, and was published in CD 176. The literature survey has been updated for this review and unpublished measurements from the French EVALUTIL database have also been added. These two sources have been used to derive the estimated the fibre concentration but as much of the literature data is from outside the UK, where removal methods and working practices may differ, preference has generally been given to the HSL UK database for estimating exposures for licensed asbestos removal work. Although the measurements are somewhat dated they are specific to controlled wet removal as carried out in the UK. As it was likely the measurements were biased towards best practice, as HSE / HSL or other monitoring personnel were on site during the work, this is counterbalanced by the fact that there will have been improvements in proficiency of use and in the performance of the controlled wet removal methods. Therefore, it was considered that current licensed asbestos removal using controlled wetting methods would have similar exposures to the good practice measured some 10 years ago.

73. Some licensed removal work is still reportedly carried out dry, and is non-compliant with HSE’s approved codes of practice and guidance but no allowances have been made for the much higher exposures that occur during dry removal or poor wet removal.

***Types and frequency of licensed asbestos removal work***

74. The database of licensed asbestos removal from FOD Health Unit (HU) has 97,940 job notifications over a period of approximately 3 years, amounting in total to 709305 working days (job-days). Because of the sample size, this is by far the most statistically reliable set of data we have. The database/ASB 5s record five categories of asbestos materials, asbestos insulating board (AIB), asbestos insulation (AI), asbestos coatings (AC), textured coatings (TC) and others (OTH). One or more of these are recorded for each job with the most abundant material first. Figure 6 summarises the number of jobs by material type. It can be seen that asbestos insulating board currently accounts for 50% of all licensed removal jobs. The average time for jobs with different ACMs varies (see table 4). The shortest time was for textured coatings and the longer times were associated with multiple types of ACMs (i.e. the larger jobs are larger to have a greater variety of ACMs). Figure 7, summarises the proportion of time spent working (in terms of job days) by material type.

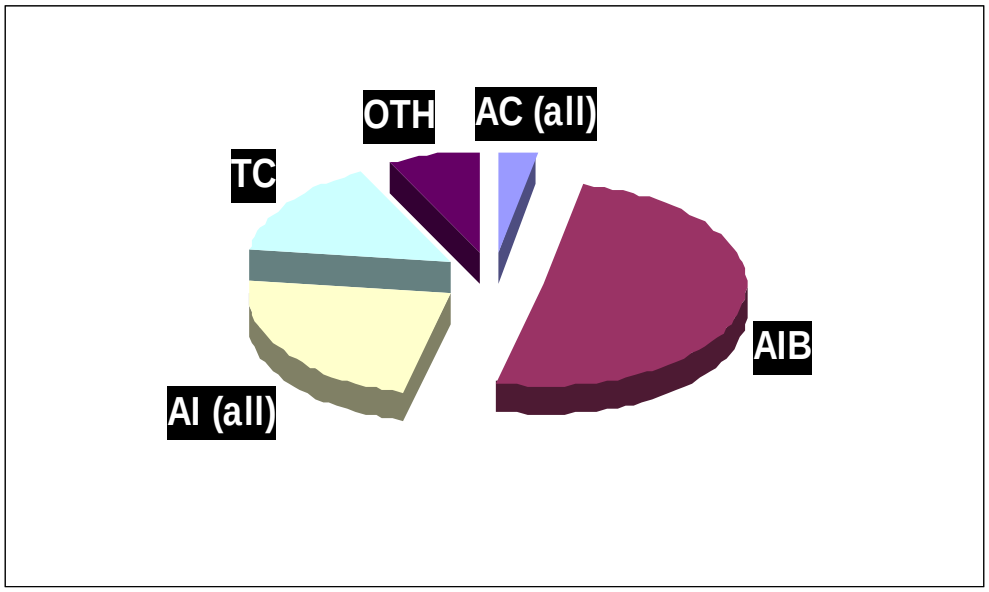



Figure 6: Relative frequency of asbestos material type encountered during licensed removal work (by number of jobs)

75. Most removal jobs are of short duration: Nearly 30% take only one day and jobs of less than 4 days duration make up more that half the notifications. But the average duration (HU data set) is 7.2 days and there are a small number of big jobs, which make a large contribution to the number of working days. More than a quarter of the working days come from jobs lasting more than 50 days, which make up less than 2% of all jobs. Jobs for which there is a mixture of ACM types tend to take longer and employ more men than average; several types of ACM are most likely to be encountered on the larger scale jobs. The two (AC+AI+AIB) 365-day jobs make a large contribution, as they each employed 14 men, and these may well make the proportions on worker-days for each ACM untypical. There are, however, other long-duration jobs in the

other ACM type categories. In general, a small number of large-scale jobs make up a large part of the working time (man-days).

76. Although one-day jobs make up more than a quarter of the total number, they only account for about 4% of working days. The duration of TC jobs tends to be less than average, as might be expected if many of these were small-scale work on domestic premises, and so too is the number of workers. So work on TC makes up a much smaller proportion of the man-days.

77. The HU data give a clear picture of the scale of licensed asbestos removal work. Over 30,000 jobs are notified each year, which is over 600 a week; on average, over 120 new jobs will be started each day. Licensed asbestos work amounts to nearly quarter of a million working days each year, which means there are nearly a thousand jobs in progress each day. With an around 3 workers as the average number for a job (see below), this means that nearly 3000 workers are engaged in licensed asbestos removal each day.

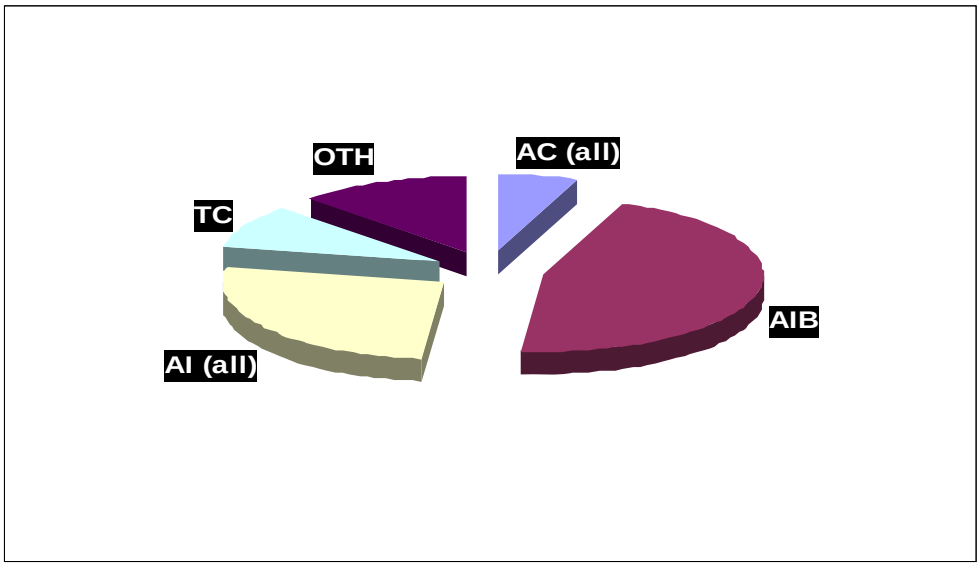



Figure 7: Relative frequency of asbestos material type encountered during licensed removal work (by number of job days)

| **Table 4: Summary of FOD database for licensed removal work** | | | | | |
|---|---|---|---|---|---|
| | By number of jobs | | By job-days | | |
| Type of ACM | Number of Jobs | Percentage of total | Number of job days | Percentage of total | Average duration of job (days) |
| AC | 2276 | 2.32% | 23056 | 3.43% | 10.1 |
| AC & AIB | 289 | 0.30% | 4589 | 0.68% | 15.9 |
| AC & AI | 220 | 0.22% | 2620 | 0.39% | 11.9 |
| AC & AI & AIB | 262 | 0.27% | 6738 | 1.00% | 25.7 |
| AIB | 49608 | 50.65% | 290134 | 43.20% | 5.8 |
| AI | 20303 | 20.73% | 167579 | 24.95% | 8.3 |
| AI & AIB | 2440 | 2.49% | 39795 | 5.93% | 16.3 |
| Other | 7245 | 7.40% | 78891 | 11.75% | 10.9 |
| TC | 15297 | 15.62% | 58239 | 8.67% | 3.8 |
| Total | 97940 | 100.00% | 671641 | 100.00% | 6.9 |

***Calculation of exposure from FOD HU database***

78. By combining the fibre measurement data with the frequency of work with each category of material it was possible to calculate the average annual exposure to all asbestos removal workers in terms of job days. A fibre concentration for “other” asbestos has to be assumed to complete the exposure assessment. A weighted mean concentration in terms of number of jobs was calculated and used but if “other” was truly other non-licensed materials rather than a mixture of licensed materials the average fibre concentration would be lower.

| **Table 5: Calculated annual exposure to asbestos removal workers (average of 3-year period 2000 – 2003).** | | | |
|---|---|---|---|
| | Arithmetic mean personal exposure | Cumulative exposure in 1 year | Percentage of total exposure |
| Type of ACM | (f/ml) | f/ml.job-days | |
| AC | 14.36 | 110361 | 24.58% |
| AC & AIB | 7.39 | 11297 | 2.52% |
| AC & AI | 9.28 | 8105 | 1.81% |
| AC & AI & AIB | 6.32 | 14202 | 3.16% |
| AIB | 0.41 | 39652 | 8.83% |
| AI | 4.2 | 234611 | 52.25% |
| AI & AIB | 2.31 | 30576 | 6.81% |
| Other | ? | 0 | 0.00% |
| Textured coatings | 0.01 | 194 | 0.04% |
| Total | | 448997 | 100.00% |

79. Invaluable though the HU data set is, two key pieces of information for risk assessment are lacking: (i) the number of workers employed, which is required to estimate the total exposure duration of all workers, i.e. to get from job-days to man-days; (ii) the asbestos type(s) encountered in the various jobs, on which the risk is strongly dependent. The maximum number of workers is given on the ASB 5 notification form but is not recorded in the HU data set. The asbestos type does not appear on the ASB 5 form but is usually given in the accompanying Job Plan.

***Additional information from ASB 5 notifications and Job plans***

80. To obtain this additional information 903 ASB 5 notifications and Job Plans (904 were examined, one being rejected as the number of workers was not given) from the Sheffield and Manchester Area Offices, covering periods of about 3 months up to October/November 2004. Table 6 gives the number of jobs and the calculated number of job days and person days from the ASB 5 forms (e.g. worker-days = total number of workers on site x length of job in days). These are likely to be overestimates for duration of exposure as not all workers will be inside the enclosure removing asbestos for the entire time and during set up and take down lower exposures are likely than attributed from the air monitoring data.

**Table 6: Analysis of Job Notifications in Sample of Abs by ACM Type**

| Type of ACM | Number of jobs | Job-days | Total person-days | Average person-days |
|---|---|---|---|---|
| AC+AI+AIB | 3 | 735 | 10245 | 3415.0 |
| AC+AI | 2 | 35 | 205 | 102.5 |
| AC+AIB+TC | 2 | 40 | 220 | 110.0 |
| AC+AIB | 5 | 107 | 424 | 84.8 |
| AC | 7 | 77 | 435 | 62.1 |
| AI+AIB+O | 2 | 42 | 168 | 84.0 |
| AI+AIB | 35 | 405 | 2263 | 64.7 |
| AI+O | 5 | 113 | 448 | 89.6 |
| AI | 135 | 1214 | 5080.5 | 37.6 |
| AIB+O | 11 | 80 | 285 | 25.9 |
| AIB+TC+O | 1 | 2 | 6 | 6.0 |
| AIB+TC | 10 | 136 | 690 | 69.0 |
| AIB | 446 | 3868 | 12746.5 | 28.6 |
| O | 53 | 806 | 3282 | 61.9 |
| TC+AI | 1 | 4 | 12 | 12.0 |
| TC+O | 4 | 308 | 1036 | 259.0 |
| TC | 181 | 589 | 1665.5 | 9.2 |
| Overall average | | | | 43.4 |
| Total | 903 | 8561 | 39211.5 | |

81. As the required information on asbestos type was given in only 723 of the 903 plan of work / notifications examined, some figures for asbestos type(s) present in each ACM type are statistically poor. Rounded off values of the

asbestos types listed against various types of ACM are given in Table 7. These were used to calculate risk factors for the ACM based on the HD relative risk factors of: chrysotile =1, amosite = 100 and crocidolite = 500. Overall, the average relative estimate of asbestos type for chrysotile: amosite: crocidolite were 10:85:5 giving a relative risk factor of 110.1 compared to chrysotile exposure only. This is somewhat different to the mix of asbestos types, estimated and used in the risk estimate for all workers (30:60:10). However, the relative risk factor for a mix of (30:60:10) =110.3, a remarkably similar overall risk.

