

ภาคผนวก ค-6

ใบรายงานผลการติดตามตรวจสอบทรัพยากรธรรมชาติ
(แหล่งกักตุนพืช, แหล่งกักตุนสัตว์ ,สัตว์หน้าดิน ,สัตว์น้ำวัยอ่อน)



สถานีวิจัยประมงศรีราชา
101/12 หมู่ 9 ต. บางพระ
อ. ศรีราชา จ. ชลบุรี 20110
โทร./โทรสาร. (038) 311379

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
Address : 11 I-5 Road, Map Ta Phut, Muang, Rayong, Thailand, 21150
Project Name : Glow Phase 5

รายงานผลการวิเคราะห์แพลงก์ตอนพืช

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 4 กันยายน 2567)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Division Cyanophyta						
Class Cyanophyceae						
Order Chroococcales						
Family Chroococcaceae						
1. Merismopedia sp.	-	-	-	-	-	38,000
Order Nostocales						
Family Oscillatoriaceae						
2. Oscillatoria sp.	-	48,000	31,000	7,000	7,000	30,000
Family Nostocaceae						
3. Pseudanabaena sp.	212,000	184,000	8,000	28,000	104,000	23,000
4. Richelia sp.	-	-	-	-	-	137,000
Family Scytonemataceae						
5. Scytonema sp.	-	8,000	-	-	-	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Division Chlorophyta						
Class Chlorophyceae						
Order Chlorococcales						
Family Scenedesmaceae						
6. Scenedesmus sp.	-	-	-	14,000	-	-
Order Ulotrichales						
Family Ulotrichaceae						
7. Geminella sp.	-	-	8,000	-	-	-
Division Chromophyta						
Class Bacillariophyceae						
Order Biddulphiales						
Suborder Coscinodiscineae						
Family Thalassiosiraceae						
8. Cyclotella sp.	670,000	256,000	179,000	114,000	7,000	137,000
9. Lauderia sp.	14,000	624,000	70,000	185,000	133,000	1,140,000
10. Skeletonema sp.	113,000	24,000	3,276,000	263,000	444,000	15,000
11. Thalassiosira sp.	3,102,000	1,000,000	328,000	781,000	1,184,000	1,368,000
Family Melosiraceae						
12. Melosira sp.	7,000	-	-	-	-	-
13. Paralia sp.	35,000	16,000	140,000	21,000	7,000	175,000
Family Leptocyliodraceae						
14. Corethron sp.	35,000	328,000	47,000	92,000	244,000	707,000
Family Coscinodiscaceae						
15. Coscinodiscus sp.	197,000	192,000	491,000	1,704,000	59,000	570,000
16. Palmeria sp.	-	80,000	226,000	7,000	7,000	167,000
Family Hemidiscaceae						
17. Actinocyclus sp.	-	16,000	23,000	-	15,000	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Family Asterolampraceae						
18. <i>Asteromphalus</i> sp.	28,000	-	-	7,000	-	-
Family Heliopeltaceae						
19. <i>Actinoptychus</i> sp.	423,000	32,000	23,000	14,000	30,000	122,000
Suborder Rhizosoleniineae						
Family Rhizosoleniaceae						
20. <i>Dactyliosolen</i> sp.	14,000	24,000	-	-	-	15,000
21. <i>Guinardia</i> sp.	261,000	400,000	-	21,000	30,000	836,000
22. <i>Proboscia</i> sp.	176,000	200,000	8,000	-	15,000	1,391,000
23. <i>Pseudosolenia</i> sp.	35,000	720,000	55,000	43,000	22,000	988,000
24. <i>Rhizosolenia</i> sp.	649,000	7,360,000	1,053,000	178,000	266,000	13,528,000
Suborder Biddulphiineae						
Family Hemiaulaceae						
25. <i>Cerataulina</i> sp.	677,000	656,000	164,000	142,000	15,000	1,163,000
26. <i>Climacodium</i> sp.	-	16,000	-	21,000	-	-
27. <i>Eucampia</i> sp.	14,000	32,000	23,000	21,000	-	388,000
28. <i>Hemiaulus</i> sp.	338,000	5,200,000	944,000	284,000	777,000	22,648,000
Family Cymatosiraceae						
29. <i>Cymatosira</i> sp.	113,000	-	16,000	-	-	-
Family Biddulphiaceae						
30. <i>Biddulphia</i> sp.	-	-	16,000	-	-	-
Family Chaetoceraceae						
31. <i>Bacteriastrum</i> sp.	120,000	1,224,000	164,000	43,000	215,000	4,560,000
32. <i>Chaetoceros</i> sp.	132,117,000	65,120,000	8,112,000	1,562,000	5,476,000	31,008,000
Family Lithodesmaceae						
33. <i>Bellorochea</i> sp.	169,000	40,000	-	-	-	38,000
34. <i>Ditylum</i> sp.	317,000	4,640,000	569,000	227,000	296,000	2,736,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
35. <i>Helicotheca</i> sp.	106,000	-	-	-	-	-
Family Eupodiscaceae						
36. <i>Odontella</i> sp.	21,000	840,000	133,000	85,000	155,000	1,254,000
37. <i>Triceratium</i> sp.	7,000	16,000	-	-	15,000	-
Order Bacillariales						
Suborder Fragilariineae						
Family Fragilariaceae						
38. <i>Fragilaria</i> sp.	-	-	-	21,000	-	-
Family Rhaphoneidaceae						
39. <i>Rhaphoneis</i> sp.	-	-	31,000	-	-	-
Family Thalassionemataceae						
40. <i>Thalassionema</i> sp.	3,976,000	35,520,000	12,480,000	7,668,000	6,808,000	31,768,000
Family Licmophoriaceae						
41. <i>Licmophora</i> sp.	7,000	-	-	-	-	7,000
Suborder Bacillariineae						
Family Achnanthaceae						
42. <i>Achnanthes</i> sp.	7,000	-	-	-	-	-
43. <i>Cocconeis</i> sp.	-	-	8,000	-	-	-
Family Lyrellaceae						
44. <i>Lyrella</i> sp.	-	-	31,000	7,000	-	23,000
Family Naviculaceae						
45. <i>Amphora</i> sp.	7,000	32,000	39,000	-	-	365,000
46. <i>Craticula</i> sp.	-	-	8,000	-	-	-
47. <i>Diploneis</i> sp.	-	8,000	39,000	14,000	-	15,000
48. <i>Haslea</i> sp.	-	-	16,000	7,000	-	-
49. <i>Meunier</i> sp.	7,000	16,000	-	-	15,000	61,000
50. <i>Navicula</i> sp.	14,000	8,000	-	7,000	-	15,000

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(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
51. <i>Pinnularia</i> sp.	-	-	23,000	-	-	7,000
52. <i>Plagiotropis</i> sp.	14,000	-	-	-	-	-
53. <i>Pleurosigma</i> sp.	63,000	64,000	172,000	28,000	7,000	403,000
54. <i>Stauroneis</i> sp.	-	-	-	-	-	15,000
55. <i>Trachyneis</i> sp.	21,000	8,000	-	-	-	-
Family Bacillariaceae						
56. <i>Bacillaria</i> sp.	-	-	16,000	-	-	213,000
57. <i>Nitzschia</i> sp.	7,000	8,000	304,000	278,000	22,000	114,000
58. <i>Pseudo-nitzschia</i> sp.	127,000	120,000	-	-	-	-
59. <i>Tryblionella</i> sp.	-	-	-	-	-	8,000
Family Surirellaceae						
60. <i>Entomoneis</i> sp.	14,000	-	8,000	-	-	7,000
61. <i>Surirella</i> sp.	14,000	-	-	-	-	-
Class Dictyochophyceae						
Order Dictyochales						
Family Dictyochophyceae						
62. <i>Dictyocha</i> sp.	14,000	40,000	-	21,000	-	15,000
Class Dinophyceae						
Order Prorocentrales						
Family Prorocentraceae						
63. <i>Prorocentrum</i> sp.	14,000	16,000	8,000	-	7,000	15,000
Order Dinophysiales						
Family Dinophysiaceae						
64. <i>Dinophysis</i> sp.	-	8,000	-	-	15,000	-
65. <i>Phalacroma</i> sp.	-	16,000	-	-	-	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Order Gymnodiniales						
Family Gymnodiniaceae						
66. <i>Gymnodinium</i> sp.	-	-	-	14,000	-	-
67. <i>Gyrodinium</i> sp.	7,000	-	23,000	-	-	-
Order Noctilucales						
Family Noctilucaceae						
68. <i>Noctiluca</i> sp.	7,000	-	23,000	99,000	22,000	-
Order Gonyaulacales						
Family Ceratiaceae						
69. <i>Ceratium</i> sp.	-	88,000	125,000	36,000	15,000	53,000
Family Gonyaulacaceae						
70. <i>Gonyaulax</i> sp.	-	40,000	-	7,000	-	-
Family Pyrophacaceae						
71. <i>Pyrophacus</i> sp.	-	-	-	-	-	7,000
Order Peridinales						
Family Peridiniaceae						
72. <i>Peridinium</i> sp.	7,000	-	-	-	-	-
Family Protoperidiniaceae						
73. <i>Protoperidinium</i> sp.	56,000	744,000	55,000	92,000	148,000	532,000
สกุลแพลงก์ตอนพืช	46	44	43	38	32	45
ปริมาณแพลงก์ตอนพืช	144,353,000	126,032,000	29,516,000	14,163,000	16,582,000	118,825,000
ดัชนีความหลากหลายแพลงก์ตอนพืช	0.4859	1.4754	1.8147	1.7999	1.7064	2.0189
ดัชนีความสม่ำเสมอแพลงก์ตอนพืช	0.1269	0.3899	0.4825	0.4948	0.4924	0.5304

Sample Location : 1. สถานี 24102070-1 : จุดสูบน้ำทะเลของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น

2. สถานี 24102069-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตกเฉียงใต้ 500 เมตร จุดที่ 1

3. สถานี 24102068-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตกเฉียงใต้ 500 เมตร จุดที่ 2

4. สถานี 24102067-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตก 500 เมตร

5. สถานี 24102066-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตกเฉียงใต้ 1,000 เมตร จุดที่ 1

6. สถานี 24102065-1 : น้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตกเฉียงใต้ 1,000 เมตร จุดที่ 2

Condition of Sample : contained in one plastic bottle, sample containers comply to pretreatment- preservation standards (APHA, USEPA)


.....
(นางสาวกนกวรรณ ขวาค่อน)
ผู้วิเคราะห์


.....
(นายอลงกต อินทรชาติ)
หัวหน้าสถานีวิจัยประมงศรีราชา



สถานีวิจัยประมงศรีราชา
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รายงานผลการวิเคราะห์แพลงก์ตอนสัตว์
ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 4 กันยายน 2567)

สกุล/กลุ่มแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Phylum Protozoa						
Subphylum Plasmodroma						
Class Sarcodina						
Subclass Rhizopoda						
Order Testacida						
Family Euglyphidae						
1. Euglypha sp.	-	-	-	-	22,000	-
Order Foraminiferida						
2. Globorotalia sp.	-	8,000	8,000	-	-	15,000
Subphylum Ciliophora						
Class Ciliata						
Subclass Spirotricha						
Order Tintinnida						
Family Tintinnididae						
3. Leprotintinnus sp.	28,000	8,000	39,000	-	-	7,000

ตาราง ผลการวิเคราะห์เพลงก้นอนสัตว์ (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุล/กลุ่มเพลงก้นอนสัตว์	ปริมาณเพลงก้นอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Family Codonellidae						
4. Tintinnopsis sp.	78,000	32,000	39,000	7,000	-	30,000
Family Codonellopsidae						
5. Codonellopsis sp.	7,000	24,000	8,000	-	-	38,000
6. Stenosemella sp.	14,000	-	-	7,000	-	15,000
Family Cyttarocylidae						
7. Favella sp.	-	-	-	-	-	8,000
Family Petalotrichidae						
8. Metacylis sp.	7,000	-	-	-	-	15,000
Family Tintinnidae						
9. Amphorella sp.	7,000	40,000	31,000	14,000	37,000	8,000
10. Eutintinnus sp.	-	8,000	-	-	-	15,000
Subclass Peritricha						
Order Peritrichida						
11. Vorticella sp.	-	56,000	-	-	37,000	220,000
Phylum Rotifera						
Class Monogononta						
Order Ploima						
Family Lecanidae						
12. Lecane sp.	-	-	-	-	7,000	-
Family Tricerceridae						
13. Trichocerca sp.	-	8,000	-	-	7,000	8,000
Phylum Chaetognatha						
Class Sagittoidea						
Family Sagittidae						
14. Sagitta sp.	-	-	-	7,000	-	7,000

ตาราง ผลการวิเคราะห์เพลงก้นอนสัตว์ (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุล/กลุ่มเพลงก้นอนสัตว์	ปริมาณเพลงก้นอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Phylum Annelida						
Class Polychaeta						
15. Polychaete larvae	-	16,000	-	64,000	37,000	7,000
Phylum Arthropoda						
Class Crustacea						
Subclass Copepoda						
16. Copepod nauplius	374,000	376,000	218,000	518,000	274,000	600,000
Order Calanoida						
17. Calanoid copepod	28,000	8,000	31,000	85,000	37,000	30,000
Order Cyclopoida						
18. Cyclopoid copepod	49,000	8,000	47,000	28,000	30,000	53,000
Order Harpacticoida						
19. Harpacticoid copepod	-	40,000	8,000	21,000	22,000	7,000
Subclass Cirripedia						
20. Cirripede nauplius	-	-	16,000	-	-	-
Phylum Mollusca						
Class Gastropoda						
21 Gastropod larvae	-	8,000	-	-	-	-
Class Bivalvia						
22 Pelecypod larvae	-	136,000	94,000	-	22,000	418,000
Phylum Echinodermata						
Class Holothuroidea						
23. Auricularia larvae	-	-	-	-	-	15,000
Class Echinoidea						
24. Echinopluteus larvae	-	-	-	-	-	7,000
Class Ophiuroidea						
25. Ophiopluteus larvae	-	-	-	-	-	15,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุล/กลุ่มแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)					
	24102070-1	24102069-1	24102068-1	24102067-1	24102066-1	24102065-1
Phylum Chordata						
Subphylum Urochordata						
Class Larvacea						
Family Oikopleuridae						
26. Oikopleura sp.	-	40,000	8,000	14,000	7,000	84,000
สกุล/กลุ่มแพลงก์ตอนสัตว์	9	16	12	10	12	22
ปริมาณแพลงก์ตอนสัตว์	592,000	816,000	547,000	765,000	539,000	1,622,000
ดัชนีความหลากหลายแพลงก์ตอนสัตว์	1.2980	1.9082	1.9326	1.2108	1.8012	1.9449
ดัชนีความสม่ำเสมอแพลงก์ตอนสัตว์	0.5907	0.6882	0.7777	0.5258	0.7249	0.6292

Sample Location : 1. สถานี 24102070-1 : จุดสูบน้ำทะเลของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น

2. สถานี 24102069-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อน แบบโคเจนเนอเรชั่นไปทางทิศตะวันตกเฉียงใต้ 500 เมตร จุดที่ 1

3. สถานี 24102068-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น ไปทางทิศตะวันตกเฉียงใต้ 500 เมตร จุดที่ 2

4. สถานี 24102067-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตก 500 เมตร

5. สถานี 24102066-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตกเฉียงใต้ 1,000 เมตร จุดที่ 1

6. สถานี 24102065-1 : น้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่นไปทางทิศตะวันตกเฉียงใต้ 1,000 เมตร จุดที่ 2

Condition of Sample : contained in one plastic bottle, sample containers comply to pretreatment- preservation standards (APHA, USEPA)



(นางสาวกนกวรรณ ขวค่อน)
ผู้วิเคราะห์



(นายอลงกต อินทรชาติ)
หัวหน้าสถานีวิจัยประมงศรีราชา



สถานีวิจัยประมงศรีราชา
101/12 หมู่ 9 ต. บางพระ
อ. ศรีราชา จ. ชลบุรี 20110
โทร./โทรสาร. (038) 311379

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
Address : 11 I-5 Road, Map Ta Phut, Muang, Rayong, Thailand, 21150
Project Location : Glow Phase 5

รายงานผลการวิเคราะห์สัตว์หน้าดิน

ตาราง ผลการวิเคราะห์สัตว์หน้าดิน (เก็บตัวอย่างวันที่ 4 กันยายน 2567)

สกุลสัตว์หน้าดิน	ปริมาณสัตว์หน้าดิน (ตัวต่อตารางเมตร)					
	24102059-1	24102058-1	24102057-1	24102056-1	24102055-1	24102054-1
Phylum Annelida						
Class Polychaeta						
Order Capitellida						
Family Capitellidae						
Heteromastus sp. (ไส้เดือนทะเล)	15	30	15	15	30	30
Family Maldanidae						
Euclymene sp. (ไส้เดือนทะเล)	-	-	-	-	15	15
Order Phyllodocida						
Family Nephtyidae						
Nephtys sp. (ไส้เดือนทะเล)	15	-	-	-	-	-
Order Terebellida						
Family Cirratulidae						
Timarete sp. (ไส้เดือนทะเล)	-	-	15	-	-	-

ตาราง ผลการวิเคราะห์สัตว์หน้าดิน (เก็บตัวอย่างวันที่ 4 กันยายน 2567)
(ต่อ)

สกุลสัตว์หน้าดิน	ปริมาณสัตว์หน้าดิน (ตัวต่อตารางเมตร)					
	24102059-1	24102058-1	24102057-1	24102056-1	24102055-1	24102054-1
Phylum Mollusca						
Class Bivalvia						
Order Cardiida						
Family Tellinidae						
Tellina sp. (หอยสองฝาชนิดหนึ่ง)	15	15	-	-	-	45
สกุลสัตว์หน้าดิน	3	2	2	1	2	3
ปริมาณสัตว์หน้าดิน	45	45	30	15	45	90
ค่าดัชนีความหลากหลายสัตว์หน้าดิน	1.0986	0.6365	0.6931	0.0000	0.6365	1.0114

Sample Location : 1. สถานี 24102059-1 : จุดสูบน้ำทะเลของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น
2. สถานี 24102058-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น ไปทางทิศตะวันตกเฉียงใต้ 500 เมตร จุดที่ 1
3. สถานี 24102057-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น ไปทางทิศตะวันตกเฉียงใต้ 500 เมตร จุดที่ 2
4. สถานี 24102056-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น ไปทางทิศตะวันตก 500 เมตร
5. สถานี 24102055-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น ไปทางทิศตะวันตกเฉียงใต้ 1,000 เมตร จุดที่ 1
6. สถานี 24102054-1 : น้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการโรงไฟฟ้าพลังความร้อนแบบโคเจนเนอเรชั่น ไปทางทิศตะวันตกเฉียงใต้ 1,000 เมตร จุดที่ 2

Condition of Sample : contained in one plastic zip bag

นายอรุณ คุ้มวงศ์
(นายอรุณ คุ้มวงศ์)
ผู้วิเคราะห์

นายอลงกต อินทรชาติ
(นายอลงกต อินทรชาติ)
หัวหน้าสถานีวิจัยประมงศรีราชา



สถานีวิจัยประมงศรีราชา
101/12 หมู่ 9 ต. บางพระ
อ. ศรีราชา จ. ชลบุรี 20110
โทร./โทรสาร. (038) 311379

