Asbestos in Soil

Issues & Solutions for Sustainable Remediation of Asbestos Contaminated Land

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What issues? The clue is in the title…

Work with

Asbestos

Regulated by the Health & Safety Executive

HSAWA 1974/Control of Asbestos Regulations 2006

Assessment, Remediation & Management of

Contaminated Land

Regulated by Local Authorities/Environment Agency

Planning/Part IIA EPA 1990/HWR 2005/Waste 2011/EPR 2007

Summary

Asbestos Hazard-Risk Assessment Framework

- **Background**
- **Hazard Assessment – identification and quantification**
- **Risk Assessment – understanding the numbers**
- **Remediation – what and how?**
- **Comment on Waste Code of Practice**
- **Examples & samples**
- **Concluding comments and EIC's work**

What's all the fuss about anyway?

Control of Asbestos Regulations – CAR 2006

- Category 1 carcinogen
- Reg 5 – identification of presence of asbestos
- Reg 6 – assessment of exposure to asbestos
- Reg 7 – plans of work
- Reg 8 – licensing of work with asbestos
- Reg 10 – information, instruction and training
- Reg 22 – health records and medical surveillance

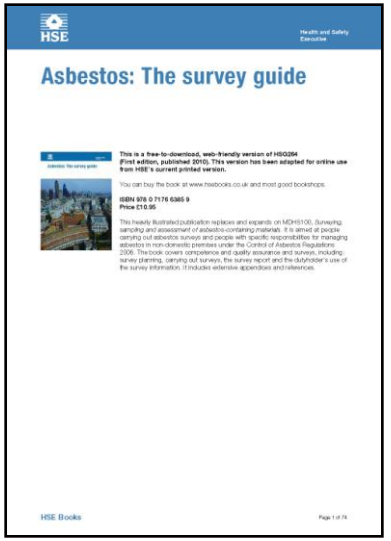
What's all the fuss about anyway?

Control of Asbestos Regulations – CAR 2006

- **Reg 16 – duty to prevent or reduce spread of asbestos**
- **Note: <u>asbestos</u> not <u>asbestos fibres</u>**
- **Significant commercial risk factors:**
  - HSE/EA/LA prosecution risk
  - Employers/Public Liability Insurance claims
  - Professional Indemnity Insurance claims
  - Adverse publicity

The view from above ground…

Compare Asbestos in Buildings



- Long-established regulatory framework
- HSG 248 Asbestos – The Analyst's Guide
- HSG 264 Asbestos – The Survey Guide
- UKAS accreditation of technical competence to BS EN ISO/IEC 17020:2004 (or ISO 9001 as a minimum)
- Individual competence demonstrated by BOHS P402 <u>& experience</u> or Certificate of Competence - Asbestos

British Occupational Hygiene Society

…and below ground?

"What do I do about asbestos?

We recognise ***asbestos is an important contaminant*** *on many sites but it doesn't fit within the standard CLEA methodology.* ***We are continuing our work to develop guidance*** *on assessing risks posed by asbestos contamination in soil however we have encountered some significant problems in getting the work to a consultation draft stage. We have had the guidance document reviewed and this has highlighted several areas that will need addressing prior to publication as a consultation draft.* ***This will be a high profile document*** *and must be 'fit for purpose' in terms of scope and usability.* ***We will need to find a level of consensus between experts before we release a draft for consultation.***"

(Environment Agency web site, 2010)

…and more recently?

What is the approach to asbestos?

"***We recognise that asbestos is an important contaminant but it is not consistent with the standard CLEA methodology.*** *We are working with the Construction Industry Research and Information Association (CIRIA) to develop further guidance in 2011/2012.*"

(Environment Agency web site, April 2011)

But, what about HSE's impending revision of HSG 248 – Asbestos: The Analyst's Guide?

Hazard Assessment for Contaminated Land

Site Investigation – Standard Approach…

- Consider objectives
- Desk study – historical contaminative uses
- Walk-over survey – current site conditions
- Intrusive investigation – trial pits, trenches & boreholes
- Laboratory analysis – UKAS/MCERTS accreditation
- Interpretation of data
- Consider objectives

Risk Assessment for Contaminated Land

QRA – quantitative risk assessment…

- CLEA – contaminated land exposure assessment model
- GAC – generic assessment criteria
- SGV – soil guideline values for long-term exposure
- HCV – health criteria values
- TOX reports

Environment Agency Position on Asbestos…

CLEA/SGV inappropriate...

