

Schedule

Singapore Test Services Pte Ltd
249 Jalan Boon Lay
Singapore 619523

Certificate No. : LA-1999-0166-F

Issue No. : 20

Date : 25 March 2018

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FIELD OF TESTING : Environmental Testing

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A1 SOURCE EMISSION	<ol style="list-style-type: none"> 1. Stack Sampling and Velocity Traverses 2. Stack Velocity & Volumetric Flow Rate 3. Stack Gas Composition, Oxygen, Carbon Monoxide, Carbon Dioxide. Dry Gas Molecular Weight 4. Stack Gas Moisture Content 5. Particulate Emissions 6. Hydrogen Halide & Halogens Emissions 7. Sampling & Analysis of CO, NO_x and SO₂ Emission from Stationary Source - Instrument method 8. Determination of SO₂ and SO₃ Emission from Stationary Source 9. Determination of Particulate Emissions from Stationary Sources (in-stack filtration method) 10. Determination of metals emissions from Stationery sources 11. Air emission sampling for Dioxins & Furans 	<p>USEPA Methods are based on the 2006 edition</p> <p>USEPA Method 1</p> <p>USEPA Method 2</p> <p>USEPA Method 3</p> <p>USEPA Method 4</p> <p>USEPA Method 5 & 5B</p> <p>USEPA Method 26A</p> <p>USEPA Method 3A, 6C and 7E & 10</p> <p>USEPA Method 6</p> <p>USEPA Method 17</p> <p>USEPA Method 29</p> <p>USEPA Method 23</p>

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A2 OFF-ROAD DIESEL ENGINE EXHAUST EMISSIONS	12. Determination of Hydrogen Sulphide content of fuel gas streams in petroleum refineries	USEPA Method 11
	13. Determination of total gaseous organic concentration using flame ionization analyzer	USEPA Method 25A
	1. Determination of engine exhaust gas emissions for gaseous compositions, Oxides of nitrogen, Carbon monoxide, Carbon dioxide, Oxygen, Total hydrocarbon and Particulate matter	ISO 8178: Part 2
B INDUSTRIAL HYGIENE MONITORING / ATMOSPHERIC AIR	1. Metal dust / fumes – Aluminium, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Molybdenum, Lead, Nickel, Phosphorus, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Vanadium, Zinc	NIOSH 7300-2003
	2. Acid – Hydrogen Fluoride	NIOSH 7906-2014
	3. Acids – Hydrogen Bromide, Hydrogen Chloride, Hydrogen Fluoride, Sulphuric Acid, Nitric Acid and Phosphoric Acid	OSHA ID-174-SG & OSHA ID-165-SG
	4. Alkaline dust - Sodium	NIOSH 7401-1994
	5. Ammonia	NIOSH 6016-1996
	6. Nuisance Dust, Particulate	NIOSH 0500-1994
	7. Respirable Dust	NIOSH 0600-1998
	8. Formaldehyde	NIOSH 3500-1994 NIOSH 2016-2003
	9. Hexavalent Chromium	NIOSH 7600-1994
	10. Asbestos	NIOSH 7400-1994

