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LABORATORY LOCATION:
(PERMANENT LABORATORY)

SPECTRUM LABORATORIES SDN. BHD.
LOT 14 (PT 5015)
JALAN PENDAMAR 27/90, SEKSYEN 27
40400 SHAH ALAM, SELANGOR
MALAYSIA

FIELDS OF TESTING: CHEMICAL, MECHANICAL & MICROBIOLOGY

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2017 (ISO/IEC 17025:2017).

This laboratory's fulfillment 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 and calibrations. 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 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring Effluent and Water	Arsenic as As	APHA 3114 C, 2005
	Biochemical Oxygen Demand (BOD ₅) 5 days @ 20 °C	APHA 5210 B & APHA 4500-O G, 2005
	Chemical Oxygen Demand (COD)	APHA 5220 B, 2005 APHA 5220 C, 2005 APHA 5220 D, 2005
	Boron as B	APHA 4500-B C, 2005
	Calcium as Ca	APHA 3111 B, 2005
	Chromium, Hexavalent	APHA 3500-Cr B, 2005
	Chromium, Trivalent	In-house method No. 1 based on APHA 3500 Cr B
Chromium, Total	APHA 3111 B, 2005	
Cadmium as Cd	APHA 3111 B, 2005	

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) Effluent and Water	Copper as Cu	APHA 3111 B, 2005
	Cyanide as CN	OSRMA P.456 APHA 4500-CN C & F, 2005 APHA 4500-CN C & E, 2005
	Free Chlorine as Cl ₂	APHA 4500-CI F, 2005
	Iron as Fe	APHA 3111 B, 2005
	Lead as Pb	APHA 3111 B, 2005
	Magnesium as Mg	APHA 3111 B, 2005
	Manganese as Mn	APHA 3111 B, 2005
	Mercury as Hg	APHA 3112 B, 2005
	Nickel as Ni	APHA 3111 B, 2005
	Oil & Grease	APHA 5520 B, 2005
pH	APHA 4500-H ⁺ B, 2005	
Phenols	APHA 5530 B & C, 2005 APHA 5530 B & D, 2005 In-house method No. 3 based on USEPA 420.2	
Potassium as K	APHA 3111 B, 2005	
Sodium as Na	APHA 3111 B, 2005	
Sulphide as S ²⁻	APHA 4500-S ²⁻ F, 2005	
Suspended Solids	APHA 2540 D, 2005	
Selenium as Se	APHA 3114 C, 2005	
Tin as Sn	APHA 3114 C, 2005	
Zinc as Zn	APHA 3111 B, 2005	
Ammonia as N (or NH ₃)	APHA 4500-NH ₃ -B, C, 2005 APHA 4500-NH ₃ F, 2005 APHA 4500-NH ₃ G, 2005	

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) Effluent and Water	Kjeldahl Nitrogen	APHA 4500-Norg B & APHA 4500- NH ₃ -C
	Formaldehyde	HACH SPECTROPHOTOMETER Method 8110
	Metals by Inductively Coupled Plasma (ICP) Method: Aluminium as Al Antimony as Sb Arsenic as As Barium as Ba Beryllium as Be Boron as B Cadmium as Cd Calcium as Ca Chromium as Cr, Total Cobalt as Co Copper as Cu Iron as Fe Lead as Pb Lithium as Li Magnesium as Mg Manganese as Mn Molybdenum as Mo Nickel as Ni Potassium as K Sodium as Na Selenium as Se Silver as Ag Strontium as Sr Silica as SiO ₂ Thallium as Tl Vanadium as V Zinc as Zn	APHA 3120 B, 2005
	Aluminium as Al	APHA 3500-Al B, 2005
	Antimony as Sb	In-house method No. 2 based on APHA 3114 C
	Antimony as Sb	APHA 3111 B, 2005
	Bismuth as Bi	APHA 3111 B, 2005
	Cobalt as Co	APHA 3111 B, 2005