**Table 7: Information from plan of work data for the asbestos types present for different Types of ACM**

| ACM Type | Type of Asbestos Present (%) | | | Calculated risk factor |
|---|---|---|---|---|
| | Chrysotile (CH) | Amosite (AM) | Crocidolite (CR) | |
| AC * | 5 | 75 | 20 | 175 |
| AC + AIB | 3 | 85 | 13 | 148 |
| AC + AI | 5 | 73 | 23 | 185 |
| AC + AI+AIB | 3 | 80 | 17 | 163 |
| AIB | 0 | 95 | 5 | 120 |
| AI | 5 | 70 | 25 | 195 |
| AI + AIB | 3 | 83 | 15 | 158 |
| O | 13 | 85 | 2 | 95 |
| TC | 100 | 0 | 0 | 1 |
| All data | 10 | 85 | 5 | 110 |

***Calculation of relative risk***

82. Table 8 brings together all the data in tables 5 –7 above and then uses this information to calculate the relative risks. Column 2 of table 8 gives the number of jobs per year by type of ACM (column 1) derived from the HU data on notifications over a three-year period. The average number of worker-days per job for each of the ACM types and combinations of types from the ASB 5 data in table 6 is entered in column 3 and multiplied by the number of jobs to obtain the total worker-days per year (column 4). Column 5 of Table 1 gives the fibre concentrations for each type of ACM derived from the HSL data (table 5). Total worker exposure in f/ml.person-days per year (column 6) is calculated by multiplying columns 4 and 5. The percentage of total worker exposure contributed by each ACM type is given in column 7. The asbestos type taken from a sample of Job Plans in table 7 and the calculated risk factors for each type of ACM are entered in column 8. Multiplying f/ml.person-days per year by the risk factor gives a value adjusted for the relative risk (column 9) from which the contribution to the total risk from each ACM types can be calculated (column 10).

83. It is worth noting that the relative risks for the various combinations of licensed materials varies between 1% - 43%, except for textured coatings which are some three orders of magnitude lower.

***Calculation of average licensed asbestos removal worker exposure for use in HD model***

84. The total worker exposure of some 4320228 f/ml.person-days per year were apportioned to the 3 asbestos types as shown at the bottom of Table 7, i.e. 10% chrysotile, 85% amosite and 5% crocidolite. The average fibre concentrations per worker have been calculated by dividing by (9000*240), i.e. based on 9000 men and 240 working days.

**Table 9: Average exposure of asbestos removal workers to different types of asbestos**

| Asbestos type | Annual worker exposure Worker days f/ml /year | Average fibre concentration Per worker |
|---|---|---|
| Chrysotile | 432023 | 0.20 |
| Amosite | 3672194 | 1.70 |
| Crocidolite | 216011 | 0.10 |

| **Table 8: Calculation of relative risks** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number of jobs in 3- year period | Number of jobs per year | Average worker-days per job | Worker-days per year | Fibre concentration (f/ml) | Exposure (Worker-days f/ml/yr.) | Percent of total exposure | Risk Factor for asbestos type | Weighted risk from work with various ACMs | Percent of total risk by type of ACM |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Type of ACM | HU | HU | ASB 5 | | f/ml | | | | | |
| AC | 2276 | 758.7 | 62.1 | 47145.7 | 14.4 | 677012.5 | 15.67% | 175.1 | 118.51 | 16.41% |
| AC & AIB | 289 | 96.3 | 84.8 | 8169.1 | 7.4 | 60328.6 | 1.40% | 147.5 | 8.90 | 1.23% |
| AC & AI | 220 | 73.3 | 102.5 | 7516.7 | 9.3 | 69754.7 | 1.61% | 185.1 | 12.91 | 1.79% |
| AC & AI & AIB | 262 | 87.3 | 3415.0 | 298243.3 | 6.3 | 1885892.0 | 43.65% | 163.4 | 308.09 | 42.67% |
| AIB | 49608 | 16536.0 | 28.6 | 472592.3 | 0.4 | 193762.8 | 4.49% | 120.0 | 23.25 | 3.22% |
| AI | 20303 | 6767.7 | 37.6 | 254689.8 | 4.2 | 1069697.3 | 24.76% | 195.1 | 208.64 | 28.89% |
| AI & AIB | 2440 | 813.3 | 64.7 | 52587.8 | 2.3 | 121214.9 | 2.81% | 157.5 | 19.09 | 2.64% |
| Other | 7245 | 2415.0 | 61.9 | 149547.7 | 1.6 | 238610.4 | 5.52% | 95.1 | 22.70 | 3.14% |
| DTC | 15297 | 5099.0 | 9.2 | 46919.2 | 0.1 | 3955.3 | 0.09% | 1.0 | 0.004 | 0.001% |
| ***Total*** | **97940** | **32646.7** | **41.9** | **1368618.5** | | **4320228** | **100.00%** | | **722.10** | **100.00%** |

AC = Asbestos Coating
AIB = Asbestos Insulating Board
AI = Asbestos Insulation
DTC = Decorative Textured Coatings

***Calculated risks using the Hodgson & Darnton (HD) Model (no RPE)***

85. The "best" estimate of the lifetime risk as excess deaths per 100000 has been calculated for 5, 10, 20 and 30 years exposure starting at age 20, which is the lowest starting age allowed by the model, the risk being greatest for the lowest starting age. The fibre concentrations above have been entered directly into the model with no allowance for the use of RPE and the risk estimates for each asbestos type and the total risk are given at the top of Table 10.

| **Table 10: Calculated values of risk using the HD model (no RPE)** | | | | |
|---|---|---|---|---|
| Length of exposure (years) | Chrysotile | Amosite | Crocidolite | Total |
| Lifetime excess deaths per 100000 after 5, 10, 20 and 30 years exposure from age 20 | | | | |
| **5** | **11.2** | **2426** | **857.5** | **3294.7** |
| 10 | 18.1 | 5115.5 | 1310.7 | 6444.3 |
| 20 | 27.8 | 10965.2 | 1803.7 | 12796.7 |
| 30 | 35 | 16561.3 | 2073.5 | 18669.8 |
| Annual excess deaths per million from 5, 10, 20 and 30 years exposure (Survival age 80) | | | | |
| **5** | **2.2** | **485.2** | **171.5** | **658.9** |
| 10 | 3.6 | 1023.1 | 262.1 | 1288.9 |
| 20 | 5.6 | 2193.0 | 360.7 | 2559.3 |
| 30 | 7.0 | 3312.3 | 414.7 | 3734.0 |
| Lifetime excess deaths based on a total of 145000 asbestos workers in a 50-year period | | | | |
| **5** | **16.2** | **3517.7** | **1243.4** | **4777.3** |
| 10 | 26.2 | 7417.5 | 1900.5 | 9344.2 |
| 20 | 40.3 | 15899.5 | 2615.4 | 18555.2 |
| 30 | 50.8 | 24013.9 | 3006.6 | 27071.2 |

86. Table 10 represents the best estimate of the current and predicted risk based on the many variables discussed above. A more detailed appraisal of the effect of the many variables is given in HSE/HSL report (Burdett and Chisholm, 2005). The largest variable is however in the risk model itself. The minimum and maximum estimates from the HD model being almost an order of magnitude lower and higher than the best estimate. As discussed data on the 2-yearly medical examinations of asbestos workers show that the average age at first examination (before starting work) is about 32. The distribution is skewed and most of the workers are aged around 25 at first examination with a significant number aged around 20. Taking the age at first exposure as 20 therefore errs on the side of caution and will lead to over-estimation of the risk.

87. The medical examinations data also show that the average years working per man is 3.09 but the majority of workers (71.5%) only have one examination, i.e. work for less than 2 years. Just over 90% of workers work for 5 years or

less. So for practical purposes, the risk estimates based on 5 years exposure (shown in bold in Table 5) apply to 90% of all workers.

88. The annual risk (Table 10, middle part) is a linear estimate of the overall lifetime risk, simple division of the lifetime by the remaining life expectancy. A figure of 50 was used for the average life expectancy (this equates with the actual age of the first medical at 32 and a life expectancy of > 80 years. This value can be used to compare with the Tolerability of Risk (TOR) model currently used by HSE to categorise the scale of the risk in societal terms (R2P2). The units have been adjusted to number of premature deaths per million.

89. To calculate the number of workers who will die from an asbestos related disease due to exposures incurred over the next 50 years; we will need to estimate of the total number of workers exposed. The information is available from the medical examinations data shows the current average years worked as an asbestos remover 3.09 years, which means a turnover of approximately 2900 workers each year, giving a total of 145000 workers in a 50-year period, assuming the current number of person employed and length of work represents the average for next 50 years. Previous predictions anticipated a rise in demolitions over time and may increase worker numbers in the short term but as removal takes place the stock of buildings with ACM's will decrease so numbers of removal workers will decline after a peak. Given that about one third of ACM's installed have been removed it is estimated that the current rate may represent a reasonable average for the next 50 years. The number of worker deaths predicted on this basis is given at the lower part of Table 10.

***Calculated risks using the Hodgson & Darnton (HD) Model (with RPE)***

90. In practice, asbestos removal work should be carried out by workers using RPE with an assigned protection factor of 40 (i.e. 95% of the workers will have protection factors above this value). The risk estimates in Table 10 are therefore worst case assuming no RPE. The fibre concentrations used to assess the risk to removal workers using RPE was reduced to 1/100th of the values in Table 9 (i.e. assumes an average 99% reduction in all removal worker exposures). The calculation on the same basis as Table 10 corresponding to these reduced fibre concentrations is given in Table 11.

| **Table 11: Calculated values of risk using the HD model (with RPE)** | | | | |
|---|---|---|---|---|
| Length of exposure (years) | Chrysotile | Amosite | Crocidolite | Total |
| Lifetime excess deaths per 100000 after 5, 10, 20 and 30 years exposure from age 20 | | | | |
| **5** | **0.3** | **33.6** | **26.1** | **60** |
| 10 | 0.5 | 53.4 | 38.9 | 92.8 |
| 20 | 0.6 | 79.3 | 50.6 | 130.5 |
| 30 | 0.7 | 97.2 | 55.3 | 153.2 |
| Annual excess deaths per million from 5, 10, 20 and 30 years exposure (Survival age 80) | | | | |
| **5** | **0.1** | **6.7** | **5.2** | **12.0** |
| 10 | 0.1 | 10.7 | 7.8 | 18.6 |
| 20 | 0.1 | 15.9 | 10.1 | 26.1 |
| 30 | 0.1 | 19.4 | 11.1 | 30.6 |
| Lifetime excess deaths based on a total of 145000 asbestos workers in a 50-year period | | | | |
| **5** | **0.4** | **48.7** | **37.8** | **87.0** |
| 10 | 0.7 | 77.4 | 56.4 | 134.6 |
| 20 | 0.9 | 115.0 | 73.4 | 189.2 |
| 30 | 1.0 | 140.9 | 80.2 | 222.1 |

***Estimate of Risk Reduction from Changes to Control Limits***

91. Tables 12 and 13, which are calculated on the same basis as Tables 10 and 11, using the proposed 0.1 f/ml control limit, to determine the reduction in risk and numbers of deaths avoided. A proportionate effect is assumed i.e. that the average fibre concentrations for amosite and crocidolite would be reduced to half the values in Table 9 and that for chrysotile to one-third. Table 12 (without RPE) and table 13 (with RPE) summarises the risk results after recalculation based on the lower control limit. The actual number of premature deaths avoided over a 50-year period is the difference between the estimated risks at the current (tables 10 & 11) and the new (tables 12 & 13) control limits. The same approach may be used to estimate reduction in risk for any proposed change to control limits.

| **Table 12: Recalculated risk results from HD model for new 0.1 f/ml control limit based on 5 years exposure only and the predicted reduction in excess deaths over 50 years (no RPE)** | | | | |
|---|---|---|---|---|
| Risk estimate | Chrysotile | Amosite | Crocidolite | Total |
| Lifetime excess deaths per 100,000 | 4.6 | 1150.9 | 503.0 | 1658.5 |
| Annual excess deaths per million | 0.9 | 230.2 | 100.6 | 331.7 |
| Lifetime excess deaths | 6.7 | 1668.8 | 729.4 | 2404.8 |
| Predicted reduction in excess deaths over 50 years. | 9.6 | 1848.9 | 514.0 | 2372.5 |

| **Table 13: Recalculated risk results from HD model for new 0.1 f/ml control limit based on 5 years exposure only and the predicted reduction in excess deaths over 50 years (with RPE)** | | | | |
|---|---|---|---|---|
| Risk estimate | Chrysotile | Amosite | Crocidolite | Total |
| Lifetime excess deaths per 100,000 | 0.1 | 19.3 | 15.5 | 34.9 |
| Annual excess deaths per million | 0.0 | 3.9 | 3.1 | 7.0 |
| Lifetime excess deaths | 0.1 | 28.0 | 22.5 | 50.6 |
| Predicted reduction in excess deaths over 50 years. | 0.3 | 20.7 | 15.4 | 36.4 |

