HOKLAS Supplementary Criteria No. 10

'Environmental Testing' Test Category - Accreditation of Site Testing and Sampling (Water, Waste Water, Soil, Sludge and Sediment)

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 site testing and sampling of water, waste water, soil, sludge and sediment in the 'Environmental Testing' Test Category. Where appropriate, the requirements given in HOKLAS Supplementary Criteria No. 6 'Environmental Testing' Test Category – Chemical Testing also apply.

(b) Only laboratories already accredited for water, waste water, soil, sludge and/or sediment testing may apply for extension of scope to cover site testing/sampling for the same parameters.

(c) Site testing includes testing performed at a site laboratory, or testing performed in situ (e.g. using test probes for direct measurement of the water body for parameters like pH, temperature, flow, dissolved oxygen, turbidity, salinity, conductivity, etc.). Sampling means sampling activities carried out on site according to a pre-determined sampling plan and a set of documented sampling procedures, including sample pretreatment and preservation by filtering, acidification, or refrigeration, etc.

(d) The terms of accreditation for sampling are restricted to operations carried out in accordance with a set of documented and well defined procedures. Accreditation will not be granted for the design of sampling programmes (i.e. sampling plans) or the subsequent interpretation of test results from such sampling programmes.

(e) Assessment, reassessment, and surveillance visit will be conducted at the individual sites as well as at the permanent laboratory.

(f) Access to the sampling/testing site shall be provided for HKAS representatives and assessors during HOKLAS assessments. If the site is not under the direct control of the laboratory, the laboratory shall have proper arrangement with the

site owner or its representative for providing the assessment team's access to parts of the site that are relevant to the activities being assessed.

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

5.1 An organisational chart for the permanent laboratory showing lines of responsibility for staff authorised to perform site testing and sampling shall be recorded and maintained.

6 Resource requirements

6.1 General

(No additional explanation)

6.2 Personnel

(a) Approved signatory requirements for site testing shall be in accordance with section 3.4 of HOKLAS SC-06 'Environmental Testing' Test Category – Chemical Testing.

(b) Approved signatories for sampling shall have:

(i) a Bachelor of Science degree in chemistry or other relevant technical disciplines, or a Bachelor of Engineering degree, or equivalent, with at least 3 years relevant sampling/testing experience; or

(ii) an Associate Degree or a Higher Diploma, or equivalent, in chemistry, engineering, or other relevant technical disciplines, with at least 5 years relevant sampling/testing experience.

Alternatively, appropriate membership of professional bodies is acceptable. In addition, he/she shall have at least six-month experience in the sampling or site testing activities for which signatory approval is sought. Special consideration may be given to persons without the above qualifications but with extensive experience (at least ten years) in the areas concerned. In all cases, candidates shall demonstrate to the assessors that his/her technical competence in the areas under consideration before signatory approval can be granted.

(c) The laboratory shall ensure that sufficient supervision is provided by competent staff to sampling/site testing personnel on site. Such supervision shall also cover contracted personnel who assist in sampling/site testing.

(d) The laboratory shall establish and maintain updated lists of authorised site testing staff and samplers for each site testing/sampling activity.

(e) The performance of each site staff shall be evaluated, normally on site, at least annually by appropriate personnel who is familiar with relevant sampling/test methods and procedures.

(f) The arrangements for the supervision of site testing/sampling shall be recorded and maintained, in particular where the site is not under the direct control of the laboratory.

(g) The responsibilities of staff member(s) nominated for control of all technical and quality matters concerned with site testing/sampling shall be recorded and maintained. There shall be a direct link between nominated staff and the technical and quality management teams and the Quality Manager of the permanent laboratory.

6.3 Facilities and environmental conditions

(a) Where sampling/tests are undertaken in a hostile environment, there shall be procedures for checking that the environment does not adversely affect the performance of sampling/test equipment.

(b) Adequate measures shall be taken to ensure good housekeeping in the sampling/testing area.

(c) In the case where automatic sampling/testing equipment is used and where operators may not be present all the time, there shall be measures to ensure security of such equipment and integrity of results/samples obtained.

