

## **Asbestos Bulk Analysis**

January 2014

**18 Guided Learning Hours**  
**3 Prior Learning Hours**

### **Description**

The *Control of Asbestos Regulations* impose duties on every organisation who analyses samples for the identification of asbestos to be accredited by UKAS for this activity.

Laboratory analysts will need to be able to analyse and identify asbestos from within samples collected out on site in accordance with the procedures described in HSG248. Possession of this qualification by staff will help organisations and companies meet the accreditation criteria for ISO17025 (testing bodies).

The qualification is divided into three units:

**Unit One: Asbestos types, uses, health effects and legislation**

**Unit Two: Theory of asbestos bulk analysis**

**Unit Three: Perform bulk analysis of asbestos samples**

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# Unit One: Asbestos Types, Uses, Health Effects & Legislation

## Summary of Learning Outcomes:

### To achieve this unit a candidate must:

1. **Know the health risks, uses and properties of asbestos**, *by being able to meet the following assessment criteria:*
  - 1.1 State the properties and characteristics of different types of asbestos.
  - 1.2 Review the types and uses of asbestos containing products.
  - 1.3 Explain the risks to health of asbestos.
  
2. **Review legislation relating to asbestos**, *by being able to meet the following assessment criterion:*
  - 2.1 Summarise legislation relating to the control and use of asbestos.

### Content:

#### 1 Know the health risks, uses and properties of asbestos

- 1.1 *Properties and characteristics of the different types of asbestos:* Crocidolite (blue asbestos), chrysotile (white asbestos) amosite (brown asbestos), actinolite, anthophyllite and tremolite, to include fibre size and shape, biopersistence, friability and solubility.
- 1.2 *Types and uses of asbestos containing products:* Asbestos contents, extent of use, reasons behind use, different fibre properties and resistances, materials asbestos was used with: sprayed coatings; lagging; insulating boards; ropes and yarns; cloth; millboard, paper and paper products; asbestos bitumen products; asbestos cement products; flooring; textured coatings and paints; mastics, sealants, putties and adhesives; reinforced plastics; plugging compounds; domestic appliances, plant and machinery, asbestos contamination in other products.
- 1.3 *Risk to health:* Asbestos related diseases: mesothelioma; asbestosis; lung cancer; risk of developing disease, including risks from low level exposures; induction or latency periods; levels of exposure to asbestos fibres; purpose of, and reasons for, asbestos control limits, clearance indicator levels and peak exposure levels.

#### 2 Review legislation relating to asbestos

- 2.1 *Legislation:* main points of the following Acts and Regulations that are relevant to asbestos **or any superseding legislation**; Health and Safety at Work etc. Act 1974, Management of Health and Safety at Work Regulations 1999, Control of Substances Hazardous to Health Regulations and amendments,

Control of Asbestos Regulations 2012, Construction (Design and Management) Regulations 2007, Hazardous Waste (England & Wales) Regulations 2005, duties of employers in control of workplaces; legal status of Approved Codes of Practise, HSE regulations and guidance notes.

## Unit Two: Theory of asbestos bulk analysis

### Summary of Learning Outcomes:

To achieve this unit a candidate must:

1. **Know how polarised light microscopy can be used in the identification of asbestos fibres**, *by being able to meet the following assessment criteria:*
  - 1.1 Describe the effect of polarised light on vitreous, crystalline and amorphous materials.
  - 1.2 State the features of asbestos fibres that allow them to be identified by polarised light microscopy.
  - 1.3 Identify equipment required for the identification of asbestos fibres by low power stereo and polarised light microscopy.
  - 1.4 Outline the use of refractive index liquids in asbestos analysis.
  - 1.5 Describe the methods used for sample preparation
  
2. **Understand factors that may prevent the identification of asbestos fibres by polarised light microscopy**, *by being able to meet the following assessment criteria:*
  - 2.1 Explain how some materials can be mistaken for asbestos fibres by polarised light microscopy.
  - 2.2 Identify procedural errors that may result in failure to accurately identify asbestos fibres.
  - 2.3 Outline quality control procedures.
  - 2.4 Outline limits of detection for the PLM method as described in HSG 248
  
3. **Know safety requirements for the use of polarised light microscopy in the identification of asbestos fibres**; *by being able to meet the following assessment criteria:*
  - 3.1 Outline procedures for maintaining safety during asbestos analysis.

