

The new 'Blue Book' method of asbestos analysis and implications for site development



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- Over 4000 people die of asbestos related diseases each year
- Asbestos is a Class 1 carcinogen
- Proven link with respiratory diseases: asbestosis, mesothelioma, bronchial carcinoma, pleural plaques (and recently ovarian cancer)
- Can remain latent for 15 – 40 years

Risk of asbestos on Brownfield Sites

- Buried asbestos uncovered during site clearance
- Site activity causes breakdown of bound ACM
- Airborne fibres generated from soil
- Carried on vehicle wheels
- Carried on clothing of site personnel

Respirable fibres

- The greatest risk to human health is from the respirable fibres, not the bound ACM
- Respirable fibres are defined as small fibres that can be inhaled into the lower regions of the lung, with the following dimensions:
- Longer than 5 μm , $<3 \mu\text{m}$ diameter, and have aspect ratios of at least 3:1

What limit should be considered an acceptable risk?

- HSE Control Limit for exposure to asbestos is 0.1 fibres/ml for a continuous average over a four hour period
- Addison et al (1988) 'The Release of Dispersed Asbestos Fibres from Soils showed that airborne fibre concentrations could be very high (> 20 f/ml), and even 0.001% of asbestos in a dry loose mixture was capable of producing airborne respirable asbestos concentrations in excess of the 0.01 f/ml clearance limit
- This value has never been ratified by any regulatory body

- Gross visual screening for ACM only – not acceptable to UKAS
- Detailed screening using a x 40/x80 standard optical microscope and remove fibrous material
- Identification of asbestos type by Polarising Light Microscopy (PLM) as per HSG 248
- Laboratories must be accredited to ISO 17025 for this analysis

Initial visual examination

- Spread out entire sample
- Examine for ACMs
 - Remove and dry for ID
- Subsample soil for ID
 - Dried for ID

Stereomicroscopy

Dried sample examined at x40 – x80

Suspect fibres removed for PLM

Polarised Light Microscopy

Place fibre in RI Liquid

Observe a range of fibre characteristics

- Polarised Light Microscopy (PLM) – crossed polars
- Birefringence: “The numerical difference between the highest and lowest Refractive Index of a mineral”, visible as interference colours.
- Extinction: Fibres disappear from view or ‘extinguish’ at four positions each 90° apart.
- Most fibres extinct when parallel with polariser or analyser
- Actinolite and Tremolite have slight ‘angle’ of extinction.
- Elongation: Relationship between fibre shape and optical properties
- Length Slow: The slow ray of the mineral is parallel with the length of the mineral
- All asbestos fibres are length slow apart from Crocidolite



- Quantification of ACM only by gravimetric measurement to 0.1%
- Quantification of smaller ACM and fibre bundles by gravimetric to 0.001%
- Quantification by dispersion and fibre measurement using Phase Contrast Microscopy (PCM) - dispersed fibres - to 0.001%
- SEM or TEM - limited commercial availability
- Fibre release test - very limited commercial availability, time consuming and expensive
- Respirable fibres in respirable dust - NEW

- Dispersed Free Fibres
- Fibre counting and sizing
- Portion of fine fraction mixed with water
- Aliquots removed and filtered
- Filter dried and cleared using acetone
- Filters evaluated at x500 – x600 magnification
 - Non-asbestos fibres discriminated using modified PCOM
 - Asbestos fibres measured (length and width)
 - Calculate mass of each fibre
 - Calculate mass % in sample

- Identification
 - Annual UKAS assessment
 - AIMS External QC scheme
 - Run by HSL
 - Quarterly
- Quantification
 - Annual UKAS assessment
 - AISS External QC scheme
 - Run by HSL
 - Four rounds so far (plus pilot round)
 - Limited number of labs participating

- The industry has difficulties with knowing what to do on site, best practice for sampling, which tests should be requested, and interpretation of the data.
- There is significant variation in laboratory testing methods for quantification of asbestos.
- So what is the industry doing about this?

- An updated version of HSG 248 The Analysts guide for Sampling, Analysis and Clearance procedures, (HSE 2005) is in progress.
- Draft version now available
- Dr Martin Gibson of HSE is responsible for this update

