Outline of CIRIA RP961 Guide
Conclusions & Recommendations

Asbestos in soil and made ground:
A Guide to Understanding & Managing Risks

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Acknowledgements

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- Steve Forster
- Paul Gribble
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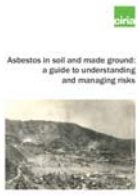
- Simon Hay
- Ian Heasman
- Phil Hellier
- Matt Hussey
- Ursula Lawrence
- Ian Martin
- David Robinson
- Phil Rozier
- Carl Slater
- Chris Vincett
- Paula Whittell
- George Wilkinson
- Rebecca Williams

What is in it

- The Ready Reference
  - A brief summary of key messages
- Introduction & "Client's guide" chpts 1 & 2
- Part 1 - understanding what matters (chpts 3 – 9)
- Part 2 - guide to assessing potential exposure and risk (chpts 10 to 17)
- Conclusions & recommendations (chpt 18)



Part 1 (Chapters 3 to 9)

- Legislation - at the start of this section
  - many aspects (and input from legal experts)
- Asbestos types, uses & products – *briefly*
- Health risks – *also briefly*
- Human exposures to asbestos
- Existing guidance on asbestos in soils
- Control of Asbestos Regs (CAR 2012)
- Release of asbestos from soils

Legal drivers: Health and safety legislation

- Mainly the Control of Asbestos Regulations 2012 (CAR)
  - Prevent or minimise the asbestos exposures to employees, and the public, relating to work activities
  - Applies to premises, which includes land, but HSE guidance relates almost exclusively to asbestos in buildings
  - Sets various short term maximum airborne levels:
    - Control limits: 0.1 f/ml over 4-hour, 0.6 f/ml over 10 minutes
    - Clearance Indicator threshold: <0.01 f/ml
      - "*not as an acceptable permanent environmental level*" CAR ACOP
  - Applies during all Site Investigation, remediation and construction work etc. at sites where asbestos is present in soils
  - Would apply post-development, to commercial and industrial premises (but not residential/ domestic exposures)

Legal drivers: Environmental legislation

- Planning: "safe development" "site is suitable for its new use" (NPPF paras 120 & 121 respectively)
  - No "safe" level has been defined in the UK for asbestos in air or soil
  - Site investigation information, including risk assessment, by a 'competent person'
- Part 2A – "significant possibility of significant harm" (categories 1 & 2)
- Waste legislation
  - Environment Agency have recently clarified the classification of asbestos-containing soils WM2 3rd edition more complex than just 0.1% asbestos

Legal drivers: Civil law

- Compensation Act 2006
  - Mesothelioma sufferers (or their families) could sue land owners and developers for compensation
  - Joint and several liability
  - Claimants required to prove "negligence" and a "material increase" in risk
  - No case law for asbestos in soil
  - In other cases, a Judge found an 18% increase in risk above **background** and accepted this as a "material increase"
  - Environmental background concentrations in air are probably very low (0.0001 f/ml in the 1980s and falling)
    - But there is some evidence of asbestos-related deaths from such exposures
- **May be main driver of future claims**

Future liabilities

- "Forewarned is forearmed"
- First time that the legal and civil liabilities relating to asbestos in soils have been collated
  - Based on expert legal input, including barristers involved in asbestos cases
  - Could result in legal, financial and reputational losses in future
  - These liabilities are real but there is no case law for asbestos in soils ... yet!
    - Like many liabilities, they may never materialise
- Corporate risk management issue for landowners and developers:
  - Opportunity to avoid/prepare for future claims/prosecutions
    - Get ahead of the game
  - Status quo is unlikely to continue
  - Ignoring them does not mean they are not real

Lowering the bar!