"***Asbestos is different from most chemicals in that it is fibrous and only causes notable toxicity if fibres become airborne and are inhaled. Potential risks from asbestos in soil depend critically on its form and human [what about non-human?] activities, such as digging or vehicle movements, which might lead to release of fibres to air.***"

So, Give me a Number…

Revised Waste Framework Directive

- **Consolidated European Waste Catalogue**
- **>0.1% w/w asbestos not ACM's = Hazardous in following materials:**
  - 17 01 06 concrete, bricks, ceramics, tiles
  - 17 05 03 soil and stones
  - 17 05 05 dredging spoil
  - 17 05 07 track ballast

So, Give me a Number…

Revised Waste Framework Directive

- **Use HSG 264 for % asbestos in bulk ACMs, leads to…**
- **…Worst-case scenario – significant overestimate**
- **UKAS-accredited gravimetric analysis – ACMs only – but not for long!**
- **Limit of quantification 0.1%**
- **Inexpensive (at least initially anyway!)**

So, Give me a Number…

ICRCL 64/85 Asbestos on Contaminated Sites ('90)

- **>0.001% w/w asbestos (not ACM) = problem?**
- **Optical microscopy (Stereo/Polarised Light/PCOM)**
- **IOM TM/88/14 (1988)**
- **ACMs and free dispersed fibres**
- **Expensive (>£100/sample), detailed, long method!**
- **Restricted capacity – several UKAS accredited labs.**

Hazard Assessment for Asbestos…

Site Investigation

- Asbestos expected from desk study or not?
- Expect unexpected – made ground/covert/open burial
- Surface versus buried – consider sampling bias
- Extreme heterogeneity – consider SI technique
- Extreme heterogeneity – sampling error+++
- ACMs versus free fibres – where is the risk?
- Bound versus friable asbestos – where is the risk?

Hazard Assessment for Asbestos…

Site Investigation

- Know what we know and plan accordingly!
- Are we properly trained?
- Do we know what to look for – ACMs versus free fibres?
- Are we properly equipped?
- Are we properly insured?

Laboratory Analysis for Asbestos

Gravimetric w/w percentage asbestos in soil

- Cheap easy to obtain result (not for long!)
- Meaningless and difficult to interpret number
- How to relate hazard (ACMs) to risk (from respirable asbestos fibres)?
- How to effectively plan remediation (or do nothing) scheme without all necessary information

Laboratory Analysis for Asbestos

Asbestos Screening Analysis

- Laboratory screen on all samples to ensure lab. workers not exposed to asbestos
- UKAS prohibit reporting of asbestos result by default
- Asbestos present in ++samples not submitted for asbestos analysis
- >0.1% free, dispersed fibres without ACMs

Remediation of Asbestos in Soil

What is to be done?

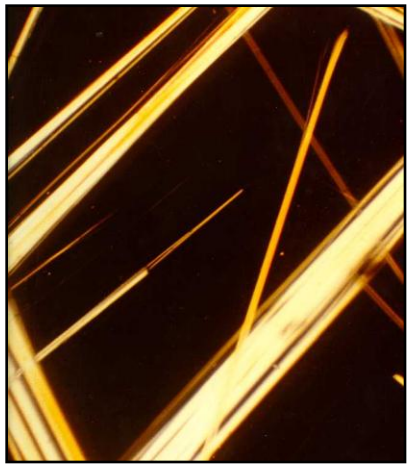
- How to effectively plan remediation (or do nothing) scheme without information on free fibre concentration
- What is the real level of risk from doing nothing – is what is present a real risk to human health?
- Uncertainty = remediate = cost £ £ £
- Excavation/disposal to hazardous waste landfill? £ £ £

Remediation of Asbestos in Soil

What is to be Done?

