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HOKLAS Supplementary Criteria No. 6

‘Environmental Testing’ Test Category – Chemical Testing

0 Introduction

- (a) This document serves to clarify and supplement the requirements of ISO/IEC 17025:2017 and HKAS Policy Document No. 1 for the accreditation of laboratories performing chemical testing of air, water, sediment, waste and other environmental samples in the Environmental Testing Test Category.
- (b) For areas not covered in this document, ISO/IEC 17025:2017, HKAS Policy Document No. 1, HKAS 002 and other relevant criteria documents shall apply. This document is not applicable to accreditation of asbestos sampling and testing, laboratories shall refer to HOKLAS SC-05 for details. For sampling and site testing of water, waste water, soil, sludge and sediment, laboratories shall refer to HOKLAS SC-10. For air sampling and on-site measurement of indoor and outdoor air, details are provided in HOKLAS SC-50.
- (c) Laboratories should note that fulfilling the requirements in this document might not necessarily meet the requirements of all test standards. Individual test standards may have specific requirements which shall be met when conducting the concerned tests.

1 Scope

(No additional explanation)

2 Normative reference

(No additional explanation)

3 Terms and definition

(No additional explanation)

4 General requirements

(No additional explanation)

5 Structural requirements

- (a) The laboratory shall have at least one staff member who has in-depth knowledge of and extensive experience in analytical chemistry. He/she shall be responsible for the technical operation of the laboratory with respect to environmental testing. Each technical area, e.g. trace elements analysis, trace organic analysis, etc., shall be adequately covered by qualified technical personnel.

6 Resource requirements

6.1 General

(No additional explanation)

6.2 Personnel

- (a) Tests shall be performed by staff members who have received adequate training in environmental testing. For tests involving the use of sophisticated analytical instruments such as GC-MS/MS, LC-MS/MS, AAS, ICP-OES, ICP-MS, etc., testing staff members are normally expected to have completed a post-secondary course in chemistry such as Higher Diploma in Applied Science. Special training shall be given to staff members operating specialised equipment such as high-resolution mass spectrometer, GC-ICP/MS, LC-ICP/MS, etc., and the testing staff members are normally expected to possess a bachelor's degree in relevant discipline. External training should be provided when techniques involving the use of specialised equipment and requiring special skills and knowledge are being introduced to the laboratory for the first time, unless the existing staff members already possessed the necessary expertise.
- (b) A training programme for each testing staff member shall be documented. The programme shall include training on the analytical techniques involved as well as the test procedures (including related procedures such as sub-sampling) and the quality assurance plans.
- (c) Approved signatories shall either have
- i. at least a Bachelor of Science degree, or equivalent, in chemistry or other relevant technical disciplines, with at least 3 years of relevant testing

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experience; or

- ii. an Associate Degree or a Higher Diploma, or equivalent, in chemistry or other relevant technical disciplines, with at least 5 years of relevant testing experience.

Note: Alternatively, appropriate membership of professional bodies is acceptable. Special consideration may be given to persons without the above qualifications but with extensive experience (at least ten years) in the test areas concerned.

- iii. Irrespective of the person's academic qualifications, the nominee shall have at least six months' experience in the test areas for which signatory approval is sought.
- iv. In all cases, candidates shall demonstrate his/her technical competence in the test areas under consideration to the assessors before signatory approval can be granted.

- (d) When training is conducted on specific techniques, as opposed to specific methods, the laboratory should define and document the technique-based competence required for an analyst to perform each test and the additional requirements related to the technique concerned.
- (e) Laboratory personnel responsible for visual assessment of colour difference of test samples, including approved signatories for the visual tests concerned, shall not have colour vision problem that may affect validity of results.