**Non-licensed removal / demolition work**

92. The risks from removal of non-licensed ACMs is harder to estimate as no information is recorded. Many smaller removals that occur will often be classed as maintenance work as there is no limit on the duration of the work as with licensed materials. However, there are three categories of non-licensed asbestos products where more extensive removal/demolition work may often be necessary: cement, bitumen and flooring products. Each of these groups contain a number of products which will normally be broken, ripped or scraped off during the removal process giving the potential for fibre release. The average concentrations when disturbing these materials are summarised in table 14. It should be noted that these averages are based on limited amounts of data.

| **Table 14: Summary of likely time weighted personal exposures during removal of unlicensed ACMs subject to scraping and breakage.** | | | |
|---|---|---|---|
| Material | All | Controlled wet removal / good practice (f/ml) | Limited controls / dry removal (f/ml) |
| Asbestos cement | 0.08 | 0.03 | 0.114 |
| Bitumen products | ≤0.08* | 0.02 | 0.08 |
| Flooring products | ≤0.08* | 0.01 | 0.05 |
| * Bitumen and flooring products have few measurement so the same value as for asbestos cement was used for the risk assessment (see table 27) | | | |

***Risk from asbestos cement products.***

*Product types and uses*

93. A wide range of cement product types was developed and the main examples are summarised in table 15.

| Table 15: Examples of uses of asbestos cement products | | |
|---|---|---|
| **Asbestos product** | **Location / use** | **Asbestos content and type / Date last used** |
| **Cement products:** Profiled sheets. | Roofing, Wall cladding. Permanent shuttering, cooling tower elements. | 10-15% asbestos (some flexible boards contain a small proportion of cellulose). Crocidolite (1950 -1969) and amosite (1945 - 1980) have been used in the manufacture of AC products, although chrysotile (used until 2000) is by far the most common type found. |
| Semi - compressed flat sheet and partition board. | Partitioning in farm buildings and infill panels for housing, shuttering in industrial buildings, decorative panels for facings, bath panels, soffits, linings to walls and ceilings, portable buildings, propagation beds in horticulture, domestic structural uses, fire surrounds, composite panels for fire protection, weather boarding. | As above. 10 -15% asbestos. Also 10 - 25% chrysotile and some amosite for asbestos wood used for fire doors etc. Composite panels contained ~ 4% chrysotile or crocidolite. |
| Fully compressed flat sheet used for tiles, slates, and board. | As above but where stronger materials are required and as cladding, decking and roof slates. (e.g. Roller skating rinks, laboratory work tops). | As for profiled sheets. |

| | | |
|---|---|---|
| Pre formed moulded products and extruded products. | Cable troughs and conduits. Cisterns and tanks. Drains and sewer pressure pipes. Fencing. Flue pipes. Rainwater goods. Roofing components (fascias, soffits, etc.) Ventilators and ducts. Weather boarding. Window cills and boxes, bath panels, draining boards, extraction hoods, copings, promenade tiles etc. | As for profiled sheets. |

***Amount of asbestos cement material***

94. Figures provided by the asbestos cement industry to HSE in the past (Simpson, 1977, 1979) have been used to estimate the amount of asbestos products released into the UK market. Two sets of figures were available: the amount of chrysotile used for production and the total production of cement products. Previous estimates (CD159, MRC, 1997) of usage, were that 2.3 million tons of chrysotile were used for roofing and cladding products and 0.4 million tons of chrysotile were used for pipe products, installed in the UK. Taking figures for other moulded products into consideration (~18%) this suggests that some 3 million tonnes of chrysotile was added to all asbestos cement products. Published estimates of production and use of asbestos cement in the 1970's is given in table 19. Figures for chrysotile use for buildings and pipes from 1940 – 1976 gave an average use of 18% for pressure pipes. Written evidence from the manufacturers show the actual amount of chrysotile in cement sheets was ~10% so this would give a maximum amount chrysotile containing asbestos cement products of some 30 million tonnes.

**Table 16: Published figures for UK production and use for asbestos cement products (thousands of tonnes)**

| | 1973 | 1975(a) | 1976 | 1975(b)* | % 1975 (b)* |
|---|---|---|---|---|---|
| Corrugated / profile sheeting | 429 | 256 | 268 | 257 | 71.4 |
| Flat sheeting | 45 | 30 | 34 | 40 | 11.1 |
| Rainwater goods | 12 | 7 | 7 | 7 | 1.9 |
| All other products | 101 | 81 | 81 | 56 | 15.6 |
| Pressure pipes | (83) | - | - | Not incl. | Not incl. |
| Total | 587 | 360 | 376 | 360 | |
| Reference | Ryder 1975 | DoE, 1977 | DoE, 1977 | Simpson 1979 | Simpson 1979 |
| *Total home deliveries taking account of imports and exports | | | | | |

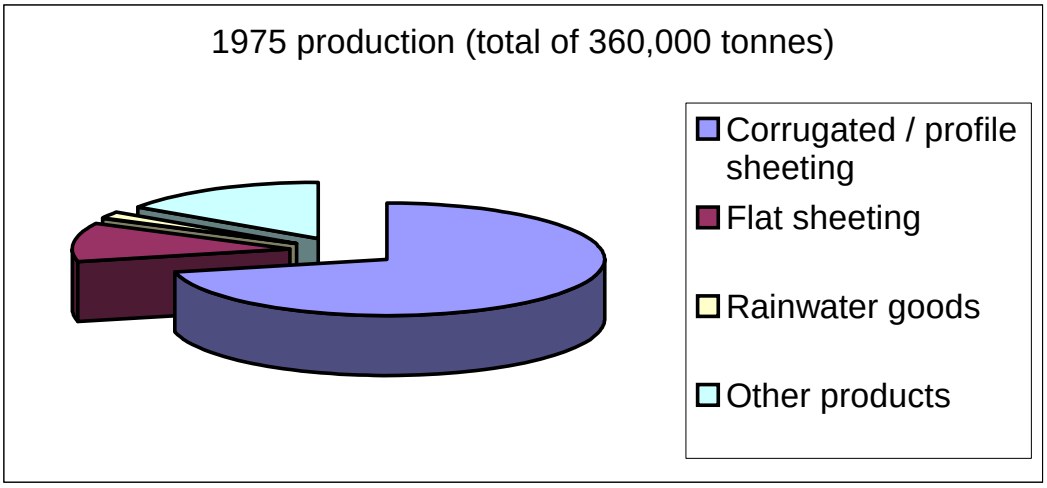



Figure 8: Types of asbestos cement used in UK home deliveries 1975(Simpson, 1977)

95. There are only limited figures supplied by industry for the amount of cement products produced. Production peaked in 1973, where a total of 527,000 tonnes of cement products were installed. The production in 1973 has also been estimated in terms of area (an area of some 30 million $m^2$ of corrugated/profile sheet and 3 million $m^2$ of flat sheet). Using previous estimates (Simpson, 1977) that the average asbestos cement production was around 0.4 million tonnes / year for 1945 – 1995 means that some 20 million tonnes of products were produced over this period. It can therefore be estimated that UK installation over the entire manufacturing period (1910 – 1999) is of the order of 30 million tonnes of asbestos cement products. Applying the relative percentages of product types estimated for 1975 UK home deliveries, this would suggest a total of 21.4 millions tonnes corrugated/profile sheet production, 3 .3 million tonnes of flat sheet.

96. The two estimates based on chrysotile use and cement product deliveries are similar. However, as some cement products contained crocidolite or amosite asbestos, as well as chrysotile, the actual amount of cement products should be higher than calculated from chrysotile alone. Cement products were also imported and exported with the latter being the higher (~3% net export) which accounts for the similarity of the two estimates that around 30 million tonnes of asbestos cement products will have been installed in the UK.

97. The use of amosite and crocidolite in asbestos cement will have an important effect on the risk. The vast majority of amosite and crocidolite imported went into non-cement products. Figures supplied to Simpson, (1979 see page 49) show that crocidolite and amosite asbestos were added to cement products from 1945 onwards. Crocidolite was not used after 1969, with figures of 574 tonnes in 1950 and 2130 tonnes in 1960 falling to low levels by the mid-sixties and to 0 by 1969. This would suggest a total of ~20,000 tonnes of crocidolite were used in the manufacture of cement products. This is about the same total amount that was estimated to have been installed for thermal and also for spray insulation.

98. The publication in 1960 of evidence linking mesothelioma to Cape crocidolite production in South Africa and the incidence of mesotheliomas in crocidolite using factories in the UK, lead to a rapid reduction in the use of crocidolite and to its temporary replacement by amosite. Amosite was used in cement sheet and pipe material by at least two major manufacturers. The estimated UK consumption figures as given by Cape industries the main producer and importer of raw crocidolite and amosite fibres (Simpson 1977) were: 227, 1278 and 1748 tonnes, for 1960, 1970 and 1975, respectively. Amosite was voluntarily reduced by industry from 1975 and there was a rapid drop in imports with a voluntary withdrawal of most amosite from 1980. Amosite use was banned in the UK in 1985. The low figure for amosite use in 1960 some 227 tonnes compared to crocidolite 2130 tonnes, suggests that most amosite was added to asbestos cement between 1960 –1980 with around 7000 tonnes in the 60's and 10,000 tonnes in the 70's with a further 3,000 tonnes outside these two decades. This means that about 20,000 tonnes of amosite was added to cement products.

99. Amosite and crocidolite was routinely used in the production of pressure pipes. Crocidolite fibre has a higher technical performance then amosite and was initially used for pressure pipes and was especially important for larger diameter pressure pipes but was increasing replaced by amosite from the mid-sixties. Typically a few percent of crocidolite or amosite would be added. Figures (Simpson 1977) for consumption in 1973 showed that 7800 tonnes of chrysotile and 1200 tonnes of amosite were used for pressure pipes. This suggests that about 1.5% amosite was added on average. In 1976 some 1100 tonnes of amosite were used in pressure pipes and 500 tonnes for building products, i.e. some 69% of the amosite used for cement products was for pressure pipes.

100. The addition of amosite and crocidolite to profile and flat cement sheets and other moulded products tended to be much more variable. The main technical purpose for adding amosite and crocidolite was to give improved de-watering and increase the rate of curing and production. As there was an additional cost compared to chrysotile this was usually done when there was a need to increase production rates in periods of high demand or when there was disruption to the supply of chrysotile. The relative occurrence of amphibole asbestos containing cement products is therefore hard to determine. A total of 20,000 tonnes of amosite represents some 0.66% of the total chrysotile use. In terms of amount of asbestos cement materials this represents some 1 million tonnes of a total of 30 million (~3%) assuming some 2% on average was added. This may be an overestimate as higher amounts of amphibole fibres (3-4%) were reportedly added. However, as seen from the figures, amosite was predominantly added to pressure pipes, so that only about a third, ~ 1% would be present in sheets and moulded products. As a similar amount of crocidolite was used, it would also make up the same percentage as amosite.

101. Amosite was also added along with chrysotile to another cement product known as asbestos wood, which was used on fire doors etc. This had a higher percentage of asbestos (24%) than normal cement sheets.

102. The estimated amounts of asbestos cement products installed into the UK by product and asbestos type are summarised in table 17. The figures are based on the 1975 (b) figures in table 16, after adjustment to include ~18% cement pressure pipes production. It has been assumed that only very limited removal or replacement of pressure pipes is taking place, as it is likely they will be left in place and remain buried and inaccessible. The amount of asbestos remaining in buildings has been estimated based on product type. No previous estimates were readily available. It was assumed that cement products used in building exteriors and subject to greater weathering have been preferentially removed compared to the estimated average of about one third of asbestos cement products overall had been removed. The weighting are shown in table 18, were used to calculate the amounts of asbestos cement products remaining.

