BOHS
British Occupational Hygiene Society

The Chartered Society for Worker Health Protection

P401 Proficiency Qualification

Identification of Asbestos in Bulk Samples by PLM

Course Syllabus

www.bohs.org

Version 1 | February 2022

Proficiency Module Syllabus

P401 – Identification of Asbestos in Bulk Samples by PLM

Teaching Aims

To provide candidates with the theoretical knowledge and practical ability to undertake safe sample handling methods and the analysis of bulk samples for the presence of asbestos using the PLM method.

Prior Knowledge and Understanding

Candidates for this course are expected to be aware of HSG 248 Asbestos: The Analysts' Guide (July 2021), and in particular Appendix 2: Determination of asbestos in bulk materials. Candidates will preferably have prior experience of analysing bulk samples and may already be participating in a quality control scheme.

In addition, candidates are expected to have had training to cover the core competencies outlined within the foundation material detailed within Table A9.1 of HSG248 Asbestos: The Analysts' Guide (July 2021). This may be achieved by In -house learning or through the P400 foundation module.

Learning Outcomes

On completion of this module, the candidate will be able to demonstrate the correct method for:

- Preparing and pre-treating samples of bulk material
- Extracting fibres and mounting in appropriate refractive index Cargille liquids
- Setting up the polarised light microscope and required quality checks
- Analysing samples and providing results on the asbestos fibres present

Content

The syllabus is structured into five sections:

		Time Allocation
1	**Asbestos fibre types and asbestos containing materials**	**15%**
2	**Sample preparation and preliminary assessment**	**30%**
3	**Setting up of the polarised light microscope and analysis of samples**	**40%**
4	**Certificates and reporting results**	**5%**
5	**Quality control**	**10%**

Note:
Reference is made in this syllabus to HSE guidance and other documentation. This list may not include the most up-to-date relevant publications from HSE and other sources and is intended as guidance for candidates only.

1 Asbestos Fibre Types and Asbestos Containing Materials (15%)

This section will provide suitable training and review of relevant documentation to ensure that the candidate understands the legal framework, legislation, and guidance pertinent to bulk analysis. Training should ensure that candidates understand the purpose of their role and the importance of accurate identification.

This section will also provide suitable theoretical knowledge and practical training to ensure that the candidate understands the fundamental differences between different asbestos types and the properties associated with them.

Candidates must be aware of how these properties have influenced the usage and application of asbestos products.

In order to achieve this the candidate must be able to learn and then demonstrate their ability in the following:

1.0.1 Understanding the specific requirements of HSG248, CAR 2012, L143 ACOP with emphasis on the responsibilities and legal duties of all roles involved.

Understanding their individual duties under Health and Safety at Work Act 1974 to carry out their work diligently so as not to create danger to themselves or to others.

1.0.2 Sufficient knowledge of the relevant parts of other key pieces of legislation including COSHH 2002 & HWR2005 and understand how these legal requirements influence working practices within bulk analysis laboratories.

1.0.3 Suitable understanding of why correct and accurate analysis of asbestos is essential; this should include the implications for getting this wrong.

1.0.4 Understanding the 6 named types of asbestos and the differences between the regulated asbestiform (fibrous) and non-fibrous mineral formations.

1.0.5 Understanding the key characteristic properties of all the asbestos types.

1.0.6 Identifying the specific properties of different asbestos types including differences between amphibole and serpentine asbestos.

1.0.7 Understanding how the key characteristics and properties have influenced the use of asbestos.

1.0.8 Suitable knowledge of the range of asbestos products and the likely asbestos types and quantities that were included within their manufacture.

1.0.9 Suitable knowledge of instances where asbestos contamination of other minerals / products can be encountered.

2 Sample Preparation & Preliminary Assessment (30%)

This section will provide suitable theoretical knowledge and practical training to ensure that the candidate is capable of undertaking the safe preparation and

preliminary assessment of bulk samples and for them to accurately interpret any observations made.