6.3 Facilities and environmental conditions

- (a) The laboratory shall provide appropriate environmental conditions and control necessary for particular tests including temperature, humidity, freedom from vibration, freedom from airborne and dust-borne contamination, special lighting, etc. Laboratory environmental conditions shall be monitored and recorded when they may adversely affect the quality, accuracy or validity of the test results. Acceptable ranges for environmental conditions such as temperature and humidity shall be defined and documented. Cases where environmental conditions fall outside the acceptable ranges shall be recorded and the effects, if any, on test results shall be evaluated. Suitable corrective actions shall be taken to rectify the situation as soon as possible.
- (b) It should be noted that both temperature and humidity fluctuations may affect

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the performance of some instruments. Laboratories shall identify instruments that require special environmental conditions. Common examples of this type of instruments include analytical balances, infrared spectrometers, etc. Laboratories shall ensure that these instruments are placed in an environment that ensures their optimum performance and fitness for the intended use. Voltage stabiliser should be used for instruments sensitive to voltage fluctuation.

- (c) There shall be effective separation between neighbouring laboratory areas of incompatible activities, especially activities in other test categories which are likely to cause contamination to environmental testing. These activities may include testing of toy, food and construction materials, etc. When selecting designated areas for special work, laboratories shall consider the previous use of the area and take appropriate measures to ensure that the area is free of contamination. Such laboratory areas include open benches, fumehoods, sample storage area, oven / furnace area, and apparatus soaking / washing area.
- (d) Trace analyses are particularly susceptible to contamination. Laboratories shall document procedures and the precautions to be taken to prevent contamination from the environment. Particular attention should be given to the presence of dust in the laboratory environment for trace elements analysis. Precautions shall be taken to avoid the ingress of dust as far as possible. Materials used for furniture, hoods and other fixtures shall not cause contamination, by generation of airborne particulates, to test samples, calibration standards and other reagents during the entire process of sample preparation and analysis. Good housekeeping is essential to minimise contamination by air-borne particulates.
- (e) For trace organic analysis, particularly for volatile organics, procedure shall be in place to avoid cross-contamination of solvents used elsewhere in the laboratory.

6.4 Equipment

- (a) For environmental testing, it is essential to avoid contamination of test samples and/or standard solutions by labware. Laboratories shall document procedures for washing labware and, where necessary, for using particular types of labware (glass, PTFE, etc.) for particular tests. Attention should be given to the possible presence of analytes such as phosphate, ammonia, metals, and surfactants in commercial detergents. Laboratories shall use, where necessary, different washing and storage procedures for labware used for different analyses. For example, labware should be soaked in acid bath to

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remove traces of elements for trace elements analysis. It is also necessary to have a set of labware dedicated for trace elements analysis to prevent possible cross-contamination. Similarly, labware for incompatible tests shall not be mixed. For example, labware used for COD testing should not be mixed with labware for trace chromium analysis or BOD testing. Procedures or precautions for labware cleaning, if given in the test standards shall be followed.

- (b) The grades of reagents used (including water) shall be stated in the methods together with guidance on precaution to be observed in their preparation or use. The absence of analytes in reagents, especially solvents used in trace organic analysis and acids used in trace elements analysis, is of particular significance. Laboratories shall ensure that reagents used are suitable for the applications. Critical reagents prepared by the laboratory shall be labelled to identify their content, strength, solvent used (other than water), any special precautions and restrictions of use, date of preparation and period of validity. The person responsible for the preparation of the reagent shall be identifiable from records.
- (c) Water is one of the most commonly used reagents in chemical analysis. Hence, means to ensure that reagent water is of the required quality is necessary. Performance of water purification system shall be checked at suitable intervals to confirm the water produced meets the testing requirements. Records of such checks shall be maintained.
- (d) Calibration curves shall be constructed as specified in the test standards. As a general guideline, at least three standards (excluding blank) should be used to establish a linear calibration graph. The standards used shall bracket the entire range of concentration of the test samples. The lowest standard shall be at a level at or below the reporting limit of the test method. The correlation coefficient of linear calibration graph shall normally be at least 0.995. Other approaches such as examining the residuals from linear regression can also be used (see Royal Society of Chemistry Analytical Methods Committee Technical Brief No 3). Guidelines given in ISO 11095 'Linear calibration using reference materials' and ISO 8466-1 'Water quality – Calibration and evaluation of analytical methods and estimation of performance characteristics – Part 1: Statistical evaluation of the linear calibration function' should be consulted, where appropriate. More calibration standards (minimum five) are required for non-linear calibration functions. For further information, ISO 8466-2 'Water quality – Calibration and evaluation of analytical methods and estimation of performance characteristics – Part 2: Calibration strategy for non-linear second-order calibration functions' should be consulted. Bracketing technique should be used, if appropriate.

