HKIAS Supplementary Criteria No. 4

Indoor Air Quality Inspection

0 Introduction

(a) This document serves to clarify and supplement the requirements of HKAS 002, HKIAS 003 and other relevant HKAS and HKIAS Supplementary Criteria documents for the accreditation of on-site inspection, monitoring and sampling activities performed by Indoor Air Quality Certificate Issuing Bodies (CIBs) under the 'Indoor Air Quality Certification Scheme for Offices and Public Places' (hereunder called the Scheme) for indoor air quality (IAQ) inspection, monitoring and sampling activities. The Scheme is administered by Environmental Protection Department of the Hong Kong SAR Government. It includes assessing the compliance with the indoor air quality (IAQ) objectives for the parameters set out in the Scheme through on-site inspection, monitoring and sampling using specified methods. The assessment criteria are given in 'A Guide on IAQ Certification Scheme for Offices and Public Places' (hereunder called 'IAQ Certification Guide') issued by the IAQ Management Group of the HKSAR Government.

For avoidance of doubt, it should be pointed out that this document only sets out the requirements for accreditation of CIBs under the HKIAS and does not modify the Scheme in any way.

(b) On-site measurement may be performed for monitoring most parameters using equipment of the required accuracy (see Clause 6.2 below). If on-site measurement is not suitable as the required accuracy cannot be achieved, the CIB is required to collect samples on-site and send those samples for laboratory testing. Laboratories performing such tests shall be accredited by HKAS or by a mutual recognition arrangement partner of HKAS. Such parameters may include, e.g., concentration of individual volatile organic compounds (VOCs), formaldehyde, nitrogen dioxide and airborne bacteria.

(c) HKAS will accept an application for HKIAS accreditation from a CIB only if the CIB covers all the IAQ parameters as set out in the Scheme. Accreditation will only be granted to the CIB after it has provided sufficient evidence to demonstrate its competence in performing the activities specified in the Scheme including on-site walkthrough inspection, monitoring and sampling as well as compliance assessment for all the parameters against the criteria stated in the Scheme.

1 Scope

(No additional explanation)

2 Normative references

(No additional explanation)

3 Terms and definitions

(a) The term ‘shall’ is used throughout this document to indicate those provisions which are mandatory. The term ‘should’ is used to indicate guidance which, although not mandatory, is provided by HKAS as a recognised means of meeting the requirements.

4 General requirements

(No additional explanation)

5 Structural requirements

(No additional explanation)

6 Resource requirements

6.1 Personnel

6.1.1 IAQ staff members performing on-site monitoring and sampling shall satisfy the requirements stated in HKIAS 003, and must have undergone and have been qualified through a documented training and authorisation system. They shall have obtained as a minimum a higher certificate/associate degree/diploma in an engineering, technology, environmental or science discipline issued by a recognised technical institute, or equivalent.

6.1.2 HKIAS operates an **approved inspector** system for IAQ inspection. Nominees assessed by the HKAS assessors to be competent will be accepted as an approved inspector for IAQ inspection. The minimum academic qualifications for nominees are the same as those stated in 6.1.1 above and they shall have a minimum of one year relevant IAQ experience. As approvals for IAQ inspectors are granted in the context of

the IAQ inspection being performed under the relevant management system of an accredited CIB, they are not to be considered as personal qualifications.

6.1.3 HKAS operates an **approved signatory** system. Nominees satisfying the requirement in 6.1.4 and assessed by the HKAS assessors to be competent will be accepted as an approved signatory for IAQ inspection. An approved signatory is authorised for signing HKIAS endorsed IAQ inspection reports. As approvals are granted in the context of the IAQ inspection being performed under the relevant management system of an accredited CIB, they are not to be considered as personal qualifications.

6.1.4 Nominees for signatory approval for signing HKIAS endorsed IAQ inspection reports shall have:

- been qualified as a Registered Professional Engineer (RPE) under the Engineers Registration Ordinance (Cap. 409) and with relevant working experience related to IAQ[Note] since obtaining the qualification; or

- been qualified as an Authorised Person within the meaning of the Building Ordinance (Cap. 123) or a public officer certified in writing by his Head of Department as having a qualification and experience which is equally acceptable and not less than 12 months relevant working experience related to IAQ [Note] since obtaining the qualification; or

- a master degree in engineering, architecture and environmental science or other relevant qualification from a university in Hong Kong, or equivalent, and not less than 24 months relevant working experience related to IAQ [Note] since obtaining the qualification

  [Note] relevant working experience includes IAQ assessment, monitoring, research, teaching, mechanical ventilation and air conditioning (MVAC) system / heating, ventilation and air conditioning (HVAC) design and management.

