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LAB 30

Edition 5 July 2022

Application of ISO/IEC 17025 for Asbestos Sampling and Testing

Contents

Changes since last edition

This publication of LAB 30 has been revised to incorporate the changes required to accommodate HSG 248 Second Edition including those aspects of the Asbestos Technical Bulletin, Issue 7.

1 Introduction

1.1 Laboratories that have been assessed by UKAS as meeting the requirements of ISO/IEC 17025:2017 *General Requirements for the Competence of Testing and Calibration Laboratories*[1] may be granted UKAS accreditation. Several guidance publications on the application of these requirements, providing extra information, detail and limitations, are listed in UKAS Publications, available at www.ukas.com.

1.2 This publication provides guidance on the application of specific requirements for laboratories carrying out asbestos sampling and/or testing. It does not cover all of the requirements of ISO/IEC 17025:2017[1] or *General Criteria for the Operation of Various Types of Bodies Performing Inspection* ISO/IEC 17020:2012[2], which remain the authoritative documents. ISO/IEC 17025 does not give detailed guidance on accreditation requirements for asbestos surveying activities. For asbestos surveying accreditation, see ISO/IEC 17020:2012 (and UKAS RG 8[3]).

1.3 By following the guidance given in this publication, laboratories will be able to demonstrate at assessment that they meet the requirements for sampling and testing. Alternative methods may be adopted provided that they are shown to give an equivalent outcome. However, UKAS policy is to accredit laboratories that follow HSE guidance in HSG 248[6] to demonstrate compliance with the Control of Asbestos Regulations 2012.

Note: This publication of LAB 30 has been revised and is now aligned to HSG 248[6] Edition 2.

1.4 The guidance contained within this publication includes reference to some requirements that are specified by the Health & Safety Executive (HSE).

2 General Guidance

2.1 In support of the requirements of CAR 2012*, UKAS offers accreditation for the following types of sampling:

(a) Air sampling:

Sampling of air onto membrane filters for subsequent fibre counting. Laboratories will be required to demonstrate competence and effective application of ISO/IEC 17025.

(b) 4-stage clearance process:

Accreditation is granted for the 4-stage clearance process (as detailed in the HSE publication HSG 248) under the ISO/IEC 17025 standard**.** Laboratories will be required to demonstrate competence and effective application of ISO/IEC 17025 for air sampling, and of the relevant inspection requirements of ISO/IEC 17020 as identified in this guidance document including the visual inspection.

(c) Bulk Sampling:

Sampling of bulk materials for subsequent asbestos identification analysis. Samples taken shall always be analysed by a laboratory holding UKAS accreditation for the appropriate asbestos test.

* Bulk sampling is not mandated under CAR2012

2.2 UKAS offers accreditation for the following types of asbestos testing as mandated by CAR 2012 – fibre counting, bulk identification and asbestos in soils, (including asbestos in soils, aggregates, ballast etc).

(a) Fibre counting:

The UK test specification for fibre counting in relation to the Control of Asbestos Regulations (CAR)[5] is given in Health and Safety Executive (HSE) document Asbestos: *The Analysts' Guide (HSG 248)*[6]. Additionally, other methods such as ISO 10312 (2019) for TEM and ISO 14966 or VDI 3492 for SEM may be applied. Other membrane filter methods may be accepted for accreditation if established they are fit for the specified purpose.

(b) Bulk identification:

Health & Safety Executive publication HSG 248 describes the physical and optical characteristics of asbestos and may be used as the basis of an accredited test method. The techniques described in HSG 248 are based on the use of polarised light microscopy, coupled with dispersion staining techniques. A documented in-house method shall be used and shall enable the following six regulated asbestos types to be identified: crocidolite, amosite, chrysotile, fibrous actinolite, fibrous anthophyllite, and fibrous tremolite.

Identification of asbestos in bulk materials using other methods may be accepted for accreditation if established they are fit for the specified purpose.

This activity extends to include the identification of bulk materials in soil samples. However, the preparation and analysis of soil samples for the subsequent identification of asbestos fibres within the soil sample is not covered by accreditation for bulk identification and is a separate accredited activity (see below).

(c) Asbestos in Soils, including soils, aggregates, ballast and slurries:

Where work activities may disturb Asbestos in Soil then the Control of Asbestos Regulations 2012 would apply. Therefore, if a laboratory is offering an asbestos testing service with respect to soil samples, accreditation to ISO/IEC 17025 is required for the identification of asbestos in soil, utilising a validated in-house method. Accreditation may be held for:

- Identification of asbestos fibres and type, and;
- Identification & *Quantification of asbestos fibres in soils

* Quantification for asbestos in soils is not mandated under CAR2012

Note: If a laboratory (such as a soil testing laboratory) is visually checking soil for signs of potential ACMs for its own Health & Safety purposes, and this information is not being reported to a customer, then the laboratory does not need to be formally accredited to ISO/IEC 17025 for the bulk identification. See Table 1.

2.3 UKAS recognises Multi-site Laboratories, Satellite Offices and Temporary Sites for accreditation purposes

(a) Accredited organisations are reminded of the requirements within the UKAS Agreement (section 3.3) to inform UKAS of any circumstance that might affect the ability of the organisation and its operations to comply with the requirements of accreditation. In particular, significant changes include those relating to key staff and location.

(b) UKAS shall be notified of all offices associated with the accredited organisation and confirmation that work is / is not undertaken at or away from that office (including any aspects of contract review). The Assessment Manager will determine whether the location needs to be included on the schedule of accreditation and specifically covered by assessment during the 4-year accreditation cycle. UKAS shall also be made aware of temporary site office / laboratories set up to service contracts lasting longer than 8 weeks, e.g., power stations and sites including non-UK domicile locations. Please ensure all this information is communicated to your UKAS Assessment Manager as soon as it is known (e.g., staff notice given, contract agreed etc.). If unsure of the significance of the change, then please bring it to the attention of your Assessment

Manager. Further information on multi-site accreditation can be found within UKAS publication GEN 1.

(c) Laboratories with multi-site accreditation may apply for a flexible scope of accreditation to enable the addition of new site laboratories without a formal extension to scope (ETS). Laboratories shall inform their Assessment Manager of their intentions in the first instance. Further information on flexible scope for multi-site accreditation can be found within UKAS publication GEN 4.

2.4 Normal requirements for frequency of witnessing scoped activities to ensure competence is suitably witnessed during a four-year accreditation cycle are:

(a) To observe the full process of a 4-Stage Clearance (with air sampling and fibre counting) at every other scheduled assessment

Whilst recognised that potentially more complex enclosures will not facilitate all four stages to be witnessed in one day, a Laboratory is still required to demonstrate competence in the accredited activity. Effective steps must be taken to facilitate witnessing by UKAS on an annual basis.

(b) Laboratory witnessed assessments – annually

With reference to the UKAS agreement – it is recognised that the witnessing of onsite activities requires the full cooperation of the Laboratory, UKAS and LARCs. Where LARCs are not cooperating reasonably or lack reasonable justification, then UKAS will notify the HSE asbestos licensing unit who may take this into account at licence renewal.

3 Glossary

4SC	Four Stage Clearance
ACM	Asbestos-Containing Material
AIB	Asbestos Insulating Board
AIMS	Asbestos in Materials Scheme
AISS	Asbestos in Soils Scheme
CAR	Control of Asbestos Regulations 2012 (as amended)
CCTV	Closed-circuit television
CPQ	Competent Persons' Qualification
CoCA	Certificate of Competence in Asbestos
CfR	Certificate for Reoccupation
DCU	Decontamination Unit/Hygiene Unit
HSE	Health and Safety Executive
IQC	Internal Quality Control
LACS	Low Asbestos Content Scheme
LARC	Licensed Asbestos Removal Contractor
PCM	Phase Contrast Microscopy
PLM	Polarised Light Microscopy
PT	Proficiency Testing
PVA	Polyvinyl Acetate
QA	Quality Assurance
QC	Quality Control
RICE	Regular Inter-laboratory Counting Exchange
SEM	Scanning Electron Microscopy
TEM	Transmission Electron Microscopy

4 General Requirements

4.1 Impartiality and Independence

(ISO/IEC 17025 clause 4.1 Impartiality, ISO/IEC 17020 clause 4.1 Impartiality & Independence - 4SC)

4.1.1 When a laboratory is employed for any sampling or testing of bulk, soils, or air, for which accreditation is held, any risks to impartiality shall be identified on an ongoing basis. For example, a laboratory shall identify the circumstances in which it or its analysts may encounter commercial, financial, or other pressures that may affect their impartiality and operational judgement in carrying out on-site clearance work. These circumstances shall be identified, with appropriate measures implemented and recorded. For example, as part of the contract review process.

4.1.2 If a laboratory is employed for site clearance certification by a removal contractor who is carrying out the removal work, then the laboratory shall be independent of that removal contractor i.e., no shared links.

Note: Throughout this document reference is made to either the "removal contractor" or *"LARC" (*Licensed Asbestos Removal Contractor*). This should be taken to refer to the asbestos removal contractor who carried out the remediation works.*

4.1.3 Shared links between the laboratory and the removal contractor can affect the level of independence required. Shared links include:

- common ownership
- common management
- contractual arrangements, including financial or commercial, e.g., where the removal contractor is a major source of work for the analyst organisation
- informal understanding, or
- other factors that may have an ability to influence the outcome of a site clearance certification.

Where shared links are unavoidable, the laboratory must demonstrate appropriate measures to address them. Such measures include making the building client fully aware of the links. These shall be in writing. Additionally, the site clearance certification shall not commence without the building client's written agreement. A robust contract review process will ensure the removal contractor supports these measures.

4.1.4 Where shared links are anticipated and/or exist, the assessment by UKAS of measures taken by the laboratory, to assure its impartiality, may require additional assessment effort. Therefore, such arrangements shall be discussed with UKAS at the earliest opportunity.

5 Structural Requirements

5.1 Organisation and Administrative

(ISO/IEC 17025 clause 5.0, ISO/IEC 17020 clause 5.1.4)

5.1.1 Liability Insurance Cover

5.1.1.1 For 4SC, the laboratory shall hold liability insurance cover that relates to the carrying out of site clearance certification following asbestos removal. Public & Employers Liability and Professional Indemnity are required as a minimum.

5.1.1.2 For 4SC, Professional Indemnity shall include Bodily Injury and Property Damage cover.

5.1.1.3 Organisations may choose to set aside specific reserves *in lieu* of insurance cover. These reserves must be commensurate with the level of cover generally provided through insurance within the asbestos inspection sector.

5.1.1.4 Additional guidance on requirements for insurance liability cover is given in ILAC-P15:05/2020[4] to which reference should be made.

5.1.2 Proficiency Testing Participation Requirements

5.1.2.1 Laboratories carrying out fibre counting, bulk identification and asbestos in soils analysis, for example, shall participate in a relevant Proficiency Testing Scheme.

5.1.2.2 Laboratories shall, in addition, maintain a satisfactory performance in the relevant scheme. Further guidance for applicant and accredited laboratories is given in section 5.1.3 and 7.7 - see also 'Ensuring the validity of results' (ISO/IEC 17025 clause 7.7).

5.1.2.3 Where a laboratory fails to maintain a satisfactory performance, appropriate corrective action shall be taken. The laboratory shall notify UKAS (via its appointed Assessment Manager) without delay if this occurs.

5.1.2.4 Organisations wishing to extend their accreditation to include an additional site location that carries out testing activities must demonstrate a satisfactory performance in a relevant proficiency testing scheme (e.g., RICE, AIMS or AISS) before UKAS can grant accreditation for the activity at the new site location by either:

(a) providing evidence that analysis performed at the new site location with new analysts is included in the organisation's existing proficiency testing scheme membership with continued satisfactory performance over a minimum of two rounds (see note below) or;

(b) demonstrating that the new site location has joined a proficiency testing scheme independently as a new participant. In this case analysts at the new site location must participate in at least two rounds of the scheme and produce results that would indicate that an acceptable performance will be achieved if extrapolated over one year.

Note: Where a laboratory uses existing participating staff, then at least one round of participation needs to be demonstrated.

5.1.2.5 Where organisations incur a break in accreditation (e.g. suspension), ensuing participation in proficiency testing scheme(s) must provide sufficient confidence to support a recommendation for reinstating accreditation. Specific scenarios will be addressed on a case-by-case basis.

5.1.3 Applicant Laboratories

5.1.3.1 Laboratories intending to undertake fibre counting, bulk identification or asbestos in soils analysis are strongly advised to apply to participate in the relevant Proficiency testing scheme: RICE, SEMS, AIMS, LACS and/or AISS, respectively, at the earliest possible opportunity.

5.1.3.2 In order to demonstrate competence in fibre counting, bulk identification, or asbestos in soil analysis for initial grant of accreditation, the laboratory shall have completed a minimum of two circulations/rounds. The results of the completed rounds must achieve a 'satisfactory' performance if extrapolated over one year.

5.1.3.3 If laboratories' performance becomes unacceptable during the application process, i.e. before grant, the applicant shall take suitable corrective action(s), which address the performance issues to progress to accreditation.

Note: Non-UK based PT Schemes other than those specified above may be accepted but the details of any proposed alternatives should be submitted to UKAS for review for suitability.