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) Effluent and Water	Gold as Au	APHA 3111 B, 2005
	Lithium as Li	APHA 3111 B, 2005
	Phosphorus as P (or PO ₄)	APHA 4500-P B & C, 2005 APHA 4500-P, B, F, 2005
	Silver as Ag	APHA 3111 B, 2005
	Strontium as Sr	APHA 3111 B, 2005
	Colour	APHA 2120 B, 2005 APHA 2120 F, 2005
	Turbidity	APHA 2130 B, 2005
	Acidity as CaCO ₃	APHA 2310 B, 2005
	Alkalinity as CaCO ₃	APHA 2320 B, 2005
	Hardness (Calculation) as CaCO ₃	APHA 2340 B, 2005
	Hardness (EDTA) as CaCO ₃	APHA 2340 C, 2005
	Conductivity	APHA 2510 B, 2005
	Chloride as Cl ⁻	APHA 4500-Cl- C, 2005
Fluoride as F	APHA 4500-F D, 2005	
Nitrite as N/ as NO ₂	APHA 4500-NO ₂ B, 2005 APHA 4500-NO ₃ F, 2005	
Nitrate as N/ as NO ₃	APHA 4500 NO ₃ B, 2005 APHA 4500-NO ₃ F, 2005	
Silica as SiO ₂	APHA 4500-SiO ₂ D, 2005	
Silicon as SiO ₂	APHA 4500-SiO ₂ C, 2005	

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) Effluent and Water	Sulphate as SO ₄	APHA 4500-SO ₄ E, 2005
	Dissolved Oxygen	APHA 4500-O G, 2005
	Total Solids	APHA 2540 B, 2005
	Total Dissolved Solids	APHA 2540 C, 2005
	Anionic Detergent as MBAS	APHA 5540 C, 2005
	Bicarbonate Alkalinity	APHA 4500 CO ₂ -D, 2005
	Carbonate Alkalinity	
	Hydroxide Alkalinity	
	Free Carbon dioxide & Total Carbon dioxide	
	Hexavalent Chromium as Cr ⁶⁺	EPA 7196 A
	Preliminary Treatment of Samples	
	Nitric Acid Digestion	APHA 3030 E, 2005
	Nitric Acid-Hydrochloric Acid Digestion	APHA 3030 F, 2005
	Nitric Acid-Sulphuric Acid Digestion	APHA 3030 G, 2005

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) Effluent and Water	Organochlorine Pesticides α -BHC β -BHC δ -BHC 4,4-DDE Aldrin Chlordane 4,4-DDT Dieldrin Endosulfan (I) Endosulfan (II) Endosulfan Sulfate Endrin Heptachlor Heptachlor Epoxide Hexachlorobenzene γ -BHC (lindane) Methoxychlor	APHA 6630-B, 2005
	2,4-D	APHA 6640-B, 1992, 18 th Edition
	Polynuclear Aromatic Hydrocarbons (PAHs) Naphthalene Acenaphthylene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benzo (a) anthracene Chrysene Benzo (b) fluoroanthene	APHA 6440-B, 2005

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) Effluent and Water	Benzo (k) fluoroanthene Benzo (a) pyrene Dibenzo (a,h) anthracene Indeno (1,2,3-cd) pyrene Benzo (g,h,i) perylene	APHA 6440 B, 2005
	Polychlorinated Biphenyls Aroclor 1016 Aroclor 1221 Aroclor 1232 Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260	APHA 6431 B, 2005
	Trihalomethanes Chloroform Dichlorobromomethanes Bromoform Dibromochloromethanes	APHA 6232 C, 2005
	Volatile Organic Compounds Benzene Toluene Ethylbenzene o-Xylene m-Xylene p-Xylene Total Xylene	APHA 6200, 2005



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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring <ul style="list-style-type: none"> Palm Oil Mill Effluent Rubber 	Biochemical Oxygen Demand Chemical Oxygen Demand Suspended Solids Oil & Grease Ammoniacal Nitrogen	DOE Malaysia Alternative Method, 2 nd Edition, 1995 DOE Malaysia Reference Method, 2 nd Edition, 1995 DOE Malaysia Alternative Method, 2 nd Edition, 1995 DOE Malaysia Reference Method, 2 nd Edition, 1995 DOE Malaysia Reference Method, 2 nd Edition, 1995
Sewage Water	pH	APHA 4500-H ⁺ B
	Temperature	APHA 2550 B
	Chemical Oxygen Demand	APHA 5220 C
	Biochemical Oxygen Demand	APHA 5210 B & APHA 4500 O-G
	Total Suspended Solids	APHA 2540 D
	Ammoniacal Nitrogen	APHA 4500-NH ₃ -B, C
	Phosphorus as P (or PO ₄)	APHA 4500-P B & C
	Oil & Grease	APHA 5520 B
Mixed Liquor	Total Suspended Solids	APHA 2540 D
	Volatile Suspended Solids (550 °C)	In-house method MLVSS based on APHA 2540 E
Polymers Plastic Material	Cadmium as Cd	BS EN 1122 B - 2001

