Laboratory Accreditation and Environmental Testing in Hong Kong

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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 ISO/IEC 17025:2005 – Technical Criteria for Laboratory Accreditation (Non-medical)

- Technical requirements
  - The laboratory shall be technically competent to perform the activity for which accreditation is sought

- Management requirements
  - The laboratory shall implement a quality management system appropriate to its scope of activities

ISO 9001 *vs* ISO/IEC 17025

- Certification with ISO 9001 determines compliance of an organisation's quality management system
- Certification *does not* specifically evaluate technical competence and *does not* mean demonstration of technical competence to produce valid data and results
- Accreditation to ISO/IEC 17025 emphasizes technical competence
- ISO/IEC17025 covers technical competence requirements that are not covered by ISO 9001

ISO/IEC 17025 – Technical requirements

Test methods

- Meet customer'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

Personnel

- Competent to perform the activity
- Training programme and records
- Competence is assessed and formally authorised before conducting the test independently

ISO/IEC 17025 – Technical requirements

Environmental conditions

- Monitor, control and record environmental conditions
- Effective separation to prevent contamination
- Control access

Sample handling

- Integrity - properties not tempered with
- Identity - from receipt to report/disposal
- Security - no loss

ISO/IEC 17025 – Technical requirements

Equipment

- Calibrated and checked routinely and before use
- Operated by authorised personnel
- Procedures for handling, storage and use
- Defective equipment isolated and labelled

Quality assurance

- Documented quality control plans
- Proficiency testing activities
- Investigate out-of-control situations

Reports

- Accurate, Clear, Unambiguous, Objective

ISO/IEC 17025 – Management requirements

- Top management commitment to quality
- Technical and quality management structure
- Document control
- Review of customer’s requests and contracts
- Review of service suppliers and subcontractors
- Customer service
- Complaint handling
- Corrective/Preventive actions & Improvement
- Record system
- Internal audits
- Management review

Hong Kong Accreditation Service (HKAS)

- The only body providing ISO/IEC 17025 accreditation in HK
- Operates the Hong Kong Laboratory Accreditation Scheme (HOKLAS)
- Accreditation assessments normally conducted onsite at the laboratory
  - HKAS officers/external lead assessors assess the against management system requirements
  - Technical assessors/experts assess the technical competence
- If a laboratory can fulfill all requirements
  - Certificate of Accreditation
  - Accredited tests will be listed on HKAS website

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 (chemical tests)

– 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)

Chemical tests for environmental samples as required by local regulations/schemes

Examples of tests required by local regulations

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 regulations

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 regulations

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 regulations

II. Environmental, Transport and Work 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 regulations

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

Appendix A

Sediment Quality Criteria for the Classification of Sediment

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
Metals *(mg/kg dry wt.)*		
Cadmium (Cd)	1.5	4
Chromium (Cr)	80	160
Copper (Cu)	65	110
Mercury (Hg)	0.5	1
Nickel (Ni)*	40	40
Lead (Pb)	75	110
Silver (Ag)	1	2
Zinc (Zn)	200	270
Metalloid *(mg/kg dry wt.)*		
Arsenic (As)	12	42
Organic-PAHs *(μg/kg dry wt.)*		
Low Molecular Weight PAHs	550	3160
High Molecular Weight PAHs	1700	9600
Organic-non-PAHs *(μg/kg dry wt.)*		
Total PCBs	23	180
Organometallics *(μg TBT/L in Interstitial water)*		
Tributyltin*	0.15	0.15

* *The contaminant level is considered to have exceeded the UCEL if it is greater than the value shown.*

Category L –
all contaminants < LCEL

Category M –
any contaminant > LCEL but all < UCEL

Category H –
any contaminant > UCEL

Examples of tests required by local regulations

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

– Further biological toxicity tests may be required to determine the appropriate disposal method

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

Examples of tests required in local regulations

III. Chapter 499

Environmental Impact Assessment Ordinance

– 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 regulations

III. Chapter 499

Environmental Impact Assessment Ordinance

– 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 regulations

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

Quality Water Supply Scheme for Buildings – Fresh Water (Plus)

- Administered by WSD
- Voluntary
- To ensure good quality of water at the taps and avoid/minimise failures in water supply
- Test parameters:
  - pH, colour, turbidity, conductivity
  - Microbiological
  - Heavy metals (e.g. Pb, Cd, Ni, Cr)
- Heavy metal tests <u>must</u> be conducted by HKAS accredited laboratories
- Metal tests also applicable to newly installed fresh water inside service (mandatory)

Indoor Air Quality Certification Scheme

- Administered by EPD
- Voluntary
- 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
- Chemical tests for air samples:
  - Nitrogen Dioxide
  - Formaldehyde

➔Must be conducted by HKAS accredited laboratories

Laboratories accredited by HOKLAS under 'Environmental Testing'

Hong Kong Accreditation Service (HKAS)
The Hong Kong Laboratory Accreditation Scheme (HOKLAS)
Index of Accredited Tests & Calibrations

Environmental Testing

Environmental Testing	Laboratory Reg. No.
Air Quality Monitoring	
Air quality testing	4,9,15,32,66
Air sampling	4,*64*
Dioxins (trapped & fly ash)	*1*,163,*196*
Gravimetric analysis	*64*
On-site testing	*64*
Stack Air Emission	*1*,*196*
Volatile organic compounds	*1*,4,66
Asbestos	*1*,15,22,*26*
Biosafety Cabinetry	15
Consumer Products	
Volatile organic compounds	*1*,39
HEPA Appliances	15
Noise	28
Sediment, Soil and Biota	*1*,15,39,66,83,163,*196*
Solid and Semi-solid Wastewater Sludge	*1*,4,39,83,*97*,128,*131*
Toxicity Tests	15,66,226
Water and Wastewater	
Microbiological testing	*1*,3,4,5,9,15,32,39,58,66,83,*97*,128,*166*,*198*
Non-metallic constituents	*1*,4,5,9,15,22,39,66,*67*,71,83,*94*,*97*,*98*,*102*,*118*,128,*176*,*196*,212
Organic pollutants	*1*,3,4,5,9,12,15,22,24,28,32,39,66,*67*,*70*,71,83,*98*,*102*,128,*131*, *196*,212
Physical examination	*1*,3,4,5,9,12,15,22,24,28,32,39,*47*,66,*67*,71,83,*94*,*97*,*102*,*118*, 128,*131*,*176*,*196*,212,230
Trace metals	*1*,4,5,15,22,32,39,66,*70*,*67*,83,*94*,128,*196*,212

Remark: Laboratories whose registration numbers are shown in *red italics* are normally not available for public testing.

16.05.2014 Hong Kong Accreditation Service (HKAS)
HOKLAS - Environmental Testing 1 / 1

Government – 11

Academic – 3

Commercial – 31

Laboratories accredited for chemical tests under ‘Environmental Testing’

Test areas	No. of accredited laboratories
Water and wastewater	42
Sediment, soil, sludge, biota	12
Air quality monitoring	13
Asbestos	4

A complete list can be found in HKAS website at

www.hkas.gov.hk

- Thank you -