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C INDOOR AIR QUALITY	11. Volatile Organic Compounds Screening by GCMS	NIOSH 2549-1996
	12. Aliphatic Hydrocarbons & Aromatic Hydrocarbons by GCFID	NIOSH 1500-2003 & NIOSH 1501-2003
	13. Mercury	NIOSH 6009-1994
	14. Hydrogen Sulfide	NIOSH 6013-1994
	15. Elements on Wipes - Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lanthanum, Lead, Manganese, Molybdenum, Nickel, Phosphorus, Selenium, Silver, Strontium, Tellurium, Thallium, Vanadium, Yttrium, Zinc & Zirconium	NIOSH 9102-2003
	16. Chlorine and Bromine	NIOSH 6011-1994
	17. Sulphur Dioxide	NIOSH 6004-1994
	18. Hydroquinone	NIOSH 5004-1994
	19. Acetic Acid	NIOSH 1603-1994
	20. 1,2,4-Trimethylbenzene Chloroform	OSHA PV 2091
	21. Trichloroethylene (TCE) & Perchloroethylene (PCE)	NIOSH 1003-2003
	1. Measurement of Volatile Organic Compounds (VOCs)	T-WI-CME-003-03-02
	2. Measurement of Carbon Dioxide (CO ₂)	T-WI-CME-003-03-03
	3. Measurement of Carbon Monoxide (CO)	T-WI-CME-003-03-03
	4. Measurement of Relative Humidity (RH)	T-WI-CME-003-03-03
	5. Measurement of Air Temperature	T-WI-CME-003-03-03
	6. Measurement of Respirable Suspended Particles	T-WI-CME-003-03-04
	7. Measurement of Air Movement (Velocity)	T-WI-CME-003-03-05

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	8. Measurement of Formaldehyde 9. Total Viable Bacteria Count 10. Total Viable Mould Count 11. Ozone 12. Measurement of Operative Temperature 13. Specification of Bacteria in Indoor Air 14. Identification of Mould in Indoor Air	T-WI-CME-003-03-06 T-WI-CME-003-03-07 T-WI-CME-003-03-07 T-WI-CME-003-03-08 T-WI-CME-003-03-09 T-WI-CME-003-03-10 T-WI-CME-003-03-11
D WATER & WASTEWATER		APHA Methods are based on 22 nd edition : 2012
i. Water for Drinking and Domestic Purposes ii. Water for Industrial Purposes iii. Sewage iv. Trade Water v. Trade Effluent vi. Ground Water	1. pH value 2. Temperature 3. Turbidity 4. Color 5. Alkalinity 6. Hardness 7. Conductivity 8. Total Solids 9. Total Dissolved Solids 10. Total Suspended Solids 11. Fixed and Volatile Solids 12. Settleable Solids 13. Elemental Analysis : Ba, Sn, Fe, Be, Mn, Cd, Cr, Cu, Pb, Ni, Se, Ag, Zn, Ca, Mg, Al, As, B, Na & K	APHA 4500H+ APHA 2550 APHA 2130 APHA 2120B / APHA 2120C APHA 2320 APHA 2340B / APHA 2340C APHA 2510 APHA 2540B APHA 2540C APHA 2540D APHA 2540E APHA 2540F APHA 3120B (ICP-OES)

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	14. Elemental Analysis: Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sr, Tl, V, Zn	APHA 3125B (ICP-MS)
	15. Mercury	APHA 3112B
	16. Anions : F ⁻ , Cl ⁻ , Br ⁻ , NO ₃ ⁻ , NO ₂ ⁻ , PO ₄ ³⁻ & SO ₄ ²⁻	APHA 4110B Ion Chromatography
	17. Cyanide	APHA 4500CN / Method 8027
	18. Chlorine (Free)	Method 8021 DPD (N,N-diethyl-p-phenylenediamine)
	19. Chlorine (Total)	Method 8167 DPD (N,N-diethyl-p-phenylenediamine)
	20. Chlorine (Residual)	Calculations (T-WI-CME-003-01-47)
	21. Chloride	APHA 4500CI-
	22. Sulfate	APHA 4500SO ₄ ²⁻ / SulfaVer 4 Method 8051
	23. BOD (Biochemical Oxygen Demand)	APHA 5210
	24. COD (Chemical Oxygen Demand)	APHA 5220 / Method 8000 (Closed Reflux)
	25. TOC (Total Organic Carbon)	APHA 5310B
	26. Oil & Grease	APHA 5520B / EPA 1664 Rev. B
	27. Phenols	Method 8047 & APHA 5530D-FIA
	28. Surfactants, Anionic	Method 8028 T-WI-CME-003-01-41
	29. Silica	Method 8282 Heteropoly Blue Method
	30. Fluoride	T-WI-CME-003-01-30