**Table 17: Estimated amounts of asbestos cement products installed in the UK by product and asbestos type (thousand of tonnes) estimated on 1975 figures.**

| Material type | Adjusted (%) | Chrysotile only | Chrysotile and amosite containing | Chrysotile and crocidolite containing | Total |
|---|---|---|---|---|---|
| Corrugated / profile sheeting | 59.1 | 17370 | 177 | 177 | 17724 |
| Flat sheeting | 9.2 | 2703 | 28 | 28 | 2759 |
| Rainwater goods | 1.6 | 473 | 5 | 5 | 483 |
| Other products | 12.9 | 3785 | 39 | 39 | 3862 |
| Pressure pipes | 17.2 | 0 | 3621 | 1552 | 5172 |
| Total | 100 | 24331 | 3869 | 1800 | 30000 |
| Amounts of amosite and crocidolite containing materials based on 1% of each | | | | | |

**Table 18: Estimated amounts of asbestos containing cement products remaining to be removed by product and asbestos type (in thousand tonnes).**

| Material type | Proportion of material remaining | Chrysotile only | Amosite containing | Crocidolite Containing | Total |
|---|---|---|---|---|---|
| Corrugated / profile sheeting | 0.5 | 8684.8 | 88.6 | 88.6 | 8862.1 |
| Flat sheeting | 0.66 | 1784.3 | 18.2 | 18.2 | 1820.7 |
| Rainwater goods | 0.5 | 236.6 | 2.4 | 2.4 | 241.4 |
| Other products | 0.75 | 2838.6 | 29.0 | 29.0 | 2896.6 |
| Pressure pipes | 0.98 | 0.0 | 3548.3 | 1520.7 | 5069.0 |
| Total | | 13544.3 | 138.2 | 138.2 | 13820.7 |

103. Assuming an average density of ~1600 kg.m$^{-3}$ for sheet cement products and an average thickness of 6.35 mm 1 tonne of asbestos cement represents an area of ~ 100 m$^2$ of flat sheet and an area of ~ 70 m$^2$ for profile sheet. This means that there remains some 800 km$^2$ of asbestos cement sheeting still to be removed of which some 8 km$^2$ contains some crocidolite and 8 km$^2$ contains some amosite.

***Number of persons handling the asbestos***

104. The number of secondary employees directly handling the cement products was also given for 1975 (Simpson, 1977) (see table 19). At the present time no asbestos cement products would be handled by builder's merchants and since installation is no longer taking place, rather fewer workers will be handling/removing asbestos cement products on a regular basis. Roof repair and replacement and/or demolition specialists would make up the main group exposed to regular contact with profile cement sheet. A larger number of general builders may occasionally remove profile cement sheets from smaller buildings (e.g. sheds, garages and from internal partitions etc.) and some moulded products (e.g. rainwater goods, water tanks, flues etc). The estimated numbers of workers carrying out demolition and removal work with asbestos cement over the next 50 years are given in table 20.

| **Table 19: Numbers of secondary employees handling cement products 1975** | |
|---|---|
| Type of job/activity | Estimated number of people |
| Roofing contractors | 18,000 |
| Builders merchants | 12,000 |
| Others | 22,000 |

| **Table 20: Estimated number of workers removing asbestos products** | | | |
|---|---|---|---|
| Type of job/activity | Current number of workers exposed | Total number of workers exposed to remove remaining asbestos | Percentage of work time working directly with asbestos cement |
| Demolition and specialist roof removal | 10,000* | 50,000 | 10 |
| General builders occasionally removing small amounts of asbestos products | 100,000* | 500,000 | 0.5 |
| *See paragraph 68 and CD 176 for detailed explanations of numbers exposed | | | |

105. Assuming the remaining sheeting material is removed over the next 50 years, the figures for demolition and specialist removers represents an average handling / removal rate of sheeting material of ~100 – 200 $m^2$ per worker per day.

**Typical fibre release**

*Work on asbestos cement products*

106. Examples of exposure data for this type of work, mostly on AC roofing, are summarised in Table 21. The removal and replacement of asbestos cement is also given, as this material does not require a licensed asbestos contractor to carry out the work. The airborne fibre concentrations measured for work on AC sheeting, mainly roofing, cover a very wide range, from below the detection limit to 1.1 f/ml. The data compiled by CONSAD quoted in HEI (1991) give 0.12 f/ml as the estimated exposure for roofing repair and this is broadly in agreement with the detailed measurements from the literature. The range of fibre concentrations reflects the many factors, which contribute to exposure, which are discussed most comprehensively by Brown (1987).

107. For removal of AC roofing and wall sheets whole (or in pieces if accidental breakage occurs), there is some evidence that wetting or sealing the sheets prior to removal does reduce exposure but the reduction is not as great as might have been expected. These types of AC sheet are dense and usually have a hard and smooth outer surface because they have to be reasonably weatherproof. Unfortunately this will make it difficult for water (or sealant) to penetrate into the body of the sheet and wetting or sealing may therefore not be very effective.

108. There is also some evidence that AC sheets that are weather-damaged may give higher exposure levels on removal. Removal of the exterior walls gives lower exposures than removal of roofing which is more exposed to the weather. Exposures when installing new AC sheets or roofing are generally much lower than for removal, probably because the sheets are unweathered and have to be handled more carefully.

109. In contrast, exposures are higher when roof sheets are being removed as part of demolition than when they are being replaced or repaired; handling of the sheets was noted as being faster and much more vigorous during demolition with more visible dust being generated (Brown, 1987). According to Brown (1987), the key to reducing exposure during roof removal is a combination of careful handling and wetting before stacking to minimise abrasion of the AC sheets.

| **Table 21: work on asbestos cement roofs personal exposure to asbestos** | | |
|---|---|---|
| **All work on asbestos cement roofing and sheets** | **Range** | **Reference** |
| | Not detected/<0.01 - 1.1 f/ml | (from data below) |
| Roof Repair "Representative" | Not detected - 0.3 f/ml | (CONSAD, 1990) |
| Roof Removal "Representative" | Not detected - 0.2 f/ml | (CONSAD, 1990) |
| Dry - replacing corrugated AC | 0.01, <0.01 f/ml | (Roberts, 1985) |
| Collecting sheets and cleaning | 0.24 f/ml | (Roberts, 1985) |
| Removal of corrugated sheets (detachment and sliding to gutter) | 0.047 f/ml | (Preat, 1993) |
| Throwing sheets into lorry | 0.161 f/ml | (Preat, 1993) |
| Removal of corrugated sheets (detachment, stacking, placing in pallets) | 0.028, 0.038 f/ml | (Preat, 1993) |
| Removal of corrugated sheets (detachment) | 0.018 f/ml | (Preat, 1993) |
| Stacking of sheets of pallets | 0.032 f/ml | (Preat, 1993) |
| Removal of slates (detached with hammer) | 0.064 f/ml | (Preat, 1993) |
| Sliding slates to gutter; throwing to ground | 0.195 f/ml | (Preat, 1993) |
| Removal of slates (detachment and stacking) | 0.037, 0.044 f/ml | (Preat, 1993) |
| Removal of slates (detachment and placing in container on roof) | 0.050, 0.176 f/ml | (Preat, 1993) |
| Removal of slates (pulling off, stacking on elevator, broken slates thrown to ground) | 0.100, 0.122 f/ml | (Preat, 1993) |
| Removal of slates (detachment with hammer, sliding to gutter) | 0.068 f/ml | (Preat, 1993) |
| Bringing slates down and throwing into container | 0.056 f/ml | (Preat, 1993) |
| Wet (but not effective) | Mean 0.020 f/ml | (Lange & Thomulka, 2000) |

| | | |
|---|---|---|
| **Roof Replacement** | | |
| Dry replacement (severely weathered) - unfastening, removal, stacking, disposal, installation of new roofing | 0.03 - 0.24 f/ml | (Brown, 1987) |
| Dry unfastening, removal, disposal, installation of new roofing (no stacking) | 0.03, 0.03 f/ml | (Brown, 1987) |
| Dry replacement (severely weathered) | 0.04 - 0.27 f/ml | (Brown, 1987) |
| Dry removal (painted) | 0.07 - 0.32 f/ml | (Brown, 1987) |
| Wet removal (painted) and replacement (careful handling and wetting as stacked) | Not detected - 0.07 f/ml | (Brown, 1987) |
| Replacement (severely weathered) after lignin sulphonate treatment | 0.23 f/ml | (Brown, 1987) |
| Replacement (severely weathered) after sealing with acrylic resin | 0.03 - 0.08 f/ml | (Brown, 1987) |
| Replacement (severely weathered) after sealing with acrylic resin | 0.04 - 0.26 f/ml | (Brown, 1987) |
| **Roof Removal - Demolition** | | |
| Dry (building collapsed) | 0.10 - 0.47 f/ml | (Brown, 1987) |
| Dry (from scissors lift) | 0.04 - 0.12 f/ml | (Brown, 1987) |
| Sheets stacked in confined space | 0.30 - 0.53 f/ml | (Brown, 1987) |
| Sheets stacked in confined space (accumulated dust under laps and ridges) | 0.34 - 1.1 f/ml | (Brown, 1987) |
| Wet | 0.05 - 0.06 f/ml | (Brown, 1987) |
| Wet (sheets staked in confined space) | 0.10 - 0.13 f/ml | (Brown, 1987) |
| Wet (sheets staked in confined space; accumulated dust under laps and ridges) | 0.29 - 0.68 f/ml | (Brown, 1987) |
| Sealed with acrylic resin | 0.11 - 0.32 f/ml | (Brown, 1987) |
| Sealed with acrylic resin (sheets stacked in confined space; accumulated dust under laps and ridges) | 0.41 - 0.76 f/ml | (Brown, 1987) |

110. The updated result in a database for removals of asbestos cement sheets under various conditions (mostly dry) are shown in table 22. A weighted mean of 0.08 f/ml was calculated for all personal data but clearly a lower mean exposure is obtained when precautions to wet the sheets before removal are taken. However as unusually the static samples gave a higher value than personal samples the figure of 0.08 f/ml were used for risk calculations and assumes no improvement in control of releases. A similar exposure for the removal of rainwater goods and other moulded cement products was assumed.

**Table 22: Summary of all results in HSL database for asbestos cement work.**

| | Type of sample | No of data /site entries | Mean (f/ml) | SD | Minimum of means | Maximum of means | No of samples | Sum (mean * number) | Weighted mean (f/ml) |
|---|---|---|---|---|---|---|---|---|---|
| All | All | 51 | 0.189 | 0.757 | 0 | 5.45 | 245 | 48.184 | 0.197 |
| | Personal | 36 | | | 0.0015 | 0.23 | 94 | 7.665 | 0.082 |
| | Static | 8 | | | 0 | 0.4 | 103 | 24.486 | 0.238 |
| | Unspecified | 7 | | | 0.008 | 5.45 | 48 | 16.033 | 0.334 |
| Dry | All | | | | 0 | | | | |
| | Personal | 7 | 0.124 | 0.076 | 0.03 | 0.23 | 39 | 4.450 | 0.114 |
| | Static | | | | | | | | |
| | Unspecified | | | | | | | | |
| Not Known | All | 43 | 0.203 | 0.825 | 0 | 5.45 | 198 | 43.494 | 0.220 |
| | Personal | 28 | 0.057 | 0.052 | 0.0015 | 0.195 | 47 | 2.975 | 0.063 |
| | Static | 8 | 0.120 | 0.149 | 0 | 0.4 | 103 | 24.486 | 0.238 |
| | Unspecified | 7 | 0.881 | 2.019 | 0.008 | 5.45 | 48 | 16.033 | 0.334 |
| Wet | All | | | | | | | | |
| | Personal | 1 | 0.03 | | 0.03 | 0.03 | 8 | 0.240 | 0.030 |
| | Static | | | | | | | | |
| | Unspecified | | | | | | | | |

***Risk estimation***

111. The risk was estimated using the Hodgson and Darnton model using the following parameters:

Average exposure = 0.08 f/ml

Percentage of time working with asbestos = 10% for demolition and specialist roof removal workers and 0.5% for general builders.

Actual average exposures = 0.008 f/ml for demolition and specialist roof removal workers and 0.0004 f/ml for general builders.

Start age = 20

Duration 10,20 & 30 years

112. The predicted numbers of lifetime deaths (per 100,000) were calculated based on a ratio of relative exposure to crocidolite, amosite and chrysotile (0.01, 0.01, and 0.98). The annual risk of death was calculated on the same basis as for licensed removal workers and the actual number of deaths, were based on the expected populations of exposed demolition and unlicensed roof removal workers (see table 23) and general building workers (see table 24) over the next 50 years.

