Laboratory Accreditation and Environmental Testing in Hong Kong

Daria Wong
Hong Kong Accreditation Service
24 February 2021

Content

1. Testing and laboratory accreditation

2. Tests for environmental samples in Hong Kong

What is testing (測試)?

- "Testing" refers to the determination of one or more characteristics of an object (e.g. lead concentration in a water sample) according to a specified technical procedure (e.g. an ISO standard)
- for checking compliance of the characteristics with standards, specifications or regulations

Laboratory Accreditation

- A 3rd party recognition for a laboratory that it is competent to carry out specific testing activity

  ⇨ Reliable results, smaller risk

- Carried out using international standards
  - General laboratories accreditation:
    - ISO/IEC 17025
  - Medical laboratories accreditation:
    - ISO 15189

ISO 9001 *vs* ISO/IEC 17025

- Certification with ISO 9001 determines compliance of an organisation's quality management system
  - *Does not* make any statement about the technical competence of a laboratory

- Accreditation to ISO/IEC 17025 emphasizes technical competence of a laboratory
  - ISO/IEC 17025 covers technical competence requirements that are not in ISO 9001
  - ISO/IEC 17025 also covers management system requirements based on ISO 9001 principles

ISO/IEC 17025 Requirements

Impartiality

- Structured to safeguard impartiality
- Undertake activities impartially
- Identified risks to impartiality e.g. those arising from its activities, relationships
- If risk is identified ➔ minimise/eliminate

Confidentiality

- Kept all information about the client confidential
- Obtain client's agreement before release of information

ISO/IEC 17025 Resource Requirements

Personnel

- Competent in performing laboratory activities
- Training and supervision
- Competence is assessed and authorised to conduct activities concerned
  - Method development
  - Conducting tests
  - Use and calibration of equipment
  - Result analysis
  - Reporting
- Continuous monitoring

ISO/IEC 17025 Resource Requirements

Environmental conditions

- Define, control and monitor environmental conditions
- Effective separation of incompatible activities and contamination prevention
- Control access

Equipment (including reagents)

- Calibrated and checked routinely/before use
- Traceable to International System of Units (SI) or other applicable references
- Procedures for handling, storage and use
- Defective equipment isolated and labelled

ISO/IEC 17025 Process Requirements

Review of requests and contracts

- Confirm laboratory's capability and resources
- Inform clients if method of choice is inappropriate/ outdated
- Cooperate with clients in clarifying request and monitoring laboratory's performance

Test methods

- Meet client's needs
- Standard *vs* non-standard methods
- Laboratory needs to demonstrate its ability to operate the selected methods and the methods are fit for the intended use

ISO/IEC 17025 Process Requirements

Sample handling

- Integrity - protection from deterioration, loss or damage
- Identity - from receipt to report/disposal

Validity of results

- Planned monitoring of validity of results
- External assurance e.g. by Proficiency Testing
- Investigate if quality control data fall outside pre-defined criteria

Reporting

- Accurate, Clear, Unambiguous, Objective
- Include all information agreed with clients and necessary for result interpretation

ISO/IEC 17025 Requirements

- Implement quality policy and objectives
- Laboratory management shows commitment to quality and improvement
- Control quality documents and records
- Maintain technical records including original observations
- Notify clients if results affected by work not conforming to defined procedures
- Define complaint handling process
- Consider and address risks and opportunities
- Corrective actions & Improvement
- Regular internal audits & management review

Hong Kong Accreditation Service (HKAS)

- Under Innovation and Technology Commission, HKSARG
- The only local body providing ISO/IEC 17025 accreditation service
- Operates the Hong Kong Laboratory Accreditation Scheme (HOKLAS) and two other schemes
- Open & Voluntary
- Accreditation assessments normally conducted onsite at the laboratory
  - Review of documents and records
  - Witnessing of tests and examinations within the scope of accreditation (specific)
- If a laboratory fulfils all requirements
  - Certificate of Accreditation
  - List of accredited tests published on HKAS website