6 Resource Requirements

6.1 Personnel

(ISO/IEC 17025 clause 6.2, ISO/IEC 17020 clause 6.1)

6.1.1 Qualifications/Training (includes Table 1 & 2)

6.1.1.1 At least one member of the laboratory staff in a position of responsibility (e.g. a member of the technical/quality management team, or the training officer) shall hold a relevant formal qualification, together with evidence of appropriate experience and demonstrable competence. As per the UKAS agreement (F044, see section 3.3.4), the laboratory shall notify UKAS in the event of the designated competent person leaving the laboratory. In addition, a suitable replacement of the designated competent person shall be appointed without undue delay and UKAS notified accordingly.

6.1.1.2 An overview of qualifications established as suitable to support competence for all activities is given in Table 1.

6.1.1.3 Examples of Competent Persons' Qualifications (CPQs) established by UKAS as suitable include:

(a) Royal Society for Public Health (RSPH)[22] Level 4 Certificate in Asbestos Laboratory and Project Management (Ofqual Qualification Number 603/0275/6)

(b) British Occupational Hygiene Society (BOHS)[11] Certificate of Competence in Asbestos – CoCA

6.1.1.4 Authorised samplers and analysts shall be suitably educated, qualified and trained, with the knowledge, skills and experience to be able to demonstrate technical competence in the appropriate area of work.

6.1.1.5 Training of samplers and air monitoring analysts progressing towards authorisation, should include a substantial content of on-site work experience (including 4SC if applicable), under the supervision of authorised personnel.

6.1.1.6 Training of analysts for bulk and soils sample analysis progressing towards authorisation, should include a substantial content of re-analysis of worked samples (in addition to QC samples) under the supervision of authorised personnel.

6.1.1.7 The need for refresher training shall be considered as part of a risk-based approach to support an organisation's ongoing competence monitoring process and to remain in line with HSG 248 and with the organisations internal procedures.

6.1.1.8 Training records shall include traceable detail of the activities completed - for example, assessments under supervision (see Table 2), sites attended, scope of works carried out, date(s) of attendance, and the identity of supervisors/trainers and trainees. They shall contain objective evidence to the extent necessary to acknowledge the achievement of the defined criteria of competence and shall include all supporting information.

Table 1 Overview of Qualifications

ACTIVITY	QUALIFICATION	ACCREDITATION REQUIREMENTS
A Person taking a bulk sample	There is no formal UKAS requirement for this activity outside of surveying, but individuals are strongly recommended to hold BOHS P402 or RSPH Level 3 Award or higher, (RSPH Level 3 Award in Asbestos Surveying) or work under supervision of a qualified surveyor	Recommended that individual works for a Body accredited for a relevant scope to ISO/IEC 17020 or ISO/IEC 17025
B Company taking a bulk sample	At least one member of the company to hold at least one of: • P402 plus S301/W504 + Portfolio of Evidence and a written assignment, or • P402 plus P405 (not necessary for full CPQ but this is strongly encouraged) or • CPQ For individuals, refer to A above. *Note: If the organisation relies on the P405 qualification, it needs to have been attained post February 2004*	Recommended that company holds relevant scope of accreditation to ISO/IEC 17020 or ISO/IEC 17025
C Person taking and analysing an air sample (not including 4SC)	Individuals to hold • BOHS P403 (since September 2010) or • RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures or • CPQ *Note: Prior to September 2010 individuals will require P403 and P404 for taking and analysing air samples,*	Works for or is an organisation holding a relevant scope of Accreditation to ISO/IEC 17025
D Company taking and analysing an air sample (not including 4SC)	Individuals to hold: • BOHS P403 or • RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures At least one member of the company must hold a CPQ	Relevant scope of Accreditation to ISO/IEC 17025
E Person undertaking 4SC work (including Hygiene Facility Clearances)	Individuals to hold: • BOHS P403 plus P404 or • RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures or • CPQ	Works for or is an organisation holding a relevant scope of Accreditation to ISO/IEC 17025
F Company undertaking 4SC work (including Hygiene Facility Clearances)	Individuals to hold: • BOHS P403 plus P404 or • RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures At least one member of the company must hold a CPQ	Relevant scope of Accreditation to ISO/IEC 17025
G Person analysing a bulk sample and/or asbestos in soil (qualitative only)	Individuals to hold: • BOHS P401 or • RSPH Level 3 Award in Asbestos Bulk Analysis or • CPQ • BOHS P408 (Optional)	Works for or is an organisation holding relevant scope of accreditation to ISO/IEC 17025
H Company analysing a bulk sample and/or asbestos in soil (qualitative only)	Individuals to hold: • BOHS P401 or • RSPH Level 3 Award in Asbestos Bulk Analysis or • CPQ • BOHS P408 (Optional)	Relevant scope of Accreditation to ISO/IEC 17025

ACTIVITY	QUALIFICATION	ACCREDITATION REQUIREMENTS
I Person analysing asbestos in soil for quantification purposes	Individuals to hold: • BOHS P401 or • RSPH Level 3 Award in Asbestos Bulk Analysis or • CPQ • BOHS P408 (Optional)	Recommended that company holds relevant scope of accreditation to ISO/IEC 17025
J Company analysing asbestos in soil for quantification purposes	Individuals to hold: • BOHS P401 or • RSPH Level 3 Award in Asbestos Bulk Analysis or • CPQ • BOHS P408 (Optional) At least one member of the company holds: • BOHS P403 or • RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures (It is recommended that at least one member of the company should hold a CPQ and P408)	Recommended that company holds relevant scope of accreditation to ISO/IEC 17025
K Person* analysing an air sample for the purposes of discrimination	Individuals to hold: • BOHS P401 plus P403 or • RSPH Level 3 Award in Asbestos Bulk Analysis plus RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures or • CPQ	Works for or is an organisation holding relevant scope of Accreditation to ISO/IEC 17025
L Company* analysing an air sample for the purposes of discrimination	Individuals to hold: • BOHS P401 plus P403 or RSPH Level 3 Award in Asbestos Bulk Analysis plus RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures At least one member of the company must hold a CPQ	Relevant scope of Accreditation to ISO/IEC 17025

** The BOHS P401/P403 and RSPH Level 3 Award in Asbestos Bulk Analysis (Ofqual Qualification Number 601/8288/X) /RSPH Level 3 Award in Asbestos Air Monitoring and Clearance Procedures (Ofqual Qualification Number 601/8256/6) are not required when using SEM & TEM techniques for the purposes of fibre discrimination*

Notes

1. *Accreditation for bulk sampling can be achieved through ISO/IEC 17025 for testing laboratories or when carried out as part of a survey through ISO/IEC 17020 for Inspection Bodies. UKAS employs the same assessment principles for both standards. However, whilst bulk sampling to ISO/IEC 17025 can be recognised on a testing schedule of accreditation, the same activity to ISO/IEC 17020 is inherent within the inspection process. As such this activity is not shown on inspection schedules.*
2. *The Royal Society for Public Health; RSPH Level 3 Award in Asbestos Surveying (Ofqual Qualification Number 601/8289/1) RSPH Level 3 Award for Asbestos Air Monitoring and Clearance Procedures (Ofqual Qualification Number 601/8256/6) and RSPH Level 3 Award for Asbestos in Bulk Analysis (Ofqual Qualification Number 601/8288/X).*
3. *BOHS (formerly BIOH) Certificate of Competence in Asbestos (gained by passing BOHS Module S301 'Asbestos & other fibres' or W504 + Portfolio of Evidence and a written assignment, followed by the oral examination).*
4. *Other qualifications approved by BOHS and acknowledged by UKAS are:*
   - *BOHS (formerly BIOH) Certificate of Operational Competence in comprehensive occupational hygiene (Cert. Occ. Hyg.), which includes a study of asbestos within the course content.*
   - *BOHS (formerly BIOH) Diploma of Professional Competence in comprehensive occupational hygiene (Dip. Occ. Hyg.) which includes a study of asbestos within the course content.*
5. *Other qualifications may be accepted by UKAS. Course details should be sent to info@ukas.com so that an evaluation of course content can be made, with the aim of establishing that the qualification provides appropriate support for analyst competence determination. Qualifications found to be suitable between LAB 30 editions will be listed in a Technical Bulletin.*

6.1.2 Fibre Counting, Air Sampling and 4-Stage Clearance Process (4SC)

6.1.2.1 The laboratory shall have a documented training procedure for analysts with or without previous competency. This shall define the criteria of competence for each stage of the process so that it is clear when an analyst becomes competent and can demonstrate effective understanding. This includes:

- the counting of suitable reference slides (across all density ranges) to demonstrate effective repeatability prior to the inclusion in the list of laboratory-approved fibre counters.
- the use of microscopes for the purposes of fibre counting and the required understanding to maintain optimum performance, e.g. lens tissue, bulb, and fuse replacement.

6.1.2.2 The laboratory shall maintain a list of all personnel who are authorised to carry out fibre counting, air sampling, clearance certification activities (including DCU), and calibration of relevant equipment. Any subsequent change to authorised status should be dated (e.g., lapse in audit) and a record kept to ensure visibility on any given date.

6.1.2.3 Analysts responsible for conducting inspections as part of the site clearance certification process are required to have appropriate qualifications, training, experience and knowledge. Details of training requirements are given below (see Table 2).

6.1.2.4 Analysts who have no evidence of previous competency in carrying out 4SC work will require at least:

- two months relevant onsite experience
- at least 6 4SC training audits to cover the range of enclosures / removals for which the staff will be authorised

These aspects:

- to be conducted under the close supervision of a fully authorised analyst, in order to gain sufficient and detailed knowledge of the 4SC and DCU clearance process.
- to be supported by a training diary (or equivalent) with records of training needs analysis.

At the end of the period of supervision, competence must then be verified by conducting a minimum of x2 on-site audits of the trainee by an authorised auditor. Details of the competency audit (including the date on which the trainee is designated as 'fully competent') must be recorded as part of the training records. The level of authorisation attained must reflect the nature of the work experienced and the assessments of competence undertaken.

6.1.2.5 An extended CV will be required for analysts who do have evidence of previous competency in carrying out 4SC work and/or air sampling and fibre counting which is reviewed to support the training needs analysis. Analysts will require to be authorised as part of a defined process, which includes an on-site audit for air sampling, fibre counting and for each type of removal/clearance for which they are to be authorised ensuring all four stages of a 4SC and a DCU clearance have been assessed. At least one further satisfactory audit will need to be completed within 3 months of authorisation.

Note: *Competence should be assessed by an authorised auditor with relevant supporting records.*

6.1.2.6 Table 2 gives details of suitable experience and knowledge for analysts carrying out 4SC certification. Table 1 gives details of minimum qualifications considered appropriate.

Table 2 - Experience, knowledge and authorisation criteria for analysts carrying out 4SC procedures

Minimum experience/authorisation	Knowledge
• 2 months appropriate on-site experience in 4SC procedures • A minimum of 6 training audits conducted under supervision, with supporting records by a fully authorised analyst, Trainee supervision must consider the range and types of clearance an analyst will be required to undertake, (e.g. Boiler rooms, AIB, sprayed coatings). This shall be defined by the laboratory's own documented criteria of 4SC classification, ensuring the nature of the associated risk and complexities are suitability captured. • Following all training audits, and to support authorisation, a minimum of x2 on-site competency audits of the trainee by an authorised auditor are conducted ensuring all 4 stages are covered per audit and the full DCU clearance process is also captured – see Note below table. • A follow-up competency audit is required within 3 months of being authorised. • Records must clearly reflect the competency demonstrated by the trainee (including their knowledge and experience).	• Familiarity with the range, location, use and appearance of asbestos products • Knowledge of appropriate sampling strategies and inspection regimes for 4SC work • Knowledge of current regulations and guidance (in particular the HSE's The Analysts' Guide) • Knowledge of the fitting, wearing and care of respiratory protective equipment • Knowledge of decontamination procedures, transiting procedures, and the use of airlocks and hygiene facilities

Note: *Training for individuals who are to be authorised for air sampling and fibre counting only (not 4SC) should follow a defined process encompassing on-site experience in air monitoring procedures, with competency audits by a fully qualified analyst. When authorised, a further audit, on-site is required within 3 months of being authorised.*

6.1.2.7 Procedures for Stage 1, Stage 2 and Stage 4 inspections require analysts to be familiar with the appearance and visual identification of various types of asbestos-containing materials. Laboratories shall ensure that analysts receive suitable training and instruction in recognising these types of materials (including, in particular, their appearance following wetting and stripping) and that training records contain appropriate confirmatory evidence of competence.

6.1.2.8 Analysts shall receive training in the use of airlocks and hygiene facilities, including all entry and exit procedures. In addition, they shall be competent to effectively decontaminate themselves (and their equipment) upon exit from enclosures - in order to prevent the spread of asbestos fibres, and to minimise exposure to others. Additional guidance is contained within the approved code of practice associated with CAR 2012 and in HSG 248.

6.1.2.9 Analysts shall be face-fitted and given training (including refresher training) in the fitting, wearing, inspection and care of respiratory protective equipment, (ref CAR 2012 regulation 10) by competent fit testers[23]. Training records shall be maintained up to date, including details of any refresher training given.

