Section 6

Syllabus

The qualification is structured into six sections, each with an indicative time allocation:

Section		Time allocation
1	Controlling health risks	5%
2	Sample handling and waste disposal	5%
3	Identification of asbestos by PLM	15%
4	Gravimetric quantification of asbestos-containing materials	15%
5	Discrimination and quantification of free fibres by dispersion and PCM	10%
6	Analysis of soils - practical application	50%

1. Controlling health risks (5%)

Learning outcomes
Candidates should understand the precautions that must be taken to control the risks to health arising from the analysis of soil. In particular, they should be able to:

1.1 Identify and evaluate the potential contaminants in samples of soil.

1.2 Explain the precautions that must be taken when working with samples of soil.

1.3 Describe how control systems are managed.

1.4 Compare and contrast the risks to health caused by the analysis of soil to the risks caused by the analysis of bulk samples.

Content
The course should include:

1.1 The possible contaminants in samples of soil, including asbestos-containing materials, free asbestos fibres and other chemical and biological hazards such as organic solvents. The relative risk to health presented by the contaminants, such as the potential for the release and inhalation of free asbestos fibres from dry soil.

1.2 The use of appropriate RPE and PPE when handling contaminated soil; the use of glove boxes and safety cabinets with appropriate extraction and HEPA filters to control the spread of asbestos fibres; the procedures for the safe use of acids and RI liquids.

1.3 The requirements for routine inspection of ventilation systems to comply with CAR and COSHH regulations.

1.4 A summary of the risks to health caused by the analysis of bulk samples as a basis on which to identify the similarities and differences to the risk caused by the analysis of soils. Differences include the potential for contaminants other than asbestos, secure packaging of heavy samples and procedures for drying of wet soil.

2. Sample handling and waste disposal (5%)

Learning outcomes
Candidates should understand how to handle samples of soil in order to support the analytical procedure and to dispose of waste samples and contaminated equipment. In particular, they should be able to:

2.1 Describe what constitutes suitable, safe and sufficient samples to be received by the laboratory.

2.2 Describe how samples are stored, opened and prepared for analysis.

2.3 Explain how to avoid cross-contamination of samples.

2.4 Explain the procedures to deal with waste samples and contaminated equipment once the analysis has been completed.

Content
The course should include:

2.1 The criteria for sufficiency of samples (a minimum of 1 litre in volume and approximately 1 kg in weight), the secure packaging of samples in airtight 1 litre polythene tubs or heavy duty polythene bags, the preference for double-bagging, and labelling conventions (unique labelling of each sample and all samples labelled as 'asbestos').

2.2 The storage of samples in a controlled area to ensure access by authorised personnel only. The requirement to open samples in an appropriate safety cabinet. The criteria for deciding when to dry wet samples and the drying methodology.

2.3 When and how to clean sampling equipment and PPE.

2.4 The procedure for dealing with waste samples and contaminated equipment, including the requirement for double bagging (in an appropriate ventilated cabinet) and labelling in line with the UN-approved method. Waste includes: waste soil, filter papers and filtrate, slides and Petri dishes. The requirement to retain sub-samples for six months after results have been issued and for a minimum of six months for quality control purposes in a controlled area prior to disposal.

3. Identification of asbestos by PLM (15%)

Learning outcomes
Candidates should understand the recognised method for identifying the presence or absence of asbestos in soil. In particular, they should be able to:

3.1 Describe the recognised method as stipulated by the relevant authority.

3.2 Explain how and why representative sub-samples are taken.

3.3 Outline the range of likely results from the method and interpret the results.

3.4 Compare the method for identifying asbestos in soil to the method for identifying asbestos in bulk samples.

Content
The course should include:

3.1 The detailed method for identifying asbestos in soil as stipulated by HSE in *HSG248 - Asbestos: the analysts' guide for sampling, analysis and clearance procedures, Appendix 7* (2016 draft or current version), including the different routes to be taken depending on the results from each step of the method.

3.2 The rationale for taking sub-samples as a more efficient approach to analysis, balanced against the need for the sub-samples to be representative of the whole sample. The rationale for the size of the first sub-sample, which should be approximately 1% of the whole sample. The way of attaining a representative sub-sample by removing around 8-10, 2.5 – 3 ml scoops randomly from different areas of the tray to give a total of 20 – 50g, or to cone and quarter the tray sample if the soil is moist. Second sub-sample 1 – 5g from the Petri dish.

3.3 The range of likely results:

- Asbestos detected;
- Asbestos found at the limit of detection (1-2 fibres/bundles are found);
- No asbestos detected.

The significance of the results and how the information can be interpreted.