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
Address : 11 I-5 Road, Map Ta Phut, Muang, Rayong, Thailand, 21150
Project Location : Glow Phase 5

รายงานผลการวิเคราะห์สัตว์น้ำวัยอ่อน
ตาราง ผลการวิเคราะห์สัตว์น้ำวัยอ่อน (เก็บตัวอย่างวันที่ 4 กันยายน 2567)

กลุ่มของสัตว์น้ำวัยอ่อน	ปริมาณสัตว์น้ำวัยอ่อน (หน่วยต่อลูกบาศก์เมตร)	
	24102062-1	24102063-1
Phylum Annelida		
Class Polychaeta		
Polychaete larvae (ตัวอ่อน ไส้เดือนทะเล)	7,000	16,000
Phylum Arthropoda		
Class Crustacea		
Subclass Copepoda		
Copepod nauplii (ตัวอ่อน โคพีพอดระยะนาอูปเลียส)	600,000	376,000
Phylum Mollusca		
Class Gastropoda		
Gastropod larvae (ตัวอ่อน หอยฝาเดียว)	-	8,000
Class Bivalvia		
Pelecypod larvae (ตัวอ่อน หอยสองฝา)	418,000	136,000

ตาราง ผลการวิเคราะห์สัตว์น้ำวัยอ่อน (เก็บตัวอย่างวันที่ 4 กันยายน 2567) (ต่อ)

กลุ่มของสัตว์น้ำวัยอ่อน	ปริมาณสัตว์น้ำวัยอ่อน (หน่วยต่อลูกบาศก์เมตร)	
	24102062-1	24102063-1
Phylum Echinodermata		
Class Holothuroidea		
Auricularia larvae (ตัวอ่อนปลิงทะเล)	15,000	-
Class Echinoidea		
Echinopluteus larvae (ตัวอ่อนมีหนามทะเล)	7,000	-
Class Ophiuroidea		
Ophiopluteus larvae (ตัวอ่อนดาวเปราะ)	15,000	-
จำนวนกลุ่มของสัตว์น้ำวัยอ่อนทั้งหมด	6	4
ปริมาณของสัตว์น้ำวัยอ่อนทั้งหมด	1,062,000	536,000

Sample Location : 1. สถานี 24102062-1 : จุดสูบน้ำทะเลของโครงการโรงไฟฟ้าพลังงานความร้อนแบบ
โคเจนเนอเรชั่น

2. สถานี 24102063-1 : แหล่งน้ำทะเลห่างจากจุดระบายน้ำทิ้งของโครงการ
โรงไฟฟ้าพลังงานความร้อนแบบ โคเจนเนอเรชั่น ไป
ทางทิศตะวันตกเฉียงใต้ 1,000 เมตร จุดที่ 1

Condition of Sample : contained in one plastic bottle, sample containers comply to
pretreatment- preservation standards (APHA, USEPA)


(นางสาวกนกวรรณ ขาวดอน)
ผู้วิเคราะห์


(นายอลงกต อินทรชาติ)
หัวหน้าสถานีวิจัยประมงศรีราชา

ภาคผนวก ค-7

ใบรายงานผลการติดตามตรวจสอบระดับเสียงโดยทั่วไป



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116836-1

Page 1 of 1

Sample Number 2486806-1
Parameter Noise (Leq 24 hrs.)
Location บริเวณชุมชนหนองแฟบ (ทม. มาบตาพุด) (GPS 47P 0730685, 1403045)
Measurement Date Sep 06 - Sep 07, 2024
Measurement by Sawai Tonpho
Sound Level meter Serial No. 873057

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	57.2	84.0	49.2
10:00 AM - 11:00 AM	58.3	88.2	50.0
11:00 AM - 12:00 PM	62.2	93.0	51.1
12:00 PM - 01:00 PM	59.4	83.7	50.8
01:00 PM - 02:00 PM	63.1	82.8	52.3
02:00 PM - 03:00 PM	58.5	79.7	51.4
03:00 PM - 04:00 PM	57.8	80.7	50.4
04:00 PM - 05:00 PM	56.9	75.7	49.6
05:00 PM - 06:00 PM	55.4	81.6	48.6
06:00 PM - 07:00 PM	53.1	73.4	47.8
07:00 PM - 08:00 PM	51.0	71.0	46.3
08:00 PM - 09:00 PM	51.8	72.7	47.2
09:00 PM - 10:00 PM	52.8	80.3	46.9
10:00 PM - 11:00 PM	52.7	78.5	46.4
11:00 PM - 12:00 AM	49.3	69.7	45.8
12:00 AM - 01:00 AM	50.9	75.6	45.3
01:00 AM - 02:00 AM	49.7	69.3	45.0
02:00 AM - 03:00 AM	52.7	76.6	45.0
03:00 AM - 04:00 AM	50.0	72.0	44.3
04:00 AM - 05:00 AM	56.0	74.3	48.2
05:00 AM - 06:00 AM	57.5	79.8	51.1
06:00 AM - 07:00 AM	61.0	80.5	50.2
07:00 AM - 08:00 AM	58.7	77.6	50.4
08:00 AM - 09:00 AM	57.9	84.0	49.6

Leq Average 24 hrs. (dB(A)) 57.3
Lmax (dB(A)) 93.0
L90 (dB(A)) 48.6
Ldn (dB(A)) 62.2
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการ
โรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

Approved by

Supot S
Supot Salamteh
Section Head

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19584-21/ EMAIL



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116837-1

Page 1 of 1

Sample Number 2486806-2
Parameter Noise (Leq 24 hrs.)
Location บริเวณชุมชนหนองแฟบ (ทม. มาบตาพุด) (GPS 47P 0730685, 1403045)
Measurement Date Sep 07 - Sep 08, 2024
Measurement by Sawai Tonpho
Sound Level meter Serial No. 873057

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	58.1	81.5	49.8
10:00 AM - 11:00 AM	59.1	88.3	48.6
11:00 AM - 12:00 PM	57.3	81.5	50.0
12:00 PM - 01:00 PM	57.5	86.4	48.6
01:00 PM - 02:00 PM	58.4	85.9	49.9
02:00 PM - 03:00 PM	57.0	78.8	51.6
03:00 PM - 04:00 PM	58.8	85.4	50.1
04:00 PM - 05:00 PM	57.2	84.1	49.6
05:00 PM - 06:00 PM	60.4	87.2	48.8
06:00 PM - 07:00 PM	61.4	91.9	48.5
07:00 PM - 08:00 PM	57.1	82.0	48.1
08:00 PM - 09:00 PM	54.9	84.2	45.6
09:00 PM - 10:00 PM	51.8	79.3	45.4
10:00 PM - 11:00 PM	53.0	78.6	43.3
11:00 PM - 12:00 AM	52.1	73.7	42.8
12:00 AM - 01:00 AM	52.2	76.1	42.8
01:00 AM - 02:00 AM	53.4	78.2	44.3
02:00 AM - 03:00 AM	51.6	73.6	45.3
03:00 AM - 04:00 AM	54.1	79.0	45.0
04:00 AM - 05:00 AM	55.5	79.4	47.9
05:00 AM - 06:00 AM	57.9	90.2	49.5
06:00 AM - 07:00 AM	56.8	80.7	47.5
07:00 AM - 08:00 AM	57.7	82.2	48.2
08:00 AM - 09:00 AM	58.1	88.1	48.7

Leq Average 24 hrs. (dB(A)) 57.1
Lmax (dB(A)) 91.9
L90 (dB(A)) 48.2
Ldn (dB(A)) 61.7
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการ
โรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

Approved by

Supot S
Supot Salamteh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116838-1

Page 1 of 1

Sample Number	2486806-3
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณชุมชนหนองแฟบ (ทนม. มาบตาพุด) (GPS 47P 0730685, 1403045)
Measurement Date	Sep 08 - Sep 0x, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No. 873057

Time	Leq (dB(A))	Lma9 (dB(A))	Lx0 (dB(A))
0x:00 AM - 10:00 AM	57.0	83.6	48.3
10:00 AM - 11:00 AM	58.4	87.1	48.4
11:00 AM - 12:00 PM	57.2	x2.3	4x.7
12:00 PM - 01:00 PM	55.x	7x.x	48.5
01:00 PM - 02:00 PM	54.5	74.2	48.x
02:00 PM - 03:00 PM	56.2	82.7	50.7
03:00 PM - 04:00 PM	65.3	105.8	50.6
04:00 PM - 05:00 PM	52.8	80.0	45.x
05:00 PM - 06:00 PM	50.x	74.1	43.x
06:00 PM - 07:00 PM	4x.0	73.3	43.6
07:00 PM - 08:00 PM	48.6	74.x	43.1
08:00 PM - 0x:00 PM	48.8	6x.x	43.6
0x:00 PM - 10:00 PM	48.2	70.x	44.6
10:00 PM - 11:00 PM	48.x	75.1	43.2
11:00 PM - 12:00 AM	46.7	74.x	41.6
12:00 AM - 01:00 AM	47.1	70.x	43.7
01:00 AM - 02:00 AM	50.0	77.0	44.5
02:00 AM - 03:00 AM	52.7	73.2	44.x
03:00 AM - 04:00 AM	50.5	74.1	43.x
04:00 AM - 05:00 AM	68.3	112.0	47.7
05:00 AM - 06:00 AM	57.7	81.0	52.1
06:00 AM - 07:00 AM	57.0	7x.0	50.6
07:00 AM - 08:00 AM	54.7	77.7	47.8
08:00 AM - 0x:00 AM	56.3	80.5	48.8

Leq Average 24 hrs. (dB(A)) 58.2
Lma9 (dB(A)) 112.0
Lx0 (dB(A)) 45.x
Ldn (dB(A)) 65.8
Standard (dB(A)) 70 115
Reference Method : ISO1xx6-1 and 1xx6-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

Approved by

Supot S
Supot Salamteh
Section Head

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S:\Reports_Air Noise.rpt (11:46AM)



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 311683m1

Page 1 of 1

Sample Number	2486806-4
Parameter	Noise (Le. 24 hrs)x
Location	บริเวณชุมชนหนองแฟบ (ทนม. มาบตาพุด) (GPS 47P 0730685, 1403045x)
Measurement Date	Sep 0m- Sep 10, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No) 873057

Tib e	Le. dBqAxx	Lb a9 dBqAxx	Lm0 dBqAxx
0m00 AM - 10:00 AM	58)7	m0)7	48)3
10:00 AM - 11:00 AM	56)0	7m)5	4m)m
11:00 AM - 12:00 PM	53)2	70)7	48)1
12:00 PM - 01:00 PM	53)0	6m)7	47)3
01:00 PM - 02:00 PM	53)8	71)6	47)7
02:00 PM - 03:00 PM	55)3	76)2	48)0
03:00 PM - 04:00 PM	64)m	86)1	52)m
04:00 PM - 05:00 PM	58)4	87)1	48)4
05:00 PM - 06:00 PM	58)5	82)1	47)4
06:00 PM - 07:00 PM	56)6	83)5	4m)1
07:00 PM - 08:00 PM	52)6	77)2	46)0
08:00 PM - 0m00 PM	4m)1	73)2	45)6
0m00 PM - 10:00 PM	4m)3	75)1	45)0
10:00 PM - 11:00 PM	46)1	63)7	42)6
11:00 PM - 12:00 AM	45)5	63)3	43)1
12:00 AM - 01:00 AM	45)3	58)1	43)0
01:00 AM - 02:00 AM	47)5	64)2	41)m
02:00 AM - 03:00 AM	53)7	80)7	42)m
03:00 AM - 04:00 AM	48)1	72)0	42)6
04:00 AM - 05:00 AM	67)6	82)2	44)6
05:00 AM - 06:00 AM	63)1	82)8	52)3
06:00 AM - 07:00 AM	65)6	85)4	52)2
07:00 AM - 08:00 AM	57)3	78)2	4m)3
08:00 AM - 0m00 AM	54)5	70)7	48)3

Le. Average 24 hrs) dBqAxx 5m)2
Lb a9 dBqAxx m0)7
Lm0 dBqAxx 47)4
Ldn dBqAxx 67)2
Standard dBqAxx 70 115
Reference Method : ISO1mm6-1 and 1mm6-2
Standard : 1) ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2) ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025)

Technical Management

Chontichak
Chonticha Sufongkoch
Scientist q3x

Approved by

Supot S
Supot Salabteh
Section Head

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S:\Reports_Air Noise.rpt (11:46AM)



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116840-1

Page 1 of 1

Sample Number	2486806-5
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณชุมชนหนองแฟบ (ทม. มาบตาพุด) (GPS 47P 0730685, 1403045)
Measurement Date	Sep 10 - Sep 11, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No. 873057

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	55.1	74.8	48.7
10:00 AM - 11:00 AM	58.7	80.3	50.8
11:00 AM - 12:00 PM	55.7	76.9	49.3
12:00 PM - 01:00 PM	53.8	71.8	47.4
01:00 PM - 02:00 PM	56.0	77.6	48.8
02:00 PM - 03:00 PM	55.8	75.4	48.7
03:00 PM - 04:00 PM	58.6	78.2	51.0
04:00 PM - 05:00 PM	55.3	74.5	49.6
05:00 PM - 06:00 PM	55.3	80.4	48.1
06:00 PM - 07:00 PM	53.0	74.1	46.5
07:00 PM - 08:00 PM	52.3	74.3	46.5
08:00 PM - 09:00 PM	51.3	77.0	46.9
09:00 PM - 10:00 PM	51.0	71.2	46.0
10:00 PM - 11:00 PM	49.5	70.8	45.2
11:00 PM - 12:00 AM	47.0	68.6	44.6
12:00 AM - 01:00 AM	46.2	63.7	44.5
01:00 AM - 02:00 AM	47.8	75.6	44.3
02:00 AM - 03:00 AM	52.7	79.7	44.0
03:00 AM - 04:00 AM	48.0	66.6	43.5
04:00 AM - 05:00 AM	53.2	73.9	44.7
05:00 AM - 06:00 AM	57.6	74.6	51.3
06:00 AM - 07:00 AM	57.6	78.5	51.8
07:00 AM - 08:00 AM	55.5	77.7	48.5
08:00 AM - 09:00 AM	56.0	79.7	49.1

Leq Average 24 hrs. (dB(A))	54.7		
Lmax (dB(A))		80.4	
L90 (dB(A))			47.4
Ldn (dB(A))	60.0		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการ
โรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

Approved by

Supt S
Supot Salamteh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116841-1

Page 1 of 1

Sample Number	2486806-6
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณชุมชนหนองแฟบ (ทม. มาบตาพุด) (GPS 47P 0730685, 1403045)
Measurement Date	Sep 11 - Sep 12, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No. 873057

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	55.3	74.6	49.4
10:00 AM - 11:00 AM	57.1	78.2	50.9
11:00 AM - 12:00 PM	54.6	69.5	49.6
12:00 PM - 01:00 PM	55.8	79.9	49.2
01:00 PM - 02:00 PM	56.3	76.5	49.8
02:00 PM - 03:00 PM	56.0	76.8	48.5
03:00 PM - 04:00 PM	60.0	86.6	51.2
04:00 PM - 05:00 PM	55.4	77.1	48.4
05:00 PM - 06:00 PM	55.5	83.9	47.2
06:00 PM - 07:00 PM	55.5	79.8	46.6
07:00 PM - 08:00 PM	50.9	71.5	45.7
08:00 PM - 09:00 PM	49.8	74.7	45.3
09:00 PM - 10:00 PM	48.2	67.1	45.3
10:00 PM - 11:00 PM	49.8	74.4	45.2
11:00 PM - 12:00 AM	48.0	71.3	44.9
12:00 AM - 01:00 AM	48.0	72.7	45.2
01:00 AM - 02:00 AM	48.6	65.7	45.6
02:00 AM - 03:00 AM	53.0	79.3	46.3
03:00 AM - 04:00 AM	49.8	67.4	47.5
04:00 AM - 05:00 AM	53.9	73.8	48.0
05:00 AM - 06:00 AM	57.1	73.0	51.0
06:00 AM - 07:00 AM	57.7	77.4	52.0
07:00 AM - 08:00 AM	54.5	72.7	47.8
08:00 AM - 09:00 AM	54.1	76.8	47.5

Leq Average 24 hrs. (dB(A))	54.7		
Lmax (dB(A))		86.6	
L90 (dB(A))			47.5
Ldn (dB(A))	60.1		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการ
โรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

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Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116842-1

Page 1 of 1

Sample Number 2486806-7
Parameter Noise (Leq 24 hrs.)
Location บริเวณชุมชนหนองแฟบ (ทม. มาบตาพุด) (GPS 47P 0730685, 1403045)
Measurement Date Sep 12 - Sep 13, 2024
Measurement by Sawai Tonpho
Sound Level meter Serial No. 873057

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	54.1	75.8	47.9
10:00 AM - 11:00 AM	55.8	77.3	50.1
11:00 AM - 12:00 PM	54.6	70.9	48.3
12:00 PM - 01:00 PM	54.6	82.4	47.7
01:00 PM - 02:00 PM	56.3	84.0	49.0
02:00 PM - 03:00 PM	55.9	73.2	49.9
03:00 PM - 04:00 PM	58.5	82.9	50.8
04:00 PM - 05:00 PM	55.9	78.9	48.3
05:00 PM - 06:00 PM	54.8	79.2	46.7
06:00 PM - 07:00 PM	52.8	74.5	44.6
07:00 PM - 08:00 PM	49.6	72.6	43.3
08:00 PM - 09:00 PM	50.7	78.7	43.7
09:00 PM - 10:00 PM	50.0	78.1	43.4
10:00 PM - 11:00 PM	46.7	69.8	43.1
11:00 PM - 12:00 AM	44.7	62.8	42.4
12:00 AM - 01:00 AM	44.5	67.4	41.8
01:00 AM - 02:00 AM	44.3	62.2	41.8
02:00 AM - 03:00 AM	51.8	78.3	41.7
03:00 AM - 04:00 AM	48.1	73.3	41.9
04:00 AM - 05:00 AM	53.3	73.7	44.1
05:00 AM - 06:00 AM	57.2	79.0	50.5
06:00 AM - 07:00 AM	59.3	83.2	52.1
07:00 AM - 08:00 AM	54.4	73.5	49.3
08:00 AM - 09:00 AM	50.7	78.7	43.7

Leq Average 24 hrs. (dB(A)) 54.2
Lmax (dB(A)) 84.0
L90 (dB(A)) 44.6
Ldn (dB(A)) 59.9
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

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Supot Salamteh
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S:\Reports\Air Noise.rpt (11:47AM)



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116843-1

Page 1 of 1

Sample Number 2486806-8
Parameter Noise (Leq 24 hrs.)
Location บริเวณชุมชนหนองแฟบ (ทม. มาบตาพุด) (GPS 47P 0731882, 1402465)
Measurement Date Sep 06 - Sep 07, 2024
Measurement by Sawai Tonpho
Sound Level meter Serial No. 6233x0