- Legal thresholds for asbestos have become ever tighter over the past fifty years
  - Levels of asbestos contamination that might have been ignored in the past are now recognised as significant.
- Developments in Europe suggest that standards will continue to tighten
  - Dutch NR and MPR values are being reviewed downwards
  - HSE recently proposed reducing the detection limits for background and enclosure leakage testing to 0.001f/ml
- Not unique to asbestos - International thresholds for other contaminants (e.g. Pb, BaP, TCE) have all been revised downwards
- If landowners and developers are to avoid civil liabilities in future, assessments need to be based on sound science and good practice guidance

Part 2: Chapters 10 to 18

- Preliminary risk assessment and CSM
- Soil sampling and analysis methods
- Air monitoring and analysis methods
- Exposure estimation
- **Risk estimation and evaluation**
- Remediation and risk management (briefly)
- Risk communication (very briefly)
- Appointment of consultants (very briefly)
- **Conclusions and recommendations**

Part 2

Managing the risks of asbestos in soil and made ground

Summary of conclusions 1

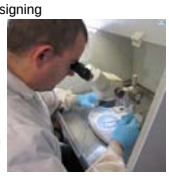
- **Historical legacy** at many redevelopment sites:
  - Wide-spread use of ACMs until they were fully banned in 1999.
  - Exact extent unknown
  - Demolition of any building constructed prior to 2000
  - Beware recycled soils and aggregates
  - Asbestos contamination expected in arisings from brownfield sites where buildings demolished or waste disposed of pre-1980s.
- **Health risks:**
  - Inhalation of asbestos causes **mesothelioma and lung cancers**
  - Robust epidemiology for high occupational exposures
  - less certainty about low-level exposures but there is strong evidence that low level exposure to asbestos poses a small, but real risk to health
  - Almost exclusively relate to the **inhalation** of airborne asbestos fibres
  - Risk ∝ cumulative exposure (fibre/ml.hours or as fibre/ml.years)
  - Potency: Crocidolite>Amosite>Chrysotile
  - **Remember the long latency of asbestos related disease**

Summary of Conclusions 2

- **Control of Asbestos Regulations 2012 (CAR)**
- applies to all site reconnaissance visits, site investigations and remediation projects where asbestos, ACMs or asbestos-containing soils will be disturbed.
  - CAR risk assessment
  - LW, NNLW, NLW
  - Information, instruction and training
- The expectations and standards for preventing and controlling exposure to asbestos have become ever tighter over the past 50 years and particularly since the 1980s. Developments in Europe suggest that standards will continue to tighten.
- Levels of asbestos contamination that might have been ignored in the past are now recognised as significant

Summary of conclusions 3

- The Preliminary Risk Assessment at all sites should consider asbestos as a potential contaminant of concern
  - Information also needed to comply with CAR, which assumes asbestos is present unless it can be proved otherwise
- Sampling and Analysis of Soil Samples
  - Health and safety risks need to be considered when designing the investigation
  - Analysis method must be fit for purpose, usually involves optical microscopy (PLM)
  - **CAR 2012 requires all analysis of soil to identify asbestos to be UKAS accredited**
  - Detection and quantification limits should be no more than 0.001%
  - Quantification may be needed for CAR risk assessment, soil risk assessment or waste classification
  - Do current methods provide the information needed for risk assessment?
    - Quantify each type of asbestos (as a percentage of total sample weight)
    - Describe state/weathering of ACMs (indication of risk of fibre release)



Summary of conclusions 4

- Monitoring and Analysis of Asbestos in Air
  - Outdoor vs indoor, occupational vs ambient
  - Monitoring and analysis must be in line with CAR and suitably accredited
  - To support a soil risk assessment, sampling and analysis methods may differ from those used for occupational hygiene (HSG248)
  - Detection limits for environmental and indoor air monitoring need to be in the order of 0.00001 f/ml to assess the risks from asbestos in soil to health of neighbours and building occupants
    - long sampling periods or "clever" analysis required
  - Electron microscopy methods are generally required to achieve the specificity and LoD needed for ambient air
  - Monitoring under dry conditions is needed if exposure estimates are to be derived. Monitoring in wet weather will produce very low concentrations in almost all situations.