**Table 23: Calculated values of risk using the HD model (no RPE) due to the demolition and removal of asbestos cement sheeting, rainwater and moulded products (Demolition and roof removal workers).**

| Length of exposure (years) | Chrysotile | Amosite | Crocidolite | Total |
|---|---|---|---|---|
| Lifetime excess deaths per 100000 after 10, 20 and 30 years exposure from age 20 | | | | |
| 10 | 0.9 | 0.1 | 1.3 | 2.4 |
| 20 | 1.2 | 0.2 | 1.8 | 3.2 |
| 30 | 1.4 | 0.2 | 2.0 | 3.6 |
| Annual excess deaths per million from 10, 20 and 30 years exposure (Survival age 80) | | | | |
| 10 | 0.19 | 0.03 | 0.26 | 0.48 |
| 20 | 0.25 | 0.04 | 0.36 | 0.65 |
| 30 | 0.27 | 0.05 | 0.40 | 0.72 |
| Lifetime excess deaths based on a total of 50,000 demolition workers in a 50-year period | | | | |
| 10 | 0.94 | 0.14 | 0.65 | 1.73 |
| 20 | 1.23 | 0.20 | 0.90 | 2.34 |
| 30 | 1.36 | 0.24 | 1.00 | 2.60 |

**Table 24: Calculated values of risk using the HD model (no RPE) due to the demolition and removal of asbestos cement sheeting, rainwater and moulded products (General Building workers).**

| Length of exposure (years) | Chrysotile | Amosite | Crocidolite | Total |
|---|---|---|---|---|
| Lifetime excess deaths per 100,000 after 10, 20 and 30 years exposure from age 20 | | | | |
| 10 | 0.10 | 0.01 | 0.10 | 0.21 |
| 20 | 0.13 | 0.02 | 0.20 | 0.35 |
| 30 | 0.14 | 0.02 | 0.20 | 0.36 |
| Annual excess deaths per million from 10, 20 and 30 years exposure (Survival age 80) | | | | |
| 10 | 0.020 | 0.003 | 0.020 | 0.042 |
| 20 | 0.025 | 0.004 | 0.040 | 0.069 |
| 30 | 0.028 | 0.004 | 0.040 | 0.072 |
| Lifetime excess deaths based on a total of 500,000 general building workers exposed over a 50-year period | | | | |
| 10 | 0.98 | 0.14 | 0.50 | 1.62 |
| 20 | 1.27 | 0.18 | 1.00 | 2.45 |
| 30 | 1.39 | 0.20 | 1.00 | 2.59 |

113. These are best estimates and give annual risk of death of less than 1 per million. Rates below 1 in a million are regarded as an acceptable risk in the HSE TOR model (R2P2). The number of premature deaths from exposure to asbestos to remove all remaining asbestos cement is some 3-5 persons depending on the duration of exposure and the absence of any RPE or controls. The effect of lowering of the control limit to 0.1 f/ml would be minimal as the average personal exposure from the database was 0.08 f/ml, although some specific operations may be reduced to achieve compliance this is unlikely to make a significant difference.

**Other non-licensed asbestos products and activities**

114. As there are no detailed records of work with unlicensed materials, the types and amounts of products produced can be used to estimate the types of materials likely to be disturbed or removed and the frequency, which it is carried out. Table 25 gives an overview of asbestos usage in the 1970's for a number of product groups. Figure 9 shows the information for 1973 the peak year for production where: ~16% were licensed materials (insulating board and other insulation). 37.4% were cement products (32.2%) and pipes. About 14% were friction products and textiles (rarely found in buildings) and the remaining 32.6% were materials which may be used in buildings. On a first analysis there appears to be about the same amount of other unlicensed asbestos products in buildings as asbestos cement products, and possibly twice as much as products requiring licensed asbestos removal.

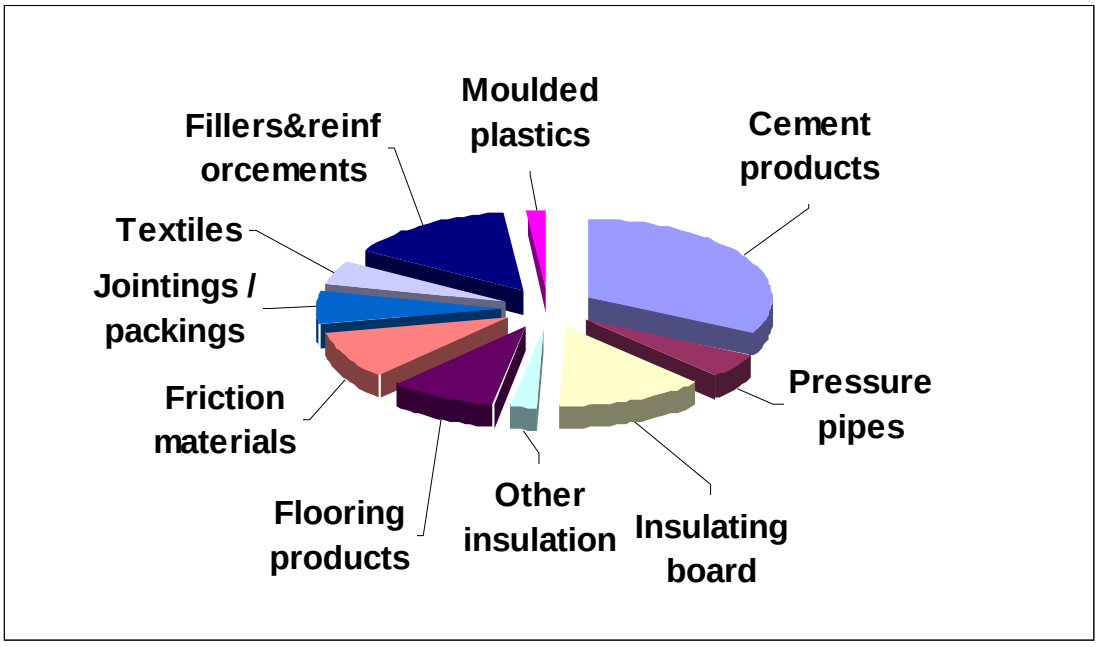



Figure 9: Relative asbestos fibre use by product type in 1973.

115. Airborne fibre concentrations during removal and maintenance work with some of these unlicensed materials are summarised in table 26 and given in more detail in tables 27 & 28.

**Table 25: Asbestos fibre use in the UK (thousands of tonnes)**

| | 1970 | 1973 | 1976 | 1978 |
|---|---|---|---|---|
| Asbestos cement products for buildings | 52.5 | 55.6 | 42.9 | 32.9 |
| Asbestos cement pressure pipes | Not given | 9.0 | 8.1 | Not given |
| Fire-resistant insulating board | 18.5 | 22.5 | 14.5 | 11.4 |
| Other insulation (incl. spray) | 4 | 4 | 0.4 | 1.5 |
| Floor tiles and coverings | 20.5 | 16.2 | 15.8 | 12.5 |
| Friction materials | 15 | 17 | 15.7 | 10.6 |
| Jointings and packings | 9 | 11.4 | 10 | 6.6 |
| Other textile materials | 9 | 8.3 | 6.3 | 5.3 |
| Fillers and reinforcements (felts, millboard, paper, underseals, mastics, adhesives) | 21.5 | 25.7 | 28.4 | 17.2 |
| Moulded plastics | 4.5 | 2.8 | 1.2 | 2.0 |
| Total | 154.5 | 172.5 | 143.3 | 100.0 |

**Table 26: Summary of results in HSL database for various types of non-licensed materials**

| Type of material | No of data /site entries | Mean (f/ml) | SD | Minimum of means | Maximum of means | No of samples | Sum (mean number) | Weighted mean (f/ml) |
|---|---|---|---|---|---|---|---|---|
| Cement sheet | 51 | 0.19 | 0.76 | 0 | 5.45 | 245 | 48.18 | 0.20 |
| Gaskets & packings | 11 | 0.14 | 0.13 | 0.01 | 0.40 | 27 | 4.93 | 0.18 |
| Floortile, mastics & bitumen | 98 | 0.15 | 0.37 | 0.00 | 3 | 184 | 23.41 | 0.13 |
| Roofing felt | 2 | 0.013 | | 0.006 | 0.02 | 30 | 0.36 | 0.012 |

**Table 27: Results in HSL database for work with asbestos containing floor tile, mastics and bitumen products**

| | Type of sample | No of data /site entries | Mean (f/ml) | SD | Minimum of means | Maximum of means | No of samples | Sum (mean number) | Weighted mean (f/ml) |
|---|---|---|---|---|---|---|---|---|---|
| All | All | 98 | 0.15 | 0.37 | 0.00 | 3 | 184 | 23.41 | 0.13 |
| | Personal | | | | | | | | |
| | Static | | | | | | | | |
| | Unspecified | | | | | | | | |
| Dry | All | 37 | 0.10 | 0.21 | 0.01 | 1.29 | 59 | 4.57 | 0.08 |
| | Personal | 6 | 0.05 | 0.05 | 0.02 | 0.14 | 28 | 1.18 | 0.04 |
| | Static | 29 | 0.07 | 0.04 | 0.01 | 0.17 | 29 | 2.05 | 0.07 |
| | Unspecified | 2 | 0.67 | 0.88 | 0.05 | 1.29 | 2 | 1.34 | 0.67 |
| Not Known | All | 47 | 0.16 | 0.45 | 0.00 | 3 | 110 | 14.92 | 0.14 |
| | Personal | 32 | 0.07 | 0.09 | 0.00 | 0.33 | 73 | 5.61 | 0.08 |
| | Static | 9 | 0.09 | 0.11 | 0.01 | 0.31 | 14 | 1.24 | 0.09 |
| | Unspecified | 6 | 0.76 | 1.15 | 0.00 | 3 | 23 | 8.08 | 0.35 |
| Wet | All | 14 | 0.21 | 0.41 | 0.02 | 1.34 | 15 | 3.92 | 0.26 |
| | Personal | 3 | 0.35 | 0.52 | 0.03 | 0.95 | 4 | 2.00 | 0.50 |
| | Static | 9 | 0.04 | 0.01 | 0.02 | 0.054 | 9 | 0.33 | 0.04 |
| | Unspecified | 2 | 0.80 | 0.77 | 0.25 | 1.34 | 2 | 1.59 | 0.80 |

Wet personal -all data from EVALUTIL - 2 entries for road-planing (asbestos in road surfacing) using a machine. Does not include samples with gypsum fibres.

**Table 28: Summary of all results in HSL database for gaskets and packings**

| | Type of sample | No of data /site entries | Mean (f/ml) | SD | Minimum of means | Maximum of means | No of samples | Sum (mean * number) | Weighted mean (f/ml) |
|---|---|---|---|---|---|---|---|---|---|
| All | All | 11 | 0.14 | 0.13 | 0.01 | 0.40 | 27 | 4.93 | 0.18 |
| Dry | All | | | | | | | | |
| | Personal | | | | | | | | |
| | Static | | | | | | | | |
| | Unspecified | | | | | | | | |
| Not Known | All | 5 | 0.18 | 0.16 | 0.01 | 0.40 | 14 | 3.17 | 0.23 |
| | Personal | 3 | 0.27 | 0.15 | 0.10 | 0.40 | 10 | 3.00 | 0.30 |
| | Static | 2 | 0.04 | 0.04 | 0.01 | 0.07 | 4 | 0.17 | 0.04 |
| | Unspecified | | | | | | | | |
| Wet | All | | | | | | | | |
| | Personal | 6 | 0.11 | 0.10 | 0.01 | 0.28 | 13 | 1.76 | 0.14 |
| | Static | | | | | | | | |
| | Unspecified | 2 | 0.80 | 0.77 | 0.25 | 1.34 | 2 | 1.59 | 0.80 |

***Risk estimation for other non-licensed materials***

116. The type of asbestos is a key determinant of the risk using the Hodgson and Darnton model. The type of asbestos used in the other unlicensed products (e.g. flooring, reinforced plastics, fillers and reinforcements) is almost all chrysotile asbestos and only high performance gaskets and packings in corrosive environments are likely to be amphibole asbestos. The percentage of amosite and crocidolite usage compared to chrysotile in other in other unlicensed (non-cement) materials is likely to be very small (<0.01%). With limited data and a variety of materials it is difficult to derive a single figure for exposure. As the majority of the work will involve flooring, mastics and roofing felt, which all release low average airborne fibre concentrations, same parameters as used for asbestos cement have been applied to the unlicensed non-cement products. These were:

    Average exposure = 0.08 f/ml to chrysotile only

    Percentage of time working with asbestos = 10% for demolition and specialist roof removal workers and 0.5% for general builders.

    Actual average exposures = 0.008 f/ml for demolition and 0.0004 f/ml for general builders.