In order to achieve this the candidate must be able to demonstrate both their knowledge and practical ability in the following:

2.0.1 Undertaking preliminary analysis of samples by low power stereo microscope.

2.0.2 A full and detailed understanding of the safety precautions required when working with asbestos to control the spread and to prevent exposure, this should include:

- Pre and post-work checks
- Handling of samples
- Use of fume / re-circulating ventilated cabinets
- Cleaning regimes

2.0.3 Understanding the potential for cross contamination issues to arise and how to control this risk.

2.0.4 Understanding the safety measures and procedural requirements required to ensure compliance with the COSHH regulations.

2.0.5 Understanding the basic morphological properties of the different asbestos types and the importance of initial observations for selecting appropriate RI liquids.

2.0.6 To be able to identify and segregate fibres from a range of different sample types. To understand the range of mechanical and chemical sample preparation options available as detailed within HSG248.

2.0.7 To be able to prepare slides for PLM analysis.

2.0.8 To be able to undertake the water absorption test and interpret the findings and to understand the importance and implications for the results of this test.

2.0.9 Understanding what information should be recorded during sample preparation including the use of timings / durations where appropriate.

2.0.10 Understanding the additional information that should be recorded such as insufficient sample size, layered or composite samples including the criteria for reporting trace asbestos content.

3 Setting up of the polarised light microscope and analysis of samples (40%)

This section will provide suitable theoretical knowledge and practical training to ensure that the candidate is capable of, understanding the optical microscopy techniques involving polarised light, applying this theory to the identification of asbestos, and setting up and using a polarised light microscope.
Candidates must be aware of a range of other fibre types and materials which can pose difficulties during bulk analysis.

In order to achieve this the candidate must be able to demonstrate both their knowledge and practical ability in the following:

3.0.1 Understanding the minimum equipment specifications necessary for polarised light microscopy and the additional components required for analysis of asbestos.

3.0.2 To be able to correctly set-up of the microscope and alignment of its component parts including the process for Koehler illumination.

3.0.3 Understanding the theory of polarised light and the effects on crystalline and amorphous materials.

3.0.4 To be able to explain the differences between isotropic and anisotropic materials.

3.0.5 To have a basic understanding of the physics behind refractive indices, colour and pleochroism, extinction, birefringence, and sign of elongation.

3.0.6 To be able to demonstrate how the theory above can be applied to analysing asbestos samples and how the observed visual differences between fibre types can be interpreted.

3.0.7 To be able to demonstrate the use and effects of refractive index liquids, the use of the Becke line, observed relief and dispersion observations.

3.0.8 To be able to demonstrate appropriate recording of observations during analysis.

3.0.9 Understand and be able to demonstrate the processes and combination of observations that lead to both negative and positive identification of all types of asbestos.

3.0.10 Understanding the strengths and weaknesses of the PLM method (including limit of detection) for identifying asbestos and difficulties that can occur during analysis.

3.0.11 Understanding the factors that can lead to unexpected and indeterminable results and the effects of the following on accurate analysis:

- Sample / fibre sizes
- Asbestos content of samples
- Interfering matrices
- Heat / fire / chemical damage
- Similar asbestos types
- Mineral variations

3.0.12 To obtain sufficient knowledge of other types of fibres and mineral formations that may interfere with asbestos identification and to understand how these can be differentiated from asbestos.

3.0.13 To have a basic understanding of alternative methods that are available for analysis.

3.0.14 To understand the requirements outlined in this qualification are not appropriate (on their own) to determine the asbestos content of soil samples.

4 Certificates and reporting results (5%)

This section will provide suitable theoretical knowledge and practical training to ensure that the candidate is capable of producing a certificate of bulk analysis and communication of the results.

In order to achieve this the candidate must be able to demonstrate both their knowledge and practical ability in the following:

4.0.1 The requirements of ISO 17025 and HSG 248 for the production of test reports to ensure that all required information is included.