6.4 Equipment

(a) Precautions shall be taken to ensure that after transportation to the site and during use, sampling, testing and measuring equipment remain in a serviceable state and in calibration. There shall be documented procedures for contingency situation when equipment is rendered inoperative or damaged at the site.

(b) Sampling apparatus shall be confirmed to be fit for intended use. Sampling apparatus, including sample container, of disposable type shall be checked and confirmed free of contamination before use, especially when subsequent testing involves trace analysis. Re-usable type of sampling apparatus, including sample container, shall be cleansed in accordance with appropriate standard procedures before being used. The cleansing process shall be documented and its effectiveness shall be demonstrated. Sampling apparatus shall also be sterilised in accordance with appropriate standard procedures if it poses possible risk of contamination to the source to be sampled.

(c) Appropriate checks shall be performed on site to confirm calibration status of critical equipment before testing/sampling commences. Where a complete calibration (see Clause 6.5 (b)) cannot be carried out on site, calibration status should be established in the permanent laboratory before and after site testing/sampling and augmented by on-site checks with suitable check standards before and during testing (see Clause 7.7 (b)). If equipment is found to be unfit for use and/or out of calibration, it shall not be used and shall immediately be withdrawn from service. Test results shall not be reported for tests carried out with equipment which is found to be out of calibration after use.

(d) Automatic site sampling/testing equipment shall be checked (either on site or in laboratory) at appropriate intervals to ensure that all operating parameters are as specified.

6.5 Metrological traceability

(a) Where it is necessary to use reference standards on site, adequate precautions shall be taken to ensure that the required calibration status is maintained during transportation and while in use.

(b) HOKLAS Supplementary Criteria No. 2 'All Test Categories – Equipment Calibration and Verification' gives detailed requirements and recommendations for equipment calibration. In chemical analyses, it is common that the calibration procedure forms an integral part of the test procedure and is given in test standard. If this is the case, the calibration procedure given in the test standard shall be followed.

(c) The calibration programme for testing equipment should at least consist of the following features and be documented and implemented.

(i) For parameters known to display linear response, at least a zero and three concentration levels should be used to construct the calibration curve. 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.

(ii) For parameters known to display non-linear response, further calibration points should be obtained, depending on individual parameters.

(iii) Normally, no test results should be reported beyond the range of calibration of the equipment. The laboratory shall take effective measure to ensure the validity of the test result if results beyond the calibration range are reported.

6.6 Externally provided products and services

(No additional explanation)

7 Process requirements

7.1 Review of requests, tenders and contracts

(a) Acceptance of job requests shall be based on information submitted by customer, which should include a detailed sampling plan (or in-situ test plan) and the tests required (may be performed in permanent laboratory) for the samples.

(b) The sampling plan (or in-situ test plan) shall include as minimum information, the exact location, sampling points, frequency, time, type of sampling (or testing), number of samples (or tests) and sample size required per sampling point. (A checklist for items normally appearing in a sampling plan (or in-situ test plan) is attached in Appendix I for reference.)

7.2 Selection, verification and validation of methods

(a) Where available, procedures published in international and national standards should be employed. Normally, only standard sampling procedures can be accredited. Moreover, when a test standard specifies a sampling procedure, that sampling procedure shall be followed. The test/sampling procedures shall be available to the staff performing sampling or testing on site.

(b) Sampling procedure should be given in adequate detail to ensure consistent application, taking into consideration the requirement of the sampling plan provided. The documented procedure should include but is not limited to the followings:
(i) specific parameter of interest;
(ii) sampling techniques;
(iii) sample volume;
(iv) sample preservation and storage requirements;
(v) type(s) of equipment used;
(vi) equipment handling and calibration requirements, if applicable.
(vii) reference should be made to any site testing procedures (if required) and to a proforma sampling record sheet (if available).

Items which normally appear in a sampling procedure are listed in Appendix II for reference. Guidance on sampling is given in various parts of ISO 5667 Water quality – Sampling and ISO 18400 *Soil quality – Sampling*.

(c) Procedures for site testing should be given in adequate detail for consistent application. The documented procedures should include but not limited to the followings:
(i) operation of the measuring equipment;

(ii) types of reference standards/materials used for calibration or verification;
(iii) method precision;
(iv) acceptance criteria for equipment drift; and
(v) performance check, if applicable.