6.1.3 Identification of Asbestos in Bulk Materials / Soil Samples and Bulk Sampling

6.1.3.1 The laboratory shall have a documented training procedure for analysts with or without previous competency. This shall include the criteria of acceptability, so that it is clear when an analyst is deemed to be competent and involve the competent analysis of suitable* bulk reference/soil samples, covering the scope of all regulated asbestos types, prior to inclusion in the list of laboratory-approved analysts. The training procedure for bulk sampling shall also be documented and shall include appropriate criteria of acceptability. At the end of the period of supervision, competence shall then be verified by auditing of the trainee.

* *Samples may include spiked samples, certified reference materials, in-house reference samples, third party reference samples e.g., AIMS.*

Note: Where bulk sampling is being carried out as part of accredited building surveys, personnel carrying out the sampling should either hold the appropriate qualifications or be working under the direct supervision of an appropriately qualified staff member. Further guidance is given in UKAS document RG 8.

6.1.3.2 For the analysis of asbestos in soils and the preparation of samples including soils, aggregates, ballast etc, then any person involved in the selection of identifiable pieces of suspected asbestos-containing material (ACM) shall be suitably trained.

6.1.3.3 Bulk/soils identification analysts should undergo a colour blindness (e.g. Ishihara) test. Colour blindness, or other visual defects, need not disqualify a prospective analyst, provided that the individual is able to properly assess the optical characteristics described in the test method (ref. also HSG 248). Tests available to complete "on-line" via the Internet or by MS Power Point or similar are not accepted as these may affect the validity of the test. Organisations conducting colour blindness assessments in-house shall use the correct colour plates and have a competent person to accurately interpret the results. Where identified, records shall clearly demonstrate continuing suitability of an individual as an analyst with assigned condition. Where justified, (e.g. physical damage to the eye(s)) analysts should undergo a retest to verify colour blind status. Refer to MS7 Colour vision examination [24] for additional guidance.

6.1.3.4 As a minimum to support authorisation:

(a) 20 bulk samples need to be satisfactorily* analysed by the bulk analyst

(b) 20 soils samples need to be satisfactorily** analysed by the soil analyst

* *see also 7.7.1.2.1*

** *see also 7.7.1.3.1*

If satisfactory performance is not demonstrated in the initial authorising batch of quality control samples then a risk-based evaluation, with a suitable action plan, shall be applied to determine the number of samples above the minimum which need to be analysed to provide confidence that the analyst can achieve consistent and valid results. Samples should include those of reference (such as former AIMS/AISS samples) as well as those typically representative of the work carried out by the laboratory. All six regulated asbestos types shall be represented as well as samples with No Asbestos Detected.

6.1.3.5 The laboratory shall maintain a list of all personnel who are authorised to carry out bulk identification, asbestos in soils analysis and bulk sampling activities. Any subsequent change to authorised status should be dated (e.g. lapse in audit) and a record kept to ensure visibility on any given date.

6.2 Facilities and Environmental Conditions

(ISO/IEC 17025 clause 6.3)

6.2.1 Air Sampling

6.2.1.1 Air sampling within enclosures and hygiene facilities, for subsequent analysis, should be undertaken in dry conditions. In the event that such conditions are not met, analysts shall record and report the actions taken along with any deviations and the reasons stated. Also see 7.5.1.10.

6.2.2 Fibre Counting

6.2.2.1 The environments in which filter preparation and fibre counting are carried out, (i.e. permanent, site and mobile laboratories) shall be monitored periodically for possible contamination with

records retained. The frequency of monitoring shall be determined by risk. The assessments must include monitoring the airborne fibre concentration.

6.2.2.2 Laboratories that carry out fibre counting and bulk/soils identification in adjacent areas (e.g., in the same room) shall also carry out static airborne fibre monitoring during bulk analysis activities and take all precautions necessary to minimise cross contamination during the filter mounting process. Refer also to Section 7.4.2.

6.2.2.3 Fibre counting shall be carried out under suitable background conditions, which may involve excluding bright lights (including sunlight) and sources of vibration (caused by mobile engines or generators etc).

6.2.3 Bulk Sampling

6.2.3.1 Authorised sampling personnel shall be aware of the potential for contamination of the samples, both from the environment, and/or from other samples. A site-specific risk assessment shall be conducted and recorded prior to any sampling operation. They must also be aware of the potential for the release of fibres to the environment whilst obtaining bulk samples and shall have documented procedures to minimise this and for ensuring that sampling points are repaired as agreed at contract review. Laboratories should also have, and apply, documented procedures for preventing third-party access during inspection and preparation of an area prior to bulk sampling operations.

6.2.3.2 The equipment used should also include items required to make good those areas from where samples are removed. Sufficient equipment, or the means of cleaning equipment between uses, shall be available to minimise the possibility of cross contamination, and to minimise the risk of contaminating the area where samples are taken.

6.2.4 Identification of Asbestos in Bulk Materials and Soils Analysis (including asbestos in soils, aggregates, ballast, etc.)

6.2.4.1 Only prepared samples for final polarised light microscopy should be evaluated within the open laboratory. All other preparation and other analytical processes shall be suitably controlled (see sections on Equipment, Section 6.3, and Sampling Handling, Section 7.4).

6.2.4.2 Laboratories shall ensure that airborne fibre monitoring is undertaken to demonstrate appropriate controls are in place to minimise fibre release in the lab and associated areas. This shall be by either a UKAS accredited laboratory (for air monitoring / fibre counting) or in-house meeting the requirements of ISO/IEC 17025 and this publication (with supporting documented records to demonstrate compliance and competence). Personal monitoring shall also be completed within the laboratory (whether permanent, site based or mobile) during bulk/soils analysis activities. Personal air monitoring can be extended beyond the monthly timeframe if suitable evidence exists, (via a risk-based approach) to justify the periodicity implemented. However, all analysts must be included in an annual monitoring programme. or sooner if recently trained/authorised to undertake bulk identification. See also section 6.2.2.2.

6.2.4.3 The laboratory shall have and apply documented procedures for the storage and disposal of asbestos waste. These procedures shall comply with all relevant legislative requirements.

6.2.4.4 The laboratory shall have a documented procedure for safe evacuation and cleaning should an uncontrolled release of asbestos, or failure of power supply, occur (ref CAR 2012 regulation 15 (1)).

6.3 Equipment

(ISO/IEC 17025 clause 6.4)

6.3.1 Air Sampling

6.3.1.1 The laboratory shall have documented procedures for the regular maintenance of sampling pumps. The procedures should include provision for assuring satisfactory performance of pumps, and for minimising the occurrence of failures during use. Adequate records of such maintenance shall be maintained. Regular maintenance shall be additional to that which is carried out for the correction of operational failures.

6.3.1.2 Regular cleaning of equipment that may be liable to contamination, or loss of performance, shall be carried out. The cleaning procedure and frequency shall be documented.

6.3.2 Bulk Sampling

6.3.2.1 Guidance on bulk sampling equipment is contained in HSG 264 and HSG 248.

6.3.3 Fibre Counting

6.3.3.1 Guidance on fibre counting equipment is contained in HSG 248.

6.3.3.2 Tally counters, or other suitable methods, shall be used for recording the number of fibres observed and graticule areas examined. The performance of the recording method(s) shall be checked periodically as defined by a risk evaluation.

6.3.3.3 The laboratory shall ensure that reagents that are used for filter clearance and mounting are fit for purpose. They shall be inspected and replaced, on a risk basis, to avoid potential deterioration (or loss) of samples and supporting records shall be maintained.

6.3.4 Bulk Identification

6.3.4.1 The laboratory shall be equipped with a fume/dust cabinet with adequate extraction and filter facilities (refer to HSG 248) for re-circulatory and/or direct extraction designs. Bi-annual assessment of operational integrity is to be undertaken as required, following regulatory requirements. Minimum face velocities of 0.5m/s are to be ascertained daily with suitable records to demonstrate compliance during periods of operational activity. The unit shall be large enough to incorporate a low-power stereo microscope and allow sample manipulation/treatment.

6.3.4.2 The laboratory shall hold a set of reference, single component, asbestos samples, together with a selection of samples having characteristics similar to materials likely to be encountered at each of its accredited locations, (including mobile).

6.3.4.3 The laboratory shall have access to suitable facilities and chemicals to enable sample pre-treatment to be carried out (especially when regulated asbestos types are not found in a material/product type that is known to have the potential to contain asbestos, see sections 7.2.5.1/7.2.5.3). In the case of certain organic materials, e.g. floor tiles, plastics, bitumen, resin, rubber, mastics and adhesives, these materials/products should be subjected to breaking and treatment with a suitable organic solvent **or** combustion (at or below 400 °C) - see Table A2.2 HSG 248.

6.3.4.4 The laboratory shall have access to accurate and traceable records associated with consumables and supplies (e.g. coverslips and microscope slides) which are suitably maintained. In particular, those for refractive index liquids shall reflect their shelf-life, i.e. storage, usage and disposal.

6.3.4.5 The ongoing storage of reagents (in use/not in use) should be in line with manufacturer's guidance (i.e. light and temperature).

6.3.5 Four-stage Clearance Process (also ISO/IEC 17020 Clause 6.2)

6.3.5.1 The laboratory shall ensure that respiratory protective equipment is maintained and inspected in accordance with a defined programme, (ref HSG53[21]). Suitable records shall also be maintained in order to meet legislative requirements in this area (ref HSG 248 and CAR 2012).

6.3.5.2 The laboratory shall have in place procedures documented to the extent necessary for the consistent and regular inspection and maintenance of their own equipment used for 4SC work.

6.3.5.3 Site equipment checklists are observed as opportunities for improvement and should be used. They will minimise the likelihood of wasted journeys by analysts, thus ensuring that additional time pressures are not placed on analysts carrying out clearance work.

6.4 Measurement Traceability

(ISO/IEC 17025 clause 6.5)

6.4.1 Air Sampling

6.4.1.1 To ensure traceability of calibration measurements of flow meters, master flow meters shall be used that are traceable directly to national/international standards, over the range at which working flow meters are to be used.

6.4.1.2 Master and working flow meters shall require periodic re-calibration. Generally, calibration intervals should not exceed the following:

Master flow meters - annually (non-rotameter types may be extended to two years)

Working flow meters - quarterly (with necessary documentary evidence of at least one year of monthly frequency calibrations to justify this longer interval)

6.4.1.3 Master flow meters shall be used to calibrate working flow meters. The working flow meters are used for routine checking of the flow rates of sampling pumps. A documented calibration procedure shall be used, and records shall be kept of all calibrations carried out.

6.4.1.4 The uncertainty of measurement of working flow meters shall be such as not to compromise the final uncertainty of measurement required.

6.4.2 Guidance on Procedures for Calibration of Working Flow Meters

6.4.2.1 In order to minimise errors due to pressure drop between the two meters, the tubing connecting the flow meters should not be of smaller internal diameter than the connecting ports of the flow meters, and its length should be kept to a minimum. All connections should be airtight.

6.4.2.2 Restrictions or valves should not be fitted between the two flow meters.

6.4.2.3 Where variable area flow meters are chosen for both the master and working flow meters, the scale length of the master should be equal to, or greater than, the scale length of the working flow meter.

6.4.3 Sampling Pumps

6.4.3.1 HSG 248 requires that the flow rate of sampling pumps be checked and recorded at the start of the sampling period, and also during the sampling period, where appropriate. The flow rate should also be checked and recorded at the end of the sampling period before switching the pump off, and where appropriate a correction applied to account for flow rate variation during sampling. The results of the flow rate checks shall be recorded.

6.4.4 Corrections for Temperature and Pressure

6.4.4.1 The method detailed in HSG 248 states that, in the UK, it is not necessary to make corrections to sample volume due to changes in atmospheric temperature and pressure. Laboratories should, however, consider at the contract review stage if extreme conditions such as hot works etc. may be present that will require temperature and pressure corrections. Where such extreme environments may be encountered the laboratory shall maintain the capability to measure temperature and barometric pressure. When necessary to take these measurements, refer to 6.4.4.2 and 6.4.4.3

6.4.4.2 Temperature and barometric pressure shall be assessed and recorded at the sampling location when these locations are outside normal operating conditions as experienced, (as defined in HSG 248). Corrections will need to be made, where appropriate, as a result of any temperature or pressure extreme differential.

6.4.4.3 For barometric pressure measurements, laboratories may often obtain 'reference' measurements from local meteorological stations, airports etc. In-house calibration of working barometers shall be carried out as and when required in accordance with documented procedures, and a defined programme.

6.4.5 Time

6.4.5.1 Calibration of working timepieces shall be carried out against an acceptable 'traceable' source (e.g., BT speaking clock/time.is). Timepieces should normally be calibrated at least annually. Records of such calibrations shall be maintained.

6.4.6 Stabilised Flow Pumps

6.4.6.1 Pumps with stabilised flow controls shall also be performance checked periodically as part of a risk-based evaluation in accordance with documented procedures. The laboratory shall demonstrate that performance is as detailed in HSG 248.

6.4.7 Guidance on Selection of Flow Meters

The following guidance is given to assist when choosing variable area flow meters, to ensure that appropriate scale divisions and sufficiently long tube lengths are used.

6.4.7.1 The following table indicates the requirements for example air flow rates in asbestos airborne fibre sampling:

Required flow rate (litre/min) for flow rates >2 litres	5% setting limit (± litre/min)
15.0	0.75
12.0	0.60
8.0	0.40
4.0	0.20
2.5	0.13

Required flow rate (litre/min) for flow rates ≤2 litres	10% setting limit (± litre/min)
2.0	0.20
1.0	0.10
0.5	0.05

6.4.7.2 In the case of variable area flow meters, the resolution of both master and working flow meters shall be sufficient to allow the above setting limits to be achieved.