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MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT	
	31. Sulfide	APHA 4500-S ²⁻ I-FIA	
	32. Nitrogen, Ammonia	APHA 4500-NH ₃ H-FIA	
	33. Nitrogen, Nitrate	T-WI-CME-003-01-31 APHA 4500-NO ₃ ⁻ I-FIA	
	34. Nitrogen, Total	T-WI-CME-001-01-09 / APHA 4500-N B - FIA	
	35. Phosphorus, Orthophosphate & Total Phosphorus	APHA 4500P B & E Method 8048, Method 8190 APHA 4500P G-FIA	
	36. Iron	T-WI-CME-003-01-45	
	37. Volatile Organic Compounds (refer to Appendix 1)	APHA 6200	
	38. Polynuclear Aromatic Hydrocarbons & Semi-volatile Organic Compounds by GCMS(refer to Appendix 3 & 4)	APHA 6440 / APHA 6410 / EPA 8270D - GCMS	
	39. Sampling and collection of water	APHA 1060	
	40. Oxyhalides : ClO ₂ ⁻ , ClO ₃ ⁻ , BrO ₃ ⁻	APHA 4110D	
	41. Cations : Li, Na, NH ₄ , K, Ca, Mg	ASTM D6916-09	
	42. Chlorophyll	APHA 10200H	
	D WATER & WASTEWATER (MICROBIOLOGY)	<u>Microbiology Tests</u>	
		1. Total Plate Count	APHA 9215B (Also at 37°C incubation for 24 h) APHA 9215D (Membrane Filter Method)
2. Total Coliform		APHA 9222B APHA 9221B & C (MPN Method)	
3. Fecal Coliform		APHA 9222D APHA 9221E (MPN Method)	
4. Fecal Streptococcus and Enterococcus		APHA 9230C	

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E POTABLE WATER	5. Enumeration and examination of <i>Legionella</i>	ISO 11731 : 1998 (E)
	6. <i>Escherichia coli</i>	APHA 9222G; APHA 9221B & F (Section 3)
	7. <i>Pseudomonas aeruginosa</i>	ISO 16266:2006 (E)
	8. Total Colony Count	ISO 6222 : 1999 (E)
	9. Sampling and Collection of Water Sample	APHA 9060 / APHA 1060
	10. <i>Staphylococcus aureus</i>	APHA 9213B(a)
		APHA Methods are based on 22 nd edition : 2012
	1. pH value	APHA 4500H ⁺
	2. Temperature	APHA 2550
	3. Turbidity	APHA 2130
	4. Color	APHA 2120B / APHA 2120C Photometric (T-WI-CME-001-01-13)
	5. Alkalinity	APHA 2320
6. Hardness	APHA 2340B / APHA 2340C	
7. Conductivity	APHA 2510	
8. Total Solids	APHA 2540B	
9. Total Dissolved Solids	APHA 2540C	
10. Total Suspended Solids	APHA 2540D	
11. Anions : F ⁻ , Cl ⁻ , Br ⁻ , NO ₃ ⁻ , NO ₂ ⁻ , PO ₄ ³⁻ , SO ₄ ²⁻	APHA 4110 Ion Chromatography	
12. Elemental Analysis : Al, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Zn	APHA 3120B (ICP-OES)	