Time	Leq (dB(A))	Lma9 (dB(A))	Lx0 (dB(A))
0x:00 AM - 10:00 AM	56.7	83.5	55.1
10:00 AM - 11:00 AM	56.6	78.0	55.3
11:00 AM - 12:00 PM	56.8	70.3	55.5
12:00 PM - 01:00 PM	58.1	76.3	55.7
01:00 PM - 02:00 PM	56.x	74.7	55.3
02:00 PM - 03:00 PM	56.1	72.6	54.x
03:00 PM - 04:00 PM	56.7	7x.2	54.7
04:00 PM - 05:00 PM	64.6	6x.5	60.2
05:00 PM - 06:00 PM	58.6	68.4	55.5
06:00 PM - 07:00 PM	54.4	66.8	53.5
07:00 PM - 08:00 PM	55.4	68.4	53.x
08:00 PM - 0x:00 PM	56.x	67.6	55.4
0x:00 PM - 10:00 PM	57.3	65.4	55.8
10:00 PM - 11:00 PM	62.8	75.5	57.8
11:00 PM - 12:00 AM	64.6	6x.5	60.2
12:00 AM - 01:00 AM	5x.6	67.7	57.0
01:00 AM - 02:00 AM	58.5	64.1	57.0
02:00 AM - 03:00 AM	57.4	61.4	56.4
03:00 AM - 04:00 AM	56.8	65.4	55.x
04:00 AM - 05:00 AM	56.8	64.7	55.8
05:00 AM - 06:00 AM	57.8	72.7	56.5
06:00 AM - 07:00 AM	57.2	75.6	56.2
07:00 AM - 08:00 AM	62.3	82.x	56.3
08:00 AM - 0x:00 AM	60.6	x2.8	54.x

Leq Average 24 hrs. (dB(A)) 5x.3
Lma9 (dB(A)) x2.8
Lx0 (dB(A)) 55.7
Ldn (dB(A)) 66.3
Standard (dB(A)) 70 115

Reference Method : ISO1xx6-1 and 1xx6-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

Approved by

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Supot Salamteh
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S:\Reports\Air Noise.rpt (11:48AM)



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116844-1

Page 1 of 1

Sample Number	2486806-(
Parameter	Noise (Leq 24 hrs)
Location	บริษัท เจริญธรรมา จำกัด (มหาชน) โรงไฟฟ้าถ่านหินถ่านหิน 11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
Measurement Date	Sep 07 - Sep 08, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No) 6233(0

Time	Le. dB(A)	Lma9 dB(A)	Lx0 dB(A)
01:00 AM - 10:00 AM	56.2	76.0	54.5
10:00 AM - 11:00 AM	55.8	67.5	54.6
11:00 AM - 12:00 PM	56.3	70.5	55.0
12:00 PM - 01:00 PM	56.6	71.0	54.8
01:00 PM - 02:00 PM	57.6	80.7	55.5
02:00 PM - 03:00 PM	56.8	78.8	55.4
03:00 PM - 04:00 PM	56.8	72.2	55.2
04:00 PM - 05:00 PM	56.6	74.8	55.1
05:00 PM - 06:00 PM	57.3	71.8	55.4
06:00 PM - 07:00 PM	57.7	70.0	56.4
07:00 PM - 08:00 PM	57.3	64.6	56.1
08:00 PM - 09:00 PM	57.2	63.8	56.2
09:00 PM - 10:00 PM	57.3	67.1	56.0
10:00 PM - 11:00 PM	63.5	61.7	57.3
11:00 PM - 12:00 AM	63.2	61.6	57.1
12:00 AM - 01:00 AM	60.5	66.8	57.1
01:00 AM - 02:00 AM	57.3	65.8	55.7
02:00 AM - 03:00 AM	56.4	61.7	55.3
03:00 AM - 04:00 AM	56.7	61.8	55.6
04:00 AM - 05:00 AM	57.3	66.1	56.3
05:00 AM - 06:00 AM	57.7	75.1	56.2
06:00 AM - 07:00 AM	57.1	74.3	55.8
07:00 AM - 08:00 AM	57.0	66.2	55.7
08:00 AM - 09:00 AM	56.8	80.8	55.6

Le. Average 24 hrs) dB(A) 58.3
Lma9 dB(A) 80.8
Lx0 dB(A) 55.6
Ldn dB(A) 65.8
Standard dB(A) 70
Reference Method : ISO1((6-1 and 1((6-2
Standard : 1) การตรวจวัดระดับเสียงรบกวนของชุมชน (ตามข้อกำหนดของกรมส่งเสริมการค้าระหว่างประเทศ) 2540) 2) การตรวจวัดระดับเสียงรบกวนของชุมชน (ตามข้อกำหนดของกรมส่งเสริมการค้าระหว่างประเทศ) 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025)

Technical Management

Chontichak
Chonticha Subongkoch
Scientist ๓

Approved by

Supot Salamteh
Section Head

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S:\Reports\Air Noise.rpt (11:48AM)



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116845-1

Page 1 of 1

Sample Number	2486806-10
Parameter	Noise (Leq 24 hrs)
Location	บริษัท เจริญธรรมา จำกัด (มหาชน) โรงไฟฟ้าถ่านหินถ่านหิน 11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
Measurement Date	Sep 08 - Sep 0x, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No. 6233x0

Time	Leq (dB(A))	Lma9 (dB(A))	Lx0 (dB(A))
0x:00 AM - 10:00 AM	56.x	6x.8	55.5
10:00 AM - 11:00 AM	56.1	64.8	55.1
11:00 AM - 12:00 PM	56.2	65.6	55.1
12:00 PM - 01:00 PM	56.1	67.1	55.0
01:00 PM - 02:00 PM	56.1	68.1	55.0
02:00 PM - 03:00 PM	56.0	64.0	55.1
03:00 PM - 04:00 PM	60.8	76.1	55.3
04:00 PM - 05:00 PM	63.4	82.6	56.3
05:00 PM - 06:00 PM	57.8	80.0	55.5
06:00 PM - 07:00 PM	57.3	78.0	56.4
07:00 PM - 08:00 PM	57.8	65.1	56.6
08:00 PM - 0x:00 PM	5x.6	66.5	57.6
0x:00 PM - 10:00 PM	64.4	6x.4	5x.x
10:00 PM - 11:00 PM	64.8	70.6	60.4
11:00 PM - 12:00 AM	61.4	68.8	58.5
12:00 AM - 01:00 AM	58.5	67.1	56.5
01:00 AM - 02:00 AM	57.0	65.0	55.x
02:00 AM - 03:00 AM	56.7	61.5	55.7
03:00 AM - 04:00 AM	56.x	61.3	56.0
04:00 AM - 05:00 AM	57.2	68.x	56.2
05:00 AM - 06:00 AM	58.1	7x.7	56.3
06:00 AM - 07:00 AM	57.3	76.2	56.1
07:00 AM - 08:00 AM	57.3	71.x	55.7
08:00 AM - 0x:00 AM	56.8	74.3	55.6

Leq Average 24 hrs. (dB(A)) 5x.3
Lma9 (dB(A)) 82.6
Lx0 (dB(A)) 55.x
Ldn (dB(A)) 66.0
Standard (dB(A)) 70
Reference Method : ISO1xx6-1 and 1xx6-2
Standard : 1. การตรวจวัดระดับเสียงรบกวนของชุมชน (ตามข้อกำหนดของกรมส่งเสริมการค้าระหว่างประเทศ) 2540) 2) การตรวจวัดระดับเสียงรบกวนของชุมชน (ตามข้อกำหนดของกรมส่งเสริมการค้าระหว่างประเทศ) 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

Approved by

Supot Salamteh
Section Head

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S:\Reports\Air Noise.rpt (11:49AM)



Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116846-1

Page 1 of 1

Sample Number	2486806-11
Parameter	Noise (Leq 24 hrs.)
Location	บริษัท เจริญธรรมา จำกัด (มหาชน) โรงไฟฟ้า (GPS 47P 0731882, 1402465)
Measurement Date	Sep 0x - Sep 10, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No. 6233x0

Time	Leq (dB(A))	Lma9 (dB(A))	Lx0 (dB(A))
0x:00 AM - 10:00 AM	56.6	73.x	55.4
10:00 AM - 11:00 AM	56.5	81.2	55.2
11:00 AM - 12:00 PM	57.3	65.5	55.4
12:00 PM - 01:00 PM	57.4	70.1	55.8
01:00 PM - 02:00 PM	56.3	76.7	55.3
02:00 PM - 03:00 PM	57.2	75.8	55.3
03:00 PM - 04:00 PM	57.1	7x.6	55.6
04:00 PM - 05:00 PM	56.5	71.x	55.7
05:00 PM - 06:00 PM	56.4	66.4	55.6
06:00 PM - 07:00 PM	56.3	62.7	55.6
07:00 PM - 08:00 PM	57.2	67.0	56.0
08:00 PM - 0x:00 PM	60.0	70.0	56.6
0x:00 PM - 10:00 PM	62.1	68.4	58.1
10:00 PM - 11:00 PM	61.7	67.x	56.5
11:00 PM - 12:00 AM	57.6	66.x	55.6
12:00 AM - 01:00 AM	56.1	63.6	55.3
01:00 AM - 02:00 AM	56.1	65.5	55.3
02:00 AM - 03:00 AM	56.7	65.2	55.8
03:00 AM - 04:00 AM	57.2	70.x	56.1
04:00 AM - 05:00 AM	57.x	78.1	56.0
05:00 AM - 06:00 AM	57.7	77.7	56.0
06:00 AM - 07:00 AM	57.5	74.x	56.1
07:00 AM - 08:00 AM	56.6	72.1	55.5
08:00 AM - 0x:00 AM	56.x	71.3	55.3

Leq Average 24 hrs. (dB(A))	57.8		
Lma9 (dB(A))		81.2	
Lx0 (dB(A))			55.6
Ldn (dB(A))	64.3		
Standard (dB(A))	70	115	

Reference Method : ISO1xx6-1 and 1xx6-2

Standard : 1. การคำนวณการรบกวนเสียงด้วยวิธีคำนวณตามวิธี 15 (พ.ศ. 2540) ฐานค่าที่ขึ้นกับประเภทของพื้นที่
2. การคำนวณการรบกวนเสียงด้วยวิธีคำนวณตามวิธี 15 (พ.ศ. 2540) ฐานค่าที่ขึ้นกับประเภทของพื้นที่

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116847-1

Page 1 of 1

Sample Number	2486806-12
Parameter	Noise (Leq 24 hrs.)
Location	บริษัท เจริญธรรมา จำกัด (มหาชน) โรงไฟฟ้า (GPS 47P 0731882, 1402465)
Measurement Date	Sep 10 - Sep 11, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No. 6233x0

Time	Leq (dB(A))	Lma9 (dB(A))	Lx0 (dB(A))
0x:00 AM - 10:00 AM	55.x	72.6	54.x
10:00 AM - 11:00 AM	56.6	77.6	54.x
11:00 AM - 12:00 PM	55.8	67.5	54.8
12:00 PM - 01:00 PM	55.x	75.7	54.x
01:00 PM - 02:00 PM	56.3	77.8	55.3
02:00 PM - 03:00 PM	57.7	77.6	55.8
03:00 PM - 04:00 PM	57.5	77.4	56.1
04:00 PM - 05:00 PM	56.5	65.3	55.7
05:00 PM - 06:00 PM	56.4	67.5	55.6
06:00 PM - 07:00 PM	56.3	62.1	55.5
07:00 PM - 08:00 PM	57.2	63.0	55.x
08:00 PM - 0x:00 PM	57.2	63.7	55.7
0x:00 PM - 10:00 PM	56.8	70.8	55.5
10:00 PM - 11:00 PM	56.3	64.0	55.3
11:00 PM - 12:00 AM	55.5	65.3	54.8
12:00 AM - 01:00 AM	55.5	66.5	54.8
01:00 AM - 02:00 AM	55.4	64.4	54.7
02:00 AM - 03:00 AM	56.3	65.x	55.3
03:00 AM - 04:00 AM	57.0	6x.2	55.x
04:00 AM - 05:00 AM	57.4	82.5	55.6
05:00 AM - 06:00 AM	57.3	7x.7	55.8
06:00 AM - 07:00 AM	5x.3	86.6	55.4
07:00 AM - 08:00 AM	56.3	71.5	54.8
08:00 AM - 0x:00 AM	56.5	72.3	54.8

Leq Average 24 hrs. (dB(A))	56.7		
Lma9 (dB(A))		86.6	
Lx0 (dB(A))			55.3
Ldn (dB(A))	63.2		
Standard (dB(A))	70	115	

Reference Method : ISO1xx6-1 and 1xx6-2

Standard : 1. การคำนวณการรบกวนเสียงด้วยวิธีคำนวณตามวิธี 15 (พ.ศ. 2540) ฐานค่าที่ขึ้นกับประเภทของพื้นที่
2. การคำนวณการรบกวนเสียงด้วยวิธีคำนวณตามวิธี 15 (พ.ศ. 2540) ฐานค่าที่ขึ้นกับประเภทของพื้นที่

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 3116848-1

Page 1 of 1

Sample Number	2486806-13
Parameter	Noise (Leq 24 hrs.)
Location	บริษัท เจริญธรรมา จำกัด (มหาชน) โรงไฟฟ้า (GPS 47P 0731882, 1402465)
Measurement Date	Sep 11 - Sep 12, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No. 6233x0

Time	Leq (dB(A))	Lma9 (dB(A))	Lx0 (dB(A))
0x:00 AM - 10:00 AM	56.x	75.x	55.5
10:00 AM - 11:00 AM	56.5	67.4	55.4
11:00 AM - 12:00 PM	56.0	74.5	54.8
12:00 PM - 01:00 PM	56.1	72.5	55.2
01:00 PM - 02:00 PM	56.3	74.1	55.4
02:00 PM - 03:00 PM	58.8	81.x	55.5
03:00 PM - 04:00 PM	56.5	70.5	55.5
04:00 PM - 05:00 PM	56.7	72.5	55.7
05:00 PM - 06:00 PM	56.1	66.2	55.3
06:00 PM - 07:00 PM	55.8	66.7	55.2
07:00 PM - 08:00 PM	55.7	5x.1	55.2
08:00 PM - 0x:00 PM	56.2	63.3	55.1
0x:00 PM - 10:00 PM	57.2	63.4	55.6
10:00 PM - 11:00 PM	56.2	62.8	55.2
11:00 PM - 12:00 AM	55.5	5x.6	54.x
12:00 AM - 01:00 AM	55.0	60.2	54.4
01:00 AM - 02:00 AM	55.2	5x.3	54.5
02:00 AM - 03:00 AM	56.6	63.3	55.7
03:00 AM - 04:00 AM	57.0	70.0	56.1
04:00 AM - 05:00 AM	5x.1	84.7	56.2
05:00 AM - 06:00 AM	57.0	73.7	55.x
06:00 AM - 07:00 AM	57.6	78.3	55.7
07:00 AM - 08:00 AM	56.6	74.0	55.6
08:00 AM - 0x:00 AM	64.x	77.7	55.4

Leq Average 24 hrs. (dB(A))	57.6		
Lma9 (dB(A))		84.7	
Lx0 (dB(A))			55.4
Ldn (dB(A))	63.4		
Standard (dB(A))	70	115	

Reference Method : ISO1xx6-1 and 1xx6-2

Standard : 1. การคำนวณค่าเฉลี่ยถ่วงน้ำหนัก ของค่าเฉลี่ย 15 (พ.ศ. 2540) ฐานค่า พิกัด ในพื้นที่ สี่เหลี่ยม 1.5 เมตร
2. การคำนวณค่าเฉลี่ยถ่วงน้ำหนัก ของค่าเฉลี่ย 15 (พ.ศ. 2540) ฐานค่า พิกัด ในพื้นที่ สี่เหลี่ยม 1.5 เมตร

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak
Chonticha Subongkoch
Scientist (3)

Approved by

Supot S
Supot Salamteh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486806
Date Received : Sep 17, 2024
Date Reported : Sep 20, 2024
Report Number: 311684m1

Page 1 of 1

Sample Number	2486806-14
Parameter	Noise (Le. 24 hrs)x
Location	บริษัท เจริญธรรมา จำกัด (มหาชน) โรงไฟฟ้า (GPS 47P 0731882, 1402465x)
Measurement Date	Sep 12 - Sep 13, 2024
Measurement by	Sawai Tonpho
Sound Level meter	Serial No) 6233m0

Tib e	Le. qdBqAxx	Lb a9 qdBqAxx	Lm0 qdBqAxx
0m00 AM - 10:00 AM	57m	73j3	56j2
10:00 AM - 11:00 AM	57j4	71j4	56j0
11:00 AM - 12:00 PM	56j5	68j1	55j2
12:00 PM - 01:00 PM	56j3	68j1	55j4
01:00 PM - 02:00 PM	56j1	70j8	55j2
02:00 PM - 03:00 PM	58j5	81j6	56j2
03:00 PM - 04:00 PM	57j3	76j8	56j5
04:00 PM - 05:00 PM	56jm	68j8	56j3
05:00 PM - 06:00 PM	56jm	65j4	56j3
06:00 PM - 07:00 PM	56j7	62j2	56j2
07:00 PM - 08:00 PM	57j1	64j2	56j3
08:00 PM - 0m00 PM	60j1	65j3	57j2
0m00 PM - 10:00 PM	62jm	6m4	61j2
10:00 PM - 11:00 PM	60j2	66jm	56j8
11:00 PM - 12:00 AM	56j8	62j2	55jm
12:00 AM - 01:00 AM	57j3	61j5	56j4
01:00 AM - 02:00 AM	56j8	61j0	56j1
02:00 AM - 03:00 AM	57j0	66jm	56j2
03:00 AM - 04:00 AM	57j5	70j3	56j5
04:00 AM - 05:00 AM	58j5	82j1	56j3
05:00 AM - 06:00 AM	57j4	75j3	56j1
06:00 AM - 07:00 AM	5m0	87j7	55jm
07:00 AM - 08:00 AM	57j3	86j0	56j1
08:00 AM - 0m00 AM	57j4	77j1	55jm

Le. Average 24 hrs) qdBqAxx	58j2		
Lb a9 qdBqAxx		87j7	
Lm0 qdBqAxx			56j2
Ldn qdBqAxx	64j4		
Standard qdBqAxx	70	115	

Reference Method : ISO1m6-1 and 1m6-2

Standard : 1) การคำนวณค่าเฉลี่ยถ่วงน้ำหนัก ของค่าเฉลี่ย 15 (พ.ศ. 2540) ฐานค่า พิกัด ในพื้นที่ สี่เหลี่ยม 1.5 เมตร
2) การคำนวณค่าเฉลี่ยถ่วงน้ำหนัก ของค่าเฉลี่ย 15 (พ.ศ. 2540) ฐานค่า พิกัด ในพื้นที่ สี่เหลี่ยม 1.5 เมตร

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025)

Technical Management

Chontichak
Chonticha Suf ongkoch
Scientist q3x

Approved by

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Supot Salab teh
Section Head

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ภาคผนวก ค-8

ใบรายงานผลการติดตามตรวจสอบความร้อนในสถานที่ทำงาน



Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486815

Date Received : Sep 18, 2024
Date Reported : Sep 24, 2024
Report Number: 3068223-1