## **Content:**

### **1 Know how polarised light microscopy can be used in the identification of asbestos fibres**

- 1.1 *Effect of polarised light on vitreous, crystalline and amorphous materials:* how polarised light can be used in the identification of vitreous, crystalline and amorphous materials by observations of colour, pleochroism, birefringence and signs of elongation and extinction; outline of physics governing polarised light and polarised light microscopy.
- 1.2 *Features of asbestos fibres that allow them to be identified by polarised light microscopy:* Identification of asbestos fibres by polarised light microscopy; colour, appearance, elasticity and morphology of different asbestos fibre types; how to recognise the hydrophobic and hydrophilic properties of asbestos fibres by polarised light microscopy.
- 1.3 *Equipment required for the identification of asbestos fibres by low power stereo and polarised light microscopy:* Types of microscopes and optics used, fume cabinets, hot plates, H Type Vacuum cleaners; reasons for use; standards required of equipment.
- 1.4 *Use of refractive index liquids in asbestos analysis:* Use of these reagents for the identification of asbestos fibres by observation of Becke line and dispersion colours; materials and equipment required; expected observations and results with different asbestos types.
- 1.5 *Sample preparation techniques:* Including crushing, acid washing or treatment, use of organic solvents to remove bitumen or plastic matrices, low temperature ashing.

### **2 Understand factors that may prevent the identification of asbestos fibres by polarised light microscopy**

- 2.1 *How some materials can be mistaken for asbestos fibres by polarised light microscopy:* other fibre types that may display similar properties to asbestos when observed by polarised light microscopy such as cob webs, leather, swarf, skin cells, polyethylene; difficulties with certain samples such as floor tiles and textured coatings; how the effect of heat such as fire damage to asbestos can affect identification.
- 2.2 *Procedural errors that may result in failure to accurately identify asbestos fibres:* inadequate sample size, non-homogenous and trace content samples, analyst fatigue, eye strain, detection limits, cross contamination during sampling and analysis, handling of samples.
- 2.3 *Quality control and quality assurance procedures:* Internal quality procedures, UKAS requirements, sample storage, AIMS.

2.4 *Outline limits of detection for PLM method:* Appreciation that the method is qualitative and not quantitative; reporting restrictions on analytical reports.

**3 Know safety requirements for the use of polarised light microscopy in the identification of asbestos fibres**

3.1 *Procedures for maintaining safety during asbestos analysis:* use of fume cabinets to include flow rates and servicing of cabinets; glove boxes, safe use of chemicals for sample preparation, safe use of refractive index liquids.

## Unit Three: Perform bulk analysis of asbestos samples

### Summary of Learning Outcomes:

To achieve this unit a candidate must:

1. **Carry out preparatory procedures for identifying asbestos fibres by polarised light microscopy, by being able to meet the following assessment criteria:**
  - 1.1 Prepare samples for polarised light microscopy.
  - 1.2 Set up a polarising microscope for use.
  
2. **Carry out polarised light microscopy for the identification of asbestos fibres, by being able to meet the following assessment criteria:**
  - 2.1 Identify asbestos fibre characteristics by the use of PLM.
  - 2.2 Demonstrate the use of refractive index liquids in the identification of asbestos fibres.
  
3. **Carry out appropriate health and safety procedures in the analysis of asbestos samples, by being able to meet the following assessment criteria:**
  - 3.1 Ensure that all analytical procedures are performed safely.
  - 3.2 Use appropriate PPE during analytical procedures.

### Content:

- 1 **Carry out preparatory procedures for identifying asbestos fibres by polarised light microscopy**
  - 1.1 *Prepare samples for polarised light microscopy:* Examination under low power stereo microscope, fibre selection, fibre extraction from materials, sample preparation methods including use of acids and solvents.
  - 1.2 *Set up a polarising microscope for use:* use and set-up of Koehler or Koehler type illumination; alignment and use of the rotating stage, polarisers and eyepieces, field and sub-stage diaphragms, phase and dispersion objectives.
  
- 2 **Carry out polarised light microscopy for the identification of asbestos fibres**
  - 2.1 *Identify asbestos fibre characteristics by the use of polarised light*



*microscopy*: identification of fibres by their characteristics (morphology and colour); pleochroism and birefringence (interference colours); signs of elongation and extinction of different asbestos types.

2.2 *Demonstrate the use of refractive index liquids in the identification of asbestos fibres*: Becke line and dispersion colours using refractive index liquids and dispersion objective; assessment of refractive indices of asbestos fibres, refractive indices of similar fibres, use of phase contrast for assessment of refractive index.

### **3 Carry out appropriate health and safety procedures in the analysis of asbestos samples**

3.1 *Ensure that all analytical procedures are performed safely*: Safe systems of work and risk assessments complied with during analytical procedures.

3.2 *Use appropriate PPE during analytical procedures*: Appropriate personal protective equipment used during analytical procedures and handling of chemicals

**Assessment:**

Attainment of the Learning Outcomes for Units 1 and 2 will be assessed by an examination consisting of 25 short-answer questions to be answered in one hour and fifteen minutes. The examination paper will be divided into two sections, one section for unit 1 (10 questions) and one section for unit 2 (15 questions). A candidate who is able to satisfy the learning outcomes must achieve a score of at least 60% for **EACH** unit in the examination.

Attainment of the Learning Outcomes for Unit 3 will be assessed by a practical assignment which will include tasks for each of the assessment criteria for these units.

Part of the assignment comprises the analysis of 6 No. AIMS samples.