6.4.7.3 The useable scale length of a variable area flow meter is as defined on the calibration certificate and should be less than the scale end points. It is unlikely that a single flow meter of this type will be sufficient to cover the range of flow rates required to monitor airborne fibre concentrations to control limits and the clearance indicator. Laboratories shall therefore be equipped with calibrated master and working flow meters to cover the range of flow rates defined within the laboratories procedures based on HSG 248.

6.4.7.4 Although the variable area (rotameter) air flow meter is probably the most common design of flow monitoring equipment utilised in environmental air sampling; the use of alternative techniques is permitted providing that the basic requirements of the test specification are met. With some alternative techniques, the necessity for pressure and temperature correction may be reduced or eliminated. In all cases, the manufacturer's guidance should be followed. The suitability, or otherwise, of alternative techniques will be determined during assessment.

6.4.8 Fibre Counting

6.4.8.1 Working stage micrometers shall be performance checked at least annually using the traceable stage micrometer. The traceable stage micrometer shall be re-calibrated periodically, i.e. every 5 years. Re-calibration shall take place sooner if its condition or accuracy appears to have changed (e.g. if the annual check reveals changes in the values obtained for the working stage micrometer).

6.4.8.2 Working stage micrometers shall be used by analysts to measure the diameter of the Walton-Beckett graticule. This should be undertaken each time the microscope is performance checked with each fibre counting session and the result recorded.

6.4.9 Identification of Asbestos in Bulk Materials and Soils (including asbestos in soils, aggregates, ballast, slurries, etc)

6.4.9.1 Containers of refractive index liquids must be labelled, or otherwise identified, to allow users to readily identify information regarding the liquid's calibration status, the due date for next calibration and expiry date.

6.4.9.2 Refractive index liquids are not generally traceable directly to national standards. Laboratories shall have a documented procedure for ensuring that refractive index liquids remain within specification. Due to heightened sensitivity in the PLM method for identifying single fibres in a few milligrams of dispersed material, performance checks shall be undertaken on liquids to detect possible contamination by particles and fibres. In situations where a laboratory wishes to implement or exceed the recommended shelf life, confirmation of suitability can be achieved by using a calibrated refractometer, or by using reference materials with refractive indexes traceable to national standards. (Traceability to international standards, e.g. American National Bureau of Standards, is achievable for Cargille refractive index liquids).

7 Process Requirements

7.1 Review of Requests, Tenders and Contracts

(ISO/IEC 17025 clause 7.1)

7.1.1 The use of standard pro-formas may be appropriate for carrying out reviews of requests, tenders and contracts.

7.1.2 In the case of requests, tenders or contracts involving repetitive work for similar sampling or analytical activities, a review shall be carried out prior to the award of the contract. This 'contract review' need not be repeated unless the scope of the work changes during the period of the contract. However, it is strongly recommended that works are reviewed upon completion to verify that the original scope/contract has been fulfilled.

7.1.3 Staff responsible for booking-in/logging jobs shall have appropriate competence in implementing 'contract review' procedures e.g. the scheduling of appropriate technical resources, ensuring suitable consideration to enable the analyst to perform the works without undue pressure.

7.1.4 Air Sampling, Fibre Counting and 4SC (also ISO/IEC17020 clause 7.1.5)

7.1.4.1 The effective scoping and planning will be of importance in ensuring that sufficient resource is allocated to the 4SC process (including Stage 2 visuals) to support the reporting of valid results.

The laboratory's procedure for 'contract review' shall include:

- a requirement to establish whether or not the testing of hygiene unit(s) and any other associated testing, e.g. personal, leak or reassurance monitoring, during and/or after the 4SC, is required to be carried out as part of the laboratory's scope of testing work.
- the suitability of the site location for setting-up a site laboratory
- the possibility of using more than one analyst during the clearance of "large" or complex enclosures
- the time needed to complete the on-site 4SC including the individual stages of the process. Particular attention of estimated visual inspection times of stage 2 is required (see also 7.5.1.3 onwards)
- The need for the Laboratory to inform the customer that a 4SC is not required for non-licensed works, even when requested e.g. for large scale Textured Coating (TC) removal. In these scenarios, a certificate of cleanliness (different from CfR) should be issued.

Note: 1. The inspection activities associated with a certificate of cleanliness are not recognised as accredited and should be appropriately disclaimed when reported with associated testing, for which accreditation is mandated e.g. reassurance

2. Part of the scoping process is to ascertain sufficiently detailed information before the works start to enable a risk assessment and analyst site-specific POW to be prepared. The above information will support this process, see also section 9.1

7.1.4.2 At stage 1 of the 4SC process, the analyst shall ensure that the work carried out is in accordance with the LARC's plan of work. The analyst shall check that the "actual" on-site work practice is in accordance with the job details in the method statement, which may be electronic. If a copy of the method statement is not available on site, the analyst shall fail Stage 1, indicating the reason for failure on the Certificate for Reoccupation. Any other deviations shall be recorded by the analyst, for reporting on the Certificate for Reoccupation.

7.1.4.3 Analysts shall take rest breaks during lengthy inspections to prevent fatigue, especially where non-powered respirators are used. Laboratories/analysts shall therefore undertake a risk-based evaluation where lengthy visual inspections are undertaken.

Note: HSG53 recommends the continuous wear time for tight-fitting (unpowered) RPE is less than an hour, after which the wearer should take a break.

7.1.5 Identification of Asbestos in Bulk Materials and Soils (including asbestos in soils, aggregates, ballast, slurries, etc)

7.1.5.1 For **Asbestos in Bulk Materials:**

The contract review process completed prior to undertaking analysis of bulk materials, which involves the analysis of defined pieces of asbestos-containing material (ACM) in accordance with HSG 248, shall ensure that sample amounts are clarified and the customer is aware of the remit and limitations (see 7.1.5.2) associated with the stated method.

7.1.5.2 **For ACM in Soils:**

The contract review process completed prior to undertaking analysis of bulk materials in soils, which involves the removal of defined pieces of asbestos-containing material (ACM) and analysing these in accordance with HSG 248, shall ensure that sample assignation and sample amounts are clarified and the customer is aware of the remit and limitations i.e. Bulk materials must be present within the samples of soil to be received by the laboratory. A laboratory for which accreditation in asbestos in soils is not held, would for example, not normally handle a soil sample of 1kg size to then search for ACMs in the entire sample.

Note: If the sample cannot be analysed due to its content i.e. no ACM fragments, the customer shall be informed to determine the next step for the sample.

7.1.5.3 **For Asbestos in Soils (including asbestos in soils, aggregate, ballast, etc):**

The contract review process completed prior to undertaking this work shall ensure that customer needs are clearly ascertained to enable the Laboratory to decide whether appropriate accreditation is held to fulfil customer requirements (see Section 2.2 c above).

7.2 Test and Calibration Methods and Method Validation

(ISO/IEC 17025 clause 7.2)

7.2.1 Air Sampling and Fibre Counting

7.2.1.1 General guidance on airborne fibre monitoring is given in the document HSG 248. This document covers the required flow rates, volumes to be sampled and number of samples required, for a range of asbestos work. Laboratories shall have documented procedures covering the range of sampling and testing activities and shall clearly distinguish between testing for compliance with the control limit, clearance indicator and other types of testing (e.g. leak, background, near-source/far-source monitoring). It is a requirement for all organisations to ensure staff always prepare, expose, mount and retain an identifiable field blank sample for each job undertaken or for longer jobs, on each day of sampling activity undertaken and sent with the field samples to the laboratory. Laboratories are required to define a 'job' to ensure field blanks are sufficiently traceable.

7.2.2 Four-stage Clearance Process (also ISO/IEC 17020 clause 7.1)

7.2.2.1 The laboratory shall have documented in-house procedural guidance on conducting thorough visual inspections. During Stage 2 of the process:

- analysts shall visually inspect the airlocks/baglocks, as well as the enclosure/work area itself
- analysts shall ensure that any fine settled dust/debris is located and subsequently notified to the LARC, where the total additional cleaning time is estimated to exceed 10 minutes, the stage 2 process should be failed
- a fingertip search shall be carried out on all surfaces within the enclosure, including floor areas, at all heights, behind items etc
- a torch (preferably LED) shall be used in addition to lighting provided by the LARC in support of a fingertip search
- analysts shall ensure that the necessary equipment, including a mirror, probes, or screwdrivers, are used during the inspection
- the presence of any dust/debris shall be remediated by the LARC prior to Stage 3 clearance air monitoring

The laboratory's inspection shall be carried out by fully trained and authorised personnel for the purpose of clearance testing, (see Sec 6.1.2.3).

7.2.2.2 Dust disturbance during Stage 3 is necessary for clearance indicator testing. Laboratories shall document the procedure that is to be adopted including reference to the method used, duration, frequency and location. Records of the dust disturbance activities shall be maintained and shall be traceable to the associated air samples.

7.2.2.3 On successful completion of Stage 3, the specific area where the enclosure was located and the surrounding area, shall be carefully inspected for asbestos debris as part of Stage 4. Transit and waste routes shall also be re-inspected for asbestos debris at this stage.

7.2.3 Bulk Sampling

7.2.3.1 Health & Safety Executive publications HSG 264 and HSG 248 describe a method for sampling of suspected asbestos-containing materials and gives guidance on asbestos sampling frequencies and these may therefore be used as the basis of a method for an accredited test. Laboratories wishing to use this approach shall produce a documented in-house procedure to describe the specific methodology adopted.

7.2.4 Fibre Counting

7.2.4.1 Laboratories shall use the methods specified in HSG 248 for PCM and methods such as ISO 10312 (2019), ISO 14966 (2019) and the VDI 3492 (2013) for SEM/TEM, unless there are acceptable alternative methods which can be demonstrated to produce equivalent results for the intended field of application.

7.2.5 Identification of Asbestos in Bulk Materials and Soils (including asbestos in soils, aggregates, ballast, slurries, etc)

7.2.5.1 A low magnification stereo microscopy examination of the sample and suitable sample preparation, in particular whenever regulated asbestos types are not found in a material/product type that is known to have the potential to contain asbestos, followed by polarised light microscopy (PLM)/dispersion staining on selected fibres (as outlined in HSG 248) may be used. Laboratories wishing to use HSG 248 as a basis for their test method shall produce a documented in-house procedure to describe the specific methodology adopted. Laboratories which do not use HSG 248 shall still have a documented in-house procedure.

7.2.5.2 The start and finish times will relate to the overall sample analysis process incurred on each sample.

7.2.5.3 Acid and solvent treatment may be undertaken on a “micro” scale by applying a few drops of appropriate acid/solvent onto small sub-samples of material on a microscope slide/suitable glassware. This allows suspect fibres to be isolated, removed, cleaned and dried prior to mounting in appropriate refractive index liquid.

7.2.5.4 Laboratories that require accreditation for analysis of asbestos in soils and associated materials (including for example soil, slurries, aggregates, ballast and sediments) shall develop appropriate documented in-house methods that include detailed sub-sampling and sample preparation procedures.

7.2.5.5 The laboratory’s in-house method for bulk identification should also contain guidance and instruction on the recognition of ‘confounding’ fibre types, i.e., fibres that possess similar morphological/microscopic properties to the various types of asbestos. Further guidance is given in HSG 248.

7.2.5.6 The maximum number of samples analysed by an authorised person in a 24-hour period (arising from operational/QA/QC purposes) is 60 samples / 70 points.

7.2.5.7 Points shall be applied for the sample, no matter how many layers are encountered. The sample/material type will determine which category is to be applied, when determining if a 1- or 2-point allocation is needed for the sample in question. Points are defined for other samples as detailed in Table A2.10 of HSG 248 including;

- cement, AIB, floor tiles, bituminous products, lagging = 1 point
- hard set lagging, vinyl floor tiles, textured coatings, soils = 2 points

Notes

1. *For any samples/points analysed in excess of these numbers the Laboratory will need to investigate via their non-conforming work process.*
2. *Quality assurance criteria as described in 7.7.1.2.3 and 7.7.1.3.3 apply to rechecks of operational samples.*

7.2 5.8 The number of soil samples for identification (either for operational or QA/QC purposes) which can be analysed by authorised analysts needs to be commensurate with the method employed, whilst mindful of the quality assurance requirements, (see Sec 7.7)

7.3 Sampling

(ISO/IEC 17025 clause 7.3)

7.3.1 Checklists should be used to ensure that all equipment required for on-site sampling is readily available.

7.3.2 Visual records, such as marked-up plans and/or photographic records should be used, wherever practicable. In the absence of formal plans/drawings, the laboratory should use sketches/diagrams to record sampling details.

7.3.3 Air Sampling

7.3.3.1 The removal contractors plan of work or method statement shall be consulted by laboratories to establish the scope of works as part of the 4-stage clearance process requirements, see sections 7.1.4.2, 7.5.1.1, 7.5.1.3. Detailed requirements on air sampling methodology are given in HSG 248.