In addition, the laboratory should ensure that performance characteristics of equipment, either provided by the manufacturer or as validated/verified by the laboratory, are defined and such information should be available for examination during assessment.

(d) Where deviations, additions or exclusions from the accredited test/sampling procedures and conditions have been imposed by the customer or initiated by the laboratory, they shall be recorded in detail. Accreditation shall not be claimed and HOKLAS endorsed reports shall not be issued for the modified procedures in such cases because the procedures have not been assessed by HKAS and hence are outside the scope of accreditation. Regulations on the inclusion of results of non-accredited activities in a HOKLAS endorsed report or certificate given in HOKLAS Supplementary Criteria No. 33 'Accreditation Regulations Specific for HOKLAS – Laboratory' apply to these cases.

(e) As far as possible, in-house test procedures shall be validated under conditions which are close to site testing conditions (i.e. similar sample matrix, flow, temperature, environmental conditions that will affect the operation of the test equipment).

(f) Reporting limits for site testing shall be set at a level at which quantitative results are obtained with a high degree of confidence. Limits of quantitation and reporting shall be suitably validated or verified.

7.3 Sampling

(a) Sampling records shall contain sufficient details to ensure that the sampling event could be repeated in exactly the same conditions and location if possible. Sketches and, where appropriate, video and photographs should be included as part of the records.

(b) The person(s) performing the sampling and/or site testing, and the supervisor if present on site, shall sign on the record sheet at the time when the activities are being carried out.

7.4 Handling of test or calibration items

(a) Precautions shall be taken during storage, handling and mounting to prevent deterioration, loss or damage to items under test on site or being transported to the permanent laboratory. Guidance given in ISO 5667 *Water Quality – Sampling Part 3: Preservation and handling of water samples* should be followed, where appropriate. The appropriate type of sample containers, storage conditions, and the maximum holding time of samples for the analyte(s) of interest shall be specified.

(b) Each individual sample collected on site shall carry, as a minimum, a unique sample identity, the sampler identity, and date, time, and location of sampling and, where relevant, the environmental conditions during sampling. Any additional information as required by the test standard shall also be recorded.

(c) Due consideration shall be given to sample preservation requirements of each particular analyte being sampled and relevant requirements shall be documented. International guidance, such as those given in ISO 5667 '*Water Quality – Sampling Part 3: Preservation and handling of water sample*s', shall be followed as far as possible. The type of preservatives and the amount used shall be recorded. Where preservation at site is not practical, other precautions shall be taken to stabilise the analyte(s) of interest where possible.

7.5 Technical records

(a) Procedures for recording and reporting all results obtained on site shall be documented and implemented, which shall be in-line with the system operating in the permanent laboratory.

(b) An up-to-date register of sites and details of type of testing/sampling undertaken at each site, e.g. sampling (types of matrix, sampling types), testing at site laboratory, in-situ testing, etc; shall be recorded and maintained.

(c) In case of sampling or in-situ testing, the details of the sampling/testing event shall be recorded. Measurements taken on site that are required for determining test results, details of the equipment used, and names of the responsible operators shall be recorded at the site. For this purpose, a proforma record sheet (may include space for diagrams) should be provided in accordance with relevant standards. Other media such as video recording

and photography should be used where appropriate to supplement written description and to serve as supporting evidence of the event.

(d) The person(s) performing the testing/sampling, and the supervisor if present on site, shall sign or otherwise be identified on the record sheet at the time when the activities are being carried out.

(e) For data taken by automatic sampling/testing equipment, the laboratory shall establish procedures for correct collection, storage and retrieval of raw data. Traceable link between the measurement taken and the final reported result shall be established.