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring <ul style="list-style-type: none"> • Sediments, Sludges & Soils • Solid wastes 	Preliminary Treatment of Samples Metals by Acid Digestion Cadmium as Cd Chromium as Cr Copper as Cu Iron as Fe Manganese as Mn Nickel as Ni Lead as Pb Zinc as Zn	EPA 3050 B - 1996 APHA 3111B, 2005
	Metals by Microwave Digestion Cadmium as Cd Chromium as Cr Copper as Cu Iron as Fe Manganese as Mn Nickel as Ni Lead as Pb Zinc as Zn	EPA 3052 - 1996/ APHA 3111 B EPA 3052 - 1996/ APHA 3120 B

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) <ul style="list-style-type: none"> Sediments, Sludges & Soils Solid wastes 	Moisture Content Hexavalent Chromium as Cr ⁶⁺	In House-Solid-01 EPA 3060A - 1996/ EPA 7196A – 1992
	Chlorinated Pesticides by Microwave Extraction-Gas Chromatography Method <ol style="list-style-type: none"> α-BHC Hexachlorobenzene β-BHC γ-BHC (Lindane) Heptachlor δ-BHC Aldrin Heptachlor Epoxide Dieldrin Endrin 4,4-DDE 4,4-DDT Endosulfan (I) Endosulfan (II) Endosulfan Sulphate Methoxychlor 4,4-DDD 	EPA 3546 (GC) – 2000



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Note:

- GC : Gas Chromatography
- EPA : Environment Protection Agency, United States of America
- APHA : Standard Methods for the Examination of Water and Wastewater; American Public Health Association, American Water Works Association and Water Environment Federation, 21st Edition (2005)
- OSRMA : Official, Standardised & Recommended Methods of Analysis, 2nd Edition, 1973; Society of Analytical Chemistry
- BS EN : European Standards
- AAS : Atomic Absorption Spectrophotometer
- ICP : Inductively Coupled Plasma

Signatories:

- | | |
|----------------------------|-------------------------|
| 1. Pang Wee See | IKM No.: A/0674/1510/83 |
| 2. Kan King Choy | IKM No.: L/0797/1886/88 |
| 3. Yong Shui Ha | IKM No.: L/1489/4746/05 |
| 4. Thulasi A/P S Selvaraja | IKM No.: M/4104/6896/14 |

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SCOPE OF TESTING: CHEMICAL**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring Ambient Air	Total Suspended Particulates (TSP) High Volume Sampler Gravimetric Method	AS 2724.3 – 1984
	Total Suspended Particulates (TSP) MiniVol TAS – Gavimetric Method	In-house method- Air-03 based on manufacturer method (Air Metrics; MiniVol TAS)
	Suspended Particulate Matter (PM ₁₀) High Volume Sampler with Selective Size Inlet	AS 3580.9.6 - 1990
	Determination of Particulates Matter (10 µm) (PM ₁₀) MiniVol TAS – Gravimetric Method	In-house method- Air-04 based on manufacturer method (Air Metrics, MiniVol TAS)
	Determination of Particulates Matter (2.5 µm) (PM _{2.5}) MiniVol TAS – Gravimetric Method	In-house method- Air-05 based on manufacturer method (Air Metrics, MiniVol TAS)
	Particulate Lead (Pb) Nitrogen Dioxide (NO ₂) Sulphur Dioxide (SO ₂)	AS 2800 - 1985 ISC Method 408 ISC Method 704A