HKAS Endorsed Test Reports and Certificates
香港認可處認可計劃認許測試報告及認可證書

HKCAS 345
TEST

HKCAS 088
MS

HKIAS 001

Test Reports & Certificates Recognised Internationally

- HKAS is signatory to
  - International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA)
  - International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA)

- Endorsed test reports and certificates issued by HKAS accredited organisations are recognised by HKAS's MRA / MLA partners
  - 105 MRA/MLA partners as at Feb 2021
  - From 104 economies worldwide (e.g. Mainland China, US, EU, Japan, ASEAN)

Benefits of using accredited testing services

- Competence of accredited laboratories assured

  ➔ Provide confidence in services

- International recognition

  – Eliminate the need for retesting in another economies (through MRA)

    ➔ Reduce costs and facilitate free trade

- Minimise the risk of failed products or services due to wrong results

  ➔ Enhance public and customers' confidence

  ➔ Due diligence under the law

Tests for environmental samples in Hong Kong

HOKLAS coverage

- Calibration Services
- Chemical Testing
- Chinese medicine
- Construction Materials
- Electrical and Electronic Products
- Environmental Testing
- Food
- Forensic Testing
- Medical Testing
- Miscellaneous
- Pharmaceutical Products
- Physical and Mechanical Testing
- Proficiency Testing Providers
- Reference Material Producers
- Testing Required By The China Compulsory Certification System
- Textiles and Garments
- Toys and Children's Products

Type of environmental tests covered by HKAS accreditation

– Chemical tests
– Microbiological tests
– Biological toxicity tests
– Noise
– HEPA appliance
– Biosafety Cabinetry

Nature of sample

– Water, Wastewater, Saline water

– Sediment, Soil, Sludge

– Biota (fish and shellfish)

– Air (indoor, outdoor, ash)

– Waste (solid, semi-solid, liquid, solvent & oil)

– Asbestos

– Consumer Products (e.g. Paint)

Examples of tests required by local authorities

I. Chapter 358AK

Technical Memorandum Standards for Effluents discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (issued under Water Control Ordinance, Cap 358 section 21)

– This technical memorandum sets the quality standards that make effluents acceptable into foul sewers, storm water drains, inland and coastal waters.

– Chemical, physical and microbial quality are covered, with test methods specified

Examples of tests required by local authorities

I. Chapter 358AK

Table 4 Standards for effluents discharged into Group B inland waters
(All units in mg/L unless otherwise stated; all figures are upper limits unless otherwise indicated)

Determinand / Flow rate (m^3/day)	≦200	>200 and ≦400	>400 and ≦600	>600 and ≦800	>800 and ≦1000	>1000 and ≦1500	>1500 and ≦2000	>2000 and ≦3000
pH (pH units)	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Temperature (℃)	35	30	30	30	30	30	30	30
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1
Suspended solids	30	30	30	30	30	30	30	30
BOD	20	20	20	20	20	20	20	20
COD	80	80	80	80	80	80	80	80
Oil & Grease	10	10	10	10	10	10	10	10
Iron	10	8	7	5	4	3	2	1
Boron	5	4	3	2.5	2	1.5	1	0.5
Barium	5	4	3	2.5	2	1.5	1	0.5
Mercury	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Selenium	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Other toxic metals individually	0.5	0.5	0.2	0.2	0.2	0.1	0.1	0.1
Total Toxic metals	2	1.5	1	0.5	0.5	0.2	0.2	0.2
Cyanide	0.1	0.1	0.1	0.08	0.08	0.05	0.05	0.03
Phenols	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sulphide	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	10	10	8	8	8	5	5	3
Sulphate	800	800	600	600	600	400	400	400
Chloride	1000	1000	800	800	800	600	600	400
Total phosphorus	10	10	10	8	8	8	5	5
Ammonia nitrogen	5	5	5	5	5	5	5	5
Nitrate + nitrite nitrogen	30	30	30	20	20	20	10	10
Surfactants (total)	5	5	5	5	5	5	5	5
E. coli (count/100ml)	100	100	100	100	100	100	100	100