7.3.4 Bulk Sampling

7.3.4.1 Laboratories shall have documented methods to cover both the physical aspects of obtaining a sample, and the sampling procedures to be employed. The laboratory's documented procedures shall contain guidance on the planned approach including an appropriate risk assessment to sampling the various types of asbestos-containing materials, i.e., asbestos cement products, loose asbestos insulation, sprayed coating etc.

7.3.4.2 In-house methods for bulk sampling shall be based on reliable, published reference sources, such as HSG 264 and HSG 248.

7.3.4.3 The laboratory should use appropriate labels to identify sampling points, wherever practicable unless not required by the customer. The sample details recorded on the labels shall be sufficient to allow traceability through the laboratory's test records.

7.4 Handling of Test and Calibration Items

(ISO/IEC 17025 clause 7.4)

7.4.1 Air Sampling

7.4.1.1 Sampling procedures and records shall be such that there is a traceable link from the sampling pump and cowl to the individual filter.

7.4.1.2 All samples shall be uniquely identified and the date, times and location of sampling, relevant environmental conditions, identification of sampler/wearer (and any other relevant information) shall be recorded at the time of sampling.

7.4.1.3 The use of brushes or brooms for the purpose of dust disturbance may give rise to excessive amounts of particulate matter on filters, and thus invalidate samples taken. Laboratories should therefore consider the use of shorter sampling periods (and the pooling of measurements to give the required minimum sampled volumes), in order to mitigate such problems. Details of alternative sampling strategies adopted (also see 7.5.1.7) shall be included in the laboratory's records, and in the air monitoring report accompanying the Certificate for Reoccupation.

7.4.1.4 Filters shall be retained in capped filter holders for transport into and out of sampling areas.

7.4.1.5 Slides shall be retained for at least twelve months, in accordance with HSG 248 guidance.

7.4.2 Bulk Samples, Identification of Asbestos in Bulk Materials and Soils Samples

7.4.2.1 To avoid cross-contamination, individual bulk samples shall be placed into a double containment system (e.g. double-bagging with resealable plastic bags/containers for bulk materials and samples of soils) immediately after taking the samples. Both the inner and outer airtight containers shall be labelled with sufficient details to identify the origin and identity of the sample, unless the inner details are clearly visible through the outer container.

7.4.2.2 Sample containers shall be re-opened only in the fume cabinet that is used for the analysis of bulk samples. For soils the initial cabinet may not necessarily be used for analysis – e.g. for drying, preparation.

7.4.2.3 Bulk samples, or representative sub-samples, shall be retained for at least six months, unless contract review specifies otherwise e.g. those items associated with litigation or prosecution.

7.4.2.4 Samples or representative sub-samples used for the purposes of analysing asbestos in soils (including soil, aggregates, ballast, slurries etc.) shall be retained for six months after the issue of the results.

7.5 Control of Technical Records

(ISO/IEC 17025 clause 7.5)

7.5.1 Air Monitoring and Four-stage Clearance Process

7.5.1.1 Prior to commencement of the 4SC procedure:

- The removal contractor shall issue a handover form[6] to confirm the site is ready for the analyst's inspection (receipt of the handover form to be recorded in the CfR)

Note: If the handover form is not received at this point the analyst should fail the 4SC at stage 1 unless they are confident by other means that the removal contractor has conducted a visual inspection of enclosure cleanliness and the analyst is confident the enclosure is clean enough to enter for a stage 2 visual inspection. The analyst will record in the CfR that the handover form was not provided but that an alternative method was used to convey the readiness of the enclosure. Evidence of the handover form (or alternative that conveys at least the information in the template form in HSG248 Table A6.4) is to be retained by the laboratory e.g. photograph.

7.5.1.2 The site clearance certification process involves four stages:

Stage 1 - preliminary check of site condition and job completeness
Stage 2 - a thorough visual inspection inside the enclosure/work area, airlock and baglock
Stage 3 - clearance air monitoring inside the enclosure with disturbance of surfaces
Stage 4 - final visual assessment post-enclosure/work area after dismantling the enclosure

Stage 1

7.5.1.3 A copy of the removal contractor's plan of work or method statement shall be reviewed by the analyst when carrying out the Stage 1 inspection in order to establish the extent of works to be undertaken (see also 'Review of requests, tenders and contracts'). If this information is not available, the Stage 1 fail shall be recorded. In the event that a copy of the diagram from the removal contractor's plan of work is not available, the analyst shall produce a site diagram including approximate dimensions, detailing the location of the enclosure, air locks, hygiene unit, waste receptacle, transit and waste routes etc. This diagram shall form part of the laboratory's formal records system. The analyst and removal contractor should agree the content of the diagram. Where the CfR is hard copy, both should sign and date the diagram, where the CfR is electronic, a note (with date and time) should be included to confirm the content of the diagram has been agreed with the removal contractor.

7.5.1.4 As part of the Stage 1 preliminary inspection of areas surrounding the enclosure/work area, transit and waste routes etc., the analyst shall record the presence of materials such as building rubble and non-asbestos debris. The analyst shall initially consult with the asbestos removal contractor requesting that interfering materials, (that may give rise to doubt regarding the completeness of the Stage 1 inspection), be cleared. If this is not possible or practicable, relevant details shall be recorded on the Certificate for Reoccupation. A detailed inspection of the hygiene unit shall also be made to establish that it is fully operational as described in HSG 248.

7.5.1.5 The analyst shall record the presence or absence of viewing panel(s), for the purpose of inspection of enclosures from the outside. Other methods of viewing, such as webcams or CCTV may also be useful during inspections. In the event that viewing panels are not present, the analyst shall record the absence of viewing panels within the site records. The integrity of the enclosure shall be verified and recorded as part of Stage 1. The analyst shall check that all

necessary equipment is present within the enclosure to permit full access for inspection and that adequate lighting is provided.

7.5.1.6 The estimated time for the visual inspection is to be established through discussion of the site conditions with the LARC and recorded in the CfR.

7.5.1.7 Additionally, supporting evidence will be of value to the analyst in assessing the integrity of the enclosure upon discussion with the removal contractor's representative, such as:

- smoke tests (see 7.8.3.2) have been carried out on the enclosure or
- leak tests (from previous analytical monitoring)
- the removal contractor's records for supporting evidence, (The Licensed Contractor's Guide[9] requires daily visual checks of enclosure integrity to be carried out by the contractor)

The analyst should, however, bear in mind that such activities may have been carried out some time prior to the clearance.

Note: It is acknowledged that the above supporting evidence is not mandatory to enable Stage 1 to be completed.

7.5.1.8 The analyst shall record, and request the removal of, any obvious asbestos debris arising from the removal work - particular attention should be paid in areas adjacent to waste skips (and the removal contractor's vehicle, if present during the inspection). In the event that substantial asbestos debris remains within the area and indicates that the final clean has not been undertaken thoroughly enough, then the analyst shall record (and report) a clearance failure at Stage 1.

Stage 2

7.5.1.9 The presence of any known asbestos-containing materials (ACMs) that are to remain in-situ following site clearance certification shall be recorded by the analyst on the Certificate for Reoccupation. A record shall be kept of any ACMs noted to remain in the enclosure during the Stage 2 visual inspection.

7.5.1.10 Remedial actions taken promptly to address problems during visual inspections shall be recorded by the analyst on the CfR. This may include the presence of leaking pipes, seepage of groundwater, 'dusty' surfaces (that may compromise the ability to read the filters after air sampling), inaccessible asbestos etc. As part of this formal record the analyst shall include photographs of the situations encountered and the discussions and actions that took place to rectify them before and during the 4SC process (see 7.5.1.3). However, should the 4SC fail for these above reasons, where applicable, they shall be clearly reported on the CfR.

7.5.1.11 Where wet enclosures are encountered and the situation cannot be rectified promptly then the visual inspection will fail.

7.5.1.12 The analyst shall record whether any sealants or lock-down sprays have been used in or around the work area or where sealants are used as part of the plan of work i.e. encapsulation or a part encapsulation project. There should be no use of sealants prior to the 4-stage clearance procedure (unless they are used as part of the control during the removal process – e.g. removing AIB ceiling tiles, or as permanent sealing). If there is evidence of unauthorised use of sealant (e.g. PVA) in a bid to obtain a clearance, then the analyst shall fail Stage 2. The analyst shall direct the LARC to remove all evidence of sealants before proceeding any further with the 4SC procedure. The analyst can authorise the use of sealants, but reasons and justification for their use (e.g. where non-asbestos dust within the enclosure has caused an air test failure) shall be recorded on the CfR.

7.5.1.13 The analyst shall record the actual time spent undertaking the visual inspection and justify any differences experienced from that estimated at Stage 1 (if >20% or >10 minutes, whichever is the greater).

Stage 3

7.5.1.14 Information to be recorded should include:

- enclosure details (including the information which is required by HSG 248),
- location(s) of the removed ACMs within the enclosure to aid sampling position(s),
- verified flowrates of individual sampling pumps,
- on/off times of pumps with dates,
- relevant environmental conditions

All Stages

7.5.1.15 Laboratories shall obtain photographic records (or other suitable form of visual media) as a means to demonstrate that all the criteria required for the 4-stage clearance to proceed have been met including:

- the removal areas are free from asbestos and
- that the enclosure has been thoroughly cleaned and
- that the enclosure is visually asbestos dust- and debris-free.
- items and areas observed, that are the reason(s) for a failed stage

Traceability of the date / analyst etc relating to any photographs / video footage shall be retained.

Note: The laboratory should obtain the permission of the site owner/customer prior to taking photographs as part of the contract review process.

7.5.1.16 Laboratories shall obtain documented confirmation of the acknowledgement by the LARCs representative of the outcome of the CfR issued (including a failed certificate).
Copies of the certificate should be issued to the removal contractor and to the building owner or occupier promptly on completion of the process.

Hygiene Facility

7.5.1.17 At the time of the 4SC the analyst shall discuss with the removal contractor whether testing is required in the hygiene unit, also see 7.1.4.1. It should be noted that separate clearance certification shall be issued promptly on completion of the process for this purpose. The analyst shall record the outcome of any relevant discussions held with the removal contractor.

7.5.1.18 Photographs shall be taken and included within the clearance certificate to demonstrate the DCU clearance procedure.

7.5.2 Bulk Sampling

7.5.2.1 It is advisable for laboratories to obtain photographic records to demonstrate the condition and location of suspected asbestos containing materials at the time of sampling/surveying (see also HSG 264[10]). The permission of the site owner/customer should be obtained prior to taking photographs.

7.5.3 Fibre Counting

7.5.3.1 Where tally counters are used, the results shall be recorded on the worksheets and/or test report at the completion of the count. If a paper recording mechanism is used for recording numbers of fibres and/or graticule areas, then the observations shall be recorded immediately after each graticule area has been examined.

7.5.3.2 The laboratory shall retain all original data relating to internal QC and RICE schemes within its record system.

7.5.4 Identification of Asbestos in Bulk Materials and Soils Samples

7.5.4.1 The laboratory shall retain all original data relating to internal QC and external proficiency schemes such as AIMS and AISS, within its record system.

7.5.4.2 Samples with more than one layer shall be examined and recorded separately.

7.5.5 Retention of Records

7.5.5.1 Laboratories are required to retain technical records for a defined minimum of 5 years. Consideration should also be given to insurance or legislative requirements, e.g., records of compliance (personal) monitoring on identifiable laboratory staff (undertaking licensable work) should be retained for at least 40 years. Associated training, quality control, etc. records should also be retained (see also Appendix 1 11.1). Where used, 'dry wipe' sheets shall be photographed/scanned before these are reused to ensure original observations are recorded. Records can be stored electronically provided there are sufficient safeguards to protect the integrity of the data.

7.6 Evaluation of Uncertainty of Measurement

(ISO/IEC 17025 clause 7.6)

7.6.1 Air Sampling

7.6.1.1 The test results from the counting of airborne fibre samples and identification of asbestos components are known to be liable to variation as a result of subjective assessment, differences in test methods and operator experience and training, for example. In order to minimise these variations, it is necessary to impose strict controls on test procedures and their implementation. Laboratories should comply with the requirements of relevant published test specifications (for example HSG 248 methods) in order to consider factors that contribute to the overall uncertainty of measurements.

7.6.2 Fibre Counting

7.6.2.1 The uncertainty of the method is stated in HSG 248. Laboratories shall demonstrate their ability to meet the stated requirements. One way of demonstrating this may be through the use of internal quality control schemes (see Appendix 1), and via participation in proficiency testing schemes.

7.6.3 Identification of Asbestos in Bulk Materials and Soils

7.6.3.1 These are qualitative methods. The uncertainty of the method adopted needs to be considered in terms of the laboratory's ability to identify all six regulated asbestos types across a range of concentrations (see also HSG 248). The laboratory should utilise, for example, the results of the AIMS/AISS samples, internal QC results and/or the analysis of well characterised 'reference materials' in order to estimate the uncertainty of measurement that is associated with bulk/soil identification. The use of accumulated data on an ongoing basis will support this process.

7.6.4 In-house Calibrations

7.6.4.1 Where flow meters and/or stage micrometers are calibrated using in-house procedures, the laboratory shall evaluate the measurement uncertainty for all calibrations undertaken. UKAS publication M3003[12] gives appropriate guidance.