- Source segregation?
- Concentration of ACMs for disposal to hazardous waste landfill? -£ →-££→-£££
- Disposal of residue to non-hazardous waste landfill -££
- Containment/re-use of residue on site -££
- Consider free fibres!!!

Remediation of Asbestos in Soil

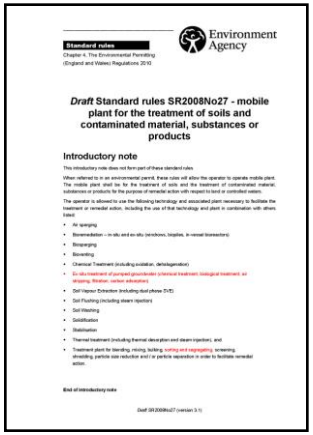


How is it to be Done?

- Consider free fibres!!!
- Bulk excavation/hand-picking of ACMs
- HSE-licensed asbestos removal contractor (expect the unexpected!) NB – EC challenge to UK!!!
- Implement on-site controls – CAR 2006
- But…

Remediation of Asbestos in Soil

Environmental Permitting Regulations 2010


Standard rules

Chapter 4, The Environmental Permitting (England and Wales) Regulations 2010

Environment Agency

Draft Standard rules SR2008No27 - mobile plant for the treatment of soils and contaminated material, substances or products

Introductory note

This introductory note does not form part of these standard rules.

When referred to in an environmental permit, these rules will allow the operator to operate mobile plant. The mobile plant shall be for the treatment of soils and the treatment of contaminated material, substances or products for the purpose of remedial action with respect to land or controlled waters.

The operator is allowed to use the following technology and associated plant necessary to facilitate the treatment or remedial action, including the use of that technology and plant in combination with others listed:

- Air sparging
- Bioremediation – in situ and ex situ (windrows, biopiles, in-vessel bioreactors)
- Bioslurping
- Bioventing
- Chemical Treatment (including oxidation, dehalogenation)
- Ex situ treatment of pumped groundwater (chemical treatment, biological treatment, air stripping, filtration, carbon adsorption)
- Soil Vapour Extraction (including dual phase (VE))
- Soil Flushing (including steam injection)
- Soil Washing
- Solidification
- Stabilisation
- Thermal treatment (including thermal desorption and steam injection), and
- Treatment plant for blending, mixing, bulking, sorting and segregating, screening, shredding, particle size reduction and / or particle separation in order to facilitate remedial action.

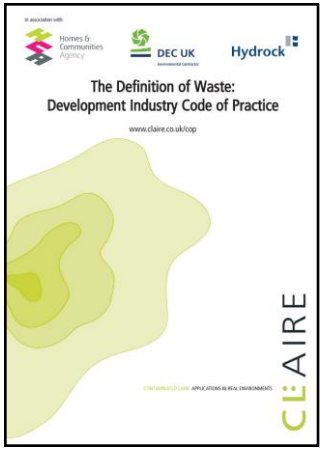
End of introductory note

Draft SR 2008No27 (version 3.1)

- **Standard Rules Permit SR2008No27 for land remediation…**
- **…using mobile plant for the treatment of soils and contaminated material, substances or products**
- **Environment Agency inconsistency – maybe/maybe not**
- **Regional/local discussion & position**

Waste Management Issues

CL:AIRE: Waste Code of Practice



- **Not contaminant specific**
- **No mention of asbestos**
- **Materials Management Plan - Implications of Asbestos**
- **Qualified Person - Implications**
  - Relevant Qualifications
  - Relevant Experience

Use of asbestos prohibited?

- **REACH revokes prohibitions in CAR 2006.**
- **REACH prohibits use of asbestos or any articles to which asbestos has intentionally been added.**
- **To maintain the incentives for waste recycling and recovery, wastes should not be regarded as substances, preparations or articles within the meaning REACH Regulation.**
- **Does this include "wastes" treated under the CL:AIRE CoP to become "recycled materials", i.e. not wastes but useable products/materials?**
- **Environment Agency publication RGN EPR13, Defining Waste Recovery: Permanent Deposit of Waste on Land appears to exclude the possibility of re-using treated asbestos-contaminated (treated/recovered) waste materials in permanent recovery operations by depositing them on land without an Environmental Permit.**

Case Study - A Tale of Three Samples

Sample 1 - contained cement, with a mass % asbestos above the hazardous waste limit, was calculated to have 22,356 respirable fibres/g.