7.6 Evaluation of measurement uncertainty

(a) Since there are various approaches to evaluate measurement uncertainty (MU) of sampling and site testing, any valid methods given by reputable professional and standard writing bodies will be accepted by HKAS. The MU evaluation should be in line with the definition given by 'International Vocabulary of Metrology - Basic and General Concepts and Associated Terms' (VIM) and should include all major MU components. Reference to Nordtest Technical Report '*Uncertainty from sampling – A Nordtest handbook for sampling planners on sampling quality assurance and uncertainty estimation*' and '*Measurement uncertainty arising from sampling: A guide to methods and approaches*' published jointly by Eurachem, EUROLAB, CITAC, Nordtest and the UK RSC Analytical Methods Committee may be useful.

7.7 Ensuring the validity of results

(a) For site testing, the quality control plans shall be established in accordance with HOKLAS SC-06 'Environmental Testing' Test Category – Chemical Testing section 10.

(b) For sampling, the quality control plans and procedures, including acceptance criteria, given in the relevant standard methods shall be followed whenever they are given. If such plans are not given, guidance as given in ISO 5667-14 *Water Quality – Sampling – Part 14: Guidance on quality assurance and quality control of environmental water sampling and handling* or other relevant international or national standards shall be followed where appropriate. A typical quality control plan includes the use of blanks, spiked samples and duplicates. Acceptance criteria shall be established and documented. The frequency of undertaking each quality control measure

shall be defined, normally not less than once per batch of samples or type of matrix or 20 samples, whichever is more frequent. Given below are some common quality control measures for sampling:

(i) Duplicate samples for assessing the precision of the sampling procedure.

(ii) Spiked samples (field blank or previously analysed environmental samples spiked with the analyte of interest) for monitoring sample instability and identifying any errors during the sampling and transportation.

(iii) Field blanks and/or rinsing blanks, which are processed through the entire sampling procedure for detecting possible contamination of sampling device or container, as well as during sampling and transportation.

(iv) Filtering recovery checks for identifying any errors relating to contamination of sampling containers and the sampling process during sample filtration processes, if applicable.

(c) Control charts shall be used to monitor the performance of the site tests and sampling, where appropriate, so that any trend in quality control data can be monitored. Control and warning limits of such charts shall be based on statistical principles. Recommendations are given in ISO 5667-14 *Water Quality – Sampling – Part 14: Guidance on quality assurance and quality control of environmental water sampling and handling*.

7.8 Reporting of results

(a) Results and information obtained from site tests/sampling shall be identified as such on reports and certificates issued by the permanent laboratory. Such test/sampling reports and certificates shall, in addition to the information required in ISO/IEC 17025, contain the following information:

(i) identity of sampler/analyst, date/time of sampling/testing, sample matrix, sample condition, whether and when the sample was preserved and means of preservation;

(ii) any abnormalities affecting the interpretation of results;

(iii) quality control data and other relevant information as requested by the customer or specified in the test standards.

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)

Appendix I
(Informative)

SAMPLING PLAN / IN-SITU TEST PLAN CHECKLIST

(a) Is there a comprehensive description of the location, timing, frequency and type of sampling?

(b) Have arrangements been made to obtain samples from the sites?

(c) Is specialised sampling equipment needed?

(d) Are samplers experienced in a particular type of sampling required?

(e) Have all analytes been listed?

(f) Have methods been specified for each analyte?

(g) Have method performance characteristics been adequately defined?

(h) What sample sizes are needed based on method and desired performance characteristics?

(i) Is there any applicable national/international standard for the sampling/test concerned?

(j) Do the method protocols comply with all the requirements of your accredited sampling procedure?

(k) How many samples are needed?

(l) How many sample sites are there?

(m) How many methods were specified?

(n) How many test samples are needed for each method?

(o) How many control site samples are needed?

(p) What types of and how many QC samples are needed?

(q) Is compositing of samples required?

Appendix II
(Informative)

ITEMS IN SAMPLING PROCEDURE

(a) The types of observations to be recorded or tests to be carried out on site.

(b) Information concerning analytical methods for testing, desired method performance characteristics, etc.

(c) Instructions for modifying procedures in case of problems. A contingency plan may be included.

(d) A list of all sampling equipment, including all sampling devices and all sampling containers. (Are the container's materials consistent with analytes? Are the container's sizes consistent with amount of samples needed?) The list should also include items like pre-treatment of sample containers, preservation materials/chemicals, materials for cleaning the equipment, labels, tape, waterproof pens and packaging materials, chain-of-custody forms and sample seals, chemical protective clothing or other safety equipment.