Page 1 of 4

Sample Number 2486815-1
Parameter Heat Stress (Sampling Time : 09.00 AM - 11.00 AM)
Measurement Date Sep 17, 2024
Measurement by Natthapon Jiengwareewong
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน - : แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
บริเวณ IP Drum HRSG	120	30.2	26.5	38.7	37.8
Average (WBGT)		30.2			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management


Supot Salamteh
Section Head

Approved by


Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486815

Date Received : Sep 18, 2024

Date Reported : Sep 24, 2024

Report Number: 3068223-1

Page 2 of 4

Sample Number 2486815-2
Parameter Heat Stress (Sampling Time : 09.00 AM - 11.00 AM)
Measurement Date Sep 17, 2024
Measurement by Natthapon Jiengwareewong
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน - : แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
บริเวณ Combustion Turbine A	120	28.5	25.9	34.6	34.0
Average (WBGT)		28.5			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management


Supot Salamteh
Section Head

Approved by


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Assistant Manager

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Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486815

Date Received : Sep 18, 2024
Date Reported : Sep 24, 2024
Report Number: 3068223-1

Page 3 of 4

Sample Number 2486815-3
Parameter Heat Stress (Sampling Time : 09.00 AM - 11.00 AM)
Measurement Date Sep 17, 2024
Measurement by Natthapon Jiengwareewong
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน - : แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
บริเวณ Combustion Turbine B	120	29.2	26.5	35.4	35.2
Average (WBGT)		29.2			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management


Supot Salamteh
Section Head

Approved by


Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486815

Date Received : Sep 18, 2024

Date Reported : Sep 24, 2024

Report Number: 3068223-1

Page 4 of 4

Sample Number 2486815-4
Parameter Heat Stress (Sampling Time : 09.00 AM - 11.00 AM)
Measurement Date Sep 17, 2024
Measurement by Natthapon Jiengwareewong
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน - : แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
บริเวณ Steam Turbine Drainage Skid	120	28.6	26.0	34.7	34.2
Average (WBGT)		28.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management


Supot Salamteh
Section Head

Approved by


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ภาคผนวก ค-9

ใบรายงานผลการตรวจวัด Noise Contour Map



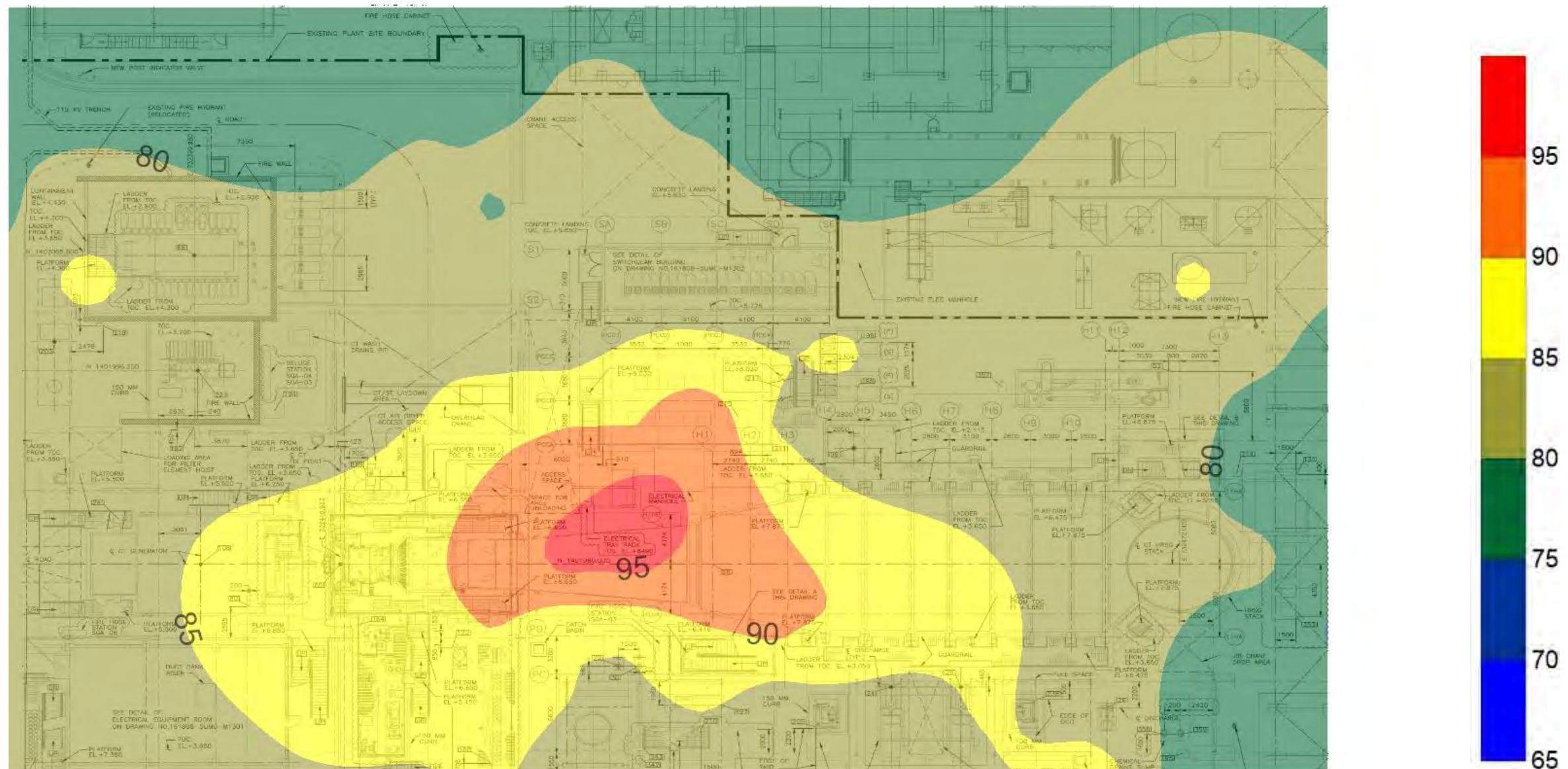
Noise Contour Map

GLOW ENERGY PUBLIC COMPANY LIMITED

Reference Number : 2467870-1

Measurement Date : Jul 11, 2024

CT-HRSG Area Ground FL EL+3650



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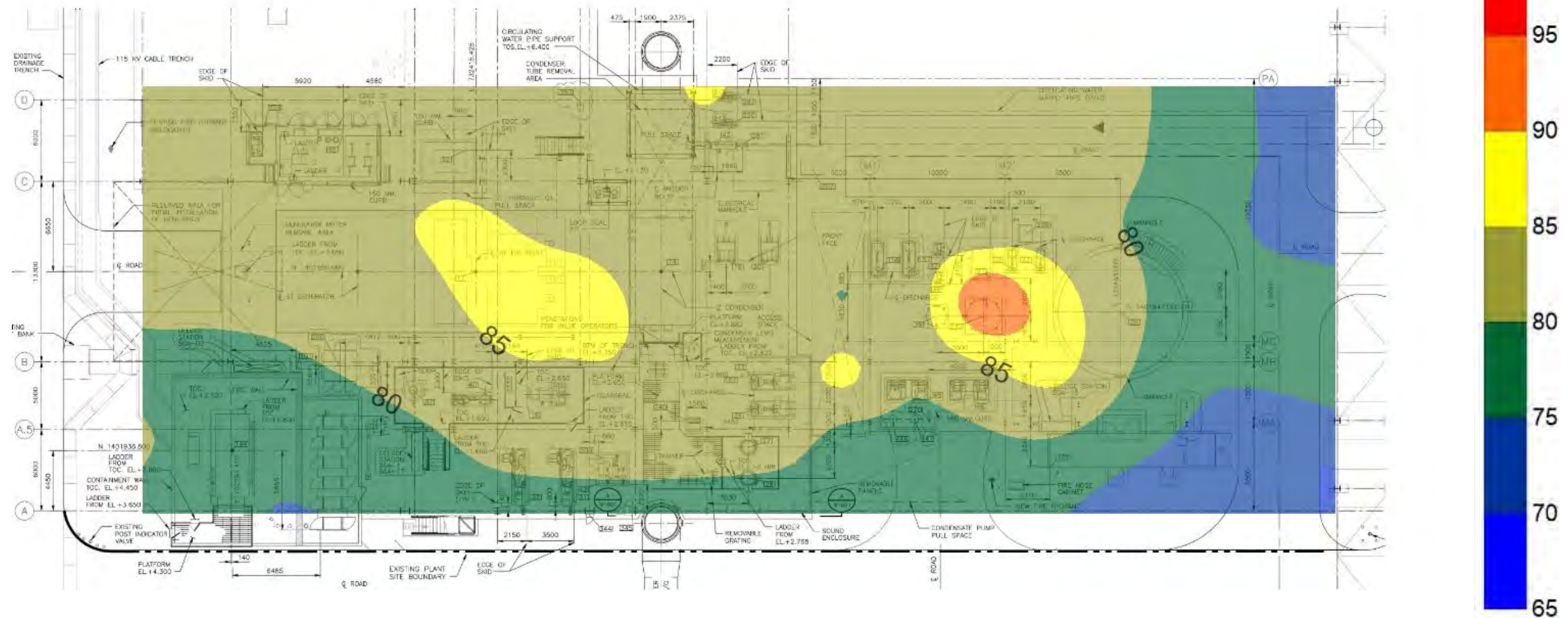
Noise Contour Map

GLOW ENERGY PUBLIC COMPANY LIMITED

(ST Area Ground FL EL)

Reference Number : 2477868-1

Measurement Date : Jul 11, 2024



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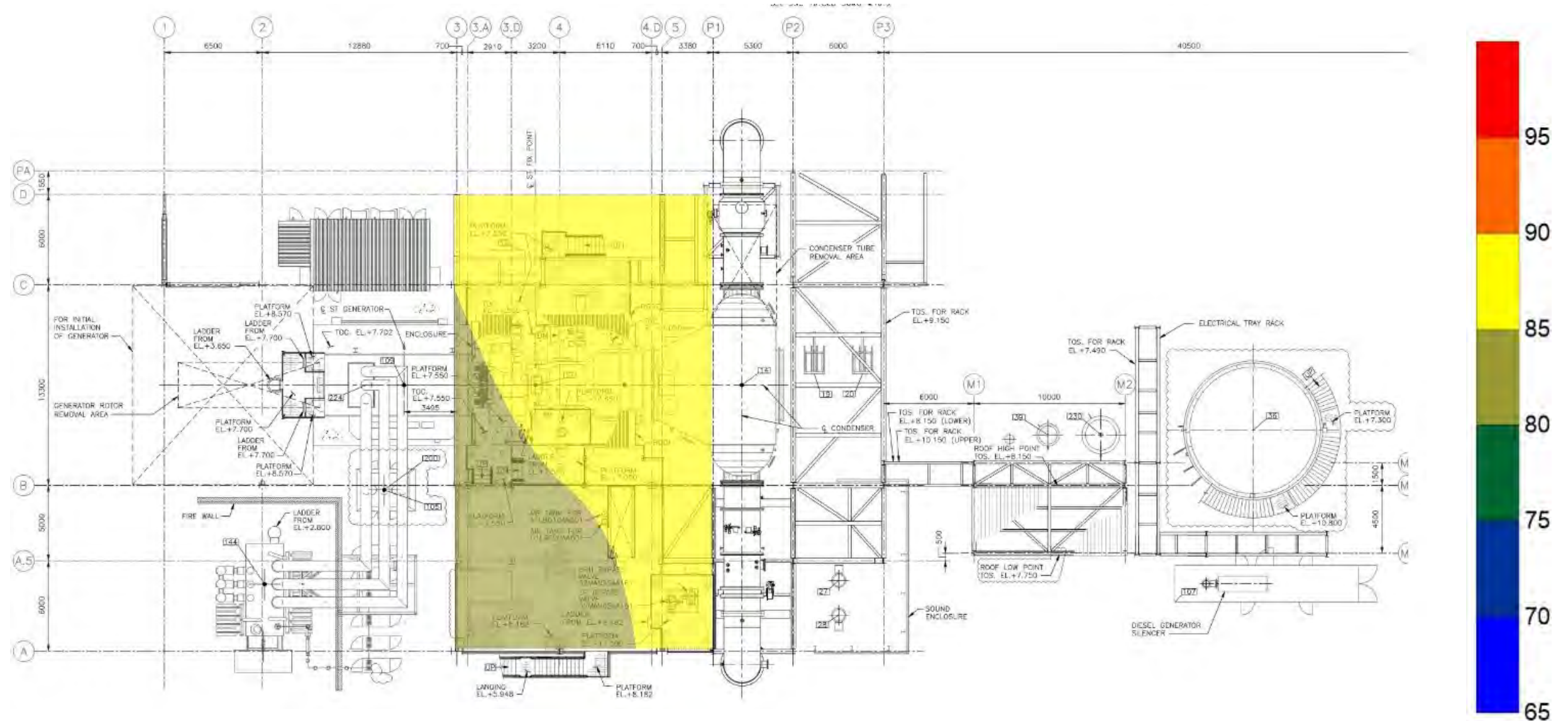
Noise Contour Map

GLOW ENERGY PUBLIC COMPANY LIMITED

Reference Number : 2477869-1

Measurement Date : Jul 11, 2024

(ST Area EL 8.182 m)



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Measurement Date : Jul 11, 2024

General Arrangement Electro Chlorination Building Area





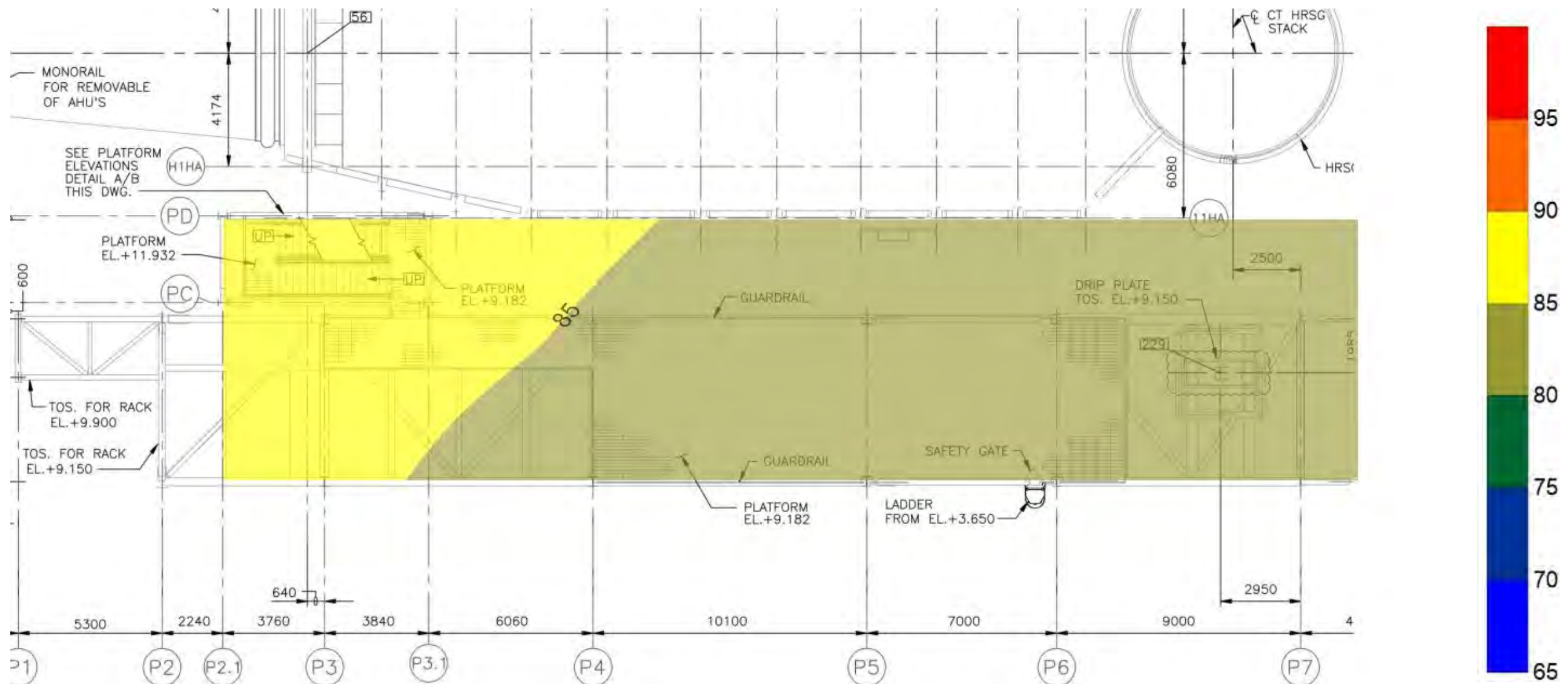
Noise Contour Map

GLOW ENERGY PUBLIC COMPANY LIMITED

CT-HRSG Area EL+9.182

Reference Number : 2477871-1

Measurement Date : Jul 11, 2024



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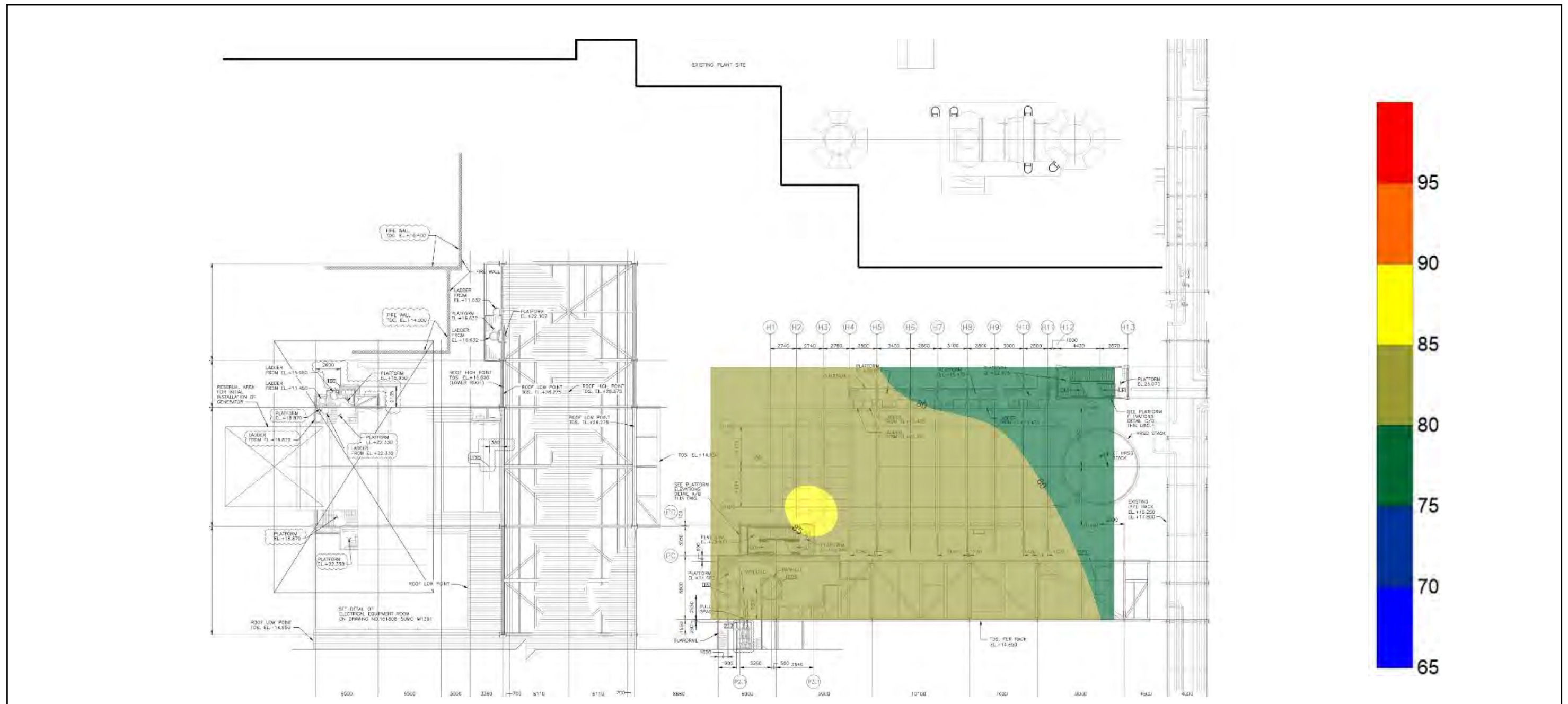
Noise Contour Map

GLOW ENERGY PUBLIC COMPANY LIMITED

CT -HRSG Area EL+14.682m.