To obtain signatory approval, a nominee shall be able to demonstrate to the satisfaction of the assessment team that he/she shall:

(i) have satisfactorily completed the training as specified in 6.1.5;

(ii) be knowledgeable in assessing mould growth in indoor environment, including the principle of mould growth in buildings, techniques in

mould inspection, prevention and control of mould growth in indoor environment. Assessing mould growth in indoor environment involves a wide range of knowledge in different disciplines, including microbiology, construction materials, MVAC system, etc. Persons assessing mould growth in indoor environment shall possess adequate knowledge in biological properties and growth of mould in indoor air environment. A person who has attended and successfully completed a relevant professional training course provided by a recognised training provider and passed its written examination could be considered eligible to conduct indoor mould inspection. Alternatively, the person shall have undergone appropriate training and passed a written examination on the aforementioned aspects provided by qualified personnel. Notwithstanding the completion of the training course or other means of appropriate training, competence of a person in indoor mould inspection shall be assessed by qualified personnel and appraised to be competent before he or she is allowed to carry out indoor mould inspection independently;

(iii) be competent in conducting the walkthrough inspection (including mould inspection) as specified in the Scheme. Only approved signatories are eligible to conduct walkthrough inspection;

(iv) be competent in assessing compliance with the IAQ objectives of the Scheme.

6.1.5 Each IAQ staff member participating in on-site monitoring and sampling shall undergo a structured training program covering at least the following aspects:

a. Principle and practice of IAQ monitoring, including measurement and sampling processes and acceptance criteria of the Scheme;
b. Interpretation of monitoring and measurement requirements and standards;
c. Factors affecting IAQ;
d. Co-ordinating and obtaining support from management and staff of the premises to be inspected;
e. Various IAQ measurement and sampling methods and procedures, their application and limitation, e.g., detection limit, and their selection;
f. Procedure for walkthrough inspection as specified in the IAQ Certification Guide, method to obtain information from the management of the premises to be inspected and records to be kept, and how such information should be used for determining how

measurement and sampling are to be performed;

g. Procedure for checking the operation of the premises against the documented specifications set by the management of the premises, e.g., those in relation to air exchange rate, frequency and effectiveness of air ducts and venetian blinds cleaning and other factors as mentioned in the IAQ Certification Guide, and recording of the findings and any abnormality;
h. Selection of the locations and timings of taking measurements or samples, including using the information obtained from the walkthrough inspection and how such locations and timings affect the overall monitoring results;
i. Principle of sampling, including statistical techniques and set up of a sampling plan based on relevant information;
j. Identification of samples and sub-samples and importance of sample identification;
k. Preservation of samples and environmental condition requirements for sampling;
l. Principle and operation of relevant measuring and sampling equipment, including automatic ones. Verification of correct functioning of equipment and recording of verification results. The criteria for selection of equipment, including accuracy requirements for a given IAQ parameter;
m. Factors affecting the accuracy of measurement results, including those related to the sampling and monitoring method, sampling and monitoring equipment, their calibration and traceability, and competence of the operator;
n. Recording and checking of the measurement details and results, including the conditions of the place during monitoring, e.g., the number of persons inside, the activities being carried out, settings of any mechanical ventilation and air-conditioning system; and
o. Drawing conclusion based on monitoring and inspection results.

Emphasis shall be given to:

(i) Requirements of the management system;
(ii) Technical and other requirements of the IAQ Certification Guide;
(iii) Expected standards of conduct and ethics;
(iv) Rationale and practice of keeping information confidential;
(v) The quality assurance plan employed by the CIB to assure the quality of results; and
(vi) The importance of adhering to documented quality and technical procedures.

6.1.6 Training shall be provided by people having the required knowledge and

capability either within the CIB or from an external party. After training, the competence of the trainees shall be assessed by qualified personnel. Only IAQ staff members appraised to be competent shall be allowed to participate in monitoring and sampling work.

6.1.7 Where an IAQ staff member is required to carry out new monitoring and sampling methods or use new IAQ monitoring and sampling procedures or measuring equipment, appropriate prior training shall also be provided.