Summary of conclusions 5

- Quantitative Exposure Estimation
  - Only necessary if a qualitative assessment suggests future potential health risks
  - Should include all reasonably likely exposures (indoor and outdoor)
  - Proper account should be taken of weather and ground conditions
  - Estimated airborne concentrations may be calculated from:
    - air monitoring data
    - 'fibre release potential' tests
    - soil concentrations using predictive modelling
    - Important to describe the limitations (uncertainty budget) for each method; therefore- "lines of evidence" approach

Summary of conclusions 6

- Risk Estimation and Evaluation
  - Only necessary if a qualitative assessment suggest future potential health risks
  - No suitable GAC for asbestos in soil
    - the hazardous waste criteria is not appropriate
    - 0.001% from ICRCL 64/85 is a level below which a risk assessment is likely to be simple.
    - Values from other countries need to be justified in a UK context
  - Currently, the most valid approach is to calculate the risk associated with predicted exposures using exposure-risk models, (e.g. ones based on Hodgson & Darnton 2000), but:
    - Extrapolation of such models over many orders of magnitude means that resulting risk estimates are indicative only and should not be used as accurate absolute values.
    - Decisions based on these risk estimates must take full account of the uncertainties involved
- A simple procedure for using the Hodgson and Darnton model to assess the risk from exposures to asbestos has been presented

Summary of conclusions 7

- **Remediation and management**
  - Health and safety risks need to be considered
  - Where permitted by the soil risk assessment, asbestos-containing soils may be left *in situ,* or reused following on-site treatment, but adequate documentation is needed to ensure exposure to such soils is suitably controlled in the future
  - Off-site disposal to landfill may be the only practical solution at some sites but will require compliance with the prevailing waste legislation and may be expensive
  - Careful verification is likely to be critical in maintaining public confidence
  - Care should be taken when importing soils and aggregates as asbestos is a common contaminant, even in certified materials. Test certificates should be checked to ensure the limits of quantification are appropriate.
  - Residual liability might be addressed using financial liability transfer mechanisms, such as insurances.
- **Risk communication**
  - Particularly important for asbestos

Wot, no 'SGV'?

- An SGV would be the amount of asbestos in the soil that would give rise to a minimal level of risk by inhalation
  - Depends on asbestos potency
  - Depends on minimal risk level
  - Depends on form of asbestos
  - Depends on release of airborne fibres
  - Depends on fibres inhaled
  - Depends on age of onset and duration of exposure

Recommendations

- The report makes 9 major recommendation to start to address the unknowns and uncertainties:
  1. Hazard classification of Asbestos-containing soils
  2. Guidance on LW, NNLW and NLW
  3. Adapting laboratory analytical reports to suit the purpose of quantitative site risk assessment
  4. Fibre releasability database of soils
  5. Commercial fibre release testing for site specific soil
  6. Current background concentrations of asbestos in air
  7. Utilising Dutch research on negligible risk levels
  8. Software implementation of models
  9. Appropriate record keeping on the presence of asbestos in soils

Hazard classification of asbestos-containing soils

- It is impossible to guarantee that the soils at any given site are completely free from asbestos.
  - At which sites does CAR apply
  - When should asbestos be a contaminant of concern?
- CAR applies where soils contain more than "trace" quantities of asbestos
  - What does this mean?
  - Which site investigations/redevelopments does CAR apply to?
- Will the risk increase as (bound) ACMs deteriorate?
  - Further research on deterioration of ACMs in soils would improve and may simplify the risk assessment.
- How do we screen out low risk sites where risks are acceptable?
  - a matrix or checklist approach, which would allow a "site score" to be produced from the desk study information and/or site investigations may be appropriate?
- Clear policy and guidance on these issues would significantly assist in facilitating sustainable developments.

Guidance on "licensable work" and "non-licensable work"

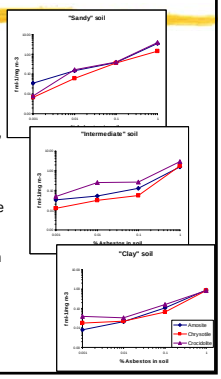
- Requirements for training, health surveillance, licenced contractors all add costs and complexity to development projects
- Existing guidance relates to ACMs in buildings; soils are excluded
- Expansion of HSE guidance to clearly and simply clarify the classification of activities involving asbestos-containing soils would be of significant assistance in facilitating sustainable developments.