Examples of tests required by local authorities

I. Chapter 358AK

Analytical methods used by Government Chemist

Parameter	Reference
pH	APHA 17ed 4500-H+B
Temperature	Note (a)
Colour	Lovibond Tintometer, 25mm cell
Conductivity	BS 2690: Part 9: 1970: Method 6
Total Suspended Solids	APHA 17ed 2540 D
Settleable Solid	APHA 17ed 2540 F
Dissolved Oxygen	APHA 17ed 4500-O G
Biochemical Oxygen Demand (BOD)	BS 6068: Section 2.14: 1984
Chemical Oxygen Demand (COD)	ASTM D 1252-88 Test Method B or APHA 17ed 5220 C & D
Oil & Grease	APHA 17ed 5520 C

Reference Notes:
ASTM -Annual Book of American Society for Testing and Materials Standards, Vol 11.01 & 11.02.
BS -British Standards Institution.
APHA 17ed -American Public Health Association. Standard Methods 17th Edition (1989).
(a) Temperature sensor should be calibrated against a mercury thermometer of 0.1℃ scale.

Examples of tests required by local authorities

II. Environmental, Transport and Works Bureau Technical Circular (Works) No. 34/2002

Management of Dredge/Excavated Sediment

– This technical circular covers the approval of dredging/ excavation proposal and marine disposal of dredged/ excavated sediment

– Sediment is classified into 3 categories based on its contaminant levels

– Different categories of sediment will be disposed via different means i.e. open sea or confined site

Examples of tests required by local authorities

II. Environmental, Transport and Work Bureau Technical Circular (Works) No. 34/2002

Table 1 - Analytical Methodology

Parameters	Preparation Method *US EPA Method*	Determination Method *US EPA Method*	Reporting Limit
Metals *(mg/kg dry wt.)*			
Cadmium (Cd)	3050B	6020A or 7000A or 7131A	0.2
Chromium (Cr)	3050B	6010C or 7000A or 7190	8
Copper (Cu)	3050B	6010C or 7000A or 7210	7
Mercury (Hg)	7471A	7471A	0.05
Nickel (Ni)	3050B	6010C or 7000A or 7520	4
Lead (Pb)	3050B	6010C or 7000A or 7420	8
Silver (Ag)	3050B	6020A or 7000A or 7761	0.1
Zinc (Zn)	3050B	6010C or 7000A or 7950	20
Metalloid *(mg/kg dry wt.)*			
Arsenic (As)	3050B	6020A or 7000A or 7061A	1
Organic-PAHs *(μg/kg dry wt.)*			
Low Molecular Weight PAHs+	3550B or 3540C and 3630C	8260B or 8270C	55
High Molecular Weight PAHs++	3550B or 3540C and 3630C	8260B or 8270C	170
Organic-non-PAHs *(μg/kg dry wt.)*			
Total PCBs+++	3550B or 3540C and 3665A	8082	3
Organometallics *(μg TBT/L in interstitial water)*			
Tributyltin	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	0.015

- All tests must be conducted by laboratories accredited by **HOKLAS** or by equivalent for the tests concerned

Examples of tests required by local authorities

III. Contaminated Land Management

Environmental Impact Assessment

– Risk-based Remediation Goals (RBRGs) was promulgated for use on 15 November 2007 for assessment of contaminated sites for different land use scenarios

– For different land usage i.e. urban residential, rural residential, industrial, and public parks, there are different limits set for chemicals that can be present in its water and soil

Examples of tests required by local authorities

III. Contaminated Land Management

EPD Guidance Manual for Use of RBRG

– Totally 54 chemical of concerns (COCs) were selected:

Volatile organic chemicals (VOCs) – 13 chemicals
Semi-volatile organic chemicals (SVOCs) – 19 chemicals
Metals – 15 chemicals
Dioxins and Polychlorinated Biphenyls (PCBs) – 2 chemicals
Petroleum carbon ranges – 3 groups
Other inorganic compounds – 1 chemical
Organometallics – 1 chemical

– All laboratory tests must be accredited by **HOKLAS** or one of its Mutual Recognition Arrangement partners

Examples of tests required by local authorities

IV. Chapter 311

Air Pollution Control Ordinance

Section 76 (1)

- An owner of premises who is required to carry out sampling, measurement or analysis of a substance containing, or suspected to contain, asbestos containing material in the premises … shall appoint a registered asbestos laboratory to carry out the sampling , measurement or analysis.
- Tests required include the identification of asbestos species and counting of asbestos fibers present in the sample collected
- Registered asbestos laboratories are accredited for the tests concerned

Commissioning Requirements for Fresh Water Supply

- WSD's Guide to Application for Water Supply
- Applicable to newly installed fresh water inside service
- Water samples need to be tested after completion of plumbing works
- Test parameters:
  - pH, colour, turbidity, conductivity, residual chlorine
  - Microbiological examinations
  - Heavy metals (Pb, Cd, Ni, Cr, Cu, Ab)
- Tests must be conducted by accredited laboratories