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- (e) Calibration graphs shall be checked at suitable intervals using calibration standard. The frequency of such check depends on the stability of the equipment and a frequency of around 5 per cent of the total number of samples tested is normally considered as appropriate, except otherwise specified by the test standards or the stability of the equipment merits a more frequent checking. Acceptance criterion shall be established and shall commensurate with the required measurement uncertainty.

6.5 Metrological traceability

- (a) HOKLAS Supplementary Criteria No. 2 ‘All Test Categories – Equipment Calibration and Verification’ provides HKAS policy on metrological traceability of measurement results. Requirements given in this Supplementary Criteria relevant to environmental testing shall be fulfilled. For chemical analyses, it is not uncommon that the calibration procedure forms an integral part of the test procedure and is given in test standards. In such case, the calibration procedure given in the test standard shall be followed.
- (b) Reference materials used for calibration shall provide the necessary metrological traceability. The requirements given in HOKLAS Supplementary Criteria No. 1 ‘Acceptability of chemical reference materials and commercial chemicals used for the calibration of equipment’ shall be followed.

6.6 Externally provided products and services

(No additional explanation)

7 Process requirements

7.1 Review of requests, tenders and contracts

(No additional explanation)

7.2 Selection, verification and validation of methods

7.2.1 Selection and verification of methods

- (a) When selecting testing methods, the needs of the customers shall be considered. For example, for environmental background monitoring, it is essential to know the expected levels of analytes present and use a method that can provide the required limits of reporting. If a piece of legislation, a standard

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or other published documents specify the conformity testing method(s)/procedure(s) to be used, that specified test method(s)/procedure(s) shall be used for conformity testing against the corresponding regulatory or specification limits. Due regard shall also be given to ensure the method selected is applicable to the matrices of the samples and expected levels of the analytes.

- (b) If specified in the standard method, the procedure for determination and/or verification of method performance characteristics such as limits of detection and quantitation, precision, recovery, etc., shall be followed. Like method validation, laboratory is required to use certified reference materials and participate in appropriate PT activities to verify its competence in performing the standard method.
- (c) The verification work to be carried out shall be appropriate to the purpose of the method, such as identification or quantification of analytes at low and high concentrations. In general, the laboratory shall demonstrate their technical competence in performing the standard method such that the method performance characteristics, such as laboratory bias, precision, sensitivity (limits of detection and quantitation) as well as the measurement uncertainty calculated from the verification data, meet the criteria specified in the standard method for all the matrices and concentrations that the laboratory will apply the method.

Note: Repeatability limit (r)/repeatability standard deviation (σ_r) and reproducibility limit (R)/reproducibility standard deviation (σ_R) are often stipulated in a standard method as benchmark performance criteria. References such as ISO 5725-6 'Accuracy (trueness and precision) of measurement methods and results – Part 6: Use in practice of accuracy values' describe how could a laboratory demonstrates that it is able to use a standard measurement method with given R (or σ_R) and r (or σ_r) in a satisfactory way, including fulfilment of precision requirement in terms of r (or σ_r) and verifying if laboratory bias is acceptable with regard to the specifications of R (or σ_R) and r (or σ_r).

- (d) The use of a 'more advanced' technique than the one specified in the test standard may sometimes constitute a deviation. This is particularly true when the analytes are defined by the analytical method (i.e. empirical method). When modifications of this nature are made, the laboratory shall assess the possible effects on the test results and, where necessary, obtain supporting evidence to justify the deviations. HKAS Executive shall be informed of such deviations. The test shall be described as particular standard with

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modification(s). Test reports shall also indicate such modification(s).