Reference Number : 2477872-1

Measurement Date : Jul 11, 2024



ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250, Thailand | PHONE +66 0 2760 3000 | FAX +66 0 2760 3197
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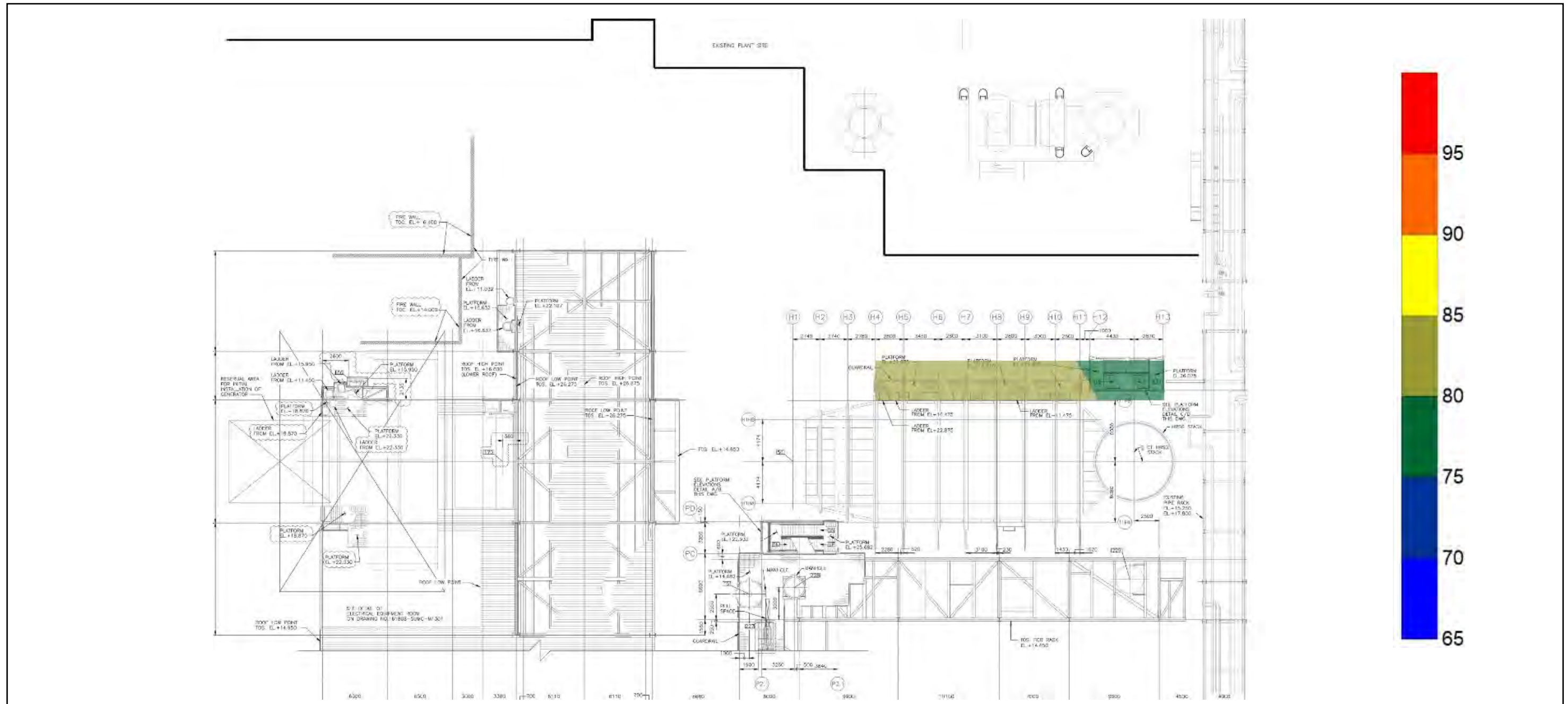
Noise Contour Map

GLOW ENERGY PUBLIC COMPANY LIMITED

Reference Number : 2477873-1

Measurement Date : Jul 11, 2024

CT-HRSG Area EL+28.175 m



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ภาคผนวก ค-10

ใบรายงานผลการติดตามตรวจสอบความเข้มแสงสว่างในในสถานที่ปฏิบัติงาน



Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150

P/O :
Project Name :
Project Location : Phase5

Lot ID: 2486818 (1)

Date Received : Sep 18, 2024
Date Reported : Dec 26, 2024
Report Number: 2486818 (1)-1 Rev. No.1

Page 1 of 2

Glow Phase 5										
Lay out No.	Location	Reference Number	Date	Time	No.	Illuminance (Lux)		Guideline Limit		Comment
						Spot	Average	Spot/Min	Average	
2	Spot : Fuel Gas Equipment Skid	2486818 (1)-1	17-Sep-24	Day time	1	10,706	-	200-300	-	Pass
		2486818 (1)-2	17-Sep-24	Day time	2	11,101	-	2000	-	
		2486818 (1)-3	17-Sep-24	Day time	3	10,535	-	600	-	
3	Spot : CEMs Enclosure	2486818 (1)-5	17-Sep-24	Day time	1	495	-	200-300	-	Pass
4	Spot : Steam Jet Ejector Skid	2486818 (1)-7	17-Sep-24	Day time	1	1,527	-	200-300	-	Pass
		2486818 (1)-8	17-Sep-24	Day time	2	1,420	-	300	-	
		2486818 (1)-9	17-Sep-24	Day time	3	1,272	-	200	-	
5	Spot : Steam Turbine Drainage Skid	2486818 (1)-11	17-Sep-24	Day time	1	1,820	-	200-300	-	Pass
		2486818 (1)-12	17-Sep-24	Day time	2	1,768	-	300	-	
		2486818 (1)-13	17-Sep-24	Day time	3	1,623	-	200	-	
		2486818 (1)-14	17-Sep-24	Night time	1	302	-	200-300	-	Pass
6	Spot : Steam Turbine Oil Middle	2486818 (1)-15	17-Sep-24	Day time	1	844	-	200-300	-	Pass
		2486818 (1)-16	17-Sep-24	Night time	1	798	-	200-300	-	Pass
7	Area : G9 KV Room	2486818 (1)-17	17-Sep-24	Night time	1	496	444	100	200	Pass
		2486818 (1)-18	17-Sep-24	Night time	2	506				
		2486818 (1)-19	17-Sep-24	Night time	3	344				
		2486818 (1)-20	17-Sep-24	Night time	4	367				
		2486818 (1)-21	17-Sep-24	Night time	5	369				
		2486818 (1)-22	17-Sep-24	Night time	6	581				
9	Area : SUS Room	2486818 (1)-24	17-Sep-24	Night time	1	879	872	100	200	Pass
		2486818 (1)-25	17-Sep-24	Night time	2	872				
		2486818 (1)-26	17-Sep-24	Night time	3	865				

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150

P/O :
Project Name :
Project Location : Phase5

Lot ID: 2486818 (1)

Date Received : Sep 18, 2024
Date Reported : Dec 26, 2024
Report Number: 2486818 (1)-1 Rev. No.1

Page 2 of 2

Glow Phase 5										
Lay out No.	Location	Reference Number	Date	Time	No.	Illuminance (Lux)		Guideline Limit		Comment
						Spot	Average	Spot/Min	Average	
10	Area : PPC Room	2486818 (1)-27	17-Sep-24	Night time	1	971	907	100	200	Pass
		2486818 (1)-28	17-Sep-24	Night time	2	1,065				
		2486818 (1)-29	17-Sep-24	Night time	3	1,050				
		2486818 (1)-30	17-Sep-24	Night time	4	933				
		2486818 (1)-31	17-Sep-24	Night time	5	858				
		2486818 (1)-32	17-Sep-24	Night time	6	806				
		2486818 (1)-33	17-Sep-24	Night time	7	795				
		2486818 (1)-34	17-Sep-24	Night time	8	697				
		2486818 (1)-35	17-Sep-24	Night time	9	958				
		2486818 (1)-36	17-Sep-24	Night time	10	976				
		2486818 (1)-37	17-Sep-24	Night time	11	952				
		2486818 (1)-38	17-Sep-24	Night time	12	823				
12	Spot : Phase 5 Ammonia Pump	2486818 (1)-40	17-Sep-24	Night time	1	213	-	200-300	-	Pass
13	Spot : Phase 5 IP/HP Phosphate Pump	2486818 (1)-41	17-Sep-24	Night time	1	228	-	200-300	-	Pass
14	Spot : Phase 5 Aux Lube oil BFP102	2486818 (1)-42	17-Sep-24	Night time	1	375	-	200-300	-	Pass

Measurement by : Natthapon Jiengwareewong

Guideline : Notification of Department of Labour Protection and Welfare, B.E.2560 (2017) dated November 27, B.E.2560 (2017), and published in the Royal Government Gazette, Vol.135, Part 39D dated February 21 B.E.2561 (2018)

Note : This Analysis test report is reissued to supersede report No.2486818 (1) -1, Date Reported : Sep 23, 2024 due to revise sample information.

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150

P/O :
Project Name :
Project Location : Phase5

Lot ID: 2486818 (1)

Date Received : Sep 18, 2024
Date Reported : Dec 26, 2024
Report Number: 2486818 (1)-2 Rev. No.1

Page 1 of 1

Glow Phase 5										
Lay out No.	Location	Reference Number	Date	Time	No.	Illuminance (Lux)		Guideline Limit		Comment
						Spot	Average	Spot/Min	Average	
2	Spot : Fuel Gas Equipment Skid	2486818 (1)-4	17-Sep-24	Night time	1	3	-	200-300	-	Fail
3	Spot : CEMs Enclosure	2486818 (1)-6	17-Sep-24	Night time	1	74	-	200-300	-	Fail
4	Spot : Steam Jet Ejector Skid	2486818 (1)-10	17-Sep-24	Night time	1	15	-	200-300	-	Fail
8	Spot : CT IPB Pressurized Control Panel	2486818 (1)-23	17-Sep-24	Night time	1	37	-	200-300	-	Fail
11	Spot : CT IPB (Isolate Phase Bus duct) Control Panel	2486818 (1)-39	17-Sep-24	Night time	1	17	-	200-300	-	Fail
15	Spot : LP Recirculation Pump	2486818 (1)-43	17-Sep-24	Night time	1	22	-	200-300	-	Fail

Measurement by : Natthapon Jiengwareewong

Guideline : Notification of Department of Labour Protection and Welfare, B.E.2560 (2017) dated November 27, B.E.2560 (2017), and published in the Royal Government Gazette, Vol.135, Part 39D dated February 21 B.E.2561 (2018)

Note : This Analysis test report is reissued to supersede report No.2486818 (1) -1, Date Reported : Sep 23, 2024 due to revise sample information.

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O :
Project Name :
Project Location: Phase5

Lot ID: 24121747 (1)

Date Received : Dec 11, 2024
Date Reported : Dec 17, 2024
Report Number: 24121747 (1)-1

Page 1 of 1

Glow Phase 5										
Lay out No.	Location	Reference Number	Date	Time	No.	Illuminance (Lux)		Guideline Limit		Comment
						Spot	Average	Spot/Min	Average	
1	Spot : CT Power Control Center Socket Outlet :	24121747 (1)-1	10-Dec-24	Day time	1	639	-	200-300	-	Pass
		24121747 (1)-2	10-Dec-24	Night time	1	582	-	200-300	-	Pass

Measurement by : Amnat Wongsakhen

Guideline : Notification of Department of Labour Protection and Welfare, B.E.2560 (2017) dated November 27, B.E.2560 (2017), and published in the Royal Government Gazette, Vol.135, Part 39D dated February 21 B.E.2561 (2018)

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O :
Project Name :
Project Location : Phase5

Lot ID: 24121747 (2)

Date Received : Dec 11, 2024
Date Reported : Dec 17, 2024
Report Number: 24121747 (2)-1

Page 1 of 1

Glow Phase 5										
Lay out No.	Location	Reference Number	Date	Time	No.	Illuminance (Lux)		Guideline Limit		Comment
						Spot	Average	Spot/Min	Average	
2	Spot : Fuel Gas Equipment Skid :	24121747 (2)-1	10-Dec-24	Night time	1	5	-	200-300	-	Fail
3	Spot : CEMs Enclosure :	24121747 (2)-2	10-Dec-24	Night time	1	58	-	200-300	-	Fail
4	Spot : Steam Jet Ejector Skid :	24121747 (2)-3	10-Dec-24	Night time	1	5	-	200-300	-	Fail
8	Spot : CT IPB Pressurized Control Panel :	24121747 (2)-4	10-Dec-24	Night time	1	74	-	200-300	-	Fail
11	Spot : CT IPB (Isolate Phase Bus duct) Control Panel :	24121747 (2)-5	10-Dec-24	Night time	1	5	-	200-300	-	Fail
15	Spot : LP Recirculation Pump :	24121747 (2)-6	10-Dec-24	Night time	1	42	-	200-300	-	Fail
16	Spot : Condensate Pump Phase 5	24121747 (2)-7	10-Dec-24	Night time	1	295	-	200-300	-	Pass

Measurement by : Amnat Wongsakhen

Guideline : Notification of Department of Labour Protection and Welfare, B.E.2560 (2017) dated November 27, B.E.2560 (2017), and published in the Royal Government Gazette, Vol.135, Part 39D dated February 21 B.E.2561 (2018)

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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ภาคผนวก ค-11

ใบรายงานผลการติดตามตรวจสอบระดับเสียงเฉลี่ยตลอดระยะเวลาการทำงาน
(Leq 8 hrs)



Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486819

Date Received : Sep 18, 2024
Date Reported : Sep 20, 2024
Report Number: 3068228-1

Page 1 of 1

Sample Number 2486819-1
Parameter Noise (Leq 8 hrs.)
Location บริเวณ Gas Turbine Closure
Measurement Date Sep 17, 2024
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:58 AM - 10:58 AM	84.9	86.2	84.6
10:58 AM - 11:58 AM	84.7	85.9	84.4
11:58 AM - 12:58 PM	84.9	86.0	84.5
12:58 PM - 01:58 PM	84.7	86.0	84.4
01:58 PM - 02:58 PM	84.9	86.3	84.5
02:58 PM - 03:58 PM	84.8	86.0	84.6
03:58 PM - 04:58 PM	84.8	86.4	84.6
04:58 PM - 05:58 PM	84.9	85.9	84.6

Leq Average 8 hrs. (dB(A))

84.8

Lmax (dB(A))

86.4

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
ในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ.๒๕๔๖

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

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ภาคผนวก ค-12

ใบรายงานผลการติดตามตรวจสอบระดับเสียงเฉลี่ยตลอดระยะเวลาการทำงาน
(TWA)



Analysis / Test Report

Client : GLOW ENERGY PUBLIC COMPANY LIMITED
11, I-5 Road, Map Ta Phut, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Glow Phase 5

Lot ID: 2486820

Date Received : Sep 18, 2024
Date Reported : Sep 24, 2024
Report Number : 3068229-1

Page 1 of 1

Sample Number 2486820-1
Sampled Date Sep 17, 2024
Sample Description Noise Dose
Location พนักงานส่วนการผลิตและส่วนซ่อมบำรุง
Personal Sampling คุณธนเดช รัตนนำชัย
Date Analysis Commenced Sep 20, 2024

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Noise Dose (12 hrs.) (Calculated from Lavg)	07:00 AM - 07:00 PM	%	-	1	38.9	No Standard	MOL, Department Labour Protection and Welfare (B.E.2561)	MOL	Rayong
Noise Dose (8 hrs.)	07:00 AM - 07:00 PM	%	-	1	36.3	No Standard	MOL, Department Labour Protection and Welfare (B.E.2561)	MOL	Rayong
TWA (12 hrs.) (Calculated from Lavg)	07:00 AM - 07:00 PM	dB(A)	-	-	78.9	83*	MOL, Department Labour Protection and Welfare (B.E.2561)	MOL	Rayong
TWA (8 hrs.)	07:00 AM - 07:00 PM	dB(A)	-	-	80.6	85	MOL, Department Labour Protection and Welfare (B.E.2561)	MOL	Rayong

Guideline :

MOL : 1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Notification of Department of Labour Protection and Welfare on the Standard of Time Weighted Average (TWA) Noise Level (B.E. 2561)
* MOL: Recommended guideline limit for 12 working hours should not be over 83 dB(A)

Sampled By : Natthapon Jiengwareewong

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Supot Salamteh
Section Head

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ใบรับรองการสอบเทียบเครื่องมือ



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / จดสอบ

right solutions.
right partner.