(e) Instructions for cleaning equipment before and after sampling.

(f) Instructions for equipment calibration and/or use.

(g) Instructions for cleaning or handling sample containers.

(h) Instructions for each type of sample collection, including numbers of samples and sample sizes designated for each type, any special sampling times or conditions, numbers, types and sizes of all QC samples, instructions for compositing samples, instructions for field preparations or measurements.

(i) Instructions for labelling samples collected.

(j) Instructions for preserving each type of sample, including maximum holding times of samples and sample storage conditions, e.g. frozen, chilled to 2-6^{o}C, in the dark, etc.

(k) Instructions for packaging, transport, and storage.

(l) Instructions for chain-of custody procedures.

(m) Safety plans.

(n) Instructions for contacting the supervisor or other designated person for advice in case of doubt.

(o) Instructions for recording of pertinent information, including taking photographs and/or videotaping.

Appendix III
(Informative)

Reference

1. ISO 5667-1 *Water quality -- Sampling – Part 1 : Guidance on the design of sampling programmes and sampling techniques*

2. ISO 5667-3 *Water quality -- Sampling – Part 3 : Preservation and handling of water samples*

3. ISO 5667-4 *Water quality -- Sampling – Part 4 : Guidance on sampling from lakes, natural and man-made*

4. ISO 5667-5 *Water quality -- Sampling – Part 5 : Guidance on sampling of drinking water from treatment works ad piped distribution systems.*

5. ISO 5667-6 *Water quality -- Sampling – Part 6 : Guidance on sampling of rivers and streams*

6. ISO 5667-7 *Water quality -- Sampling – Part 7 : Guidance on sampling of water and steam in boiler plants*

7. ISO 5667-8 *Water quality -- Sampling – Part 8 : Guidance on the sampling of wet deposition*

8. ISO 5667-9 *Water quality -- Sampling – Part 9 : Guidance on sampling from marine waters*

9. ISO 5667-10 *Water quality -- Sampling – Part 10 : Guidance on sampling of waste water*

10. ISO 5667-11 *Water quality -- Sampling – Part 11 : Guidance on sampling of ground waters*

11. ISO 5667-12 *Water quality -- Sampling – Part 12 : Guidance on sampling of bottom sediments from rivers, lakes and estuarine areas*

12. ISO 5667-13 *Water quality -- Sampling – Part 13 : Guidance on sampling of sludges*

13. ISO 5667-14 *Water quality -- Sampling – Part 14 : Guidance on quality assurance and quality control of environmental water sampling and handling*

14. ISO 5667-15 *Water quality -- Sampling – Part 15 : Guidance on the preservation and handling of sludge and sediment samples*

15. ISO 5667-16 *Water quality -- Sampling – Part 16 : Guidance on biotesting of samples*

16. ISO 5667-17 *Water quality -- Sampling – Part 17 : Guidance on sampling of bulk suspended solids*

17. ISO 5667-19 *Water quality – Sampling – Part 19 : Guidance on sampling of marine sediments*

18. ISO 5667-20 *Water quality -- Sampling – Part 20: Guidance on the use of sampling data for decision making -- compliance with thresholds and classification systems*

19. ISO 18400-101 *Soil quality -- Sampling -- Part 101: Framework for the preparation and application of a sampling plan*

20. ISO 18400-102 *Soil quality -- Sampling -- Part 102: Selection and application of sampling techniques*

21. ISO 18400-104 *Soil quality -- Sampling -- Part 104: Strategies*

22. ISO 18400-107 *Soil quality -- Sampling -- Part 107: Recording and reporting*

23. ISO 18512 *Soil quality – Guidance on long and short term storage of soil samples*

24. EURACHEM / CITAC Guide – *Measurement uncertainty arising from sampling: A guide to methods and approaches*

25. Nordtest Technical Report 604 *Uncertainty from sampling – A Nordtest handbook for sampling planners on sampling quality assurance and uncertainty estimation*

Remark: For undated references cited, the latest edition (including any amendments) applies.