Asbestos Compliance and Retrospective Risk Analysis

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Agenda

• Projected mesotheliomas
• Factors reducing exposure
• Factors which could inhibit future reduction
• Retrospective Risk Analysis
• Sentencing Guidelines
• Suggested boundaries on harm risk categories
Projections of Annual GB Mesothelioma Mortality
(From HSE statistics 2017)

Mesothelioma in Great Britain: annual actual and predicted deaths

Substantial increase in annual deaths due to asbestos exposures prior to 1980

Projected: 2,500 per year until 2020

Shaded area represents the upper and lower prediction interval
Evidence of Asbestos Exposure Reduction: 
Average Amphibole Lung Burden by Period of Birth

Figure 5: National mesothelioma mortality and average amphibole asbestos lung burdens* in Britain by period of birth (million fibres/gm longer than 5 microns)

- Cumulative mesothelioma mortality per million by age 50
- Male mortality rate
- Female mortality rate
- Male mean amphibole concentration
- Female mean amphibole concentration

Mean amphibole lung concentration (million fibres/gm): 0, 0.02, 0.04, 0.06, 0.08, 0.1
Regulatory and other Factors (“Leading Indicators?”) affecting Asbestos Exposure include:

- **Prohibition of asbestos use:**
  - Crocidolite 1970, Amosite 1980s, All ACMs 1999

- **Prevention of exposure** (specific duty 1983)

- **Changes in work practices/control:**
  - eg wet stripping, power tool reduction, training, awareness

- **Licensing regime**

- **Tighter Control Limits**

- **Duty-to-manage**

- **Changes in nature of materials being removed/disturbed**
  - eg less sprayed coating/more AC, artex

- **Enforcement action**
Warning: Predicted Mesothelioma Deaths from 2045-2100
(from CAR 2012, PIR 2017)

Figure 1 – Predicted annual deaths and exposures from the different scenarios

- Predicted deaths, scenario B: worst case
- Predicted deaths, scenario C: intermediate case
- Predicted deaths, scenario A: continuing control
- Exposure, scenario B: no control from 2016 - worst case
- Exposure, scenario C: no control from 2016 - intermediate case
- Exposure, scenario A: continuing control from 2016

*Relative changes in annual population asbestos exposure are used to predict subsequent mesothelioma mortality in the HSE model; the absolute scaling of the exposure profile is arbitrary in this chart.

Source: HSE Mesothelioma Projections Model
Factors which could inhibit future rate of decline in exposure and disease

- Employer’s ignorance/omissions/poor compliance
- Worker’s complacency regarding risks
- Worker’s unreliable skill in identifying ACMs
- Retrospective Risk Analysis (RRA)
  - Quantitative calculation of future risk of developing disease based on individual exposure incidents
Retrospective Risk Analysis

• Now being used in asbestos prosecutions to support positions on “likelihood of future harm”
  – Encouraged by new sentencing guidelines
  – Not surprisingly, defence often concludes that risks from individual incidents are low

• If risks are really low, what is the incentive for an unscrupulous employer to control etc?

• May have the potential to trivialise or undermine the extent or significance of failures with regulatory requirements?
RRA is possible because….

• Asbestos is a cumulative hazardous agent

• Risk of developing disease is “made-up” of a series of exposures (fibre level x duration)(doses)

• So can examine the implications of individual incidents on lifetime risks
Exposure assessment: “Refurbishment” Worker

What might asbestos exposure consist of during a working year?

Example for illustrative purposes only
Exposure assessment: “Refurbishment” Worker

What might exposure consist of during a working year? (Generally unknown and unrecorded except for “incident”?)

![Graph showing intensity of exposure over working days over 1 year](Image)

- 0.014 f/ml.yr
- <0.001 f/ml.yr
One uncontrolled exposure will increase his risk (even if not materially)
Mesothelioma Risk

Repeated exposure events will continually increase his risk

Figures for illustration only
Courtesy of Martin Stear
New Sentencing Guidelines and RRA:
“The Health and Safety Offences, Corporate Manslaughter and Food Safety and Hygiene Offences: Definitive Guideline issued by the Sentencing Council”

- Applies from 1 February 2016
- England and Wales:
  - Mandatory for Courts to follow
  - Advisory in Scotland
- Requires the Court to apply a step-wise approach to sentencing: Must consider:
  - Culpability (Extent of compliance)
  - “Harm risked” (Health effect/outcome)
  - “Likelihood of harm occurring” (RRA)
  - “Size” (ie turnover) of company
Culpability (Extent of compliance): 4 Categories

- **Very high**: Deliberate breach of or flagrant disregard for the law

- **High**: Offender fell far short of appropriate standard for example by:
  - Failing to put in place measures that are recognised standards in the industry
  - Ignoring concerns
  - Failing to changes following prior incident(s) exposing risks to H&S
  - Allowing breaches to subsist over a long period
  - Serious and/or systemic failure within the organisation to address H&S risks

- **Medium**: Offender fell short of appropriate standard:
  - Between descriptions in "high" and "low" culpability categories
  - Systems in place but these were not sufficiently adhered to or implemented

- **Low**: Offender did not fall far short of the appropriate standard for example because:
  - Significant efforts made to address the risk but were inadequate on this occasion
  - There was no warning/circumstance indicating a risk to H&S
  - Failings minor/occurred as an isolated incident
Harm

• The offence is in creating a risk of harm:
  • Actual harm is not an ingredient of health and safety offences

• The Court when sentencing has to assess:
  • The risk of harm (health outcome) created by the offence (class it as A, B or C), and
  • The likelihood of that harm arising (high, medium or low)
# Harm: Categorisations of “Harm risked”