    Start age = 20

    Duration 10,20 & 30 years

117. When applied to the same populations of workers 50,000 demolition workers and 500,000 general building workers over the next 50 years, the same estimates as for chrysotile in tables 23 and 24 are found i.e. a total of 2 excess deaths. A reduction in the control limit to 0.1 f/ml are unlikely to make a significant difference to much of the demolition and removal work and these figures assume no RPE is used. A maximum benefit of 1 life has been assumed.

**Effect of a reduction in control limit for maintenance and other workers who may incidentally disturb ACMs**

*Numbers of maintenance workers affected by the new control limit*

118. The provisions in article 10A of the new EU directive, “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”, limits the likelihood of significant exposure to maintenance or other workers from unknowing disturbance of ACMs. Also, article 3 requires that exposures above the control limit for maintenance and other workers will not be exceeded. Therefore if full compliance with articles 10A and 3 are assumed (as used to estimate the numbers of workers protected in paragraph A44) this means that

the additional lives saved from a lower control limit are already accounted for in the estimates.

119. Article 3 of the new Directive specifically limits maintenance activities which do not have to be notified etc (i.e. unlicensed work) to sporadic and low intensity work below the control limit and restricts such work to specific types of materials:

a) short, non-continuous maintenance activities in which only non-friable materials are handled,

b) removal without deterioration of non-degraded materials in which the asbestos fibres are firmly linked in a matrix,

c) encapsulation or sealing of asbestos-containing materials which are in good condition.

120. Compliance with Article 3 will therefore restrict any maintenance work with licensed materials and it is arguable nearly all maintenance work will be on unlicensed ACMs, which predominantly contain chrysotile. However, until the exact impact of the "sporadic and low intensity work" is better defined, the impact of the current arrangements has been calculated for both licensed and unlicensed materials.

***Estimates of numbers of maintenance workers***

121. In the RIA for the new EU directive it was estimated that some 1.8 million workers are likely to disturb asbestos during routine work activity. The major groups affected are electricians (280,000); carpenters and joiners (260,000); plumbers and heating engineers (170,000); painters and decorators (150,000) and other construction and maintenance workers (around 500,000). Non maintenance workers (for example surveyors and valuers, building managers and inspectors and civil engineers) account for another 500,000 workers, although we believe that their exposure would be typically very low.

122. The estimated exposure before any of the directive is implemented, was that some 200,000 workers are currently exposed at levels above the current control limit of 0.2 f/ml for a proportion of their working time. A large amount of this exposure will be inadvertent, and exposure will be far lower than this if efforts are made at control. A reduction in the control limit to 0.1 f/ml over a 4-hour TWA would increase this number to a total of 400,000 maintenance workers of a total of 1.8 million.

123. If full compliance is not assumed or realised there will be some additional benefits from the lower control limit for up to 200,000 of the estimated 1. 8 million regularly exposed maintenance & other building workers (see table 1 & 3). Although, given the limited information on the main variables (e.g. type of materials, type of asbestos, frequency and duration of exposures above or at the old control limit) the net benefit is difficult to estimate. It is also unlikely to be realised in practice, given the low likelihood that an accurate assessment or sampling will take place, for most maintenance work.

***Calculation of the maximum theoretical benefit based on the currentCircumstances***

124. A maximum theoretical benefit can be calculated by assuming that some 200,000 maintenance workers would have been fully complying with the 0.2 f/ml limit and from 2006 would have taken further measures to fully comply with the 0.1 f/ml limit. (note: the effect of reducing chrysotile from 0.3 to 0.1f/ml are also calculated). The fibre type they are exposed to has been taken as the same as for licensed materials and an assumption that each of these workers carries out 1 hour a week of maintenance work on licensed materials for half of the working year (i.e. 24 x 1 hour per year). This is equivalent to one half of the maximum allowed at present and represent 1% contact time with licensed ACM's.

125. Maintenance work on unlicensed materials is not restricted to 1 hour per week. Table 26, gives the weighted means of the HSL database of air monitoring measurements and shows these materials are in the range of 0.1 – 0.2 f/ml. However, these include some high static measurement and the results for personal exposures should be taken into account e.g. tables 22 for AC cement and table 27 for floor tile, mastics and bitumen products which show average personal exposures below 0.1 f/ml. The exception is table 28 for work with gasket and packings, where the results are based on simulations rather than actual maintenance work. As shown in figure 9, the majority of the ACMs used in buildings are chrysotile based and relatively few jobs will exceed the new control limit. Using figure 9 it can be seen that about 30% of the ACMs in buildings are licensed (mainly groups: other insulation and AIB) and about 70% are unlicensed (exclude friction products and pressure pipes) therefore it has been assumed that for each hour of maintenance work on licensed products there is two hours work on unlicensed chrysotile products at 0.2 f/ml. This assumes an average of 3% exposure at the 0.2 f/ml control limit.

126. The risk for amosite and crocidolite materials was calculated (see table 29) based on 30 years of exposure from age 20, using the HD model for an exposure at 0.2 f/ml for 24 hours of a 2400 hour working year and subtracting the risk from an exposure at 0.1 f/ml for 24 hours of a 2400 hour working year for amosite and crocidolite. Similarly for chrysotile the 0.3 f/ml risk was subtracted from the calculated risk for an exposure at 0.1 f/ml, but the cumulative exposure at 0.3 was doubled to account for unlicensed materials. The results of these differences are summarised for the best estimates and adjusted for likelihood each fibre type will be encountered in a licensed (1%) and unlicensed (3%) situation, using the ratios of 0.05:0.85:2.1 for crocidolite, amosite and chrysotile respectively. The annual excess deaths were calculated assuming a 60 - year survival from age 20 and that over the next 50 years a turnover of x3 occurs in the 200,000 maintenance workers who may be affected. As no reduction for removal of ACMs in the intervening period have been made and a long duration of exposure has been assumed, this hypothetical value is likely to be a considerable overestimate of the benefits in terms of premature deaths avoided.

| **Table 29: Calculated best values of risk using the HD model for the reduced risk from lowering the control limit from 0.2 f/ml to 0.1 f/ml for amosite and crocidolite and 0.3 to 0.1 f/ml for chrysotile for maintenance work on licensed and unlicensed ACMs after adjusting for types of materials encountered and frequency (No RPE).** | | | | |
|---|---|---|---|---|
| Length of exposure (years) | Crocidolite | Amosite | Chrysotile | Total |
| Lifetime excess deaths per 100,000 after 30 years exposure from age 20 | | | | |
| 30 | 1.05 | 5.44 | 1.92 | 8.41 |
| Annual excess deaths per million from 30 years exposure (Survival age 80) | | | | |
| 30 | 6.3 | 32.64 | 11.52 | 50.46 |
| Lifetime excess deaths based on a total of 0.6 million maintenance workers over a 50-year period | | | | |
| 30 | 6.3 | 32.64 | 11.52 | 50.46 |

| **Table 30: Calculated best values of risk using the HD model for the reduced risk from lowering the control limit from 0.2 f/ml to 0.1 f/ml for amosite and crocidolite and 0.3 to 0.1 f/ml for chrysotile for maintenance work on licensed and unlicensed ACMs after adjusting for types of materials encountered and frequency. ( X10 APR RPE).** | | | | |
|---|---|---|---|---|
| Length of exposure (years) | Crocidolite | Amosite | Chrysotile | Total |
| Lifetime excess deaths per 100,000 after 30 years exposure from age 20 | | | | |
| 30 | 0.33 | 0.85 | 0.105 | 1.29 |
| Annual excess deaths per million from 30 years exposure (Survival age 80) | | | | |
| 30 | 2.01 | 5.1 | 0.63 | 7.74 |
| Lifetime excess deaths based on a total of 0.6 million maintenance workers over a 50-year period | | | | |
| 30 | 2.01 | 5.1 | 0.63 | 7.74 |

127. The same calculation has been done assuming x10 APF respiratory protection is worn by the maintenance workers, as required by guidance and approved code of practice for table 30. Again it must be stressed these are hypothetical calculations based on an exact reduction being achieved over a prolonged period of 30 years with an early age of first exposure and a continuous high amount of contact with licensed materials throughout the entire time.

***Actual benefits to maintenance workers***

128. In practice, compliance with the articles 3, 10A and 12 of the new directive it is expected to result in many fewer (or no) maintenance workers working with crocidolite and amosite asbestos containing materials, and these will be either

avoided or removed prior to the work by a specialist asbestos removal contractor.

129. If compliance with articles 3, 10 and 12 of the directive is achieved and RPE and controls stipulated in HSE guidance is followed, the net benefit of the reduction in the control limit over 50 years will be the avoidance of 1-2 premature deaths amongst maintenance workers.

**Uncertainty of the estimates**

130. Although only the "best" estimate has been calculated there are a number of uncertainties in the estimates. By far the greatest uncertainty is present in the epidemiology and the linear extrapolation from the available dose-response relationships. The HD model also calculates both a minimum and maximum value of deaths based on the epidemiology. The various estimates for the number of deaths for asbestos cement exposure due to uncertainty in the epidemiological model are given in table 31. This is a substantial range and hence the best estimate only has been used. Other variations due to limited exposure data, frequency of exposure and duration will also affect the best estimate. These are likely to produce a variation of approximately a factor of two on the best estimate.

**Table 31: Estimates from HD model of total number of deaths over 50 year period from asbestos exposure due to the demolition and removal of asbestos cement sheeting.**

| Duration (yrs) | Best | Max | Min |
|---|---|---|---|
| Demolition and specialist roof removal workers | | | |
| 10 | 1.7 | 8.4 | 0.2 |
| 20 | 2.3 | 11.2 | 0.4 |
| 30 | 2.6 | 12.9 | 0.4 |
| General Building workers | | | |
| 10 | 1.6 | 12.3 | 0.1 |
| 20 | 2.5 | 15.6 | 0.1 |
| 30 | 2.6 | 17.1 | 0.1 |

**Summary of risks**

131. The 'best' estimate of the numbers of asbestos-related deaths from the exposure patterns before the duty to manage came into effect were:

1) 9000 in total, including both occupational and non-occupational exposure, of which
2) 4700 occurred in maintenance and removal workers in the commercial sector;
3) 3100 occurred in maintenance and removal workers in the residential sector.

132. These deaths would arise from exposures taking place over the next 50 years and occur over the next 100 years.

133. The figure of 7,800 excluded deaths related to purely environmental exposures (~1,200). The number of occupational exposure deaths avoided was estimated at 58% of 7,800, or 4,500, with around 2,000 as a result of indirect, or work-related, exposure. The remaining 1,300 deaths would be as a result of domestic exposure, most of which are not covered by CAW (or the amended Directive).

134. The numbers of these deaths which can be avoided, depends on the level of compliance, awareness and training, so that ACMs are managed and only disturbed in a controlled way. Within these totals, assuming RPE is worn, it is calculated that some 87 excess deaths will occur among some 145,000 asbestos removal workers who are working with licensed materials. A lowering of the control limits to 0.1 f/ml will prevent an additional 36 asbestos related deaths among licensed asbestos removal workers wearing the recommended RPE (assuming an average nominal protection factor of 100). The importance of the RPE and the lower control limit is shown by that some 2372 deaths would be avoided by full compliance with the 0.1 f/ml control limit, if no RPE was worn.

135. For all work on unlicensed materials (assuming no RPE is worn) between 3-6 deaths will be prevented, depending on the duration of the exposures. Often some level of RPE would be worn and the number of preventable deaths would decrease to ~ 1. The lowering of the control limit is unlikely to have a significant effect in reducing the number of deaths for work on unlicensed materials.

136. If full compliance with articles 3 and 10A of the new directive is assumed, the lowering of the control limit for maintenance and other building workers will have a small effect (<7 premature deaths), compared to the number of lives saved by avoiding exposures.

137. It is worth noting that the relative risks for the various combinations of licensed materials varies between 1% - 43%, except for textured coatings, which are some three orders of magnitude lower (0.001%). It is questionable that the risk from textured coatings is significant enough to be included as requiring a licensed removal.

## References

ACoP, L27, Work with asbestos which does not normally require a licence. Control of Asbestos at Work Regulations 2002. Approved Code of Practice L27 (Fourth edition) HSE Books 2002 ISBN 0 7176 2562 1

ACoP, L28, Work with asbestos insulation, asbestos coating and asbestos insulating board. Control of Asbestos at Work Regulations 2002. Approved Code of Practice L28 (Fourth edition) HSE Books 2002 ISBN 0 7176 2563 X.

Asbestos (Licensing) Regulations 1983 SI 1983/1649 The Stationary Office 1983 ISBN 011 037649 8 as amended by the Asbestos (Licensing) Regulations 1998 SI 1998/3233 The Stationary Office ISBN 0 11 080279 9.