7.7 Ensuring the Validity of Results

(ISO/IEC 17025 clause 7.7)

7.7.1 Internal Quality Control

7.7.1.1 Fibre Counting (Air)

7.7.1.1.1 All analysts authorised to carry out fibre counting using PCM and/or electron microscopy shall participate in the laboratory's own internal quality control (QC) scheme and maintain a satisfactory level of performance against a defined set of criteria.

7.7.1.1.2 Guidance on setting-up and maintaining a suitable internal QC scheme is given in Appendix 1 of this document.

7.7.1.1.3 The internal scheme shall monitor the performance of analysts relative to the laboratory mean performance. The scheme shall incorporate the counting of reference slides with stated acceptable mean results. Fibre density similar to those used in the RICE/SEMS schemes may assist in the comparison of internal QC performance with RICE/SEMS performance. Operational slides based on fibre density shall also be selected and be incorporated into the internal QC scheme This will serve to monitor consistency and performance of each counter from sample to sample and day-to-day. Laboratories using SEMS may retain samples sent as part of the SEMS PT scheme and use them for training or QC purposes.

7.7.1.1.4 The QC scheme shall reflect the nature of the work undertaken by the laboratory. Analysts who undertake fibre counting on-site for example shall therefore carry out their quality control in on-site locations wherever possible.

7.7.1.1.5 A minimum acceptable level of quality control participation for an established laboratory is 4 reference slides per working month per analyst.

7.7.1.1.6 A procedure shall also be in place, which states the predetermined frequency and method for randomly assessing (replicate testing) routine slides for reproducibility. All analysts shall;

- have one of their site slides re-counted and
- undertake a recount of a colleague's operational slides per working month

All analysts authorised for fibre counting shall be included in the replicate test process.

7.7.1.1.7 In cases where operational fibre counting is rarely undertaken, additional quality control will be necessary to demonstrate ongoing competence.

7.7.1.1.8 In the event that the number of graticule areas examined by an analyst exceeds 2400 in any working day, additional documented quality control shall be undertaken on all affected slides.

7.7.1.1.9 Individual analysts shall receive periodic feedback of their performance, in a graphical form. Their performance shall be assessed against defined and documented criteria of acceptability on at least a monthly basis.

7.7.1.1.10 The laboratory shall have a defined policy and procedure for implementing corrective action, in the event of an analyst not participating in the IQC scheme or their performance falls outside defined limits of acceptability (see also Appendix 1).

7.7.1.2 Bulk Identification

7.7.1.2.1 All analysts authorised to carry out bulk identification shall participate in the laboratory's own internal quality control (QC) scheme and maintain a satisfactory level of performance against a defined set of criteria. The performance scoring system may, for example, be based on the AIMS scoring system. Where analysts incur a break in the QC scheme of more than one month, they shall be reauthorised in-line with defined criteria (e.g., based on length of absence and changes to management system/technical updates).

7.7.1.2.2 The laboratory's internal QC scheme should include reference samples (such as former AIMS samples) as well as samples representative of the work carried out by the laboratory.

The scheme shall incorporate all six regulated asbestos types at a variety of concentrations over an annual cycle. A minimum acceptable quality control would be 2 previously analysed samples per working month per analyst. This paragraph should also be read in conjunction with 7.7.1.2.3 below.

7.7.1.2.3 A QA programme based on HSG 248 shall also be in place:

- A minimum overall re-analysis of 5% on new operational samples shall be maintained on a daily basis Note
- Additionally, when daily samples analysed are in excess of the requirements described in HSG 248 (Table A2.10) then reanalysis of 20% of operational samples, per analyst shall be undertaken.

Note For very low daily analysis rates (e.g. <10 samples per day per analyst) the 'daily basis' maybe extended to weekly/monthly if justified as part of a risk-based assessment. The risk-based assessment needs to include that results are only issued to the customer upon completion of any required reanalysis.

7.7.1.2.4 Reanalysis of operational samples for quality assurance (as per HSG 248) shall be undertaken by an authorised analyst who has not already reached 40 points. These may be selected using a risk-based approach. Factors to consider include, no asbestos detected samples and samples considered more difficult e.g., layered matrices.

7.7.1.2.5 A laboratory's library bank of reference samples for bulk identification, shall include all six types of asbestos, including negative samples and a range of materials typically analysed by the laboratory. 20 samples as a minimum is deemed reasonable to achieve this requirement, which is expected to increase as a laboratory matures.

7.7.1.3 Asbestos in Soils Analysis (including asbestos in soils, aggregate, ballast, etc.)

7.7.1.3.1 All analysts authorised to carry out soil analysis shall participate in the laboratory's own internal quality control (QC) scheme and maintain a satisfactory level of performance against a defined set of criteria. Where analysts incur a break in the QC scheme of more than one month, they shall be reauthorised in-line with defined criteria, (e.g., based on length of absence and changes to management system/technical updates).

7.7.1.3.2 The laboratory's internal QC scheme shall include reference samples (such as former AISS samples) as well as samples representative of the work carried out by the laboratory. The scheme shall incorporate all six regulated asbestos types at a variety of concentrations over an annual cycle. Where relevant, a minimum acceptable quality control for:

- Qualitative analysis would be: one sample per working month per analyst. This sample is to be selected from across the various types of soils for which the analyst is authorised e.g. soils, ballast, sediment etc. All soil types for which the analyst is authorised shall be covered over an annual cycle.
- Quantitative analysis would be: one sample per working month per analyst. This sample is to be selected from across the various types of soils for which the analyst is authorised e.g. soils, ballast, sediment etc. All soil types for which the analyst is authorised shall be covered over an annual cycle.
- Fibre discrimination would be: two library slides to be counted each month (see 7.7.1.3.5).

7.7.1.3.3 A QA programme based on HSG 248 shall also be in place:

- A minimum overall re-analysis of 5% on new operational samples shall be maintained on a daily basis Note
- Additionally, when daily samples analysed are in excess of the requirements described in HSG 248 (Table A2.10) then reanalysis of 20% of operational samples, per analyst shall be undertaken.

Note For very low daily analysis rates (e.g. <10 samples per day per analyst) the 'daily basis' maybe extended to weekly/monthly if justified as part of a risk-based assessment. The risk-based assessment needs to incorporate that results are only issued to the customer upon completion of any required reanalysis.

As a minimum for routine analysis:

- Qualitative assessments require one customer sample per month to be undertaken, which shall replicate the original analysis
- Quantitative assessments require one customer sample per month to be undertaken, which shall replicate the original analysis
- Fibre counting/discrimination requires one customer slide per month per analyst to be recounted

7.7.1.3.4 A laboratory's library bank of reference samples for qualitative and, where relevant, quantitative purposes, needs to include all six types of asbestos, including negative samples and a range of materials typically analysed by the laboratory. 20 samples as a minimum is deemed reasonable to achieve this requirement, which is expected to increase as a laboratory matures.

7.7.1.3.5 To support fibre counting, a range of slides are required, covering both amphibole and serpentine fibres, across a range of densities reflective of operational activity.

7.7.1.3.6 In the event that the number of graticule areas examined in any working day by an individual analyst exceeds 2400, additional documented quality control shall be undertaken on all affected slides requiring 100% reanalysis by another authorised analyst.

7.7.2 External Quality Assurance

7.7.2.1 Fibre Counting (Air)

7.7.2.1.1 All analysts who are authorised to carry out fibre counting shall participate in the Regular Inter-laboratory Counting Exchanges (RICE) scheme and/or the Scanning Electron Microscopy (SEMS) Fibre Counting Scheme as appropriate. Laboratories should achieve and maintain a satisfactory classification in the schemes.

7.7.2.1.2 Categories of RICE performance are issued after a laboratory has participated in four rounds (circulations), i.e. a maximum of about 16 months from initial participation. UKAS will accept extra rounds if the laboratory needs to demonstrate competence, e.g., for initial assessment or when an Unsatisfactory scheme classification is attained. The performance of an SEM laboratory is assessed as soon as two consecutive rounds have been completed. Performance scores may be published on the HSE Science Division website unless the laboratory has specifically requested otherwise.

7.7.2.1.3 The laboratory shall retain copies of all original data that relate to Scheme counts within its record system.

7.7.2.1.4 All staff involved in fibre counting at all named sites documented on the schedule of accreditation shall participate in the external proficiency-testing scheme, in at least 3 of the last 4 rounds. Counts by analysts not submitted on a PT round shall be assessed for suitability and scored accordingly in line with the scheme rules.

7.7.2.1.5 The laboratory shall implement its defined nonconforming work procedures in the event that RICE/SEMS fibre counting performance becomes unsatisfactory or the performance of individuals produces unsatisfactory results, i.e. Band 'C'. If a laboratory's RICE/SEMS PT performance becomes unsatisfactory UKAS shall be informed immediately; the accreditation of the laboratory will be reviewed and may be suspended or withdrawn.

7.7.2.2 Bulk Identification and/or Asbestos in Soils

7.7.2.2.1 The laboratory shall participate in appropriate inter-laboratory comparison exercises or proficiency testing schemes as relevant, e.g. the Asbestos in Materials (AIMS), Low Asbestos Content Scheme (LACS) or Asbestos in Soils (AISS) scheme.

7.7.2.2.2 All staff involved at all named sites documented on the schedule of accreditation shall participate in the relevant external proficiency-testing scheme, each member of staff shall participate in the external scheme at least once in every 12 months. UKAS will accept extra rounds if the laboratory needs to demonstrate competence, e.g., for initial assessment or when an "Unsatisfactory" classification is attained.

7.7.2.2.3 The laboratory shall implement its defined nonconforming work procedures in the event that deficiencies in inter-laboratory comparisons or proficiency testing schemes are identified or the performance of individuals produces anomalous results, i.e. "non-critical/critical/supercritical". If a laboratory's AIMS/LACS/AISS performance becomes unsatisfactory, UKAS shall be informed immediately; the accreditation of the laboratory will be reviewed and may be suspended or withdrawn.

7.7.2.2.4 AIMS is considered suitable by UKAS for asbestos identification testing providers using EM/EDXS in place of PLM.

Note: AIMS may not be appropriate for laboratories that undertake fibre counting by EM/EDXS who only report results as fibre concentrations and then divide into classes such as amphibole, chrysotile, organic etc (as described in ISO 14966 method), as these laboratories do not need to identify individual fibre types.

7.7.2.2.5 Laboratories undertaking asbestos fibre counting by electron microscopy are required to participate in the Scanning Electron Microscopy (SEM) Fibre Counting Scheme[7]. The recommended methods of analysis defined in the Scheme are the ISO 14966 and the VDI 3492.

Note: The AISS does not cover ballast or sediments and slurries or other types of soil, which may also be on the scope of accreditation. Labs must demonstrate how quality of assurance of these matrices is implemented.

7.8 Reporting the Results

(ISO/IEC 17025 clause 7.8, ISO/IEC 17020 clause 7.4)

7.8.1 Laboratories shall ensure that the requirements of the BEIS publication "National Accreditation Logo and Symbols: Conditions for use by UKAS and UKAS Accredited Organisations"[15] are met whenever the accreditation symbols or reference to accreditation are used.

7.8.2 Laboratories that include opinions and interpretations in test reports shall follow the guidance contained in UKAS Publication GEN 6[16]. Disclaimers shall also be included in reports that include surveying activities, when accreditation for asbestos surveying is not held (see also Section 1.1).

7.8.3 Air Monitoring (including 4SC)

7.8.3.1 For clearance indicator testing, it is not considered practical to report the associated evaluation of uncertainty of measurement. The laboratory shall, however, comply with individual customer requirements and report uncertainty, if requested.

7.8.3.2 Activities such as 'smoke testing' are not covered by UKAS accreditation; the laboratory shall ensure that the test reports contain relevant disclaimers, where appropriate.

7.8.3.3 The CfR for a failed 4SC shall be clearly reported and fully detail the reasons for the failure, (Refer to HSG 248 for additional specific guidance on failure criteria). Laboratories are required to record failures such that the data can support trend analysis and needed improvement as part of their risk-based approach.

7.8.3.4 Photographs shall be included within the CfR for all stages and the DCU clearance certificate.

7.8.4 Bulk Identification

7.8.4.1 The laboratory shall ensure that the quantification of asbestos content of bulk materials is not reported: reports shall not refer to percentages, minor/major content etc. The laboratory will also ensure that the identification of non-asbestos fibre types is reported as non-accredited activities. The reporting of 'trace' is permitted.

7.8.4.2 Where samples are rechecked as part of a quality assurance program, results shall only be issued to the customer upon completion of the reanalysis.

7.8.5 Asbestos in Soils (including asbestos in soils, aggregates, ballast, etc.)

7.8.5.1 **For Asbestos-Containing Material (ACM) in Soils:**

Where analysis of samples involves the removal of defined pieces or fragments which are visually consistent with potential or known asbestos-containing materials (ACM), the report shall clearly state the matrix of the sample being that of the ACM analysed. The report shall not state the descriptor as a matrix of soil as described by either the customer and/or lab analyst.

7.8.5.2 **For Asbestos in Soils (Qualitative):**

Where identification only is undertaken by the Laboratory, the resulting reports from this analysis shall state the matrix as described but cannot report any quantification of the asbestos content as accredited work.

8 Management System Requirements

8.1 Actions to Address Risks and Opportunities

(ISO/IEC 17025 clause 8.5)

8.1.1 The ISO/IEC 17025:2017 standard introduced a risk-based thinking approach. Risk-based thinking enables a laboratory to determine the factors that could cause its processes and its management system to deviate from the planned results, to put in place preventive controls to minimise negative effects and to make maximum use of opportunities as they arise.