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Particulate Matter (PM10)	High Volume	RVC_F50186	-	-	On site Calibration
Ambient	Particulate Matter (PM10)	High Volume	RVC_F50186	-	-	On site Calibration
Ambient	Particulate Matter (PM10)	High Volume	RVC_F50189	-	-	On site Calibration
Ambient	Particulate Matter (PM10)	High Volume	RVC_F50204	22-Feb-24	22-Feb-25	12
Ambient	Total Suspended Particulate	High Volume	RVC_F50217	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RVC_F50176	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RVC_F50181	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RVC_F50662	22-Feb-24	22-Feb-25	12
Ambient	Total Suspended Particulate	Digital Balance	RVC_F50055	22-Feb-24	22-Feb-25	6
Ambient	Nitrogen Dioxide	NO _x Analyzer	RVC_F50261	3-Jul-24	2-Jan-25	6
Ambient	Nitrogen Dioxide	NO _x Analyzer	RVC_F50264	2-Jul-24	2-Jan-25	6
Ambient	Nitrogen Dioxide	NO _x Analyzer	RVC_F50453	3-Jul-24	3-Jan-25	6
Ambient	Nitrogen Dioxide	NO _x Analyzer	RVC_F50463	3-Jul-24	3-Jan-25	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RVC_F50260	4-Jul-24	4-Jan-25	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RVC_F50263	4-Jul-24	4-Jan-25	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RVC_F50454	5-Jul-24	5-Jan-25	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RVC_F50460	5-Jul-24	5-Jan-25	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RVC_F50543	20-Aug-24	20-Feb-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RVC_F50544	21-Jul-23	21-Jan-25	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RVC_F50646	20-Jun-23	20-Dec-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RVC_F50649	20-Jun-23	20-Dec-24	18
Stack (CSM)	Stack of Nitrogen	Analyzer - System Calibration, Stack	-	-	-	-
Stack (CSM)	Sulfur Dioxide	Analyzer - System Calibration, Stack	-	-	-	-
Stack (CSM)	Dioxin	Analyzer - System Calibration, Stack	-	-	-	-
Stack	Total Suspended Particulate	Comstar Control Unit	RVC_F50660	13-Jul-24	10-Jan-26	6
Stack	Total Suspended Particulate	PM10 Taper	RVC_F50473	13-Jul-24	10-Jan-25	6
Stack	Total Suspended Particulate	Flue Gas Analyzer	RVC_F50665	22-Feb-24	21-Feb-25	12
Stack	Total Suspended Particulate	Digital Balance	RVC_F50053	22-Feb-24	22-Feb-25	12
Noise	eq 24 hrs	Sound Calibrator	RVC_F50213	22-Feb-24	22-Feb-25	12
Noise	eq 24 hrs	Sound Level Meter	RVC_F50381	19-Oct-23	19-Oct-24	12
Noise	eq 24 hrs	Sound Level Meter	RVC_F50615	5-Jan-24	4-Jan-25	12
Noise	eq 8 hrs	Sound Calibrator	RVC_F50213	22-Feb-24	22-Feb-25	12
Noise	eq 8 hrs	Sound Level Meter	RVC_F50380	25-Jan-24	24-Jan-25	12
Noise	Noise Dose TWA	Dose Badger Reader	RVC_F50211	15-Dec-23	14-Dec-24	12
Heat	Heat Stress	Heat Stress Monitor	RVC_F50339	15-Jan-24	14-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RVC_F50360	15-Jan-24	14-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RVC_F50521	25-Jan-24	24-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RVC_F50522	25-Jan-24	24-Jan-25	12
Illuminance	Illuminance	Lux Meter	RVC_F50200	16-Jan-24	16-Jan-25	12
Illuminance	Illuminance	Lux Meter	RVC_F50474	14-Mar-24	13-Mar-25	12
Refract Lab	ref at 25 °C	ref Meter	RVC_F50232	14-Mar-23	14-Jan-25	18
Refract Lab	Diffusivity	Chamber (Gold Room)	RVC_F50184	11-Jan-24	11-Dec-25	18
Refract Lab	Diffusional Coefficient	Chamber (Gold Room)	RVC_F50184	11-Jan-24	11-Dec-25	18
Refract Lab	BCD	DO meter with sensor	RVC_F50232	04-Jul-23	24-Jan-25	18
Refract Lab	BCD	Incubator	RVC_F50234	13-Nov-24	13-May-25	18
Refract Lab	Total Suspended Solids	Electronic Balance	RVC_F50058	22-Feb-24	22-Feb-25	12
Refract Lab	Total Suspended Solids	Hot Air Oven	RVC_F50033	21-Mar-24	21-Sep-25	18
Refract Lab	Total Dissolved Solids 180°C	Electronic Balance	RVC_F50202	22-Feb-24	22-Feb-25	12
Refract Lab	Total Dissolved Solids 180°C	Hot Air Oven	RVC_F50033	21-Mar-24	21-Sep-25	18
Refract Lab	Conductivity	Conductivity meter	RVC_F50209	8-Sep-23	4-Mar-25	18
Refract Lab	Salinity	Conductivity meter	RVC_F50209	8-Sep-23	4-Mar-25	18
Refract Lab	Temperature	pH meter	RVC_F50506	1-Jul-23	1-Jul-25	12

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / จดสอบ

right solutions.
right partner.

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Sea Water	pH at 25 °C	pH Meter	RVC_F50132	14-Dec-23	14-Jan-25	18
Sea Water	Dissolved Oxygen	Chemster (Gold Room)	RVC_F50188	13-Jan-24	13-Dec-25	18
Sea Water	Total Dissolved Solids 180°C	Electronic Balance	RVC_F50202	22-Feb-24	22-Feb-25	12
Sea Water	Total Dissolved Solids 180°C	Hot Air Oven	RVC_F50210	21-Mar-24	21-Sep-25	18
Sea Water	Conductivity	Conductivity meter	RVC_F50209	4-Sep-23	4-Mar-25	18
Sea Water	Salinity	Conductivity meter	RVC_F50209	4-Sep-23	4-Mar-25	18
Sea Water	Temperature	pH meter	RVC_F50204	1-Jul-24	1-Jul-25	12
Sea Water	Fertility	Chamber (Gold Room)	RVC_F50335	13-Jan-24	13-Dec-25	18
Sea Water	BCD	DO meter with Sensor	RVC_F50232	24-Jul-23	24-Jan-25	18
Sea Water	BCD	Incubator	RVC_F50184	11-Jan-24	11-May-26	18
Sea Water	Total Suspended Solids	Electronic Balance	RVC_F50202	22-Feb-24	22-Feb-25	12
Sea Water	Total Suspended Solids	Hot Air Oven	RVC_F50210	21-Mar-24	21-Sep-25	18

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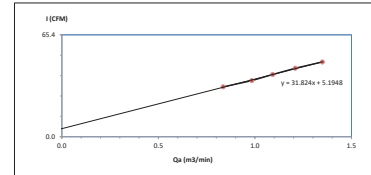
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High Volume Air Sampler Calibration Worksheet

Project Site :	GLOW ENERGY PUBLIC COMPANY LIMITED	Barometric Pressure (mm Hg) :	757
Calibrate Location :	สำนักงานสิ่งแวดล้อมภาคที่ 11 นครราชสีมา	Temperature (°C) :	31
Calibrate Date :	8-Sep-24	High Volume ID :	RVC_F50186
CalibrationSheet No.:	C-080924-RVC_F50186	High Volume Model :	TE-5009X
Calibrator ID :	RVC_F50205	High Volume S/N :	4794
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	1 / Chart (CFM)	Linear Regression
1	1.5	0.835	32	Slope: 31.8244
2	2.1	0.984	36	Intercept: 5.1948
3	2.6	1.092	40	Correlation Coefficient: 0.9986
4	3.2	1.209	44	
5	4.0	1.349	48	



Calibrated by: 
(Mr. Anurak Tongkhamakda)
Field Scientist(2)

Approved by: 
(Mr. Noppong Juntarapan)
Enviro Field Coordinator Scientist (3)

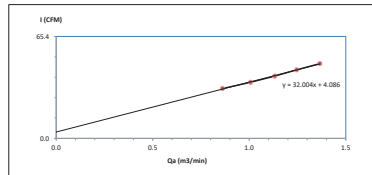
FORM NO. F-06-074 REVISION NO.2 ISSUE DATE: 26/11/23



High Volume Air Sampler Calibration Worksheet

Project Site :	GLOW ENERGY PUBLIC COMPANY LIMITED	Barometric Pressure (mm Hg) :	757
Calibrate Location :	สำนักงานสิ่งแวดล้อมภาคที่ 11 นครราชสีมา	Temperature (°C) :	31
Calibrate Date :	8-Sep-24	High Volume ID :	RVC_F50188
CalibrationSheet No.:	C-080924-RVC_F50188	High Volume Model :	TE-5009X
Calibrator ID :	RVC_F50205	High Volume S/N :	4796
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	1 / Chart (CFM)	Linear Regression
1	1.6	0.861	32	Slope: 32.0037
2	2.2	1.006	36	Intercept: 4.0860
3	2.8	1.132	40	Correlation Coefficient: 0.9989
4	3.4	1.245	44	
5	4.1	1.365	48	



Calibrated by: 
(Mr. Anurak Tongkhamakda)
Field Scientist(2)

Approved by: 
(Mr. Noppong Juntarapan)
Enviro Field Coordinator Scientist (3)

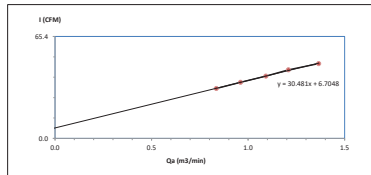
FORM NO. F-06-074 REVISION NO.2 ISSUE DATE: 26/11/23





High Volume Air Sampler Calibration Worksheet

Project Site :	GLOW ENERGY PUBLIC COMPANY LIMITED	Barometric Pressure (mm Hg) :	757
Calibrate Location :	สำนักงานสิ่งแวดล้อมภาคที่ 11 นครราชสีมา	Temperature (°C) :	31
Calibrate Date :	8-Sep-24	High Volume ID :	RVC_F50189
CalibrationSheet No.:	C-080924-RVC_F50189	High Volume Model :	TE-5009X
Calibrator ID :	RVC_F50205	High Volume S/N :	4797
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	1 / Chart (CFM)	Linear Regression
1	1.5	0.835	32	Slope: 30.4810
2	2.0	0.960	36	Intercept: 6.7048
3	2.6	1.092	40	Correlation Coefficient: 0.9990
4	3.2	1.209	44	
5	4.1	1.365	48	



Calibrated by: 
(Mr. Anurak Tongkhamakda)
Field Scientist(2)

Approved by: 
(Mr. Noppong Juntarapan)
Enviro Field Coordinator Scientist (3)

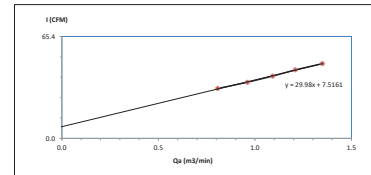
FORM NO. F-06-074 REVISION NO.2 ISSUE DATE: 26/11/23



High Volume Air Sampler Calibration Worksheet

Project Site :	GLOW ENERGY PUBLIC COMPANY LIMITED	Barometric Pressure (mm Hg) :	757
Calibrate Location :	สำนักงานสิ่งแวดล้อมภาคที่ 11 นครราชสีมา	Temperature (°C) :	31
Calibrate Date :	8-Sep-24	High Volume ID :	RVC_F50294
CalibrationSheet No.:	C-080924-RVC_F50294	High Volume Model :	TE-5009X
Calibrator ID :	RVC_F50205	High Volume S/N :	5501
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	1 / Chart (CFM)	Linear Regression
1	1.4	0.807	32	Slope: 29.9799
2	2.0	0.960	36	Intercept: 7.5161
3	2.6	1.092	40	Correlation Coefficient: 0.9991
4	3.2	1.209	44	
5	4.0	1.349	48	



Calibrated by: 
(Mr. Anurak Tongkhamakda)
Field Scientist(2)

Approved by: 
(Mr. Noppong Juntarapan)
Enviro Field Coordinator Scientist (3)

FORM NO. F-06-074 REVISION NO.2 ISSUE DATE: 26/11/23



Certificate of Calibration

Model Number: LA130S-F
Description: Analytical Balance
Serial Number: 25409864
ID No.: RYG_EN0001
Manufacturer: Sartorius

Certificate No.: 24BCI0068
Issued Date: Friday, February 23, 2024
Reference No.: 229198
Page No.: 1 of 2

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T.Maesam Khu, A.Pluak Daeng, Rayong 21140, Thailand
Calibrated Place: ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
616/10 Moo 5 T.Maesam Khu, A.Pluak Daeng, Rayong 21140, Thailand.

Calibrated By: Mr.Chonchai Inthana
Calibration Date: Thursday, February 22, 2024
Calibration Procedure No.: This calibration was conducted by Using in-house calibration procedure number (WI-003)
Based on UKAS LAB 14 : 2019

Metrological data :
Capacity : 150 g Readability : 0.0001 g
Ambients Conditions:
Temperature : 23.6 °C ± 5.0 °C
Humidity : 54.0 % RH ± 10.0 % RH
Pressure : 9.999 hPa ± 0.001 hPa

Reasons for calibration
☐ New Installation ☐ Service / Required ☒ Re-calibrating Maintenance
Equipment Condition: ☒ Good Operate ☐ Not

Measurement Method UKAS Publication Ref :Lab 14
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Model Number	Description	Traceability	Certificate No.	Due Date
YC9011-622-00	Sartorius weight set 1mg - 500g E2 YC9011-622-00	TGS	1425081975	23-Aug-2025
MHB-382SD	Humidity/Balometer/Temp. Lutron MHB-382SD	DKSH	C19231845	23-Aug-2024

This certificate relate and apply this equipment only.
This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division
Sartorius (Thailand) Co., Ltd.

Mr.Chonchai Inthana(Technical Manager)

SOP FM 33 03 February 2022

Certificate of Calibration

Model Number: LA130S-F
Description: Analytical Balance
Serial Number: 25409864
ID No.: RYG_EN0001
Manufacturer: Sartorius

Certificate No.: 24BCI0068
Issued Date: Friday, February 23, 2024
Reference No.: 229198
Page No.: 2 of 2

Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The reproducibility is the ability of a weighing instrument to display nearly identical readings under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to represent reproducibility quantitatively.	The off-center loading error is yielded by the difference between the results of the load, i.e. 10 g or 50 g of maximum capacity, placed in the middle of the weighing pan and balance each of four additional measurement points (4 positions defined according to GUM, RPL).
Nominal Value (Low Load) 10 g Tolerance 0.0001 g	Nominal value : 50 g Tolerance : 0.0004 g
Nominal Value (High Load) 100 g Tolerance 0.0001 g	Difference 1 -0.0001 2 0.0001 3 0.0002 4 0.0002 5 0.0000 6 -
Standard Deviation 0.00003 0.00008	

Linearity
The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.
Tolerance 0.0002 g
Nominal Value (g) 0.01 0.05 0.1 0.5 1 2 5 10 20 100
Conventional Mass Value (g) 0.0100 0.0500 0.1000 0.5000 1.0000 2.0000 5.0000 10.0000 20.0000 100.0000
Displayed Value (g) 0.0100 0.0500 0.1000 0.5000 1.0000 2.0000 5.0000 10.0001 20.0001 99.9999
Deviation (g) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0001 0.0001 -0.0001
Uncertainty (g) 0.00020 0.00021 0.00021 0.00021 0.00021 0.00021 0.00021 0.00024 0.00021 0.00024
End of Report

SOP FM 33 03 February 2022

High Volume Air Sampler Calibration Worksheet

Project Site: GLOW ENERGY PUBLIC COMPANY LIMITED
Barometric Pressure (mm Hg) : 757

Calibrate Location: กรุงเทพมหานคร
Temperature (°C) : 31

Calibrate Date: 8-Sep-24
High Volume ID : RYG.FS0177

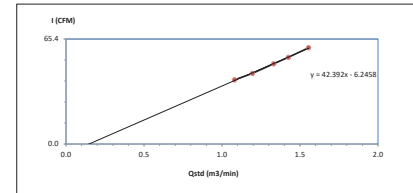
CalibrationSheet No.: C-080924-RYG.FS0177
High Volume Model : TE-5170D

Calibrator ID: RYG.FS0205
High Volume S/N : 4804

Calibrator Model : TE-5028A
Calibrator Slope : 1.52567

Calibrator S/N : 1166
Calibrator Intercept : -0.03613

Test No.	Delta H ₂ O (inch)	Q _{vol} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.6	1.0805	40	Slope: 42.3918
2	3.2	1.1947	44	Intercept: -6.2458
3	4.0	1.3315	50	Correlation Coefficient: 0.9989
4	4.6	1.4252	54	
5	5.5	1.5550	60	



Calibrated by: (Mr.Amarak Tonghaisakulda) Field Scientist(2)
Approved by: (Mr.Noppang Juntarapan) Enviro Field Coordinator Scientist (3)

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

High Volume Air Sampler Calibration Worksheet

Project Site: GLOW ENERGY PUBLIC COMPANY LIMITED
Barometric Pressure (mm Hg) : 757

Calibrate Location: กรุงเทพมหานคร
Temperature (°C) : 31

Calibrate Date: 8-Sep-24
High Volume ID : RYG.FS0178

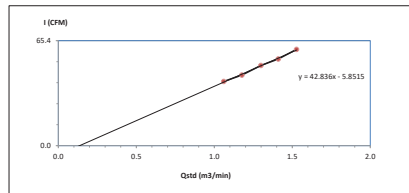
CalibrationSheet No.: C-080924-RYG.FS0178
High Volume Model : TE-5170D

Calibrator ID: RYG.FS0205
High Volume S/N : 4804

Calibrator Model : TE-5028A
Calibrator Slope : 1.52567

Calibrator S/N : 1166
Calibrator Intercept : -0.03613

Test No.	Delta H ₂ O (inch)	Q _{vol} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.5	1.0602	40	Slope: 42.8364
2	3.1	1.1765	44	Intercept: -5.8515
3	3.8	1.2987	50	Correlation Coefficient: 0.9980
4	4.5	1.4100	54	
5	5.3	1.5272	60	



Calibrated by: (Mr.Amarak Tonghaisakulda) Field Scientist(2)
Approved by: (Mr.Noppang Juntarapan) Enviro Field Coordinator Scientist (3)

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

High Volume Air Sampler Calibration Worksheet

Project Site: GLOW ENERGY PUBLIC COMPANY LIMITED
Barometric Pressure (mm Hg) : 757

Calibrate Location: กรุงเทพมหานคร
Temperature (°C) : 31

Calibrate Date: 8-Sep-24
High Volume ID : RYG.FS0181

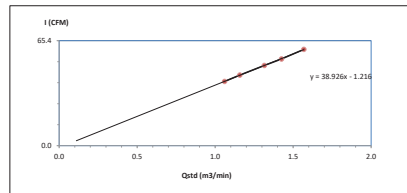
CalibrationSheet No.: C-080924-RYG.FS0181
High Volume Model : TE-5170D

Calibrator ID: RYG.FS0205
High Volume S/N : 4804

Calibrator Model : TE-5028A
Calibrator Slope : 1.52567

Calibrator S/N : 1166
Calibrator Intercept : -0.03613

Test No.	Delta H ₂ O (inch)	Q _{vol} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.5	1.0602	40	Slope: 38.9261
2	3.0	1.1579	44	Intercept: -1.2160
3	3.9	1.3152	50	Correlation Coefficient: 0.9998
4	4.6	1.4252	54	
5	5.6	1.5688	60	



Calibrated by: (Mr.Amarak Tonghaisakulda) Field Scientist(2)
Approved by: (Mr.Noppang Juntarapan) Enviro Field Coordinator Scientist (3)

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

High Volume Air Sampler Calibration Worksheet

Project Site: GLOW ENERGY PUBLIC COMPANY LIMITED
Barometric Pressure (mm Hg) : 757

Calibrate Location: กรุงเทพมหานคร
Temperature (°C) : 31

Calibrate Date: 8-Sep-24
High Volume ID : RYG.FS0662

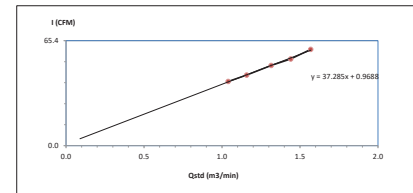
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High Volume Model : TE-5009X

Calibrator ID: RYG.FS0205
High Volume S/N : 6259

Calibrator Model : TE-5028A
Calibrator Slope : 1.52567

Calibrator S/N : 1166
Calibrator Intercept : -0.03613

Test No.	Delta H ₂ O (inch)	Q _{vol} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.4	1.0395	40	Slope: 37.2849
2	3.0	1.1579	44	Intercept: 0.9688
3	3.9	1.3152	50	Correlation Coefficient: 0.9983
4	4.7	1.4402	54	
5	5.6	1.5688	60	