7.2.2 Validation of methods

- (a) Laboratories should pay particular attention to the scope/applicability such as analytes, concentration ranges and sample matrices of a standard method. If standard methods are used outside their intended scope, validation is required.
- (b) For environmental testing, some of the method performance characteristics are of particular importance. They include, for example, selectivity, limits of detection and quantitation, precision and bias, applicable concentration range and applicable sample matrices. It is thus important that laboratory-developed methods shall be validated against, amongst others, these characteristics. Moreover, laboratory shall demonstrate its competence to perform the test by the use of certified reference materials and participation in proficiency testing programmes, if available.
- (c) Laboratories shall define how limits of detection, quantitation and reporting are derived. These procedures shall be in line with guidelines given in national or international standards or by reputable professional bodies. The limits shall not give an unrealistic impression of the method's capability. Reporting limits shall be set at a level at which quantitative results are obtained with a high degree of confidence. Limits of detection, quantitation and reporting shall be suitably verified. Examples of such guidelines are given in APHA 'Standard Methods for the Examination of Water and Wastewater', IUPAC Technical Report 'Harmonized Guidelines for Single-Laboratory Validation of Methods of Analysis', ISO 11843-2 'Capability of detection – Part 2: Methodology in the linear calibration case' and ISO/TS 13530 'Water Quality – Guidance on analytical quality control for chemical and physiochemical water analysis'.
- (d) Method bias shall be assessed using matrix certified reference materials (CRMs), if available. The CRMs used shall be of the same matrices as the sample matrices. The levels of the analytes shall also be within the ranges of applicability of the method. The procedure given by ISO Guide 33 'Reference materials – Good practice in using certified reference materials' should be used to assess the trueness of the test method. If suitable matrix CRMs are not available, recovery studies or comparisons with standard reference methods shall be carried out. The recovery studies should be carried out by spiking the analyte into matrix blank. The type of matrices chosen for validation studies should be representative of those encountered in routine operation and should serve the intended purpose of the method. Additional guideline is given in IUPAC Technical Report 'Harmonised Guidelines for the use of Recovery Information in Analytical Measurement'.

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- (e) Confirmation of the identity of organic compounds is necessary for non-selective methods, e.g. gas chromatographic methods employing electron capture detector, flame ionisation detector, or thermal conductivity detector, etc.; or liquid chromatographic methods employing refractive index detector or evaporative light scattering detector, etc. Procedure and criteria for confirmation of organic compounds shall be documented. The confirmation method shall be able to reliably confirm the identity of the organic compound at the reporting limit.
- (f) The performance of a validated method may change due to many reasons. It is therefore necessary to review the performance characteristics of test methods at suitable intervals and perform revalidation if necessary. Such review may also arise when the performance of the method is affected by changes such as changes in the procedure, equipment, environmental conditions, etc.

7.3 Sampling

- (a) Sampling of environmental test samples from site is covered in HOKLAS SC-10 and HOKLAS SC-50 and will not be repeated in this document.
- (b) Laboratories shall have procedures for taking test portions from a laboratory sample and shall have measures to ensure that the test portions are representative of the sample. This is particularly important for inhomogeneous samples such as biota, soil and sediment. Standard methods such as ASTM D3976 'Standard Practice for Preparation of Sediment Samples for Chemical Analysis' contain useful guidance. Customers should be consulted on the procedure to be used for taking test portions from the laboratory samples, if necessary. It may be necessary to report the procedure used in the test reports.

7.4 Handling of test or calibration items

- (a) Laboratory shall examine and record the condition and appearance of the samples upon receipt. Items to be checked include, where appropriate, type of sample container, volume or amount of sample, temperature, pH, colour, etc. Any deviations of test item from specified conditions shall be handled in accordance with Cl. 7.4.3 of ISO/IEC 17025: 2017.
- (b) Test samples shall be suitably preserved and stored as soon as practicable upon receipt. The preservatives used and the storage conditions shall conform to guidelines given in relevant standards such as ISO 5667-3 'Water quality – Sampling – Part 3: Preservation and handling of water samples', APHA 'Standard Methods for the Examination of Water and Wastewater', ISO

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5667-15 'Water quality – Sampling – Part 15: Guidance on preservation and handling of the sludge and sediment samples', and Chapter Three (Inorganic Analytes) as well as Chapter Four (Organic Analytes) of USEPA SW-846 test methods. The temperature of the sample storage shall be monitored and recorded to demonstrate that the requirements are fulfilled. Tests shall be performed within the recommended maximum holding times.