8.1.2 Examples of where a risk-based approach can be utilised have been given in this document. Where identified as part of laboratory activities in general, the Laboratory shall plan actions accordingly to address the identified risk and/or opportunity and evaluate their effectiveness on the organisation's systems of work, taking into account the inherent high-risk nature of asbestos testing activities. Records shall be suitable and to the extent necessary to support observed outcomes.

8.2 Corrective Action and Improvement

(ISO/IEC 17025 clause 8.7 & 8.6, ISO/IEC 17020 clause 8.7 & 8.8)

8.2.1 Air Sampling - Site Assessment for Reoccupation (4SC Process)

8.2.1.1 Accreditation to ISO/IEC 17025 includes the requirement to implement corrective actions and improvement initiatives and consider risks/opportunities. Organisations shall implement a programme of site revisits of analysts work when issues of poor work have been identified (either through complaint or internal audit) e.g., return visits to sites of similar conditions immediately or soon after the CfR has been issued – to be undertaken more frequently than the requirement to audit staff specified in 'Internal Audits' for QC purposes.

8.3 Internal Audits

(ISO/IEC 17025 clause 8.8, ISO/IEC 17020 clause 8.6)

8.3.1 Sampling and Testing (Air and Bulk/Soils)

8.3.1.1 All authorised sampling and testing personnel and procedures shall be audited for each accredited activity on at least a 12-monthly basis in accordance with a planned programme, using documented auditing procedures. These procedures shall include witnessing of authorised personnel carrying out accredited site/laboratory work. Visual auditing techniques should be complemented with sufficient oral questioning of personnel to verify that they possess the knowledge and experience required to be deemed competent for all aspects of work that they are authorised to perform. Such auditing should normally be carried out by a designated "competent auditor" (i.e. a person that possesses qualifications, training, experience and

knowledge to meet the requirements of each activity). "Competent auditor" shall be authorised as an auditor. Internal auditing procedures shall include witnessing of authorised personnel carrying out on-site inspection and testing activities associated with site clearance certification that covers a range of complexity and/or types of four stage clearance over a four-year period.

8.3.1.2 In addition for 4SC, the quantity of site audits shall be a minimum of 2 per analyst per year (with reasonable intervals in between).
Table 3 sets out the arrangements for:

- internal auditing of each analyst
- on site reinspection of stage 2
- desktop audit of 5% of 4SC CfRs.

Note: Any changes to these arrangements will conveyed via the Asbestos Technical Bulletin

Table 3 – Analyst audits and reinspection requirements (4SC)

Requirement	Scope	What this looks like
On-site audit of each individual analyst Minimum 2 times per year with reasonable intervals in between	This relates to 4SC only and should include all 4 stages and be on site. Stage 1 Stage 2 Stage 3 Stage 4 **Table 2.1** (of HSG248) sets the site auditing protocol.	'**Reasonable intervals in between'** is to ensure a continuous approach to audit rather than this being a 'tick box' exercise. The duration of the interval may be dictated by performance at the last audit – if poor then, a repeat may be required sooner (additional audits may be required). Otherwise, it may be governed by the type of sites covered i.e. to ensure a suitable site, acknowledging HSG248 para 2.16 which states 'the auditing programme should cover a representative range of: ■ removed materials (e.g. sprayed coating, insulation, AIB, wet-blasting); ■ enclosure complexity's, arising for example from usage of the area/property, size of enclosure, extent of remediation; ■ individual analysts carrying out the clearance inspections Where the nature of the organisations work does not facilitate this, it will be up to the organisation to capture this as part of the audit and consider opportunities for experience and audit to be gained in the future.
On-site reinspection of Stage 2 for each individual analyst Minimum 2 times per year with reasonable intervals in between	This relates to Stage 2 only and is a visual check that no visible dust or debris is remaining	The re-inspection is of the entire enclosure or for larger enclosures a representative area. A **'blind' separate and independent reinspection** of Stage 2 conducted promptly after the analyst has completed the visual inspection. HSE acknowledges that the word **'blind'** needs clarification. HSE and UKAS agreed that **blind** refers to the auditor having no prior knowledge of what the analyst has seen or done. It does not necessarily mean totally unexpected as this is likely to be impractical in many cases. The word **separate** is used to describe the how the reinspection is undertaken in practice, in other words as a separate exercise, not closely shadowing or working directly alongside the analyst. If a very large enclosure, then it may be appropriate for the analyst to progress to different part of the enclosure. Otherwise, they would need to wait outside the enclosure whilst the re-inspection takes place.

Requirement	Scope	What this looks like
		The word **independent** is used to describe the auditor themselves and how they approach the reinspection. Independence requires striving for an objective unbiased approach displaying integrity. For larger enclosures (where the Stage 2 visual takes many hours – days), it may be possible for the auditor to witness a representative part of Stage 2 **and** undertake a re-inspection in a different part of the enclosure. Completing the 4SC site audit **and** the Stage 2 reinspection will **not** be possible for smaller enclosures as the reinspection can't be demonstrated as being 'blind'. There should be **no colluding between the parties** means unbiased i.e. no agreement between the analyst and their auditor to alter the results of the internal audit. For an audit not to be a waste of time or a 'tick box' exercise, it must be reported accurately and fairly.
Desk top audit of 5% of 4SC CfR	5% of total number of 4SC CfR undertaken by the analyst organisation per year. The CfR is checked against the criteria in Table 2.2 of HSG248	This can be undertaken at the office etc.

9 Additional ISO/IEC 17020 Requirements – 4SC

The following paragraphs contain guidance on specific requirements of ISO/IEC 17020 (inspection activities).

9.1 Safety procedures and instructions - ISO/IEC 17020 clause 7.1.9

9.1.1 Risk assessments shall be carried out for all jobs involving 4-stage site clearance work. These shall be fully documented and must include consideration of all site-specific hazards that are likely to be encountered. The review shall also include the site arrangements for fire or emergency evacuation (unless a previous assessment is available) and suitable for review with confirmation of any risk present. Laboratories shall consider aspects such as the possible need for working at heights, 'lone working', working in confined spaces etc - and also their obligation to take reasonable steps to ensure that the health and safety of other persons are not affected by their actions.

9.1.2 Procedures for carrying out risk assessments shall be documented, and analysts shall receive adequate training in the fitting, wearing and care of respiratory protective equipment (including face fit testing and where relevant refresher training). In addition, analysts shall receive training in decontamination procedures, transiting procedures, and the use of airlocks and hygiene facilities.

9.1.3 Arrangements should be made for effective emergency procedures to be enacted in the event of loss of services to the hygiene unit, failure of any appliance - including negative pressure unit(s), accident or illness, fire etc. Emergency procedures should include access to the emergency services (e.g. via the use of a mobile telephone), and also knowledge of escape routes etc with suitable consideration of details contained within the LARCs POW/Risk Assessment for control measures.

APPENDIX 1 - Fibre Counting (Asbestos) by the Use of Optical Microscopy – An Internal Quality Control Scheme

This guidance is based on the technical paper by Ogden et al[17] and was prepared by one of the authors, T Shenton-Taylor. The paper also contains additional useful information on operating internal QC schemes for fibre counting.

Introduction

1.1 Laboratories seeking UKAS accreditation for fibre counting are required to authorise those analysts undertaking the counting. These analysts are required to participate, and maintain a satisfactory performance, in an internal quality control scheme that enables their performance to be assessed on at least a monthly basis. Descriptions of four internal quality control schemes were published by Ogden *et al*, but with the majority of accredited laboratories being primarily involved in counting low density (clearance indicator testing) slides, the most popular scheme adopted is that described as 'The LGC System' in the paper. Some laboratories have, however, encountered difficulties in interpreting the operation of this scheme. In addition, the paper contains only limited guidance on how the individual's performance can be assessed.

1.2 This Appendix is intended to give more detailed guidance on how a laboratory might initiate an internal quality control scheme, and how individual counter performance can be assessed. It assumes that no data exists at the starting point, but acknowledges that laboratories may, in practice, be able to incorporate data previously produced by its counters.

1.3 One major change that this Appendix makes to the scheme as published is the use of density results (fibres/mm^2) rather than number results (fibres counted in a number of fields). This has significant advantages when producing and interpreting the data to be used and removes the problems posed (but often forgotten) of varying values for the Walton-Beckett graticule diameters, and the number of graticule areas actually counted.

2 Objectives of Fibre Counting Internal Quality Control Schemes

2.1 The scheme described is designed to meet the needs of the laboratory to ensure that its individual counters are performing satisfactorily both as individuals, and within the laboratory as a whole. It should, however, be remembered that it represents only one aspect of quality control with respect to fibre counting, since there is also the requirement for the laboratory to participate in the Regular Interlaboratory Counting Exchange (RICE) scheme, and to undertake recounting of randomly selected operational slides (although a more risk-based approach may be adopted for the selection of slides). The individual/laboratory performance within these additional quality control activities must be assessed in relation to defined criteria of acceptable performance. Laboratories should be aware that criteria for the counting of operational slides cannot be defined in the way used within RICE, or to the rigours of the internal quality control scheme that this Appendix describes.

3 Reference Slides - Quality and Fibre Density Ranges

3.1 Ideally, a set of at least thirty reference slides should be established as soon as possible, but in any case within 12 months after accreditation is granted. In order to reduce the time to get a scheme running, an initial set of ten reference slides is required. The slides must be permanently mounted, preferably by the method routinely used by the laboratory. The density range of the reference slides should reflect the levels routinely encountered by the laboratory and should be divided into three groups. Laboratories are encouraged also to include slides of other fibre types than the usual amphibole slides, for example chrysotile, machine made vitreous fibres (MMVF) or synthetic fibres. If necessary, such slides could be generated in house or obtained from other sources.

3.2 These groups are termed: Low <15f/mm², Medium 15-30f/mm² and High >30f/mm². The reference set for a laboratory concerned primarily with 'clearance indicator' type work should contain ~25% Low, ~50% Medium and ~25% High density slides.

3.3 The figure above assumes a notional sample volume of ~480 litres, so laboratories that routinely and consistently sample higher volumes may need to set different levels of fibre density for the three ranges to those specified in Sec 3.2.

4 Reference Slides - Setting the Laboratory Reference Value

4.1 In order to set a laboratory reference value, in fibres/mm², for the reference slides, at least ten counts should be carried out on each slide. These counts should preferably be generated by those analysts in the laboratory who perform to the requirements of 'satisfactory' classification in the RICE scheme. Counts on prospective reference slides can be provided by external counters but care should be taken to check the eventual data carefully to ensure that a grouping effect is not present (i.e. that the external counters are not consistently 'outliers' when compared to those of the laboratory's own counters).

4.2 The laboratory reference value is then obtained by calculating the arithmetic mean of the set of counts obtained on the prospective reference slide.

4.3 The use of the arithmetic mean represents the simplest solution and is consistent with previous approaches. However, it is recognised that other systems might be more appropriate, e.g. the use of the median if the results were to fit a skewed normal distribution. This possibility was investigated, in a limited way, by examining data on prospective reference slides produced by three laboratories on three different sets of slides. For two of the three laboratories there was no significant difference (a visual, not statistical assessment) between the value of the arithmetic mean and the median. This was not the case in the third, but it is believed that this may have been attributed to the fact that the data had been generated by counters at different locations, and that individual counters appeared to be counting somewhat erratically. It should be emphasised that limited data was available in all cases. It is interesting to note that the data from the latter laboratory appeared to approach a log-normal distribution.

5 Reference Slides - Screening Process

5.1 The reference slides should be checked to ensure that they are of good quality in respect of mounting, and that the fibres are evenly distributed over the whole of the filter area. An example of the data that might be collected for two prospective reference slides is given in Table 1. Some check should be made on the spread of data to ensure that the slide is suitable for use as a reference slide. As an initial suggestion, the following criteria should be met: for low density slides, the standard deviation should be <50% of the mean value, for medium density it should be <40%, and for high density it should be <30%. It must be emphasised that these values are a first 'guesstimate' based on limited data, and they may need to be revised as more data becomes available.

Table 1

Reference slide No.1

COUNT			COUNT DATA			RESULT	
No.	Date	Counter	W/B Diam.	Fibres	Fields	Fibres/mm²	
1	3rd Jan.	AB	100	17	200	10.83	
2	3rd Jan.	CD	102	20	200	12.24	
3	4th Jan.	EF	99	17	210	10.51	
4	5th Jan.	AB	100	13½	200	6.60	
5	5th Jan.	CD	102	15	200	9.18	
6	5th Jan.	EF	99	26	204	16.55	
7	5th Jan.	AB	100	24½	200	15.61	
8	8th Jan.	AB	100	10	200	6.37	
9	12th Jan.	EF	99	16	200	10.39	First 10 counts:-
10	16th Jan.	CD	102	19½	220	10.85	Mean = 10.91 ESD = 3.96
11	16th Jan.	EF	99	19	200	12.34	[Suitability check gives
12	18th Jan.	AB	100	18	200	11.46	standard deviation
13	1st Feb.	CD	102	21½	200	13.16	of 3.30, which is
14	1st Feb.	EF	99	20	200	12.99	30.2% of Mean - i.e. <50%, so slide is OK].