Calibrated by: (Mr.Amarak Tonghaisakulda) Field Scientist(2)
Approved by: (Mr.Noppang Juntarapan) Enviro Field Coordinator Scientist (3)

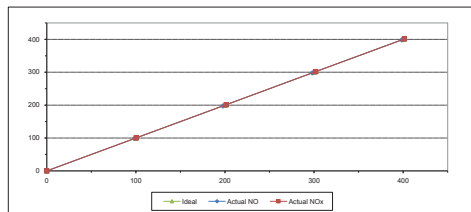
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



MULTIPOINT CALIBRATION REPORT

Calibration Date 2-Jul-24 Equipment Name NOx Analyzer
Manufacturer HORIBA Model APNA-370
Serial No. SEEAW59E Equipment ID RYG_FS0261
Calibrator Manufacturer Teledyne API Model 700
Serial No. 947
Std. Gas Concentration (PPM) 55.86 Cylinder No. GN0027222
Cylinder Pressure (psf) 1800 Certified By Alrgas Inc.
Certified Date 9-Feb-22 Expired Date 9-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.70	-1.30	-1.30	100.20	0.20	0.20
2	200.00	197.70	-2.30	-1.15	201.20	1.20	0.60
3	300.00	298.10	-1.90	-0.63	302.00	2.00	0.67
4	400.00	398.50	-1.50	-0.38	401.40	1.40	0.35
AVERAGE (%)				-0.67			0.38



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrant)
Assistant General Manager

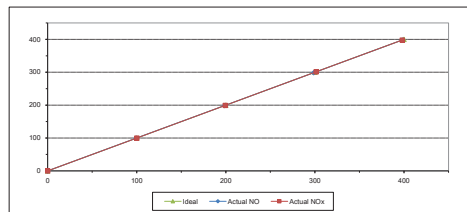
ALS Laboratory Group
FORM NO. : F 06-056 REVISION NO. : - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 2-Jul-24 Equipment Name NOx Analyzer
Manufacturer HORIBA Model APNA-370
Serial No. 9G514J8K Equipment ID RYG_FS0264
Calibrator Manufacturer Teledyne API Model 700
Serial No. 947
Std. Gas Concentration (PPM) 55.86 Cylinder No. GN0027222
Cylinder Pressure (psf) 1800 Certified By Alrgas Inc.
Certified Date 9-Feb-22 Expired Date 9-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	100.10	0.10	0.10
2	200.00	198.50	-1.50	-0.75	199.30	-0.70	-0.35
3	300.00	298.60	-1.40	-0.47	301.40	1.40	0.47
4	400.00	398.20	-1.80	-0.45	398.00	-2.00	-0.50
AVERAGE (%)				-0.48			-0.04



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrant)
Assistant General Manager

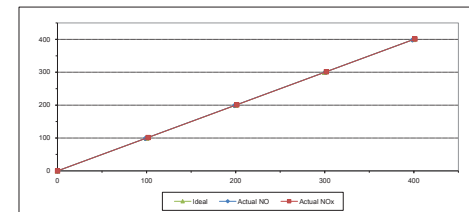
ALS Laboratory Group
FORM NO. : F 06-056 REVISION NO. : - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 2-Jul-24 Equipment Name NOx Analyzer
Manufacturer HORIBA Model APNA-370
Serial No. ALPDVOWY Equipment ID RYG_FS0466
Calibrator Manufacturer Teledyne API Model 700
Serial No. 947
Std. Gas Concentration (PPM) 55.86 Cylinder No. GN0027222
Cylinder Pressure (psf) 1800 Certified By Alrgas Inc.
Certified Date 9-Feb-22 Expired Date 9-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.40	-1.40	101.60	1.60	1.60
2	200.00	198.80	-1.20	-0.60	201.30	1.30	0.65
3	300.00	301.00	1.00	0.33	301.80	1.80	0.60
4	400.00	398.50	-1.50	-0.38	401.30	1.30	0.33
AVERAGE (%)				-0.39			0.68



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrant)
Assistant General Manager

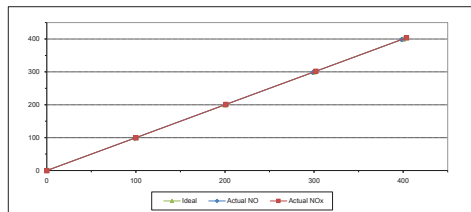
ALS Laboratory Group
FORM NO. : F 06-056 REVISION NO. : - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 2-Jul-24 Equipment Name NOx Analyzer
Manufacturer HORIBA Model APNA-370
Serial No. T86HMM41 Equipment ID RYG_FS0461
Calibrator Manufacturer Teledyne API Model 700
Serial No. 947
Std. Gas Concentration (PPM) 55.86 Cylinder No. GN0027222
Cylinder Pressure (psf) 1800 Certified By Alrgas Inc.
Certified Date 9-Feb-22 Expired Date 9-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.70	-1.30	-1.30	100.10	0.10	0.10
2	200.00	201.00	1.00	0.50	201.10	1.10	0.55
3	300.00	298.70	-1.30	-0.43	302.10	2.10	0.70
4	400.00	398.40	-1.60	-0.40	403.70	3.70	0.92
AVERAGE (%)				-0.31			0.47



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrant)
Assistant General Manager

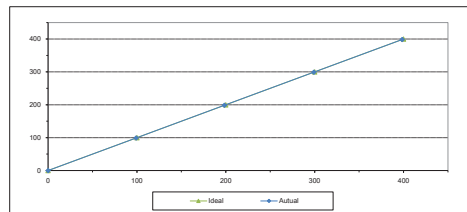
ALS Laboratory Group
FORM NO. : F 06-056 REVISION NO. : - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jul-24 Equipment Name SO2 Analyzer
Manufacturer HORIBA Model APSA-370
Serial No. 8H0DQJF Equipment ID RYG_FS0260
Calibrator Manufacturer Teledyne API Model 700
Serial No. 947
Std. Gas Concentration (PPM) 55.3 Cylinder No. GN0027222
Cylinder Pressure (psf) 1800 Certified By Alrgas Inc.
Certified Date 9-Feb-22 Expired Date 9-Feb-30

CALIBRATION RESULTS				
Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90
2	200.00	198.50	-1.50	-0.75
3	300.00	299.10	-0.90	-0.30
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.46



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrant)
Assistant General Manager

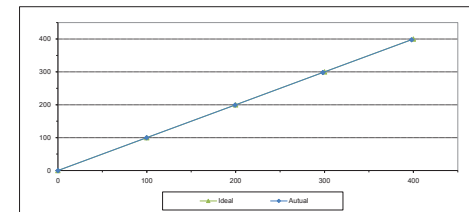
ALS Laboratory Group
FORM NO. : F 06-056 REVISION NO. : - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jul-24 Equipment Name SO2 Analyzer
Manufacturer HORIBA Model APSA-370
Serial No. YPRQJ20 Equipment ID RYG_FS0263
Calibrator Manufacturer Teledyne API Model 700
Serial No. 947
Std. Gas Concentration (PPM) 55.3 Cylinder No. GN0027222
Cylinder Pressure (psf) 1800 Certified By Alrgas Inc.
Certified Date 9-Feb-22 Expired Date 9-Feb-30

CALIBRATION RESULTS				
Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.80	-0.20	-0.20
2	200.00	199.40	-0.60	-0.30
3	300.00	298.20	-1.80	-0.60
4	400.00	398.00	-2.00	-0.50
AVERAGE (%)				-0.30



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrant)
Assistant General Manager

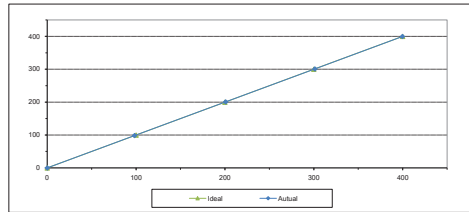
ALS Laboratory Group
FORM NO. : F 06-056 REVISION NO. : - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jun-24	Equipment Name	802 Analyzer
Manufacturer	HORIBA	Model	APBA-370
Serial No.	H053D6FA	Equipment ID	RYG_F90464
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	0-Feb-22	Expired Date	0-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.30	-1.70	-1.70
2	200.00	200.80	0.80	0.40
3	300.00	301.20	1.20	0.40
4	400.00	399.70	-0.30	-0.08
AVERAGE (%)				-0.18



Calibrated By

(Mr.Jirawat Sakam)
Field Environmental Scientist (3)

Approved By

(Mr.Serayuth Jitrantorn)
Assistant General Manager

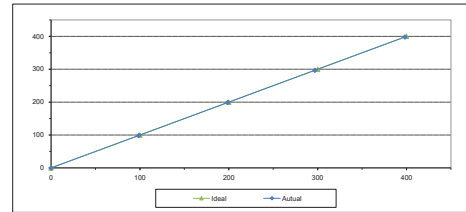
ALS Laboratory Group
FORM NO. : F-06-056 REVISION NO. : - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jul-24	Equipment Name	802 Analyzer
Manufacturer	HORIBA	Model	APBA-370
Serial No.	VABFLSH	Equipment ID	RYG_F90460
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	0-Feb-22	Expired Date	0-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.70	-1.30	-1.30
2	200.00	198.80	-1.20	-0.60
3	300.00	296.90	-3.10	-1.03
4	400.00	398.20	-1.80	-0.45
AVERAGE (%)				-0.68



Calibrated By

(Mr.Jirawat Sakam)
Field Environmental Scientist (3)

Approved By

(Mr.Serayuth Jitrantorn)
Assistant General Manager

ALS Laboratory Group
FORM NO. : F-06-056 REVISION NO. : - ISSUE DATE: 02/04/12



JIRANATEE ASSOCIATES CO.,LTD.
82/14 IL 6/10-16
Pattana 1/1, N. Wattana, Bangkok,
Bangkok 10110 Thailand
Tel: +662-0588812
Mobile: +662-0588843
E-mail: jee-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
REG-TR-15-17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department



NSC-TIS-TIS 17025
CALIBRATION 0367

Certificate Number

CWS-030-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

Relative Humidity

Atmospheric Pressure

PLACE OF CALIBRATION

CALIBRATION CONDITIONS

Preconditioning

Measurement Condition

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Mr. Sorawat Thairatana

Mr. Jirawat Sakam

Mr. Jirawat Sakam

Mr. Jirawat Sakam

Mr. Jirawat Sakam

Mr. Jirawat Sakam

Mr. Jirawat Sakam

Mr. Jirawat Sakam

Mr. Jirawat Sakam

Mr. Jirawat Sakam

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IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
CALIBRATION/0307
Air speed measurement laboratory
Calibration services department.
Certificate Number: CWS-001-66

CERTIFICATE OF CALIBRATION
Page 1 of 2 Pages
MEASUREMENT ITEM: Cup anemometer
MANUFACTURER: NOVATIME
MODEL/TYPE: Sensor WS-02F
SERIAL NUMBER: Data logger 110-WS-250L-0
ID NUMBER: Sensor WSD-A5662
CONDITION AS RECEIVED: Data logger AS662
CUSTOMER: Uvel item
RECEIVED DATE: 11 Jul 2023
MEASUREMENT DATE: 21 Jul 2023
ISSUE DATE: 21 Jul 2023
ENVIRONMENTAL CONDITIONS: Ambient condition in the laboratory are as follows
Temperature: 23.0 ± 1.0 °C
Relative Humidity: 55.0 ± 1.0 %RH
Atmospheric Pressure: 1010 ± 1.0 hPa
PLACE OF CALIBRATION: Effel-type wind tunnel of Iranatee Associates Co., Ltd.
CALIBRATION CONDITIONS: Wind tunnel cross-section area: 900 cm²
Win direction frontal area: 129 cm²
Diameter of measuring pipe: 129 mm
Blockage of test object: 0.143 [-]
Preconditioning: 24 hours at ambient conditions.
Measurement Condition: The average values during measurement are (24.0) °C, (61.7) %RH and (1011.6) hPa.
TABULATION OF RESULTS: The table on next page give the measured values.
Calibrated by: [Signature]
Approved signature: Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
CALIBRATION/0307
Air speed measurement laboratory
Calibration services department.
Certificate Number: CWS-001-66

CERTIFICATE OF CALIBRATION
Page 1 of 2 Pages
MEASUREMENT RESULTS: The cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 10 m/s, was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle. UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.
UUC (m/s) | Temp. room (°C) | Error (m/s) | U (k=2) (m/s)
1.04 | 23.95 | -0.2 | 0.11
2.079 | 24.08 | 1.8 | -0.3 | 0.11
3.039 | 24.04 | 2.8 | -0.2 | 0.11
4.100 | 24.11 | 3.9 | -0.3 | 0.11
5.00 | 23.72 | 4.8 | -0.3 | 0.11
5.99 | 23.80 | 5.8 | -0.7 | 0.11
7.04 | 23.68 | 6.8 | -0.2 | 0.11
8.15 | 23.64 | 7.9 | -0.3 | 0.11
9.09 | 23.90 | 9.0 | -0.1 | 0.11
10.05 | 23.40 | 9.9 | -0.3 | 0.11
11.10 | 23.48 | 10.9 | -0.2 | 0.11
12.11 | 23.40 | 12.0 | -0.1 | 0.11
13.16 | 23.20 | 13.0 | -0.1 | 0.11
14.20 | 23.40 | 14.0 | -0.2 | 0.11
15.21 | 23.50 | 15.0 | -0.2 | 0.11
16.27 | 23.44 | 16.1 | -0.2 | 0.11
Remarks: Calibration results may vary for the tested circumstances and environmental conditions during which calibration took place.
* Uncertainty of standard
* Uncertainty of Unit Under Calibration
PHOTO OF CALIBRATION SET-UP: [Image of calibration setup]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
CALIBRATION/0307
Air speed measurement laboratory
Calibration services department.
Certificate Number: CWD-001-66

CERTIFICATE OF CALIBRATION
Page 1 of 2 Pages
MEASUREMENT ITEM: Wind Direction Sensor
MANUFACTURER: NOVATIME
MODEL/TYPE: Sensor WS-02F
SERIAL NUMBER: Data logger 110-WS-250L-0
ID NUMBER: Sensor WSD-A5662
CONDITION AS RECEIVED: Data logger AS662
CUSTOMER: Uvel item
RECEIVED DATE: 11 Jul 2023
MEASUREMENT DATE: 21 Jul 2023
ISSUE DATE: 21 Jul 2023
ENVIRONMENTAL CONDITIONS: Ambient condition in the laboratory are as follows
Temperature: 23.0 ± 1.0 °C
Relative Humidity: 55.0 ± 1.0 %RH
Atmospheric Pressure: 1010 ± 1.0 hPa
PLACE OF CALIBRATION: Effel-type wind tunnel of Iranatee Associates Co., Ltd.
CALIBRATION CONDITIONS: Wind tunnel cross-section area: 900 cm²
Win direction frontal area: 129 cm²
Diameter of measuring pipe: 129 mm
Blockage of test object: 0.143 [-]
Preconditioning: 24 hours at ambient conditions.
Measurement Condition: The average values during measurement are (23.8) °C, (63.0) %RH and (1011.6) hPa.
TABULATION OF RESULTS: The table on next page give the measured values.
Calibrated by: [Signature]
Approved signature: Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
CALIBRATION/0307
Air speed measurement laboratory
Calibration services department.
Certificate Number: CWD-001-66
Page 2 of 2 Pages
MEASUREMENT RESULTS: The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counter-clockwise directions after offset adjustment had been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.
Air speed (m/s) | D (°) | Error (°) | U (k=2) (°)
45.000 | 45 | -4 | 1.0
90.000 | 87 | -3 | 1.0
135.000 | 132 | -3 | 1.0
180.000 | 180 | 0 | 1.0
225.000 | 228 | 3 | 1.0
270.000 | 273 | 3 | 1.0
315.000 | 318 | 1 | 1.0
360.000 | 359 | -1 | 1.0
Remarks: Calibration results only count for the tested circumstances and environmental conditions during which calibration took place.
* Direction of standard
* Direction of Unit Under Calibration
End of Certificate of Calibration

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
CALIBRATION/0307
Air speed measurement laboratory
Calibration services department.
Certificate Number: CDT-037-66
Page 1 of 2
CERTIFICATE OF CALIBRATION
Equipment Name: Data Logger with Temperature sensor
Manufacturer: NOVATIME
Model: 110-WS-250L-0
Serial No.: AS662
ID No.: RYG_F50544
Customer: Name: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Prathachan 40, Prathachan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Received date: 11 Jul 2023
Calibration date: 21 Jul 2023
Issue date: 21 Jul 2023
Reference Used During Calibration: 1. Standard Temperature Probe Model: STS-100 A500, Serial No.: 667682-09, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DTI-1000-A MK II, Serial No.: 671467-00591, Due date: 22 July 2023
Calibration Condition: Temperature: (23±0.3) °C
Relative Humidity: (55±15)%
Traceability: The measurement results are traceable to the international system of units (SI) through National Institute of Metrology (NIMT) Certificate number: TT-0038-23, Certificate number: ER-0092-22
Calibration Procedure: The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was based on ITS-90.
Notes: The certificate is valid only to the item calibrated on date and place of calibration.

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
CALIBRATION/0307
Air speed measurement laboratory
Calibration services department.
Certificate No.: CDT-037-66
Page 2 of 2
Result of Calibration: [X] Without Adjustment [] With Adjustment
Calibration Range: 20-40 °C
Function: This equipment was connected with temperature sensor Model: HMP60 S/N: T2320591.
Dimension: Diameter 12 mm, Length 80 mm.
Immersion Depth (mm) | Standard (°C) | UUC Reading (°C) | Error (°C) | Uncertainty (°C)
70 | 20.060 | 19.8 | -0.5 | 0.099
70 | 25.054 | 24.6 | -0.5 | 0.099
70 | 30.050 | 29.7 | -0.3 | 0.14
70 | 35.043 | 34.5 | -0.5 | 0.099
70 | 40.036 | 39.5 | -0.5 | 0.14
UUC: Unit Under Calibration
The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.
*** End of Certificate ***

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

CERTIFICATE OF CALIBRATION

Calibration No.: RH-01072023
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novolyx
Model/Type : 110-WD-25DL-D
Serial Number : AS502
ID No. : RYG_FS0644
Customer : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:
The measurement was carried out in an ambient temperature of (25±0.1°C), and relative humidity of (50±0.1%).

Measurement Method:
Unit Under Calibration (UUC) was calibrated by comparison method with standard chilled mirror hygrometer model: 1860-3 in the humidity generator chamber to determine the errors.

Traceability:
This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number: Z0926-601, Due date: Sep 26, 2024.

Measurement Date : Jul 21, 2023
Issued Date : Jul 21, 2023

Measurement Results:
This equipment was connected with indoor air quality probe and Displayed (JRF) on display. Model: HMP00, Serial number: T2320091.
Calibration was performed in the range of 20%RH to 80%RH
The results of calibration are reported in table below.