3.4 The difference in the nature of ACMs in soil from those in buildings. Asbestos in buildings are present primarily in the form of identifiable intact defined products in good condition with known asbestos content. Asbestos in soil can exist in various stages of decomposition or degradation. Some types of ACM will retain their inherent product integrity, but with a tendency over time for the material matrix to deteriorate and asbestos fibres to become 'unbound' or loosely attached to other particles. These fibres or fibre bundles are invariably retained within the damp soil matrix. In both cases, identification is by PLM.

4. Gravimetric quantification of asbestos-containing materials (15%)

Learning outcomes
Candidates should understand the recognised method for quantifying asbestos-containing materials in soil. In particular, they should be able to:

4.1 Describe the method as stipulated by the relevant authority.

4.2 Explain how and why representative sub-samples are taken.

4.3 Explain how the total asbestos content is calculated and how it is reported to the client.

4.4 Outline the likely results from the method and interpret the results.

Content
The course should include:

4.1 The method as stipulated by the Environment Agency in *The quantification of asbestos in soil and associated materials* (July 2016 version 14 draft or current version) with regards to '*Stage 2*' and the selection and weighing of identifiable pieces of ACM.

4.2 The approach to be taken for selecting ACMs, along with how they are grouped according to material and asbestos type. The need to determine whether free fibres/bundles are present and how this impacts on the final stage of analysis.

4.3 The use of HSE guidance (including *HSG264*) as part of the identification and calculation of the mass percentage of asbestos fibre, along with how this information should be reported.

4.4 The range of likely results from this part of the method should be able to establish the different percentages of each asbestos fibre type, plus the bearing this value has with regards to how to deal with the soil.

5. Discrimination and quantification of free fibres by dispersion and PCM (10%)

Learning outcomes
Candidates should understand the method for discriminating and quantifying free asbestos fibres in soil. In particular, candidates should be able to:

5.1 Describe the method stipulated by the relevant authority.

5.2 Outline the theory of phase contrast microscopy and describe how to set up a microscope ready for the analysis of free fibres.

5.3 Outline the limitations of the method and techniques to improve accuracy of the results.

5.4 Explain how the mass percentage of asbestos in the sample is estimated.

5.5 Explain how the results of the method are reported to the client.

Content
The course should include:

5.1 The method as stipulated by the Environment Agency in *The quantification of asbestos in soil and associated materials* (July 2016 version 14 draft or current version) with regards to '*Stage 3*' for the discrimination and quantification of free fibres, and the use of a representative sub-sample.

5.2 The setting up of a microscope for phase contrast microscopy (PCM), including the use of test and calibration slides. The use of PCM/polariser/red tint plate to discriminate and then count asbestos fibres.

5.3 Details regarding the interferences and limitations as a result of asbestos not uniformly distributed in soils, along with discrimination of fibres based on morphology and width. Accuracy can be increased using additional quality control and alternative techniques.

5.4 The mass percentage estimated through counting the qualifying fibres and also including the presumed fibres.

5.5 The process and method for evaluating the percentage of asbestos-free fibre content in the original sample on a dry weight basis. The reported results also need to include the ACMs/visible fibres.

6. Analysis of soils – practical application (50%)

Learning outcomes
Candidates should be able to carry out the full three-stage analytical procedure using the methods stipulated by the relevant authorities, taking the necessary precautions to control risk to health. In particular, they should be able to:

6.1 Demonstrate good practice in sample handling.

6.2 Demonstrate compliance with the methods stipulated by the relevant authorities for a range of sample types.

6.3 Demonstrate the correct use of weighing balances, stereomicroscopy, PLM and PCM microscopes.

6.4 Demonstrate safe working practices.

6.5 Calculate accurate results for a range of sample types, report the results in an appropriate format and provide advice for the client.

Content

The course should include:

6.1 Dealing with samples arriving into the laboratory. The preparation of samples within controlled environments to prevent contamination. Cleaning of equipment and disposal techniques for waste.

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6.2 Practice in the analysis of a range of samples following the methods stipulated in HSE and the Environment Agency publications. This includes *HSG248 Asbestos: the analysts' guide*; *HSG264 Asbestos: the survey guide,* and *The determination of asbestos in soil and associated materials.*

6.3 Practice in setting up and utilising all types of microscopes used during the analysis of samples, including the checks required before analysis commences and the calibration of analytical balances.

6.4 Working safely using appropriately ventilated ovens and cabinets, while also eliminating contamination risks.

6.5 Practice in the analysis of samples to include identification and quantification of the percentage of ACMs/asbestos fibres plus free fibres present.