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SCOPE OF TESTING: CHEMICAL**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) Ambient Air	Particulate Heavy Metals (High Volume Sampler Collection) Cadmium as Cd Chromium as Cr Copper as Cu Iron as Fe Manganese as Mn Nickel as Ni Zinc as Zn	In-house method- Air-01 based on AS 2800 - 1985/ APHA 3111 B, 2005
	Aluminium as Al	In-house method- Air- 02 based on AS 2800- 1985/ APHA 3120 B, 2005
	Determination of Ozone (O ₃) in the atmosphere Determination of Carbon monoxide (CO) in atmosphere	APHA ISC 820 ASTM D 4599-90
Effluent and Water	pH Temperature Dissolved Oxygen Conductivity Turbidity	APHA 4500-H ⁺ B, 2005 APHA 2550 B, 2005 APHA 4500-O G, 2005 APHA 2510 B, 2005 APHA 2130 B, 2005
Noise	Environment Noise Level	ISO 1996-1

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SCOPE OF TESTING: MECHANICAL**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring Vibration Measurement	Measurement of Vibration Level of Construction, Open Site & Building	In-house method-Vibration-01 based on Manufacturer method

SCOPE OF TESTING: CHEMICAL**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring Flue Gas	Determination of Particulate Emissions from Stationary Sources	EPA 40, CFR 60, App. A, Method 5
	Determination of Sulfur Dioxide Emissions from Stationary Sources	EPA 40, CFR 60, App. A, Method 6
	Determination of Nitrogen Oxide Emissions from Stationary Sources	EPA 40, CFR 60, App. A, Method 7
	Determination of Sulfuric Acid Mist and Sulfur Dioxide Emissions from Stationary Sources	EPA 40, CFR 60, App. A, Method 8
	Determination of Metal Emissions from Stationary Sources	EPA 40, CFR 60, App. A, Method 29
	Determination of Concentration and Mass Flow of Particulate Matter in Flue Gas for Stationary Sources Emission	MS 1596:2003
	Determination of Dark Smoke Emissions from Chimney Using Ringelman Smoke Chart	BS 2742: 1969
	Determination of CO ₂ , CO, O ₂ , NO ₂ & SO ₂	In-house method-Flue Gas-01 based on manufacturer method

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SCOPE OF TESTING: CHEMICAL**SITE: CATEGORY I**Note:

- ISC : Methods of Air Sampling and Analysis, 3rd Edition, 1990; Intersociety Committee
- AS : Australian Standard
- APHA : Standard Methods for the Examination of Water and Wastewater; American Public Health Association, American Water Works Association and Water Environment Federation
- ISO : International Organization for Standardization
- APHA
ISC 820 : APHA Inter Society Committee
- ASTAM : American Society For Testing and Materials 1993, Volume 11.03
- EPA : Environmental Protection Agency, Part 60
- CFR : Code of Federal Regulations
- BS : British Standard, First Revision 1969
- MS : Malaysian Standard, ICS 13.040.40, 2003

Signatories:

- | | |
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| 1. Pang Wee See | IKM No.: A/0674/1510/83 |
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SCOPE OF TESTING: MICROBIOLOGY

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Effluent and Water	Heterotrophic Plate Count/ Total Plate Count (Pour Plate Method)	APHA 9215 B, 2005
	Heterotrophic Plate Count/ Total Plate Count (Spread Plate Method)	APHA 9215 C, 2005
	Total <i>Coliform</i> Fermentation Techniques	APHA 9221 B, 2005
	Total <i>Coliform</i> Membrane Filtration Techniques	In-house method- Micro-01 (Based on APHA 9222 B, 2005)
	<i>E.coli</i> Fermentation Techniques	In-house method- Micro-03 (Based on APHA 9221 E, 2005)
	<i>E.coli</i> Membrane Filtration Techniques	In-house method- Micro-02 (Based on APHA 9222 G, 2005)
	<i>Fecal Coliform</i> Fermentation Techniques	APHA 9221 E, 2005

Note:

APHA : Standard Methods for the Examination of Water and Wastewater; American Public Health Association, American Water Works Association and Water Environment Federation

Signatories:

1. Prof. Dr. Thong Kwai Lin (Non-resident)
2. Fitratul Azimah binti Idris