6.1.8 Appropriate training shall also be provided to staff members conducting other technical and administrative work.

6.1.9 The training system, the training provided and records of trainee appraisal shall be documented and kept properly for future inspection.

6.1.10 It is useful to keep a competence log listing which IAQ staff members are competent to perform which parameters of IAQ monitoring, measurements and sampling. IAQ jobs may be assigned to suitable IAQ staff members according to this log.

6.1.11 The performance of all IAQ staff members, including on-site performance, shall be properly supervised. Staff conducting the supervision shall either be approved signatories or approved inspectors. Where the supervision is impracticable, the CIB shall establish and implement an effective feedback system to monitor the conduct and performance of IAQ staff members.

6.2 Facilities and equipment

6.2.1 For equipment having significant influence on the IAQ monitoring or sampling results, the CIB shall use those under its long-term control to perform the IAQ monitoring and sampling. Appendix A sets out the calibration/verification requirement for most of the necessary equipment used for the on-site IAQ monitoring and sampling. Where it is properly justified by the CIB, equipment not under its control may be used.

6.2.2 The equipment used for on-site work shall be verified before or after use unless there is evidence to confirm that such verification is not necessary. For example, the flow rate of a sampling pump shall be checked with a calibrated flowmeter at each use to ensure its proper function, in accordance with instructions given by the manufacturer. Records of verification shall be kept, standard verification procedures shall be provided and the IAQ staff members shall be trained to conduct such

verification checks. Where necessary, the IAQ staff members shall also be provided with the necessary reference standards or equipment to conduct the verification checks. For equipment not under the long-term control of the CIB, for example, equipment provided by the management of the premises, the CIB shall verify that the equipment is suitable for the purpose, including its measurement range, accuracy, calibration traceability and that the equipment is functioning properly before it is used. Records of such verification shall be kept.

6.2.3 When electronic means are used for the processing, storage and transfer of information, the systems shall satisfy relevant requirements of HKIAS 003 and this Supplementary Criteria. Particular attention shall be paid to the validation of software, safety and security of information, maintenance of confidentiality and identity authentication.

6.2.4 Unless otherwise stated in the relevant standards or IAQ Certification Guide, the uncertainty of any measuring devices should be less than 10% of the value being measured, unless there is evidence to demonstrate that this is not technically possible.

6.2.5 When it is necessary to evaluate the uncertainty of a measurement, the methodology explained in the ISO 'Guide to Expression of Uncertainty in Measurement' (GUM) shall be used.

6.3 Subcontracting

6.3.1 Whenever an accredited CIB subcontracts any part of the IAQ monitoring, measurement and sampling to another organisation, the subcontractor shall be accredited by HKAS or its MRA partners for performing the activities. Furthermore, results of the subcontracted activities shall be provided in endorsed reports.

7 Process requirements

7.1 Inspection methods and procedures

7.1.1 CIB shall provide adequate and up-to-date documented work instructions to IAQ staff members to ensure that all monitoring and sampling are performed according to the requirements of the IAQ Certification Guide.

7.1.2 The working details of the IAQ inspection should be determined by the approved signatory based on the knowledge of the premises in terms of its usage pattern, worst case situations, design of the MVAC system and

provisions, and any other findings obtained from the walkthrough inspection, etc. as detailed in the IAQ Certification Guide.

7.1.3 Work instructions provided to IAQ staff members performing on-site monitoring and sampling shall, as a minimum, include the following information:

a. The address and identification of the premises and the date and time of the monitoring, details of the contact person, the IAQ parameters to be measured and/or sampled, the locations of the monitoring and/or sampling points, and any other relevant general information. It may be useful to identify each inspection job with a unique identification number;
b. Instruction specific to the given inspection, e.g., the measurement and sampling methods to be used for each monitoring or sampling point, the sampling plan, the sample size and equipment to be used, the conditions (including the types of activities being performed inside the premises, the number of people inside the premises, etc.) under which the measurement or sampling is to be performed; and
c. General inspection instruction, including recording details of measurement results and samples taken, identification of air samples, equipment operation and verification instructions, instruction on recording of results, preservation of samples, etc.

7.1.4 A CIB shall specify the environmental conditions under which IAQ monitoring and sampling should be conducted and instruct its IAQ staff members to ensure that such conditions are satisfied during the monitoring and sampling process. If monitoring and sampling activities must be performed under conditions outside the acceptable ranges, (e.g., insisted by the client) the CIB shall provide instructions to its IAQ staff members to ensure that the monitoring and sampling are performed under controlled conditions and that such discrepancies are recorded and reported. The influence of such discrepancies shall be taken into account when determining the grading of the premises.