Laboratory analysis and reporting

- Asbestos is unlike any other contaminants; there is no simple chemical test and concentration is not the only important metric
- Risk relates to the ability to release airborne fibres:
  - Type(s) of asbestos present
  - Type and condition of ACMs
  - Concentration of each type and form
- Changes to laboratory methods and/or reporting procedures are required to provide the detailed characterisation needed to inform an adequate risk assessment
- A range of methods is needed to allow consultants to schedule testing cost-effectively based on site-specific considerations

Fibre release database 1

- Addison et al (1988) provides some laboratory data correlating soil and air concentrations relative to soil dust in air concentrations
  - Pure loose asbestos fibres of each of three major types in varying concentrations (1%, 0.1%, 0.01%, 0.001%) - not bonded ACMs
  - "worst case" were dry soils - the condition which represents the greatest hazard
  - Effect of moisture content
  - Only 3 soil types – not representative of most made ground
- Important advantages of lab tests:
  - Concentrations of asbestos in soil accurately known
  - Condition of asbestos in soil accurately known
  - Condition of soil accurately known
  - Dilution conditions controlled by the experimenter
  - scaling from lab tests to sites can be based on airborne concentrations of soil dust.



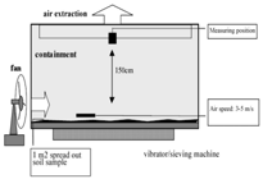
Fibre release database 2

- Report shows site measurements published from the Dutch RIVM
- Shows that airborne concentrations measured on site increase in proportion to the estimated asbestos content in soil
- Note that details in the RIVM report indicate that the site measurements were with "damping down" - therefore the data are not a guide to what will happen when the ground dries and activities (e.g. vehicular movements) take place without damping down

- **RECOMMENDATION**
- There is a need to expand the (lab and field) database to a wider range of soil types (including made ground and aggregates) containing a more representative range of ACMs and asbestos
- Full details of the methods, LoDs and atmospheric conditions, soil type etc would also be needed
- Would assist in deriving a robust estimate "acceptable" thresholds etc

Commercial "Fibre release tests"

- Rather than quantify asbestos in soils and estimate the release of airborne fibres would it be more appropriate to measure fibre release more directly?
- Such tests tend to be time consuming, costly and unlikely to be used routinely
  - Cf. Bioavailability testing
  - May be cost-effective at some sites?
- HSL offers one such test
- Further development and more widely available commercial tests may be advantageous
- Alternatively, non-commercial methods could be employed to populate the fibre release database



Current background concentrations in air

- What are the current background concentrations of asbestos in ambient air?
  - What risks do these pose to the general population?
- Are they higher or lower than those produced by asbestos-containing soils?
- There is little relevant contemporary UK data
- May be of importance to future defence of civil claims and for setting asbestos policy

Establishing "Negligible risk levels"

- The Dutch *chose* a "negligible risk" level intended to protect the population from long-term non-occupational environmental exposures to airborne asbestos
- No comparable values exist in the UK.
- The development of such *policy* values **might** greatly simplify the assessment of asbestos-containing soils and provide clarity regarding future liabilities

Availability of asbestos risk models

- Several exposure-risk models have been proposed in the literature
- Chapter 15 provides a ready reckoner
- But software to implement such predictions and explore the potential risk profile at different sites is not readily available – commercially or to academic researchers
- There may be value in having software available to the contaminated land community to facilitate site-specific soil risk assessments
- Although, the use of such software would still require significant scientific expertise and additional training for risk assessors.

Recording the presence of asbestos in soils

- The location of asbestos-containing soils needs to be recorded to ensure that subsequent disturbance is minimised
- For non-domestic properties this can be achieved in the H&S file or Asbestos register (which technically already applies to the entire premises not just the building)
  - There is lack of guidance to ensure that the information is recorded in a uniform manner and remains accessible
- There is no legal requirement or formal process for recording asbestos-containing soils at domestic (residential) properties, but these are likely to pose the greatest risks in the future.

Finally

- The guide provides a lot of information
- It should help those with duties and potential liabilities
- It should help protect those who work on sites with an asbestos-in-soil hazard
- It may be a step towards deriving more robust science-based policy on the management of asbestos-containing soils across the UK.