In order to be awarded the certificate candidates must achieve the learning outcomes for all units.

## Guidance:

| Recommended Reading & Additional Reading                                                                                                              | Qualification |          |                 |            |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|-----------------|------------|---------------|
|                                                                                                                                                       | Analyst       | Surveyor | Project Manager | Dutyholder | Bulk Analysis |
| Asbestos - The Analyst's Guide for Sampling, Analysis and Clearance Procedures (HSG248) HSE 2005                                                      | ✓             | ✓        | ✓               | ✓          | ✓             |
| HSG247 Asbestos: The Licensed Contractors Guide HSE 2006                                                                                              | ✓             |          | ✓               | ✓          |               |
| Asbestos and Man-Made Mineral Fibres In Buildings. Practical Guidance Thomas Telford 1999                                                             |               | ✓        |                 |            |               |
| Asbestos Essentials - Task Manual Task guidance sheets for the building, maintenance and allied trades. (HSG 210) HSE 2012                            | ✓             |          | ✓               | ✓          |               |
| Introduction to Asbestos Essentials comprehensive guidance on working with asbestos in the building maintenance and allied trades. (HSG 213) HSE 2001 | ✓             |          | ✓               | ✓          |               |
| HSG264 Asbestos: The Survey Guide HSE 2012                                                                                                            |               | ✓        |                 | ✓          |               |
| HSG189/2 Working with asbestos cement HSE 1999                                                                                                        | ✓             |          | ✓               | ✓          |               |
| Work with Materials containing Asbestos, Approved Code of Practice (L143) HSE 2006                                                                    | ✓             | ✓        | ✓               | ✓          | ✓             |
| HSG53 The selection use and maintenance of respiratory protective equipment HSE 1998                                                                  | ✓             | ✓        | ✓               |            |               |
| MDHS59 Man-made mineral fibre by phase contrast light microscopy HSE 1988                                                                             | ✓             |          | ✓               |            |               |
| Lab 30 – Application of ISO/IEC 17025 for Asbestos Sampling and Testing Edition 2 2008                                                                |               |          | ✓               |            |               |
| RG8 - Accreditation of Bodies Surveying for Asbestos in Premises Edition 2 2008                                                                       |               | ✓        |                 |            |               |
| Asbestos for Surveyors (W. Sanderson) Estate Gazettes 2 <sup>nd</sup> edition (2007)                                                                  |               | ✓        |                 |            |               |
| A Comprehensive Guide to Managing Asbestos in remises (HSG 227) HSE 2002                                                                              |               | ✓        |                 | ✓          |               |
| Asbestos: RICS Guidance Note: Implications for members and their clients. RICS Books 2003                                                             |               |          |                 | ✓          |               |
| The Management of Asbestos in Non-Domestic Premises (L127) HSE 2006                                                                                   |               | ✓        |                 | ✓          |               |
| Managing health and safety in construction; Construction (Design and Management) Regulations 2007; ACOP & Guidance, (L144) HSE 2007                   |               |          | ✓               | ✓          |               |
| How Are You Managing? - Dealing with the Risks of Asbestos in Buildings (DVD)                                                                         |               |          |                 | ✓          |               |
| Managing Asbestos in Buildings: A Brief Guide. INDG223 HSE 2012                                                                                       |               | ✓        |                 | ✓          |               |
| Hazardous Waste Regulations 2005                                                                                                                      | ✓             |          | ✓               | ✓          |               |

Note that many of the HSE publications are available as free downloads from the HSE web-site at <http://www.hse.gov.uk/pubns/books/index-catalogue.htm>

The following web-sites also have useful information:

Asbestos Testing and Consultancy Association [www.atac.org.uk](http://www.atac.org.uk)

Asbestos Removal Contractors Association [www.arca.org.uk](http://www.arca.org.uk)

Health and Safety Executive [www.hse.gov.uk](http://www.hse.gov.uk)

Royal Institution of Chartered Surveyors [www.rics.org.uk](http://www.rics.org.uk)

### ***Special Needs:***

Centres that have candidates with special needs should consult The Society's *Regulations and Guidance for Candidates with Special Assessment Needs*, this is available from The Society and The Society's web site ([www.rsph.org.uk](http://www.rsph.org.uk)).

### **Recommended Qualifications and Experience of Tutors:**

The Society would expect that tutors have teaching experience and a qualification in a relevant subject area, but recognises that experienced teachers can often compensate for a lack of initial subject knowledge, or experienced practitioners for a lack of teaching experience.

The Society recommends that centres utilise a team of tutors in the delivery of this qualification, and that at least one tutor has suitable practical experience in the analysis of asbestos samples by polarised light microscopy within the previous five years.

Centres should be registered with The Society.

Any enquiries about this qualification should be made to:

The Qualifications Department  
Royal Society for Public Health  
John Snow House  
59 Mansell Street  
London  
E1 8AN

Tel. 020 7265 7350  
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