7.1.5 The location and period of monitoring and sampling shall be representative of the premises being monitored. Reference to the IAQ Certification Guide is essential.

7.1.6 The CIB shall ensure that proper arrangements and permission for monitoring and sampling have been made with the management of the premise prior to performing the on-site work.

7.1.7 Before carrying out on-site activities, the CIB shall brief the responsible

person of the premises on the purpose and procedure of the monitoring and sampling and solicit his cooperation.

7.1.8 Proforma worksheets, logbooks or electronic recording systems for recording results, details of monitoring and sampling procedures, environmental and other conditions affecting the results shall be provided.

7.2 Handling inspection items and samples

7.2.1 Air samples obtained on-site shall be uniquely identified to avoid confusion regarding their identity at any time. Details of their origins (e.g. sampling locations) shall be recorded. It may be useful to assign a unique code to each sample.

7.2.2 A chain-of-custody documentation system should be implemented to keep track of the status of air samples.

7.2.3 Where it is necessary to send air samples to accredited laboratories for testing or retain air samples for reference, the CIB shall ensure that they are adequately identified, properly kept to avoid confusion and deterioration.

7.3 Inspection records

7.3.1 Inspection records shall include sufficient information to permit satisfactory evaluation of the inspection. The record system shall permit the ready retrieval of information supporting the results reported to the client. In general, the following items of information shall be kept:

a. General information on the identity of the premises inspected, including its address and other unique identification;
b. The identity of the client and any other pertinent information;
c. Walkthrough floor plan, observations and findings;
d. Detailed records of each mould inspection including the areas and locations inspected, the observations and findings;
e. Details of the monitoring and sampling carried out and conditions under which they are carried out, including the IAQ parameters, identifications and locations of the monitoring points, the time of making the measurements or taking the samples, environmental conditions during monitoring and sampling;
f. The identities of the IAQ staff members;

g. Condition of the premises during the monitoring and sampling. For example, information such as the status and settings of the ventilation system during IAQ monitoring and sampling, usage pattern of premises, possible pollution sources such as dusting activities/vacuuming, use of photocopier, etc.;
h. Identification of the monitoring and sampling method, including the sampling plan and any deviations from it;
i. Identifications of the origins of individual samples and sub-samples.
j. Identification of the acceptance criteria and detection limits of the measurement method used; and
k. Evidence that the IAQ inspection results have undergone all the necessary quality assurance checks, e.g. the identity and signatory of the checking and reviewing staff member and equipment verification records.

To enable IAQ results evaluation and to demonstrate the validity of the results, more information may have to be recorded. For example, photographs may have to be taken and kept to demonstrate that the sampling locations have been correctly selected or to show details of any observed abnormality.

For record traceability, it may be useful to include the work order number, or an equivalent identification number on every document relating to that inspection.

7.4 Inspection reports and inspection certificates

7.4.1 Before issuing the final inspection results to the client, the CIB shall ensure that all the inspection results, calculation, data transfer, inspection conclusions and professional judgements have been properly checked. Checks shall confirm the following:

a. The instructions of the clients have been accurately and comprehensively executed;
b. Proper monitoring and sampling methods have been used;
c. The monitoring and sampling have been performed by approved IAQ inspectors;
d. The results have been checked and verified by an approved signatory;
e. The equipment used is suitable and properly checked and calibrated;
f. Samples have been obtained in accordance with the sampling plan under the specified conditions, e.g., the location and size of the sample, environmental conditions, the activities being carried out in the premise at the time of sampling, etc;

g. Samples and where necessary, sub-samples have been properly identified;
h. Data transfer and calculations have been correctly made;
i. The inspection findings have been properly recorded and all records are traceable.
j. All the necessary data required for arriving at the conclusion, including results obtained from any laboratory or subcontractor, have been obtained;
k. Observed anomalies have been properly classified;
l. The quality control plan has been properly followed and quality control data have been properly reviewed.
m. The conclusions have been properly derived from the monitoring and inspection findings;
n. Any professional judgements have been properly made in accordance with any guidelines issued by the CIB and the basis of the professional judgement has been clearly recorded; and
o. Information included in IAQ inspection reports is correct and properly signed by an authorised person, and for endorsed reports, by an approved signatory.