Brown, S.K., Asbestos Exposure During Renovation and Demolition of Asbestos-Cement Clad Buildings, Am. Ind. Hyg. Assoc. J. 48 (5) 478-486, 1987.

CD159, Proposals for the amendments of the Control of asbestos of work regulations 1987, HSE, 2000

CD176 Amendments of the Control of asbestos of work regulations 1987 and ACoP Regulatory Impact Assessment, HSE, 2002.

CAW (2002) Control of asbestos at work regulations 2002, SI 2002/2675, The Stationary Office, ISBN 0 7176 2382 3.

CONSAD Research Corporation. "Economic analysis of the proposed revisions to the OSHA asbestos standard for construction and general Industry. OSHA J-9-8-0033, U.S. Dept. of Labor, Washington, DC. 1990.

EU Directive 2003/18/EC Protection of workers from the risks related to exposure to asbestos at work, amending Council Directive 83/477/EEC. OJEU, L97/48 (15:4:2003).

Hodgson, J.T. and Darnton A. The quantitative risks of mesotheliomas and lung cancer in relation to asbestos exposure. Annals of Occupational Hygiene, Volume 44, No 8, pages 565-601, 2000.

MDHS 39/4 Asbestos fibres in air: Sampling and evaluation by phase contrast microscopy (PCM) under the Control of Asbestos at Work Regulations HSE Books 1997 ISBN 0-7176-1113-2.

MDHS 100 Surveying, sampling and assessment of asbestos-containing materials HSE Books, 2001. ISBN 0 7176 2076 X.

Peto, J., Hodgson, J.T., Mathews, F.E. and Jones, J.R., "Continuing increase in mesothelioma mortality in Britain." The Lancet, 345, March 4, 535 - 539, 1995.

R2P2- Reducing risks protecting people – HSE's decision making process. HSE Books, 2001, ISBN 0 7176 2151 0.

Preat, B. Suveillance de Chantiers avec Fibres-Ciment. Instituut voor Reddingswezen, Ergonomie en Arbeidshygiene, Hasselt, Belgium; Report Ref. 2240-F, 1993.

Roberts, T.A. Occupational exposure to asbestos during removal of asbestos cement roofing sheets, HSE FCG Inspector's Report W/FCG/528/85, 1985.

Ryder, J.F. Uses of Fibre cement in RILEM symposium on fibre reinforced cement and concrete, Lancaster, UK. The Construction Press Ltd. p31, 1975.

The Asbestos (Prohibition) Regulations 1992, SI 3067, as amended 1999 SI 2373, as amended 2003, SI 1889.

Simpson (1977) Selective written evidence submitted to the Advisory Committee on Asbestos 1976-77, HMSO, ISBN 0 11 883004 X

Simpson (1979) Asbestos: Final report of the Advisory Committee on Asbestos Volumes 1 & 2, HMSO, London UK.

**ANNEX 1**
**RIA ANNEX B**

# RESULTS OF CONSULTATION

## Responses to the Consultative Document

The consultation document was published on 3 November 2005 and closed for comment on 31 January 2006. Copies were sent to some 3,200 interested parties and also published on HSE's websites. Just over 500 responses were received.

The choice of preferred option remaine unchanged after consultation. Responses showed substantial support for the majority of the proposals (most in excess of 75% of respondents) and there was a general recognition that the proposals will tighten protection for all those who work with asbestos containing materials. For example, responses to the following issues were:

- a single control limit 0.1 fibres per $cm^3$ ($f/cm^3$) for all types of asbestos. 85% of respondents agreed with the proposal and its underlying aims to reduce exposure to as low as reasonably practicable and simplify compliance with the controls. There were a few concerns however, such as the capability of existing respiratory protective equipment (RPE) to provide the necessary level of protection and the need for guidance;
- a further alignment with the control hierarchy detailed in the Control of Substances Hazardous to Health Regulations. 89% of respondents agreed with the proposal, but some had concerns: for example, whether it might undermine the importance of using RPE and if the alignment with COSHH was wholly accurate;
- mandatory training requirements for those exposed or liable to be exposed to asbestos at work. 88% of respondents agreed with the proposal although, again, there were some concerns such as worries about the quality and extent of training and competency of trainers.

There was also substantial support (89%) for the proposal for a single set of Regulations and a single ACoP on work with asbestos.

However, two of the proposals were more contentious - those to:

- implement the requirement of the Asbestos Worker Protection Directive relating to 'sporadic and low intensity exposure'; and linked with this,
- remove textured decorative coatings (TDCs) containing asbestos from the licensing regime.

Over 60% of respondents did not support these proposals. Concerns included:

- the term "sporadic and low intensity" was ambiguous and there was confusion as to whether it applied to activities or level of exposure;
- the de-licensing of work with TDCs would result in an inadequate level of control not only for workers but also for the public exposed to fibres. Some suggested it would be better to bring other currently de-licensed work into the licensing regime rather than de-licence work with TDCs. Some considered a clearer, less ambiguous evidence base was needed before the de-licensing of TDCs could be justified.

Few substantive comments were received about the contents of the partial RIA, which was part of the Consultation Document, most comments did not provide additional information on costs and benefits.

### Action after the end of consultation

In February, the research, which provided evidence for the proposal in the CD to remove TCs from the licensing regime, was peer reviewed. The research, using standard controlled removal (wetting, air extraction) techniques, had demonstrated that the upper end of the range of potential exposures that could arise for employees engaged in the removal of textured decorative coatings was 0.08 f/cm$^3$, which is below the proposed control limit of 0.1 f/cm$^3$. The research was published by the Health and Safety Laboratory (HSL) during 2005.

The peer review was undertaken by the independent Working Group on Action To Control Chemicals (WATCH). The conclusions of the review were that:

- 0.08 f/cm$^3$ (4 hrs time weighted average or TWA), as chrysotile fibre, is the most reliable estimate of the upper end of the range of potential exposures that could arise for operatives engaged in the removal of asbestos-containing textured decorative coatings, under conditions specified in the draft Control of Asbestos Regulations 2006;
- the research was appropriate to address exposure of operatives under such circumstances and that the results were reliable in this context. The research was not designed to address the question of the potential spread of asbestos contamination into the premises from which asbestos-containg decorative coatings were being removed.

In response to early comments about this research received during consultation, HSE commissioned HSL to carry out further measurements of airborne asbestos fibre concentrations during the removal of TCs to further assess the effects of the changes in the control regime being proposed in the draft ACoP. The main conclusions of this further research were:

- during removal of TCs from a wider range of surfaces, the fibre concentrations produced were less than 0.1 f/cm$^3$;
- personal airborne fibre concentrations were only increased by less than a quarter when air extraction was switched off;
- visual assessment would be an effective method of assessing that the area was safe for reoccupation;
- it is unlikely that fibre releases would exceed 0.01 f/cm$^3$ in the immediate area just outside removal enclosures whilst textured decorative coatings are being removed;
- when appropriate controls were not used and TCs were dry scraped with no air extraction, short term peaks of up to 0.2 f/cm$^3$ could be produced. However, it was unlikely that the new 4 hour Control Limit would be exceeded and removal without appropriate controls would be a clear breach of asbestos regulations.

This new research confirmed the view that risks from TCs containing asbestos are much lower than previously thought; are much less than for other licensed materials;

and are comparable to the risks from work with asbestos cement, which does not require a licence.

The Health and Safety Commission considered the proposals for revised asbestos regulations at meetings on 9 May, 4 and 25 July 2006. The Commission looked at the complete package of draft regulations, Approved Codes of Practice, guidance, training and enforcement and agreed that there should be a risk-based approach to the licensing of asbestos, with licensing reserved for high risk products and processes.

The Commission noted that the concept of "sporadic and low intensity exposure" was taken from the EU Directive, which requires Member States to lay down practical guidelines for its determination. The Commission agreed that if a peak exposure level of 0.6 fibres per $cm^3$ of air measured over a ten minute period could be exceeded then such work could not be considered to give rise to "sporadic and low intensity exposure". If a risk assessment demonstrates that this could be exceeded in a working day, then the work would have to be carried out under licensed conditions. This definition of “sporadic and low intensity exposure” should be within the Regulations and the Regulations should allow the Commission to set the exposure levels which determine whether work falls within this category or not.

This approach should remove any doubt over the meaning of the term but HSE would also set out the type of work that cannot be considered to give rise to sporadic and low intensity exposure in the Approved Code of Practice.

Under the new Regulations, work with textured decorative coatings containing asbestos (TCs) will be removed from the licensing regime as research shows that the levels of exposure to asbestos fibres from such work are low. The Commission considered new research on TCs and, at its meeting on 4 July 2006, evidence of the relative risks of exposure from different asbestos materials. At the 25 July meeting the Commission noted that although there were concerns from some stakeholders about the removal of TCs from the licensing regime, it believes that, overall, the proposed Regulations significantly tighten the controls on working with asbestos materials. The Commission was assured that there would be adequate enforcement of the new regime and asked the Health and Safety Executive to monitor implementation of the Regulations and to bring any concerns about TCs to the Commission’s attention.

In effect it is proposed that options 2, 3, 4 and 5 will be implemented, largely as set out in the Consultation Document and outlined above, with minor changes to make explicit the definition of “sporadic and low intensity exposure”. HSE believes that the costs and benefits of the proposals remain within the ranges set out in the RIA.

**ANNEX 1**
**RIA ANNEX C**

**ANNEX 1**
**RIA ANNEX D**

## LIST OF OTHER GOVERNMENT DEPARTMENTS AND AGENCIES CONSULTED

**Audit Commission**
**Biotechnology and Biological Science Research Council (NDPB)**
**Department for Education & Skills**
**Department of Health**
**Department of Trade & Industry**
**Environment Agency**
**Foreign & Commonwealth Office**
**HM Fire Service Inspectorate**
**Industrial Injuries Advisory Council**
**Ministry of Agriculture Fisheries and Food (now Defra)**
**Ministry of Defence**
**National Assembly for Wales**
**Northern Ireland Committee**
**Office of the Deputy Prime Minister**
**Small Business Service**
**The Crown Estate**
**The Home Office**
**The Scottish Executive**
**The Stationery Office**
**Welsh Development Agency**
**Welsh Office**

## LIST OF ABBREVIATIONS USED

| | |
|---|---|
| ACMs | Asbestos-containing materials |
| ACoPs | Approved Codes of Practice |
| ALARP | As low as is reasonably practicable |
| ASLIC | Asbestos (Licensing) Regulations 1983 |
| AWPD | European Asbestos Worker Protection Directive |
| CAW | Control of Asbestos at Work Regulations 2002 |
| COSHH | Control of Substances Hazardous to Health Regulations 2004 |
| DCU | De-contamination Unit |
| EMM | Enforcement Management Model |
| ERM | European Reference Method |
| HSE | Health and Safety Executive |
| HSL | Health and Safety Laboratory |
| LA | Local Authority |
| Prohibitions Regulations | Asbestos (Prohibitions) Regulations (as amended) 1999 |
| RIA | Regulatory Impact Assessment |
| RICE | Regular Inter-laboratory Counting Exchange |
| RPE | Respiratory Protective Equipment |
| SBS | Small Business Service |
| SQWG | European Council's Social Questions Working Group |
| STEL | Short term exposure limit |
| TC | Textured Coatings |
| TDC | Textured Decorative Coatings |
| TWA | Time weighted average |
| UKAS | United Kingdom Accreditation Service |
| WHO | World Health Organisation |

## TRANSPOSITION NOTE

1. This note sets out the way in which the Control of Asbestos Regulations 2006 (the 'Asbestos Regulations') and an associated Approved Code of Practice (ACoP) transpose the main elements of Council Directive 83/477/EEC on the protection of workers from the risks related to exposure to asbestos at work (the Asbestos Worker Protection Directive – or AWPD) as amended by Council Directive 91/382/EEC and, in particular, Directive 2003/18/EC.

2. The Asbestos Regulations are made under the Health and Safety at Work etc Act 1974 and therefore apply only in Great Britain. Northern Ireland and Gibraltar will bring forward separate measures necessary to implement the Directive in those territories. As explained in the table below, the Maritime and Coastguard Agency are implementing the extension of the Directive to sea transport (see Article 1(2)).

3. The provisions of AWPD which have not been amended by Directive 2003/18/EC, have been brought forward into the Asbestos Regulations unchanged. This Transposition Note nevertheless indicates where all the provisions of AWPD have been transposed while highlighting (**in bold**) the changes made to implement the provisions of AWPD amended by Directive 2003/18/EC.