- (c) Frequently, it is necessary to split a sample for testing for different parameters. It is essential that such sub-samples are representative of the original sample and that their identities are maintained at all times. Splitting of samples is not allowed for some test parameters such as oil and grease, volatile organics, etc. Additional samples for these types of testing shall be obtained from the customers, if necessary.
- (d) Access to the sample storage shall be controlled and only authorised persons shall have access to the sample storage. The storage may have to be locked.

7.5 Technical records

(No additional explanation)

7.6 Evaluation of measurement uncertainty

- (a) It is recognised that various approaches to evaluating measurement uncertainty are available. HKAS accepts approaches which are published by reputable professional bodies or standard writing bodies. However, it is important that the measurement uncertainty obtained shall be in line with the definition given in JCGM 200 'International vocabulary of metrology - Basic and general concepts and associated terms (VIM)'. ISO 11352 'Water quality – Estimation of measurement uncertainty based on validation and quality control data', EURACHEM/CITAC CG4 'Quantifying Uncertainty in Analytical Measurement', VAM Project 3.2.1 'Development and Harmonisation of Measurement Uncertainty Principles, Part (d): Protocol for uncertainty evaluation from validation data' published by LGC (UK), and Nordtest Technical Report 537 'Handbook for calculation of measurement uncertainty in environmental laboratories' provide useful guidance on evaluation of measurement uncertainty in chemical measurement.
- (b) In general, the degree of rigor relates to the level of risk. To properly evaluate safety, substantial property risk or financial risk, or for litigation purpose, a relatively rigorous uncertainty evaluation is required for the associated tests.
- (c) Where sampling (or sub-sampling) forms a part of the test, the uncertainty

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arising from the sampling process shall be considered by the laboratory. In other words, it is necessary to analyse the representativeness of the sub-sample (i.e. test portion) as part of the measurement uncertainty evaluation. Nordtest Technical Report 604 'Uncertainty from sampling – A Nordtest handbook for sampling planners on sampling quality assurance and uncertainty estimation' and EURACHEM/CITAC Guide 'Measurement uncertainty arising from sampling: A guide to methods and approaches' produced jointly by EURACHEM, EUROLAB, CITAC, Nordtest and the RSC Analytical Methods Committee may be followed.

- (d) The uncertainty of physical measurements, the purity of calibration reference materials and their uncertainties, the uncertainties associated with recovery (bias) trials (when recovery factors are applied to results), as well as precision data, if significant, shall be considered in the evaluation of measurement uncertainty.
- (e) Professional judgement may be used for evaluating uncertainty attributed to certain sources where better evaluation is not available or readily accessible. Where professional judgement has to be used for identifying significant sources, it shall be based on objective evidence or previous experience. Evaluation of measurement uncertainty containing significant sources evaluated by professional judgement shall not be used for applications demanding the most rigorous evaluation of uncertainty.

Notes:

- (1) *Measurement uncertainty may be evaluated by rigorously considering individual sources, with mathematical combination to produce a measurement uncertainty. This approach is often considered appropriate for the most critical work, including for the characterisation of reference materials.*
- (2) *Another approach to evaluate measurement uncertainty is based on proficiency tests or interlaboratory studies, quality control and method verification/validation data, taking into consideration additional uncertainty sources. Additional sources that need to be considered may include sample homogeneity and stability, calibration/reference material, bias/recovery, equipment uncertainty (where only one item of equipment was used in obtaining the precision data). For evaluation of measurement uncertainty of method and laboratory bias from proficiency testing data, references such as ISO 11352 'Water quality – Estimation of measurement uncertainty based on validation and quality control data', Nordtest Technical Report 537 'Handbook for Calculation of Measurement Uncertainty in Environmental Laboratories' and EUROLAB Technical Report 'Measurement uncertainty*

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revisited: Alternative approaches to uncertainty evaluation' may be useful.