<table>
<thead>
<tr>
<th>Health outcome</th>
<th>Seriousness of harm risked</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level A</strong></td>
<td></td>
</tr>
<tr>
<td>- Death</td>
<td></td>
</tr>
<tr>
<td>- Physical or mental impairment resulting in lifelong dependency on third party care for basic needs</td>
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<tr>
<td>- Significantly reduced life expectancy</td>
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<tr>
<td><strong>Level B</strong></td>
<td></td>
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<tr>
<td>- Physical or mental impairment, not amounting to Level A, which has a substantial and long-term effect on the sufferer’s ability to carry out normal day-to-day activities or on their ability to return to work</td>
<td></td>
</tr>
<tr>
<td>- A progressive, permanent or irreversible condition</td>
<td></td>
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<tr>
<td><strong>Level C</strong></td>
<td></td>
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<tr>
<td>- All other cases not falling within Level A or Level B</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RRA</th>
<th>Harm category 1</th>
<th>Harm category 2</th>
<th>Harm category 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High likelihood of harm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harm category 1</td>
<td>Harm category 2</td>
<td>Harm category 3</td>
</tr>
<tr>
<td><strong>Medium likelihood of harm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harm category 2</td>
<td>Harm category 3</td>
<td>Harm category 4</td>
</tr>
<tr>
<td><strong>Low likelihood of harm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harm category 3</td>
<td>Harm category 4</td>
<td>Harm category 4 (start towards bottom of range)</td>
</tr>
</tbody>
</table>
Likelihood (Probability) of Harm

- Likelihood of harm depends on:
  - Exposure level and duration
- Can be expressed in fibre/ml.years
  - “Cumulative dose”
- Is derived from risk models (eg Hodgson and Darnton)
  - Models have established the probability of harm arising based on cumulative doses
  - Based on historical data
Sentencing Guidelines: 
Likelihood of Harm 

- Currently there is no guidance on what H, M and L means quantitatively 
- Likely to be inconsistency in terms of how the 3-level categorisation is applied 
- Typically it is concluded that the likelihood of harm is low 
- This paper suggests establishing quantitative boundaries between: 
  - Low and medium risk 
  - Medium and high risk 
- Purpose: to seek to ensure “appropriate” level of risk is applied
Sentencing Guidelines
Suggested Boundaries: Low-medium risk

- **Lifetime risk of developing mesothelioma spontaneously (with no asbestos exposure) estimated as**
  - 1 in 10,000 (or 10 in 100,000) (equivalent to 50-100 mesotheliomas per year)

- **An additional risk of 1 in 10,000 (ie on top of the spontaneous background risk) effectively**
  - **Doubles** the overall risk and therefore “materially increases the risk”

- **This is a natural boundary for low to medium risk**

- **In summary:**
  - **“Low”**: Any exposure with a lifetime risk of <1 in 10,000
  - **“Medium”**: >1 in 10,000 considered to be at least medium
Sentencing Guidelines
Suggested Boundaries: Medium-high risk

- A lifetime risk of developing mesothelioma of 1 in 1000 (or 100 in 100,000) is 10-fold higher than risk of spontaneously developing mesothelioma.

- This is the level of risk seen in high risk jobs in the past.

- This forms a natural boundary between medium and high risk.
<table>
<thead>
<tr>
<th>Likelihood category</th>
<th>Lifetime risk</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>1 in 1000 or higher</td>
<td>Risk consistent with that seen in high risk jobs in the past</td>
</tr>
<tr>
<td>Medium</td>
<td>1 in 10,000 to &lt;1 in 1000</td>
<td>Risk is at least doubled but less than the risks observed in for work in high risk jobs in the past</td>
</tr>
<tr>
<td>Low</td>
<td>Less than 1 in 10,000</td>
<td>Additional risk due to asbestos less than doubles the spontaneous risk</td>
</tr>
</tbody>
</table>
Application of the boundaries using risk model exposure cumulative dose data

Table 1: Cumulative exposure bands for which lifetime risks are High (H), Medium (M) or Low (L) by fibre type

<table>
<thead>
<tr>
<th>Cumulative exposure (f/ml.yrs)</th>
<th>Crocidolite</th>
<th>Amosite</th>
<th>Chrysotile</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or more</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>0.5 to &lt;10</td>
<td>H</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>0.2 to &lt;0.5</td>
<td>H</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>0.02 to &lt;0.2</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>0.01 to &lt;0.02</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>0.001 to &lt;0.01</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>&lt;0.001</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>
Amosite: High, Medium and Low lifetime risks of asbestos-related cancer according to exposure level and duration (= f/ml.yrs)

<table>
<thead>
<tr>
<th>Level (f/ml)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Months</td>
</tr>
<tr>
<td></td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>0.1</td>
<td>0.1</td>
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<tr>
<td>0.05</td>
<td>0.05</td>
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<td>0.02</td>
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<tr>
<td>0.002</td>
<td>0.002</td>
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<tr>
<td>0.001</td>
<td>0.001</td>
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</table>
Final Comments:  
Suggested Boundaries: Benefits

• Should help to improve consistency in determining harm categories in sentencing guidelines to assist the courts

• Should reduce unsubstantiated claims of low risk

But also need to ensure that:

• The “dose” is correctly/accurately assessed:
  – Will need best quality information on exposure levels and duration

• The appropriate level of culpability is assigned:
  – Serious failures in compliance have occurred.
Finally:
HSE website: www.hse.gov.uk/asbestos

• Best to avoid incidents altogether
• Asbestos App..... Web/mobile/Tablet