4. The Asbestos Regulations and the associated ACoP do what is necessary to implement AWPD and the amendments Directive 2003/18/EC makes to it. However, like earlier Regulations, they continue to go beyond the requirements of the Directive in three important respects. First, they retain requirements that work with certain materials containing asbestos where the risks of exposure to asbestos fibres are considered high (eg work with asbestos insulation board), must be carried out by contractors licensed by the Health and Safety Executive (HSE). This regime has been in place since 1983 as a result of domestic, UK policy is that it is necessary to have such a regime over and above the requirements of AWPD.

5. Second, they retain the duty to manage asbestos in non-domestic premises (regulation 4). The duty to manage was introduced in 2004 and addresses the need for those who have control of non-domestic premises to identify whether asbestos is present, and if so, put into action a plan of work to ensure that anyone who might be exposed to asbestos fibres is protected.

6. Third, our implementation of the amended Article 8. Article 8 requires employers to ensure that workers are not exposed to airborne concentrations of asbestos in excess of 0.1 fibres per cm3 as an **8-hour** time-weighted average. However, the definition of "control limit" in regulation 2(1) defines this as 0.1 fibres per cm3 as a **4-hour** time weighted average. This is tighter than the Directive and has been done to reflect normal working practice in determining levels of airborne concentrations of asbestos.

7. As explained in the Explanatory Memorandum, the Asbestos Regulations makes a change to the licensing regime by aligning the scope of these requirements with the scope of those (such as notification) that are derived from AWPD. Regulation 3(2), which implements Article 3(3), also disapplies the licensing requirements from work which is likely to be "sporadic and of low intensity". This change has no efect, in practice, on the types of materials containing asbestos which are subject to the licensing regime. However, it does have the effect of removing most work with textured decorative coatings containing asbestos (TCs) from the licensing regime. Almost all work with such materials is likely to be "sporadic and of low intensity" and, as a result, the ACoP advises that most work with TCs no longer requires a licence. It also means that only licensed work will be notified and only licensed workers will need health records and medicals.

| **Asbestos Worker Protection Directive (AWPD) as amended by Directive 2003/18/EC** | | | |
|---|---|---|---|
| **Article** | **Objective** | **Implementation** | **Responsibility** |
| Article 1 | Sets out the aim of AWPD – the protection of workers from the risks arising from exposure to asbestos. | Many provisions place duties on employers to protect their employees eg regulation 6.<br>Regulation 3(1) applies Regulations to self-employed persons. | Secretary of State |
| **Article 1(2)** | **Disapplication to sea and air transport deleted by Directive 2003/18/EC**. | **Asbestos Regulations applies to air transport but contains a disapplication in relation to activities on board ship (regulation 3(6)). This reflects the responsibility for health and safety that the Maritime and Coastguard Agency (MCA) has. The MCA are covering the application to sea transport under separate regulations on which consultation finished in July.** | **Secretary of State and MCA** |
| **Article 2** | **Defines the various types of asbestos – amended by Directive 2003/18/EC** | **Regulation 2(1) – see Note 1 below** | **Secretary of State** |
| Article 3(1) | Application of Directive to activities in which workers may be exposed to asbestos dust. | Implicit in regulations as a whole | Secretary of State |
| Article 3(2) | Requires the assessment of risk of exposure to asbestos | Regulation 6(1) | Secretary of State |
| **Article 3(3)** | **Provides a derogation from compliance with provisions in Article 4, 15 and 16. – amended by Directive 2003/18/EC.** | **Regulation 3(2) – see also Explanatory Memorandum** | **Secretary of State** |
| **Article 3(3) bis** | **New provision introduced by Article 2003/18/EC requiring Member States (MS) to lay down practical guidelines for the determination of sporadic and low intensity exposure (Article 3(3)).** | **Regulation 3(3) provides power for HSC to establish practical guidelines which are specified in the associated Approved Code of Practice. (see also Explanatory Memorandum)** | **Secretary of State.**<br>**For ACoP, the HSC with the consent of the Secretary of State** |
| Article 3(4) | Risk assessment to be the subject of consultation with workers and/or their representatives | Implemented through the Safety Representatives and Safety Committee Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996 | Secretary of State |
| Article 4(1) | Requires notification of work with asbestos to an enforcing authority (except where provided for by Article 3(3) | Regulation 9 | Secretary of State |
| **Article 4(2)** | **Requires notification before work commences and for the notification to include a** | **Regulation 9(1) and Schedule 1** | **Secretary of State** |

| Asbestos Worker Protection Directive (AWPD) as amended by Directive 2003/18/EC | | | |
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| **Article** | **Objective** | **Implementation** | **Responsibility** |
| | **description of the work. Amended by Directive 2003/18/EC** | | |
| Article 4(3) | Provides for access for workers and/or their representatives to notification documents | Implemented through the Safety Representatives and Safety Committee Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996 | Secretary of State |
| **Article 4(4)** | **Amended by Directive 2003/18/EC by requiring a new notification each time changes in working conditions may result in an increase of exposure to asbestos.** | **Regulation 9(2)** | **Secretary of State** |
| **Article 5** | **Prohibits the application of asbestos by spraying. Amended by Directive 2003/18/EC by adding prohibition on activities which expose workers to asbestos during extraction, manufacture or processing of asbestos products or products with asbestos intentionally added.** | **Regulations 25, 26, 28 and 29** | **Secretary of State** |
| **Article 6** | **Directive 2003/18EC replaces original Article 6 with new provision requiring exposure of workers to asbestos to be reduced to a minimum and in any case below the limit value (control limit) laid down in Article 8. This to be achieved in particular through a number of specific measures such as limiting the number of workers.** | **Regulation 11, 14, 17 24 and 30** | **Secretary of State** |
| **Article 7** | **Directive 2003/18/EC replaces original Article with new provison requiring sampling of asbestos in the air to ensure compliance with control limit laid down in Article 8. Sampling to be done by suitably qualified personnel and by the WHO recommended method. Sampling to be carried out after consultation with workers and/or their** | **Regulations 2(1) (definition of control limit), 19 and 20. Provision on consultation implemented through the Safety Representatives and Safety Committee Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996** | **Secretary of State** |

| Asbestos Worker Protection Directive (AWPD) as amended by Directive 2003/18/EC | | | |
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| **Article** | **Objective** | **Implementation** | **Responsibility** |
| | **representatives.** | | |
| **Article 8** | **Directive 2003/18/EC replaces original Article. Requires employers to ensure that workers are not exposed to airborne concentrations of asbestos in excess of 0.1 fibres per $cm^3$ as an 8-hour time-weighted average. This single limit for all forms of asbestos replaces separate limits for amphiboles and chrysotile** | **Regulations 2(1) (definition of control limit) and 11 (see paragraph 5 above)** | **Secretary of State** |
| Article 9 | Provisions relating to the adaptation of the Directive to technical progress. | Not applicable | Not applicable |
| **Article 10(1)** | **Amended by Directive 2003/18/EC by requiring that the reasons for any exceeding of the single control limit (Article 8) are identified and appropriate measures taken as soon as possible.** | **Regulation 11(5)** | **Secretary of State** |
| Article 10(2) | Requires determination of asbestos in air concentrations to ensure measures taken are effective | Regulation 11(5) | Secretary of State |
| **Article 10(3)** | **Directive 2003/18/EC replaces original provision by providing that where exposure cannot be reduced by other means, then the use of RPE should be used, but that this should be kept to a minimum. Requires the provision of appropriate breaks from working with RPE where necessary in consultation with workers and/or their representatives** | **Regulation 11. This is supported by an ACoP which draws attention to the need to comply with the Safety Representatives and Safety Committee Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996.** | **Secretary of State. For ACoP,.the Health and Safety Commission with the consent of the Secretary of State** |
| **Article 10(a)** | **New provision inserted by Directive 2003/18/EC requiring employers to take necessary steps to identify materials containing asbestos before carrying out demolition or maintenance work.** | **Regulation 5** | **Secretary of State** |
| **Article 11(1)** | **Amended by Directive 2003/18/EC requiring employers to put in place measures to protect workers from the spread of dust arising from asbestos outside the** | **Regulation 16** | **Secretary of State** |

| Asbestos Worker Protection Directive (AWPD) as amended by Directive 2003/18/EC | | | |
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| **Article** | **Objective** | **Implementation** | **Responsibility** |
| | **premises** | | |
| Article 11(2) | Requires consultation with workers and/or their representatives on measures required by Article 11(1) | Safety Representatives and Safety Committee Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996. | Secretary of State |
| Article 12(1) | Requires a plan of work to be drawn up before work with asbestos in started | Regulation 7 | Secretary of State |
| **Article 12(2)** | **Amended by Directive 2003/18/EC by adding to the measures that the plan of work should specify** | **Regulations 7 and 17** | **Secretary of State** |
| Article 12(3) | Requires the plan of work to be notified to enforcement authorities when requested | Covered by s.20(2)(k) of the Health and Safety at Work etc Act 1974 | Secretary of State |
| **Article 12(a)** | **New Article inserted by Directive 2003/18/EC requiring employers to provide appropriate training for all workers who are likely to be exposed to asbestos. Training to be provided at regular intervals, be sufficient to provide the necessary knowledge and skills and must cover certain elements** | **Regulation 10** | **Secretary of State** |
| **Article 12(b)** | **New Article inserted by Directive 2003/18/EC requiring firms carrying out demolition or removal work to provide evidence of their ability to do so.** | **Regulation 8 for licensable work. For non-licensable work regulations 10(1)(b) and 7 supported by ACoP** | **Secretary of State. For ACoP, the Health and Safety Commission with the consent of the Secretary of State** |
| Article 13 | Prescribes the demarcation of asbestos work areas, the facilities and equipment to be provided with these areas and the activities limited within them. | Regulations 14, 18 and 23 | Secretary of State |
| Article 14 | Prescribes the information to be given to workers and/or their representatives on work with asbestos and the results of the measurement of the concentration of asbestos fibres | Regulation 10 and Safety Representatives and Safety Committee Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996. | Secretary of State |
| **Article 14(2)(b)** | **Amended by Directive 2003/18/EC by requiring the provision of information to workers should the control** | **Regulations 2(1) (definition of control limit), 10(2)(c) and 11(5)(b)** | **Secretary of State** |

| Asbestos Worker Protection Directive (AWPD) as amended by Directive 2003/18/EC | | | |
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| **Article** | **Objective** | **Implementation** | **Responsibility** |
| | **limit be exceeded.** | | |
| Article 15 | Subject to Article 3(3) requires an assessment of workers health prior to work with asbestos. | Regulation 22 | Secretary of State |
| **Article 15(3)** | **Amended by Directive 2003/18/EC by adding a requirement for continuing medical surveillance should the doctor or authority responsible think it necessary** | **Regulation 22(9)** | **Secretary of State** |
| Article 16(1) | Subject to Article 3(3), requires records of exposure to asbestos to be made. | Regulations 19(3) and 22 | Secretary of State |
| **Article 16(2)** | **Amended by Directive 2003/18/EC by increasing the length of time an employer must keep the record from 30 to 40 years** | **Regulation 22(1)(b)** | **Secretary of State** |
| **Article 16(3)** | **Amended by Directive 2003/18/EC by requiring that the medical records be made available to the responsible authority in cases where an undertaking ceases trading.** | **Regulation 22(8)(c)** | **Secretary of State** |
| **Article 16(a)** | **New Article inserted by Directive 2003/18/EC requiring MS to provide for adequate sanctions in the event of breach of the requirements of AWPD** | **No change needed to Regulations. Sanctions for breaches of health and safety law are dealt with under the Health and Safety at Work etc Act 1974.** | **Secretary of State** |
| **Annex I (deleted)** | **Annex I set out details on the reference method for measuring the concentration of asbestos fibres in the air. This has been replaced by the reference to WHO recommended method (Article 7)** | **Regulation 2(1) (definition of control limit)** | **Secretary of State** |
| **Annex II** | **Sets out practical recommendations for the clinical assessment of workers (Article 15). Minor changes made by Directive 2003/18/EC to point 3.** | **These are only recommendations so there is no need for implementation. However, the provisions carried forward in regulation 22 covers health examination in overall terms and this is supplemented by guidance for doctors issued by HSE** | **Health and Safety Executive** |

Note 1. Regulation 2(1) elaborates the amended definition. This is to rectify an inaccuracy in the way in which the Directive now defines asbestos. The Directive places a (*) against each number and indicates that this refers to the number in the CAS Registry. The CAS Registry applies the (*) to all numbers except that for chrysotile – hence the lack of a (*) against this substance in regulation 2(1).