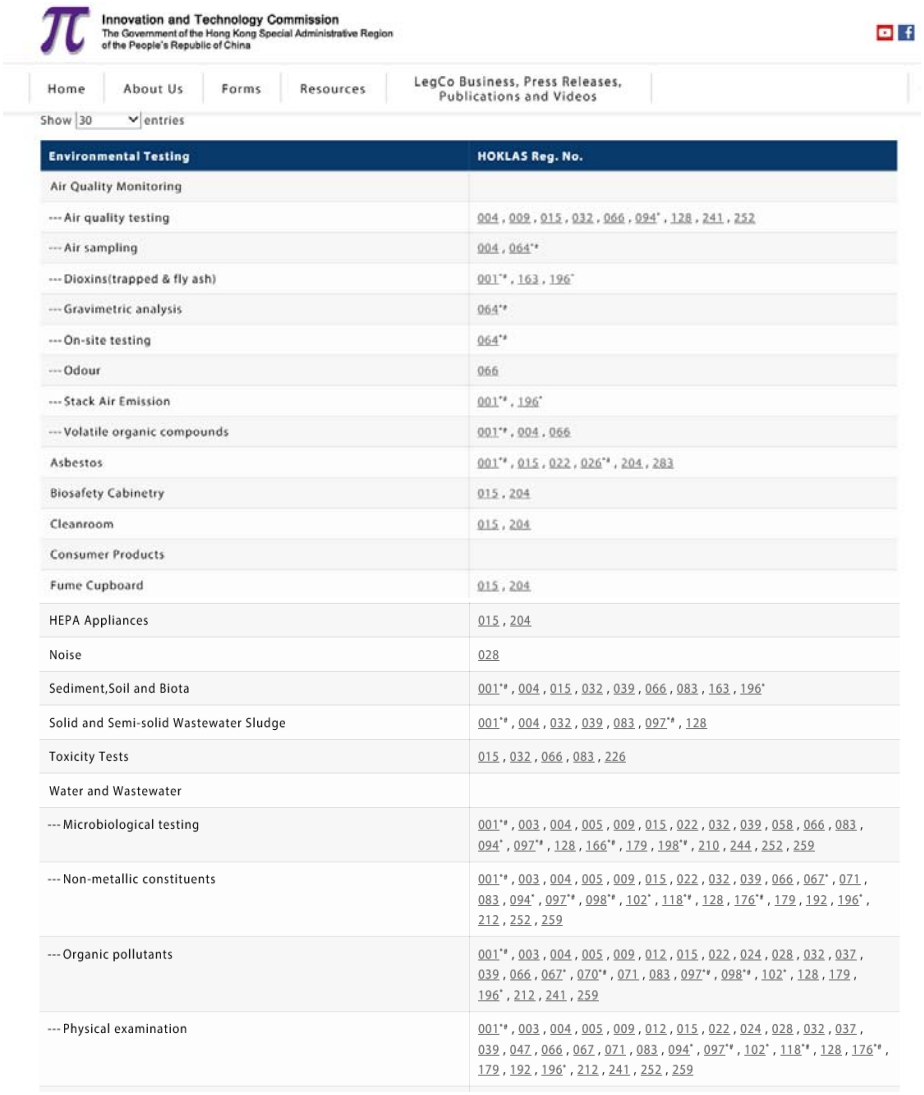
Indoor Air Quality Certification Scheme

- Administered by EPD
- To improve indoor air quality in offices and public places e.g. shopping mall
- 'Good' and 'Excellence' class based on real-time measurements and analysis of air samples
- Testing of air samples:
  - Nitrogen Dioxide
  - Formaldehyde
  - Airborne bacteria
  - Individual VOCs

➔Must be conducted by accredited laboratories

(Source: Indoor Airy Quality Information Centre)

Laboratories accredited by HOKLAS for 'Environmental Testing'



Innovation and Technology Commission
The Government of the Hong Kong Special Administrative Region of the People's Republic of China

Home | About Us | Forms | Resources | LegCo Business, Press Releases, Publications and Videos

Show 30 entries

Environmental Testing	HOKLAS Reg. No.
Air Quality Monitoring	
--- Air quality testing	004 , 009 , 015 , 032 , 066 , 094* , 128 , 241 , 252
--- Air sampling	004 , 064"*
--- Dioxins(trapped & fly ash)	001"* , 163 , 196*
--- Gravimetric analysis	064"*
--- On-site testing	064"*
--- Odour	066
--- Stack Air Emission	001"* , 196*
--- Volatile organic compounds	001"* , 004 , 066
Asbestos	001"* , 015 , 022 , 026"* , 204 , 283
Biosafety Cabinetry	015 , 204
Cleanroom	015 , 204
Consumer Products	
Fume Cupboard	015 , 204
HEPA Appliances	015 , 204
Noise	028
Sediment,Soil and Biota	001"* , 004 , 015 , 032 , 039 , 066 , 083 , 163 , 196*
Solid and Semi-solid Wastewater Sludge	001"* , 004 , 032 , 039 , 083 , 097"* , 128
Toxicity Tests	015 , 032 , 066 , 083 , 226
Water and Wastewater	
--- Microbiological testing	001"* , 003 , 004 , 005 , 009 , 015 , 022 , 032 , 039 , 058 , 066 , 083 , 094* , 097"* , 128 , 166"* , 179 , 198"* , 210 , 244 , 252 , 259
--- Non-metallic constituents	001"* , 003 , 004 , 005 , 009 , 015 , 022 , 032 , 039 , 066 , 067* , 071 , 083 , 094* , 097"* , 098"* , 102* , 118"* , 128 , 176"* , 179 , 192 , 196* , 212 , 252 , 259
--- Organic pollutants	001"* , 003 , 004 , 005 , 009 , 012 , 015 , 022 , 024 , 028 , 032 , 037 , 039 , 066 , 067* , 070"* , 071 , 083 , 097"* , 098"* , 102* , 128 , 179 , 196* , 212 , 241 , 259
--- Physical examination	001"* , 003 , 004 , 005 , 009 , 012 , 015 , 022 , 024 , 028 , 032 , 037 , 039 , 047 , 066 , 067 , 071 , 083 , 094* , 097"* , 102* , 118"* , 128 , 176"* , 179 , 192 , 196* , 212 , 241 , 252 , 259

Commercial – 33

Government – 10

Educational – 2

Details available at HKAS website

www.hkas.gov.hk

- Thank you -