- (3) *In standard methods where repeatability standard deviation (σ_r) and reproducibility standard deviation (σ_R) as determined in accordance with ISO 5725-2 'Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method' are provided, the information may be adopted for measurement uncertainty evaluation as per ISO 21748 'Guidance for the use of repeatability, reproducibility and trueness estimates in measurement uncertainty evaluation'.*

7.7 Ensuring validity of results

- (a) Laboratories shall establish and implement quality control plans to ensure and demonstrate that the measurement process is in-control and test results generated are accurate and reliable. Laboratories shall have procedure for preventing the reporting of incorrect results. Common quality control procedures include the analysis of blanks, duplicates, spikes, and controls. The plans shall include frequency of performing quality control samples, their acceptance criteria and actions to be taken in cases of acceptance criteria not being met. Laboratories shall document their quality control plans and procedures for each test method and matrix.
- (b) The quality control plans and procedures, including acceptance criteria, whenever given in the relevant test standards shall be followed. In the absence of such plans, the following shall be followed, where applicable.
- i. Blanks
Method blanks shall be performed at a minimum frequency of one per preparation batch of samples per matrix type or one per twenty samples, whichever is more frequent. A method blank should consist of reagent water and all reagents, in same amounts as test samples, which are in contact with or added to a sample during the entire analytical procedure. Method blanks shall be processed through the entire analytical procedure simultaneously with other test samples within the same preparation batch. Values of method blanks above the acceptance limit indicate possible contamination of the batch of samples analysed simultaneously with the blank. Normally, the values of blank should be below the method detection limit.
 - ii. Laboratory control sample (LCS)
LCS shall be analysed at a minimum frequency of one per twenty samples or one for each batch of samples, whichever is more frequent. LCS should

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be prepared in a matrix and at a concentration level that is normally encountered.

iii. Spikes

Matrix spikes shall be performed at a minimum frequency of one per batch of samples or type of matrix or twenty samples, whichever is more frequent. Spiking shall be done before the sample is analysed and should be at a concentration less than or equal to the mid-point of the calibration curve, or that commonly encountered in samples. The amount of spike added shall not alter the matrix of the sample significantly. The spike and the calibration standards used in the same run should be prepared from different stock solutions or by different analysts, if possible.

iv. Duplicates

Duplicate samples (or duplicate spike/LCS, if applicable) shall be analysed at a minimum frequency of one per batch of samples or type of matrix or twenty samples, whichever is more frequent.

(c) Control charts shall be used where appropriate to monitor the performance of the laboratory. Control and warning limits of such charts shall be based on statistical principles. Laboratories shall also observe any trend that is indicated in control charts. The procedure for constructing control charts and the associated out-of-control criteria whenever stipulated in the test standard shall be followed. In the absence of such procedure, recommendations given in ISO 5725-6 'Accuracy (trueness and precision) of measurement methods and results Part 6: Use in practice of accuracy values', IUPAC 'Harmonized guidelines for internal quality control in analytical chemistry laboratories', ISO 7870-2 'Control charts – Part 2: Shewhart control charts', ISO 7870-4 'Control charts – Part 4: Cumulative sum charts', ISO 7870-6 'Control charts – Part 6: EWMA control charts', ISO/TS 13530 'Water quality – Guidance on analytical quality control for chemical and physiochemical water analysis', and APHA Standard Methods for the Examination of Water and Wastewater should be consulted, if appropriate.

(d) Proficiency testing (PT) activities

i. Laboratories shall establish schedules for verifying their performance by analysing matrix CRMs, where available. Laboratories shall also participate in appropriate PT activities for each area of technical competence, as defined by a minimum of one measurement technique, parameter and matrix which are related (please refer to Appendix C of ILAC-P9:01/2024 for more details).

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- ii. The frequency of participation in PT activities shall commensurate with the outcome of the laboratory's risk assessment and shall be minimum once per year for each area of technical competence. If significant change is introduced to a verified/validated method, the performance of the method shall be demonstrated by participation in PT activities.
- iii. Laboratories shall document procedures for rectifying unsatisfactory performance in PT activities. If unsatisfactory results are obtained, the laboratory shall promptly investigate the root cause(s), take action(s) to rectify the problem(s) and demonstrate that it can achieve satisfactory performance for the test/method in question. All findings and actions taken in connection with unsatisfactory performance shall be recorded.