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	13. Elemental Analysis: Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sr, Ti, V, Zn	APHA 3125B (ICP-MS)
	14. Mercury	APHA 3112B
	15. Chlorine (Free)	Method 8021 DPD (N,N- diethyl-p-phenylenediamine)
	16. Chlorine (Total)	Method 8167 DPD (N,N- diethyl-p-phenylenediamine)
	17. Chlorine (Residual)	Calculations (T-WI-CME-003-01-47)
	18. Chloride	APHA 4500CI-
	19. Sulfate	APHA 4500SO ₄ ²⁻ / SulfaVer 4 Method 8051
	20. Silica	Method 8282 Heteropoly Blue Method
	21. TOC (Total Organic Carbon)	APHA 5310B / T-WI-CME-001-01-09
	22. Nitrogen, Total	T-WI-CME-001-01-09 / APHA 4500- B-FIA
	23. Iron	T-WI-CME-003-01-45
	24. Sampling and collection of water sample (from faucets)	APHA 9060 APHA 1060
	25. Volatile Organic Compound (refer to Appendix 1)	APHA 6200
	26. Trihalomethanes (refer to Appendix 2)	APHA 6232
	27. Polynuclear Aromatic Hydrocarbon & Semi-Volatile Organic Compounds by GCMS (refer to Appendix 3 & 4)	APHA 6440/ APHA 6410/ EPA 8270D
	28. Pesticide by GCMS (refer to Appendix 4)	APHA 6630

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F COOLING TOWERS WATER & WATER FOUNTAINS	<ol style="list-style-type: none">1. Enumeration and examination of <i>Legionella</i>2. Total Bacterial Count	ISO 11731 : 1998 (E) APHA 9215B (incubation at 37°C for 24 h)
G NOISE MEASUREMENT	<ol style="list-style-type: none">1. Measurement of Factory Noise2. Measurement of Boundary Noise	T-WI-CME-003-05-01 T-WI-CME-003-05-02
H SLUDGE, SOIL AND SOLID WASTE	<ol style="list-style-type: none">1. Toxicity Characteristic Leaching Procedure2. Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils	EPA 1311 EPA 3051
I COMPRESSED AIR / BREATHING AIR	<ol style="list-style-type: none">1. Determination of Moisture Content2. Determination of Particulates and Oil Mist Content3. Determination of Carbon Dioxide and Carbon Monoxide content4. Determination of Oxygen Content5. Determination of Particle Count	T-WI-CME-003-07-02 T-WI-CME-003-07-03 T-WI-CME-003-07-04 T-WI-CME-003-07-05 T-WI-CME-07-06 ISO 8573

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Approved Signatories

1. Mr Yeo Mong Soon - For Section D1 – D40, & H1 – H2
2. Mr Yap Jian Jie - For Sections B, D, E, G & H
3. Ms Xie Caiwen - Sections B, D & G except the microbiology tests
4. Mr Vincent Wu Hock Soon - Section A.1, A.2, G and I only
5. Mr Ix Ho Chee Hei - For all microbiology tests, Section C & Section E (Tests 1 – 7, 12, 15 – 17)
6. Mr Jonathan Velarde - Section A.1, A.2 and I
7. Mr Kenneth Santos Borlongan - Section A.1, A.2, C, G and I
8. Mr Paz Patrick Mark Masa - Section A.1
9. Muhammad Zulhairi Bin Awaruddin - Section C (Tests 1 – 11)
10. Mr Koo Weoi Jong - For all microbiology tests, Section C & Section E (Tests 1 – 7, 12, 15 – 17)
11. Ms Tan Hui Ying, Yvonne - Sections D & E, except all microbiological tests

Note:

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid test results. The **management system requirements** in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.

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Appendix 1 VOLATILE ORGANIC COMPOUNDS & SOLVENTS (APHA 6200)		
n-hexane	1,2,4-trimethylbenzene	Tetrahydrofuran
n-heptane	Styrene	Isopropyl ether
n-octane	1,1,1-trichloroethane	Methyl tert butyl ether
n-nonane	1,1,2-trichloroethane	2-methyl-1-propanol
n-decane	Dichloromethane	2-butanone
Benzene	Tetrachloromethane	4-methyl-2-pentanone
Toluene	Trichloroethane	Dimethylsulphoxide
Ethylbenzene	Tetrachloroethene	Dimethylformamide
o-xylene	Diethylether	Dimethyl sulfide
m-xylene	Furan	Turpentine (alpha-pinene)
p-xylene		