Sample 2 - containing insulation (chrysotile only) was below the hazardous waste limit, but was calculated to have 265,937 respirable fibres/g.

Sample 3 - from a power station contained no ACM's, only loose fibres, was calculated to contain over 120 million respirable fibres/g.

Case Study - A Tale of Three Samples

Test	Units			
Total Mass% Asbestos (i+ii)	Mass %	**0.117**	**0.088**	**2.880**
Quantification by PCOM (i)	Mass %	<0.001	0.002	2.880
Gravimetric Quantification (ii)	Mass %	0.117	0.086	
Breakdown of Gravimetric Analysis				
Mass of Sample	g	12133.40	9259.82	
ACMs present*		Cement	Insulation	
Mass of ACM in sample	g	94.73	9.39	
% ACM by mass	%	0.78	0.10	
% asbestos in ACM	%	15	85	
% asbestos in sample	%	0.12	0.09	
Potentially Respirable Fibres	**fibres/g**	**22,356**	**265,937**	**120,435,951**

Case Study - A Tale of Three Samples

These results show that:

- **A simple quantification result not enough to assess risk**
- **Gravimetric analysis alone useless**
- **Risk not necessarily correlated to the amount of asbestos present**
- **Sample 3 is the most hazardous by far, and gravimetric analysis would have been unable to provide a result!**
- **Respirable fibres more useful in comparing relative risk**

Remediation of Asbestos in Soil

The big dichotomy…

- **>0.1% w/w ACM in soil (all asbestos cement fragments)**
  - hazardous waste
  - Low (potential) risk
- **<0.01% w/w ACM & free fibres in soil**
  - Non-hazardous waste
  - High (potential) risk

Remediation of Asbestos in Soil

The big dichotomy…

- **0.01 fibres/millilitre of air – limit of quantification of WHO method (PCOM) for background reassurance air monitoring**
- **0.0001 fibres/millilitre of air – urban ambient background concentration of asbestos in air (Supreme Court expert witness evidence)**

Samples on Display

Three samples of asbestos in various matrices

- **All three are >0.1% w/w**
  - 0.1% chrysotile (in cement)
  - 0.1% amosite (free fibres)
  - 0.1% crocidolite (free fibres)
- **Can <u>you</u> tell just by looking?**

Samples on Display

One sample of raw asbestos insulation:

- **0.1g amosite**
- **Processed material has low density**
- **Each fibre can split into millions of respirable fibres**

A View to the Horizon?

- Long-awaited EA guidance…
- …EA no longer actively developing guidance…
- …HSE resources cut…
- EU Asbestos Directive - challenge to UK Govt.
- Supreme Court judgement - March 2011
- Industry risk exposure – increasing^{+++}?
- EIC - Asbestos in Soil Working Group…

EIC Asbestos in Soil Working Group Aims

- to bring together the asbestos management, occupational hygiene and brownfield management sectors with the aim of promoting the development of a consistent and harmonised approach to the regulation, investigation, analysis, assessment and management of asbestos in soil.
- to promote and guide the development of practical comprehensive, non-statutory practitioner guidance on asbestos in soil that provides a consistent approach for UK industry, stakeholders and regulators.

EIC Asbestos in Soil Working Group Aims

- to promote and guide the development and uptake of a professional qualification framework for the brownfield and asbestos management sectors, building on the existing framework for the management of asbestos in buildings, and relevant statutory requirements.
- to engage with the HSE, the EA and representatives of Local Authority Contaminated Land Officers - with the aim of promoting a consistent, unified and transparent regime for the regulation of all aspects relating to the remediation of land contaminated by asbestos.

EIC Asbestos in Soil Working Group Aims

- **to promote and develop an improvement in public and stakeholder awareness of relevant issues, including *inter alia* health & safety, technical, legal and insurance, related to the occurrence of and investigation and remediation of asbestos in soil.**
- **to work with relevant organisations to achieve the above for the benefit of EIC members.**

Thank you for listening…

…questions will be taken at the end of the session

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