Reference slide No.2

COUNT			COUNT DATA			RESULT	
No.	Date	Counter	W/B Diam.	Fibres	Fields	Fibres/mm²	
1	3rd Jan.	AB	100	102½	42	310.9	
2	5th Jan.	AB	100	120	45	339.7	
3	5th Jan.	CD	102	101	38	325.3	
4	5th Jan.	EF	99	50	20	324.8	
5	12th Jan.	AB	100	110	35	400.4	
6	12th Jan.	CD	102	102½	46	272.7	
7	16th Jan.	EF	99	50	30	216.5	
8	20th Jan.	AB	100	100	34	374.7	
9	20th Jan.	CD	102	101½	47	264.3	First 10 counts:-
10	24th Jan.	EF	99	50½	22	298.2	Mean = 312.7 ESD = 64.99
11	1st Feb.	CD	102	102	40	312.1	[Suitability check gives
12	1st Feb.	EF	99	100½	33	395.5	standard deviation
13	5th Feb.	AB	100	52	24	276.0	of 53.73, which is
14	17th Mar.	AB	100	102	44	295.3	17.2% of Mean - i.e. <30%, so slide is OK].

5.2 The standard deviations given for the reference slides in Table 1 have been calculated using the formula most commonly used in electronic calculators:

$$\text{Standard Deviation} = \sqrt{\frac{\sum(X - \overline{X})^2}{n - 1}}$$

6 Calculation of the Expected Standard Deviation (ESD)

6.1 When the laboratory reference value has been assigned to a slide, the 'ESD', for that slide, may be calculated. This may be achieved by substituting the Laboratory Reference Data value for *N*, in terms of fibres/mm², in the Ogden[18] equation:

$$\text{ESD} = \sqrt{(N + 0.04N^2)}$$

This equation is strictly only applicable when using the number result system (see Section 1.3). In order to minimise the effects of changing to the fibre density system, it is necessary to ensure

that 200 fields or 100 fibres are counted when using the reference slides. It remains appropriate to require that at least 20 fields are counted. Where the mean fibre density is less than approximately 2 f/mm², apply a minimum ESD value of 2.0. Where the reference density is less than 10 f/mm², there is a risk that counts which are within the confidence limits in Figure A1.6 in HSG 248 will give rise to unacceptable PV results in this scheme. Laboratories should be discouraged from using slides below 10 f/mm² if possible. Preferably, they should use slides which are at or just below the 'clearance indicator' (equivalent to about 13f/mm²).

6.2 An example for a reference set of thirty slides is given in Table 2. The ESD values are given to two decimal places but this should not be taken to imply any particular level of accuracy.

6.3 It is recommended that the laboratory reference value is recalculated when a slide has results from twenty counts. This value is then used to calculate the new ESD for future use. Recalculation of the laboratory reference value should take place after every subsequent ten counts but no action is taken unless the new value is more than a defined value from the reference value. The defined value for unacceptable change may have to vary with slide density, but an initial value of 10% should be tried. This is obviously more likely to cause problems with low density slides. Should this limit be exceeded, then the data from the reference slide should be examined to check whether counter performance, or the quality of the slide, is deteriorating. The former circumstance might require retraining of a counter, whilst the latter may necessitate removal of the individual slide from the reference stock.

7 Calculation of Performance

7.1 Each authorised counter should count at least four laboratory reference slides per month (see Section 7.7.1.1.5 of LAB30). These should generally reflect the type of slides routinely encountered. The typical mix for a counter primarily involved in 'clearance indicator' type work should be 2 low, 1 medium and 1 high, but this should not be a standard mix for obvious reasons.

Table 2

Reference Slide No.	Date Introduced	Reference Data			
		N (f/mm²)	ESD	No. of Counts	
1	16th Jan.	11.11	4.01	10	
2	24th Jan.	312.7	64.99	10	
3	16th Jan.	5.48	2.58	10	
4	16th Jan.	25.22	7.12	20	
5	24th Jan.	45.09	11.24	20	
6	16th Jan.	8.08	3.27	10	
7	24th Jan.	144.8	31.36	20	
8	24th Jan.	22.17	6.47	10	
9	24th Jan.	10.77	3.93	10	
10	24th Jan.	4.96	2.44	10	
11	19th Feb	2.14	2.00	10	
12	19th Feb.	68.53	16.01	10	
13	19th Feb.	12.20	4.26	10	
14	19th Feb.	37.46	9.67	10	
15	19th Feb.	8.47	3.37	10	
16	19th Feb.	110.2	24.41	10	
17	19th Feb.	12.62	4.36	10	
18	19th Feb.	47.47	11.73	10	
19	19th Feb.	14.39	4.76	10	
20	19th Feb.	3.58	2.02	10	
21	29th Mar.	20.31	6.07	10	
22	29th Mar.	6.14	2.77	10	
23	29th Mar.	247.3	51.90	10	
24	29th Mar.	10.31	3.82	10	
25	29th Mar.	16.47	5.23	10	
26	29th Mar.	12.92	4.43	10	
27	29th Mar.	28.39	7.79	10	
28	29th Mar.	18.00	5.56	10	
29	29th Mar.	1.07	2.00	10	
30	29th Mar.	14.80	4.85	10	

7.2 Table 3 shows the results produced by counter 'AB' over the period January to April. It shows the date of counting, microscope used, the reference slides counted, and the results obtained in terms of numbers of fibres and fields. The counter also submits the calculated density (f/mm²) using the measured value for the Walton-Beckett graticule diameter. The Laboratory Reference Values are known and the performance of 'AB' must now be assessed by comparison of the individual's results with the reference value. AB's performance value (PV) is calculated - for each individual slide counted - using the following formula:

$$PV = \frac{\text{AB's result (f / mm}^2\text{)} - \text{Laboratory Reference Value } N \text{ (f / mm}^2\text{)}}{\text{Laboratory Reference Value ESD}}$$

7.3 The performance results obtained can then be plotted in a graphical format (see Lab 30, Section 7.7.1.1.9). The results generated from the counting of low density slides are differentiated from medium and high density in order to facilitate the identification of possible retraining requirements, should those become necessary.

7.4 The scheme described can be computerised, i.e. using spreadsheets or databases.

8 Assessment of Counter Performance

8.1 Each individual counter's performance should be checked on a monthly basis (i.e. after the completion of a QC round for the counter) against a defined set of acceptance criteria. Whilst it would be desirable to be able to set tight controls at the outset, it is more sensible to set achievable limits to begin with (within reason of course), and to gradually tighten them as experience of the scheme increases.

9 Criteria of Acceptable Performance

9.1 An established laboratory that has run an internal quality control scheme for some time (perhaps with a fairly stable group of counters) shall be able to meet the following criteria:

(a) No individual performance value to be outside the range of -2.0 to +2.0.

(b) A running modulised (i.e., ignore signs) mean, for an individual counter, of the last six performance values, to be maintained at <1.0.

(c) At least 80% of the performance values from the last 4 months for each individual to lie between -1.25 and +1.25.

9.2 For a laboratory beginning to operate an internal quality control scheme for fibre counting, the following criteria might be more appropriate. (It must be remembered that the aim will be to tighten the acceptable performance limits as soon as practicable). The initial criteria might then be:

(a) No individual performance value to be outside the range -2.0 to +2.0.

(b) A running modulised mean of the last six performance values to be maintained at <1.5, with 1.0 acting as a warning level.

(c) At least 80% of the performance values from the last four months for each individual to lie between -1.5 and +1.5.

Table 3

QC Period	Date Counted	Micro Used	AB				Laboratory Reference Values		AB's Performance Value	AB's Rolling Mean
			Count Results							
			Slide	Fibres	Fields	f/mm²	N (f/mm²)	ESD		
January	28th Jan.	A	1	18	200	11.46	11.11	4.01	+0.09	
January	28th Jan.	A	2	100	51	249.8	312.7	64.99	-0.97	
January	28th Jan.	A	3	7½	200	4.78	5.48	2.58	-0.27	
January	28th Jan.	A	4	32	200	20.38	25.22	7.12	-0.68	
January	28th Jan.	A	5	50½	126	51.06	45.09	11.24	+0.53	
February	7th Feb.	A	6	6½	200	4.14	8.08	3.27	-1.20	0.62
February	10th Feb.	B	7	100	104	122.49	144.8	31.36	-0.71	0.73
February	10th Feb.	B	8	35	200	22.29	22.17	6.47	+0.02	0.57
February	16th Feb.	A	9	17	200	10.83	10.77	3.93	+0.02	0.53
February	16th Feb.	A	10	16	200	10.19	4.96	2.44	+2.14	0.77
(February)	3rd Mar.	A	10(recount)	10	200	6.37	4.96	2.44	+0.58	
March	17th Mar.	A	2	102	44	295.3	312.7	64.99	-0.27	0.73
March	17th Mar.	A	13	30½	200	19.43	12.20	4.26	+1.70	0.81
March	17th Mar.	A	15	14	200	8.92	8.47	3.37	+0.13	0.71
March	17th Mar.	A	17	20½	200	13.06	12.62	4.36	+0.10	0.73
March	17th Mar.	A	20	2½	200	1.59	3.58	2.02	-0.99	0.89
April	10th Apr.	B	7	50	48	132.7	144.8	31.36	-0.39	0.60
April	10th Apr.	B	8	38½	200	24.52	22.17	6.47	+0.36	0.61
April	12th Apr.	A	27	50	180	35.39	28.39	7.79	+0.90	0.48
April	12th Apr.	A	19	17½	200	11.15	14.39	4.76	-0.68	0.57
April	12th Apr.	A	20	6½	200	4.14	3.58	2.02	+0.28	0.60

Consequences of Failing to Meet Criteria of Acceptable Performance

10.1 Failure of a counter to meet any of the above criteria must result in appropriate action by a designated person (normally the quality manager) who is responsible for checking system performance on a monthly basis. The three criteria will require different responses and are discussed separately.

10.2 A counter returning a performance value outside the range -2.0 to +2.0 (see paragraphs 9.1(a) and 9.2(a)) should be required to recount the slide concerned as soon as possible, and the counter should be temporarily withdrawn from operational counting (i.e. without amendment to the list of authorised counters). The original performance values should be used when calculating the analysts running modulised mean value to give an accurate modulised mean value and any re-count values should be documented and included in the modulised mean value calculation. If the recount result enables the counter's performance to be assessed as 'satisfactory' then no specific further action is necessary. If the recount result still leaves the analyst outside the acceptable criteria, then action must be taken to identify and correct the problem. If informal or formal retraining takes place, the counter should be required to count a defined number of reference slides, usually linked to the laboratory's training schedules, and must meet defined acceptance criteria in order to return to operational counting. If a long delay is anticipated in the corrective action programme (e.g. of more than 1 week) then the analyst should be formally removed from the list of authorised counters.

10.3 The use of a warning level indicator (see paragraph 9.2(b)) is designed to prevent counters going outside the level set for the running modulised mean. Should a counter fail to meet this criterion (see paragraphs 9.1(b) and 9.2(b)), then they should be removed from the list of authorised counters and undergo some formal retraining. This should again be linked to the training schedule, but before returning to the list of authorised counters the individual must complete a formal assessment, using reference slides, to ensure that they are meeting the criteria laid down. Since this process is likely to take more time than the action required under 10.2, it is probable that the name of the individual will need to be formally removed from the list of authorised counters.

10.4 Interpretation of an individual's performance to the third criterion (see paragraphs 9.1(c) and 9.2(c)) must be a little more flexible, since it must allow the quality manager (or other designated person), the opportunity to interpret reasons for failing to comply. This interpretation will include consideration of the types of samples involved, and the degree of non-compliance. It must always be remembered that the possibility of 'rogue' results when dealing with low density slides is quite high, and the QC scheme should not result in a constant stream of counters requiring retraining.

10.5 When an individual fails to meet any of the criteria laid down, all 'observations' and 'corrective actions' must be documented. Where the defined criteria are overruled (e.g., see paragraph 10.4), then justification for this action must also be documented. Where an analyst's performance is found to be unsatisfactory, serious consideration should be given as to whether recent results produced by the analyst should be checked. Again, all actions must be documented.

10.6 Where analysts have been absent from the QC scheme for a consecutive period, (greater than 2 months) they must be fully assessed prior to being reauthorised.

10.7 The application of trend analysis techniques should also monitor "positive" or "negative" bias in an analyst's counting performance to address tendency to consistently undercount or overcount.

11 Records

11.1 Comprehensive records should be kept for all aspects of the internal quality control scheme. This should include the data used to establish reference slides, records of data generated by individual counters within the scheme, data showing individual counter performance, and any documentation resulting from failure of counters to meet defined criteria of acceptable performance.

11.2 Analysts must receive feedback of their performance. It is recommended that this is achieved by use of graphical presentations (see also Lab 30, Section 7.7.1.1.9). Laboratories, both established and new, may find it beneficial to display the performance graphs for all of their individual counters in the laboratory.

12 Auditing

12.1 The laboratory should include all aspects of the internal fibre counting quality control scheme in the audit programme of the laboratory. Special attention should be paid to checking that individuals have participated at the required level, that the criteria for acceptable performance have been met, that the criteria set remain acceptable, that any failure to meet the criteria has resulted in appropriate action, and that implemented action has been effective with all records maintained.

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