Appendix 2 APHA 6232			
TRIHALOMETHANES	CHLORINATED ALIPHATIC COMPOUNDS	MONOCYCLIC AROMATIC HYDROCARBONS	CHLORINATED AROMATIC COMPOUNDS (Chlorinated Benzenes)
Bromodichloromethane	Dichloromethane (methylene chloride)	Benzene	Chlorobenzene
Tribromomethane	Trichloromethane (chloroform)	Toluene	1,2-dichlorobenzene
Trichloromethane	1,1-dichloroethane	Ethylbenzene	1,3-dichlorobenzene
Dibromochloromethane	1,2-dichloroethane	m-xylene	1,4-dichlorobenzene
	1,1,2-trichloroethane	o-xylene	
	1,1-dichloropropane	p-xylene	
	1,2-dichloropropane	Styrene	
	1,3-dichloropropane		
	2,2-dichloropropane		
	Chloroethene (vinyl chloride)		
	1,1-dichloroethylene		
	Cis-1,2-dichloroethylene		
	Tetrachloroethene (Perchloroethylene)		

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Appendix 3 EPA 8270D			
POLYCYCLIC AROMATIC HYDROCARBONS	(Chlorinated Phenols)		(Chlorinated PAHs)
3,4-dichloroaniline	2-chlorophenol	2,3,4-trichlorophenol	1-chloronaphthalene
3,5-dichloroaniline	3-chlorophenol	2,3,5-trichlorophenol	2-chloronaphthalene
2,3,4-trichloroaniline	4-chlorophenol	2,3,6-trichlorophenol	
2,4,5-trichloroaniline	2,3-dichlorophenol	2,4,5-trichlorophenol	
2,4,6-trichloroaniline	2,4-dichlorophenol	2,4,6-trichlorophenol	
3,4,5-trichloroaniline	2,5-dichlorophenol	3,4,5-trichlorophenol	
Pentachloroaniline	2,6-dichlorophenol	2,3,4,5-tetrachlorophenol	
Pentachlorophenol	3,4-dichlorophenol	2,3,4,6-tetrachlorophenol	
4-chloro-2-methylphenol	3,5-dichlorophenol	2,3,5,6-tetrachlorophenol	
4-chloro-3-methylphenol			
PHENOLS	LONG CHAIN MONOCYCLIC AROMATIC HYDROCARBONS		OTHER HALOGENATED AROMATIC HYDROCARBONS
Phenol	Dodecylbenzene		Polybrominated diphenyl ethers (PBDEs)
2-methylphenol			Polybrominated biphenyls (PBBs)
3-methylphenol			
4-methylphenol			
Catechol (1,2-benzenediol)			
Resorcinol (1,3-benzenediol)			
Hydroquinone (1,4-benzenediol)			

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Appendix 4 APHA 6630/ EPA 8270		
(Carbamate Insecticides)	Organochlorine Insecticides)	
Carbaryl	2,4 prime-DDT	Beta-HCH
Carbofuran	4,4 prime-DDT	Gamma-HCH
Molinate	2,4 prime-DDD	Heptachlor
(Pyrethroid Insecticide)	4,4 prime-DDD	Heptachlor exo-epoxide
Bifenthrin	2,4 prime-DDE	Methoxychlor
D-trans-Allthrin	4,4 prime-DDE	Mirex
Esfenvalerate	Aldrin	Oxy-chlordane
Fenvalerate	Chlordane	Pentachlorophenol
	Chlordecone Hydrate	Chlorpyrifos
	Dieldrin	Chlortoluron
	Endosulfan	Dimethoate
	Endosulfan Sulfate	Malathion
	Endrin	Parathion-ethyl
	Alpha-HCH	Terbufos-sulfone
FUNGICIDES	HERBICIDES	
Captan	Atrazine	Nitrofen
Dicloran	Bromacil	Norflurazon
Quintozene	Cyanazine	Pendimethalin
Vinclozolin	Hexazinone	Prometryne
	Isoproturon	Propazine
	Metochlor	Thiobencarb
		Trifluralin