7.4.2 Where it is necessary to issue an interim report, the requirements to be fulfilled shall be the same as those for issuing a full report.

7.5 Complaints and appeals

(No additional explanation)

7.6 Complaints and appeals process

(No additional explanation)

8 Management system requirements

(No additional explanation)

APPENDIX A

CALIBRATION/VERIFICATION REQUIREMENT

This Appendix lists the recommended calibration/verification requirements for equipment of on-site IAQ sampling and measurements.

Type of equipment	Recommended maximum period between successive calibration/verification	Calibration/verification procedure or guidance documents and equipment requirements
TEMPERATURE MEASURING DEVICE		
Mercury-in-glass thermometer (MIGT) (May be used for checking electronic thermometers)	5 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	6 months	One-point check at the ice point.
Electronic thermometers (Electronic, digital and platinum resistance type)	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check against a calibrated MIGT at a temperature within the range in which the instrument is normally used.
Thermocouple or thermistor	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check against a calibrated MIGT at a temperature within the range in which the instrument is normally used.

Type of equipment	Recommended maximum period between successive calibration/verification	Calibration/verification procedure or guidance documents and equipment requirements
RELATIVE HUMIDITY MEASURING DEVICE		
Psychrometer or hygrometer or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check against a calibrated hygrometer at a RH value within the range in which the instrument is normally used.
CARBON DIOXIDE MEASURING DEVICE		
Non dispersive infrared type or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check using reference gas having proper measurement showing traceability.
CARBON MONOXIDE MEASURING DEVICE		
Electro-chemical type or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check using reference gas having proper measurement showing traceability.

Type of equipment	Recommended maximum period between successive calibration/verification	Calibration/verification procedure or guidance documents and equipment requirements
RADON MEASURING DEVICE		
Electronic radon monitor or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
FORMALDEHYDE (HCHO) DETECTION		
Formaldehyde detector or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check using reference gas having proper measurement showing traceability or following the manufactuer's instructions.
FORMALDEHYDE (HCHO) SAMPLING DEVICE		
Working air flowmeter for field use or built into pump	Before each use or as recommended by the manufacturer	Check at the applicable flow rate using a calibrated reference flowmeter.
Reference flowmeter (e.g. rotameter)	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.

Type of equipment	Recommended maximum period between successive calibration/verification	Calibration/verification procedure or guidance documents and equipment requirements
NITROGEN DIOXIDE DETECTION		
Chemiluminescence detector equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check using reference gas having proper measurement showing traceability.
Electrochemical type or equivalent	1 year or as per manufacturer's recommendation	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check using reference gas having proper measurement showing traceability

Type of equipment	Recommended maximum period between successive calibration/verification	Calibration/verification procedure or guidance documents and equipment requirements
NITROGEN DIOXIDE DETECTION		
Direct measurement of absorption (at 450nm) type or equivalent	1 year or as per manufacturer's recommendation	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check using reference gas having proper measurement showing traceability.
OZONE MEASURING DEVICE		
Heated metal oxide semi-conductor, electro-chemical type or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check at a specified point using a UV emitter with certificate of traceability to national or international standards.
RESPIRABLE SUSPENDED PARTICULATES MEASURING DEVICE		
Light scattering type or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check Flow rate check, if applicable.

Type of equipment	Recommended maximum period between successive calibration/verification	Calibration/verification procedure or guidance documents and equipment requirements
TOTAL VOLATILE ORGANIC COMPOUNDS MEASURING DEVICE		
Photo-ionisation sensor type or equivalent	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
	Three months, or less if necessary	One-point check using reference gas having proper measurement traceability.
INDIVIDUAL VOLATILE ORGANIC COMPOUNDS MEASURING DEVICE		
Working air flowmeter for field use or built into pump	Before each use or as recommended by the manufacturer	Check at the applicable flow rate using a calibrated reference flowmeter.
Reference flowmeter (e.g. rotameter)	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.
AIRBORNE BACTERIA SAMPLING DEVICE		
Working air flowmeter for field use or built into pump	Before each use or as recommended by the manufacturer	Check at the applicable flow rate using a calibrated reference flowmeter.
Reference flowmeter (e.g. rotameter)	2 years	By a calibration body satisfying clauses 2.1 and 2.2 of HOKLAS SC-02.