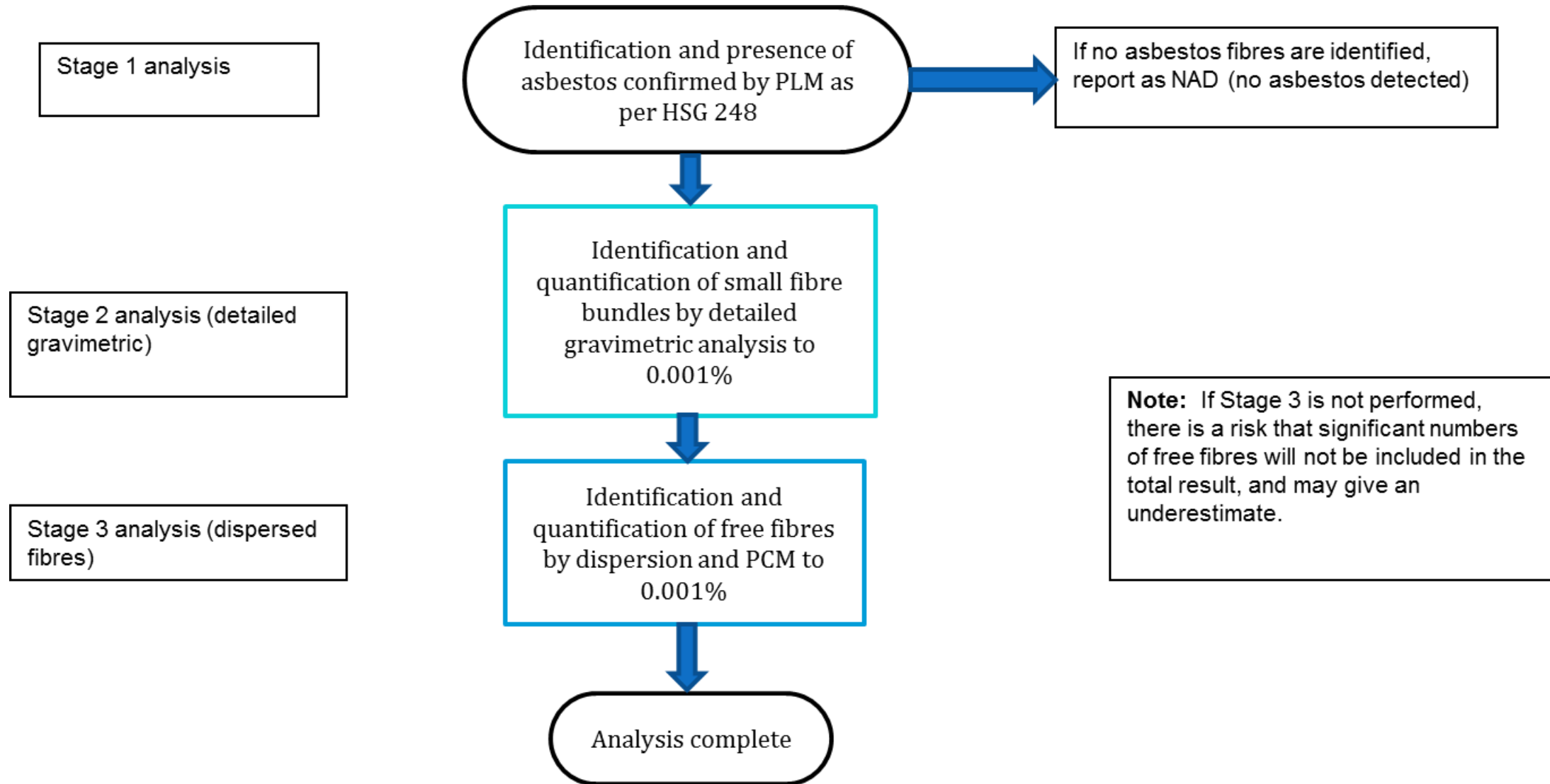
- EIC (Environmental Industries Commission) asbestos subgroup set up in 2010
- CIRIA PSG set up in Jan 2012 after appointment of contractor (LQM & IOM) to produce clients' guide
- The document (200+ pages) was published March 2014: 'Asbestos in soil and made ground: a guide to understanding and managing the risks'
- Comprehensive document, and highlighted areas where more information was required

- Joint Industry Working Group (JIWG) set up in Nov 2011
- Secretariat by CL:AIRE, and chaired by Steve Forster of IEG Technologies, - their aim is to build on the CIRIA document and produce a CoP by the end of 2015
- Representatives on the PSG from consultants, landowners, lawyers, developers, labs, the regulators and insurers
- Working closely with the regulators – EA, DEFRA, HSE and UKAS

- Additional information to be provided in the CoP:
- Background levels of asbestos in 400 soils
- Information on fibre release rates from a wide range of soil types and asbestos concentrations
- An algorithm helping to predict risk from any particular site
- A recommended, robust method for identification and quantification of asbestos in soils

- Blue book methods
- Also known as MEWAM – methods for the examination of water and associated materials
- Written by the Standing Committee of Analysts (SCA) – several working groups
- Published by the Environment Agency, currently still on their website
- Over 200 methods, widely recognised by industry and the regulators
- Far more methods for water, but solids working group set up in 2001

- Stage 1: Identification – HSG 248 the Analyst’s guide for Sampling, Analysis and Clearance Procedures (2005)
- Stage 2: Quantification – gravimetric for ACM and fibre bundles
- Stage 3: Quantification – dispersion, followed by measurement and counting using PCM for dispersed free fibres
- Laboratories should be accredited to ISO 17025 for this method as each stage involves some fibre discrimination, but so far, this is not mandatory



- Standardisation of Laboratory Approach
- Standardisation of Output
- Assurance of Quality & Robustness of Results.