7.8 Reporting of results

- (a) A description of the samples as received shall normally be given in test reports. The description shall include, where relevant to the interpretation of test results, a description of the number, appearance and volume/amount of samples, type of container, condition when received, (e.g. whether the samples are frozen, chilled or at ambient temperature), whether they have already been preserved before receipt.
- (b) When test results are below the reporting limits, an indication of the reporting limits shall be given in test reports.
- (c) If results to be reported are numerical values, policy and instructions on the numerical expression of the results (e.g. the required number of significant figures, the rounding interval) shall be given.
- (d) Other information necessary for the proper interpretation of test results (e.g. quality control results, relevant information provided by customers, measurement uncertainty, etc.) shall be reported. Qualifying statements on test results shall be given, if necessary.
- (e) The sample preparation procedure and/or the sampling procedure shall be given if it is required for the proper interpretation of test results. For solid samples, the weight basis on which test results are calculated (e.g. dry basis, as received basis or wet basis) shall be given. Dry to wet weight ratios of samples shall be reported, where necessary.
- (f) Some test standards require the reporting of additional information. In these cases, the test reports shall include all the information required by the test standards.

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(g) In determining decision rule, international guidelines, such as ILAC-G8:09/2019 'Guidelines on Decision Rules and Statements of Conformity' and EURACHEM/CITAC Guide 'Use of uncertainty information in compliance assessment' and EUROLAB Technical Report 'Decision rules applied to conformity assessment' may be followed.

7.9 Complaints

(No additional explanation)

7.10 Nonconforming work

(No additional explanation)

7.11 Control of data and information management

(No additional explanation)

8 Management system requirements

(No additional explanation)

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**Annex
(Informative)**

Bibliography

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- 2 APHA *Standard Methods for the Examination of Water and Wastewater*
- 3 ASTM D3976 *Standard Practice for Preparation of Sediment Samples for Chemical Analysis*
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- 5 EURACHEM / CITAC Guide *Measurement uncertainty arising from sampling: A guide to methods and approaches*
- 6 EURACHEM/CITAC Guide *Use of uncertainty information in compliance assessment*
- 7 EUROLAB Technical Report No. 1/2007: *Measurement uncertainty revisited: Alternative approaches to uncertainty evaluation*
- 8 EUROLAB Technical Report No. 01/2017: *Decision rules applied to conformity assessment*
- 9 ILAC-G8:09/2019 *Guidelines on Decision Rules and Statements of Conformity*
- 10 ILAC-P9:01/2024 *ILAC Policy for Proficiency Testing and/or Interlaboratory Comparisons other than Proficiency Testing*
- 11 ISO Guide 33 *Reference materials – Good practice in using reference materials*
- 12 ISO 5667-3 *Water quality – Sampling – Part 3: Preservation and handling of water samples*
- 13 ISO 5667-15 *Water quality – Sampling – Part 15: Guidance on the preservation and handling of sludge and sediment samples*
- 14 ISO 5725-2 *Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

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- 16 ISO 11352 *Water quality – Estimation of Measurement Uncertainty based on Validation and Quality Control Data*
- 17 ISO 21748 *Guidance for the use of repeatability, reproducibility and trueness estimates in measurement uncertainty evaluation*
- 18 ISO 8466-1 *Water quality – Calibration and evaluation of analytical methods and estimation of performance characteristics Part 1: Statistical evaluation of the linear calibration function*
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- 20 ISO 11095 *Linear calibration using reference materials*
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- 22 ISO 7870-2 *Control charts – Part 2: Shewhart control charts*
- 23 ISO 7870-4 *Control charts – Part 4: Cumulative sum charts*
- 24 ISO 7870-6 *Control charts – Part 6: EWMA control charts*
- 25 ISO/TS 13530 *Water quality – Guidance on analytical quality control for chemical and physiochemical water analysis*
- 26 JCGM 200 *International Vocabulary of metrology - Basic and general concepts and associated terms (VIM)*
- 27 Nordtest Technical Report 537 *Handbook for Calculation of Measurement Uncertainty in Environmental Laboratories*
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- 33 USEPA SW-846 test method, Chapter Four: *Organic Analytes*
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Remark: For dated references in the whole Annex, only the edition cited applies. For undated references cited, the latest edition (including any amendments) applies.