4.0.2 Understanding the importance and significance of producing accurate and adequate information within certificates.

4.0.3 To be able to complete a bulk certificate of analysis based on information available and analysis undertaken.

5 Quality Control (10%)

This section will provide suitable theoretical knowledge and practical training to ensure that the candidate has suitable knowledge and understanding of quality control requirements.

In order to achieve this the candidate must be able to demonstrate both their knowledge and practical ability in the following:

5.0.1 Understanding the importance and frequency of air monitoring, including background testing and personal testing for bulk analysts.

5.0.2 Understanding the importance and operation of both internal sample libraries and the external proficiency scheme AIMS.

5.0.3 Understanding the requirements governing minimum durations for sample analysis.

5.0.4 Understanding the factors associated with fatigue and eye strain and the measures taken to control these risks.

5.0.5 To understand, and be able to calculate, daily limits for individual analysts and the requirements for quality checks on work exceeding these limits.

5.0.6 Understanding the need for internal working systems procedures and the processes to determine initial and ongoing competence of individual analysts.

5.0.7 Understanding the checking and maintenance regimes for essential equipment and materials used for bulk analysis.

5.0.8 To understand where feedback should be provided to those who provide samples for analysis.

References and Further Reading

(1) HSG248 (July 2021) Asbestos: The Analysts' Guide
(2) Control of Asbestos Regulations (CAR) 2012
(3) L143 (2013) Managing and working with asbestos. Control of Asbestos Regulations 2012, Approved Code of Practice and Guidance
(4) ISO 17025 (2017) General requirements for the competence of testing and calibration laboratories
(5) Asbestos and man-made mineral fibres in buildings: Practical Guidance, Thomas Telford DETR (1999)

Course Length

This course will require at least **18** hours of study time, of which **14** hours will be taught (teaching and practical assessment) and **4** hours will be independent (in the candidates' own time).

Examinations and Assessment

Candidates are required to pass all of the following parts (A, B and C below) to be awarded this qualification.

A The Practical Assessment

The practical assessment must be carried out by the Tutor during the relevant part of the course for all candidates. This is to ensure that every candidate can demonstrate their individual ability and correct method for:

- Working safely at a fume cupboard whilst using a stereo microscope to examine samples
- Correctly preparing slides for examination under a polarising microscope
- Setting up a polarising microscope to allow identification of asbestos types within a sample

Further information about the practical assessment is published in the P401 Practical Assessment and Examination Guidance document.

B Written Examination

This is an open book examination comprising of approximately 30 (100 marks) short-answer questions, with variable marks, illustrated by photographs and diagrams, as appropriate, to be answered in 90 minutes.

The examination covers **ALL** sections of the syllabus in proportion to the time allocation given on the front page of the syllabus and is overseen by a BOHS invigilator.

The overall pass mark is 55% with a requirement to reach at least 45% of the available marks in each section of the syllabus.

Further information is available in the P401 Examination Guidance document.

C Practical Examination

This is an open book practical examination with a time allowance of 4 hours, which requires candidates to identify the asbestos types in six samples. The samples are from the AIMs scheme, provided to BOHS by HSL.

Candidates are permitted to access relevant hard copy reference material only. Communication between candidates is not permitted. The examination is overseen by a BOHS specialist invigilator who will confirm suitability of the facilities.

Further information about the practical examination and its marking schedule is published in the P401 Practical Assessment and Examination Guidance document.

Certification

Candidates who pass all the parts (A, B and C) within 12 months will be awarded a Proficiency Certificate in:

(P401) Identification of Asbestos in Bulk Samples (PLM)

Related Courses

Further courses which would be beneficial to candidates following this career path:

- P401 Identification of Asbestos in Bulk Samples (PLM) Refresher at appropriate intervals
- P402 Surveying and Sampling Strategies for Asbestos in Buildings
- P402RPT Report Writing for Asbestos Surveys
- P403 Air Sampling and Fibre Counting (PCM)
- P404 Clearance Testing and the Requirements of a Certificate for Reoccupation
- P405 Management of Asbestos in Buildings