Determined (RH%)	Standard (RH%)	UUC reading (RH%)	Error (RH%)	Uncertainty (RH%)
20	20.07	16.3	-3.8	0.1
50	50.23	45.0	-5.2	0.1
80	80.23	73.6	-6.7	0.1

Performed by
☐ Mr. Sorawat Thachalad
☒ Miss Jitraporn Lertsongphol
☐ Miss Ruangsang Phoommit



Approved Signatory: Mr. Parinya Booncharoen
Calibration Department Manager

THIS CALIBRATION REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Air speed measurement laboratory
Calibration service department
Iranatee Associates Co., Ltd.
63/14-15/67/35-36
Petchkasem 7/71, Wathapra, Bangkok,
Bangkok 10600 Thailand
Tel: +66(0)2868012
Mobile: +66(0)2868013
E-mail: jira-calibration@iranatee.com
Web site: www.jiranatee.com

Page 1 of 2 Pages

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novolyx
MODEL/TYPE : Sensor WS-07A
SERIAL NUMBER : Data logger: 110-WD-25DL-D
ID NUMBER : Sensor: WS04-A5078
CONDITION AS-RECEIVED : NPL_T0566
CUSTOMER : New Item
ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Jun 2023
MEASUREMENT DATE : 20 Jun 2023
ISSUE DATE : 20 Jun 2023

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 0.3 °C
Relative Humidity : 50.0 ± 0.5 %RH
Atmospheric Pressure : 1013.0 ± 0.1 hPa

PLACE OF CALIBRATION : Efflu-type wind tunnel of Iranatee Associates Co., Ltd.

CALIBRATION CONDITIONS : Wind tunnel cross-section area : 900 cm²
Wind direction (upright) angle : 100 cm²
Diameter of mounting pipe : mm
Blockage ratio of test object : 0.111 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.2) °C, (44.1) %RH and (1001.4) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawat Thachalad
☐ Miss Jitraporn Lertsongphol



Approved Signatory: Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:
1. Validity of measurement area of the wind tunnel
2. Provided cross-section area of the tested object include mounting pipe
3. Diameter of mounting pipe
4. Ratio 1 to 1

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.



Certificate Number
CD-014-66

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 100 mm respectively away from wind tunnel nozzle. UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

U _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	U _{ref} (m/s)	Error (m/s)	U (k=2) (m/s)
1.003	24.20	24.15	0.9	-0.1	0.1
2.026	24.02	24.15	1.9	-0.1	0.1
3.003	24.04	24.15	3.0	0.0	0.1
4.112	24.02	24.15	4.0	-0.1	0.1
5.03	24.28	24.15	5.0	0.0	0.1
5.99	24.12	24.15	6.0	0.0	0.1
7.05	24.22	24.15	7.1	0.0	0.1
8.16	24.20	24.15	8.0	-0.1	0.1
9.09	24.20	24.15	9.0	-0.1	0.1
10.08	24.14	24.15	10.0	-0.1	0.1
11.14	24.18	24.15	11.1	-0.1	0.1
12.13	24.18	24.15	12.2	0.1	0.1
13.19	24.18	24.15	13.2	0.0	0.1
14.24	24.14	24.15	14.3	-0.1	0.1
15.23	24.10	24.15	15.1	-0.1	0.1
16.29	24.10	24.15	16.3	0.0	0.1

Remark:
1. Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
2. Velocity of standard
3. Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the cup anemometer calibration in the wind tunnel of Iranatee Associates Co., Ltd. The cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to image distortion.

End of Certificate of Calibration
IRANATEE ASSOCIATES CO., LTD.

Accredited calibration laboratory
ISO/IEC 17025:2017
NAC-TSP-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration service department

Certificate Number
CD-014-66

Page 1 of 2 Pages

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novolyx
MODEL/TYPE : Sensor WS-07A
SERIAL NUMBER : Data logger: 110-WD-25DL-D
ID NUMBER : Sensor: WS04-A5078
CONDITION AS-RECEIVED : NPL_T0566
CUSTOMER : New Item
ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Jun 2023
MEASUREMENT DATE : 20 Jun 2023
ISSUE DATE : 20 Jun 2023

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 0.3 °C
Relative Humidity : 50.0 ± 0.5 %RH
Atmospheric Pressure : 1013.0 ± 0.1 hPa

PLACE OF CALIBRATION : Efflu-type wind tunnel of Iranatee Associates Co., Ltd.

CALIBRATION CONDITION : Wind tunnel cross-section area : 900 cm²
Wind direction (upright) angle : 120 cm²
Diameter of mounting pipe : mm
Blockage ratio of test object : 0.143 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.3)°C, (48.2) %RH and (1009.3) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawat Thachalad
☐ Miss Jitraporn Lertsongphol



Approved Signatory: Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:
1. Validity of measurement area of the wind tunnel
2. Provided cross-section area of the tested object include mounting pipe
3. Diameter of mounting pipe
4. Ratio 1 to 1

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counter-clockwise direction after adjustment has been made. The flow speed of wind tunnel (initially 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D _{ref} Degree (°)	D _{ref} Degree (°)	Error Degree (°)
0.000	0	0	0
45.000	41	-2	1.0
90.000	88	-2	1.0
135.000	133	-2	1.0
180.000	180	0	1.0
225.000	226	1	1.0
270.001	272	2	1.0
315.000	318	1	1.0

Remark:
1. Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
2. Direction of standard
3. Direction of Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No.: CT-024-66
Page 1 of 2

Equipment Name: Data Logger with Temperature sensor
Manufacturer: Novolyx
Model: 110-WD-25DL-D
Serial No.: AS5078
ID No.: RYG_FS0648

Customer: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Received date: 16 Jun 2023
Calibration date: 20 Jun 2023
Issue date: 22 Jun 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DT1-1000-A MK II,
Serial No.: 871407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±0.1) °C
Relative Humidity: (55±1.5)%

Calibration Procedure
The temperature calibration was done by In-House calibration method as WS-C-001, according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was based on ITS-90.

Traceability
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: IT-0038-23, Certificate number: ER-0092-22

Notes: The certificate is valid only to the item calibrated on date and place of calibration.

Calibrated by:
☒ Mr. Sorawat Thachalad
☐ Miss Jitraporn Lertsongphol
☐ Miss Ruangsang Phoommit



Approved Signatory: Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Certificate No.: CT-024-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
Calibration Range: 20-40 °C

Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: V1920213.

Dimension : Diameter 12 mm. Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.057	20.0	-0.1	0.099
70	25.052	24.9	-0.2	0.099
70	30.045	29.8	-0.2	0.14
70	35.039	34.8	-0.2	0.099
70	40.034	39.7	-0.3	0.099

UUC* : Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No.: RH-07062023
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novolyne
Model/Type : 110-WS-250L-D
Serial Number : A5978
ID No. : P020648
Customer : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (25.3)°C, and relative humidity of (50±1)5%.

Measurement Method:

Unit Under Calibration (UUC) was calibrated by comparison method with standard chilled mirror hygrometer model: 1860-3 in the humidity generator chamber to determine the errors.

Traceability:

This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number: 20920-601, Due date: Sep 26, 2024.

Measurement Date : Jun 20, 2023
Issued Date : Jun 22, 2023

Measurement Results:

This equipment was connected with indoor air quality probe and Displayed (DPI) on display. Model: HMP60, Serial number: V1920213.
Calibration was performed in the range of 20%RH to 80%RH

The results of calibration are reported in table below.

Determined (RH%)	Standard (RH%)	UUC (RH%)	Error (RH%)	Uncertainty (RH%)
20	20.07	20.7	0.6	0.52
50	50.53	49.1	-1.1	0.51
80	80.30	79.1	-1.2	0.51

Performed by
☒ Mr. Sorawit Thachakul
☒ Miss Jitraporn Lertsomphon
☐ Miss Phuangsomai Phoomsil



Approved Signature: Mr. Parinya Booncharoen
Calibration Department Manager

THIS CALIBRATION REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Pressure measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No.: CP-008-66

Page 2 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER : Novolyne
MODEL/TYPE : Sensor: 110-WS-250P
Data logger: 110-WS-250L-D
SERIAL NUMBER : Sensor: BP-A5978
Data logger: A5978
ID NUMBER : RTE, F50048
CONDITION AS-RECEIVED : New item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Jun 2023
MEASUREMENT DATE : 20 Jun 2023
ISSUE DATE : 20 Jun 2023

CONDITION OF THIS RESULT OF CALIBRATION:

1. Reference Standard Instrument:

Instrument : Model : Serial No. : Certificate No. : Due Date :
Absolute Pressure Transducer : CP2350 : 41001226P : MP-0205-22 : 02 Dec 2023

2. The UUC* was installed in vertical orientation based on reference standard instrument and center of UUC* was used as the reference level.

3. Calibration conditions:

4. Condition : ☒ Normal ☐ Abnormal
Pressure transmitting medium : Air
at (20°C, 1 bar) : 1.19 kg/m³
M_{max} : (55±15) %
P_{max} : (125±10) %
P_{min} : (102±10) mbar

5. The certificate is valid only to the item calibrated on date and place of calibration

Calibrated by:
☒ Mr. Sorawit Thachakul
☐ Miss Jitraporn Lertsomphon



Approved signature: Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Pressure measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No.: CP-008-66

Page 2 of 2 Pages

MEASUREMENT RESULTS

☒ Without adjustment ☐ With adjustment

CALIBRATION IN THE RANGE OF

950 mbar to 1050 mbar

The results of calibration and associated measurement uncertainties are reported in the table below.

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.11	950.9	0.8	0.97
970.10	970.6	0.5	0.70
990.07	990.3	0.3	0.48
1010.06	1010.0	0.0	0.37
1030.06	1029.8	-0.3	0.49
1049.56	1049.1	-0.4	0.96

Note: UUC* Unit Under Calibration

To convert the result in report unit to Pa should be multiply by 100

★ End of certificate ★



Pressure measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER : The cup anemometer was calibrated against
MODEL/TYPE : Sensor: WS-07A
Data logger: 110-WS-250L-D
SERIAL NUMBER : Sensor: WDS-A5980
Data logger: A5980
ID NUMBER : RTE, F50449
CONDITION AS-RECEIVED : New item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Jun 2023

MEASUREMENT DATE : 20 Jun 2023

ISSUE DATE : 20 Jun 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature : (23.0 ± 1.0) °C
Relative Humidity : (55.0 ± 15.0) %RH
Atmospheric Pressure : (1010 ± 10) hPa

PLACE OF CALIBRATION : Sift-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

Wind tunnel cross-section area : 900 cm²
Wind direction (upwind) : 100 cm
Diameter of measuring pipe : - mm
Blockage ratio of test object : 0.111 %

Preconditioning

Measurement Condition : 24 hours at ambient conditions.

The average values during measurement are (24.4) °C, (41.8) %RH and (1011.1) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thachakul
☒ Miss Jitraporn Lertsomphon



Approved signature: Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

* Validity measurement area of the wind tunnel

* Provided cross-section area of the tested object include measuring pipe

* Diameter of measuring pipe

* Ratio: 1%

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Page 2 of 2 Pages

MEASUREMENT RESULTS⁵

The cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 100 mm respectively away from wind tunnel nozzle. UUC was installed at center of the section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 30 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

UUC (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	UUC (m/s)	Error (m/s)	U (k=2) (m/s)
1.053	24.30	24.40	0.9	-0.1	0.11
2.025	24.50	24.40	1.9	-0.1	0.11
2.999	24.60	24.40	2.9	-0.1	0.11
4.109	24.34	24.40	4.0	-0.1	0.31
5.03	24.32	24.40	4.9	-0.1	0.31
6.01	24.32	24.40	5.9	-0.1	0.31
7.05	24.24	24.40	7.0	-0.1	0.31
8.17	24.14	24.40	8.0	-0.2	0.31
9.10	24.20	24.40	9.0	-0.1	0.31
10.08	24.10	24.40	9.9	-0.1	0.31
11.14	24.20	24.40	11.0	-0.1	0.31
12.13	24.10	24.40	12.0	-0.2	0.31
13.19	24.14	24.40	13.0	-0.2	0.31
14.23	24.10	24.40	14.0	-0.2	0.31
15.33	24.10	24.40	15.1	-0.2	0.31
16.29	24.10	24.40	16.1	-0.2	0.31

Remark:

* Calibration results only report for the listed circumstances and environmental conditions during which calibration took place

* Velocity of standard

* Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to space geometry.



Certificate Number
CD-015-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS RECEIVED
CUSTOMER

Wind Direction Sensor
Novelty
Sensor: WS-02FA
Data logger: 110-WS-250L-D
Sensor: MP-0580
Data logger: AS980
RYO, FS0649
New Item
ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasan Rd., Phatthanasan Rd., Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

Calibration procedure:
The wind direction sensor was calibrated against
Standard: Factory Encoder model: A100075
0000-015-010 on close trajectory of 30-
type wind tunnel with 900 cm² open 100-010-010
area. The WS-02FA logger on RYO-000-015-010
Wind energy generation system, Part 1-1,
Power performance measurement of electricity
producing wind turbines, March 2017 was used as
a calibration guide.

Traceability:
This certificate provides a traceability of the
measurement to recognized the national
standard, due to realization of the international
system of units (SI) through the NIMT (National
Metrology Institute of Thailand) via Certificate
number: 00-000-010

Uncertainty of Measurement:
The reported uncertainty of measurement is
based on the standard uncertainty multiplied by a
coverage factor k=2. Which for a normal
distribution corresponds to a coverage probability
of approximately 95%. The standard uncertainty
has been determined in accordance with the GUM
Evaluation of measurement
data - Guide to the expression of uncertainty in
measurement

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

16 Jun 2023
20 Jun 2023
20 Jun 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:
Temperature: 23.0 ± 0.5 °C
Relative humidity: 55 ± 1.5 %
Atmospheric pressure: 1010 ± 10 hPa

PLACE OF CALIBRATION

Off-site wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION

Wind tunnel cross section area: 900 cm²
Wind direction frontal area: 129 mm²
Diameter of mounting pipe: 5.543 mm
Blockage ratio of test object: 1%

Preconditioning
Measurement Condition

24 hours at ambient conditions.
The average values during measurement are (24.3°C, 47.4% RH and 1010.9 hPa).

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
Mr. Soravit Thachalad
Miss Jitraporn Lertsomphol



Approved signature:
Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:
1. Initial inspection area of the wind tunnel
2. Properly cross section area of the tested object include mounting pipe
3. Diameter of mounting pipe
4. Ratio 1:1

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Page 2 of 2 Pages

MEASUREMENT RESULTS

At speed m/s	D _{ref} Degree (°)	D _{ref} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
0.000	0	0	0	1.0
45.000	45	45	-2	1.0
90.000	90	90	-3	1.0
135.000	135	135	-2	1.0
180.000	180	180	0	1.0
225.000	225	225	1	1.0
270.000	270	270	2	1.0
315.000	315	315	1	1.0

Remarks:

1. Calibration events only occur for the tested circumstances and environmental conditions during which calibration type takes

2. Deviation of standard

3. Deviation of unit under calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No.: CP-026-66
Page 1 of 2

Equipment Name: Data Logger with Temperature sensor
Manufacturer: Novatex
Model: 110-WS-250L-D
Serial No.: AS980
ID No.: RYO_FS0649

Customer:
Name: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Phatthanasan Rd., Phatthanasan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 16 Jun 2023
Calibration date: 20 Jun 2023
Issue date: 22 Jun 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 871407-00591 Due date: 22 July 2023

Calibration Condition

Temperature: (23±0.3) °C
Relative Humidity: (55±1.5)%

Calibration Procedure

The temperature calibration was done by in-house
calibration method as WI-CL-001, according to
comparison method with standard digital temperature
indicator and standard temperature probe. The
temperature scale was based on ITS-90.

Traceability

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology (NIMT) Certificate
number: TT-0038-23, Certificate number: ER-0092-
22

Notes: The certificate is valid only to the item calibrated on date and place of calibration.

Calibrated by:

Mr. Soravit Thachalad
Miss Jitraporn Lertsomphol
Miss Rungpraporn Phoomthit



Approved signature:
Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

CERTIFICATE OF CALIBRATION

Certificate No.: CP-026-66
Page 1 of 2 Pages

Result of Calibration:

Calibration Ranges: 20-40 °C

Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: V1920214.

Dimension: Diameter 12 mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.057	20.0	-0.1	0.099
70	25.051	24.9	-0.2	0.099
70	30.044	29.8	-0.2	0.099
70	35.039	34.8	-0.2	0.099
70	40.034	39.7	-0.3	0.099

UUC*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2
providing a level of confidence of approximately 95%.

* End of Certificate *



CERTIFICATE OF CALIBRATION

Certificate No.: CP-026-66
Page 1 of 2 Pages

Measurement Item

Relative humidity with data logger

Manufacturer

Novatex

Model/Type

110-WS-250L-D

Serial Number

AS980

ID No.

RYO_FS0649

Customer

ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasan Rd., Phatthanasan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (25±0.3)°C, and relative humidity of (50±1.0)%.

Measurement Method:

Unit Under Calibration (UUC) was calibrated by comparison method with standard chilled mirror hygrometer model: 1860-
3 in the humidity generator chamber to determine the errors.

Traceability:

This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of
Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number: 20926-
001, Due date: Sep 26, 2024.

Measurement Date: Jun 20, 2023

Issued Date: Jun 22, 2023

Measurement Results:

This equipment was connected with indoor air quality probe and Displayed (RH) on display. Model: HMP60, Serial number:
V1920214.

Calibration was performed in the range of 20RH to 80RH

The results of calibration are reported in table below.

Determined (RH%)	Standard Reading (RH%)	UUC (RH%)	Error (RH%)	Uncertainty ±(RH%)
20	20.04	19.3	-0.7	0.52
50	50.25	49.5	-0.8	0.52
80	80.33	80.5	0.2	0.52

Performed by:

Mr. Soravit Thachalad
Miss Jitraporn Lertsomphol
Miss Rungpraporn Phoomthit



Approved signature:
Mr. Parinya Booncharoen
Calibration Department Manager

THIS CALIBRATION REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

CERTIFICATE OF CALIBRATION

Certificate No.: CP-026-66
Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER

Novatex

Model/Type

110-WS-250L-D

Serial Number

AS980

ID NUMBER

RYO_FS0649

CONDITION AS RECEIVED

CUSTOMER

ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasan Rd., Phatthanasan Rd., Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE

16 Jun 2023

MEASUREMENT DATE

20 Jun 2023

ISSUE DATE

20 Jun 2023

CONDITION OF THIS RESULT OF CALIBRATION:

1. Reference Standard Instrument:
Instrument Model Serial No. Certificate No. Due Date
Absolute Pressure Transducer CP2550 41001240 MP-0205-22 02 Dec 2023

2. The UUC was installed in vertical orientation above reference standard instrument and center of UUC* was used as the reference level.

3. Calibration conditions:
Condition: 2 Normal 3 Abnormal
Pressure transmitting medium: Air
P_{abs} (20°C, 1 bar): 1.19 kg/m³
P_{rel}: (55±1.5) %
T_{amb}: (26±1) °C
P_{unit}: (1013±10) mbar

4. The certificate is valid only to the item calibrated on date and place of calibration

Calibrated by:

Mr. Soravit Thachalad
Miss Jitraporn Lertsomphol



Approved signature:
Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

CERTIFICATE OF CALIBRATION

Certificate No. : CP-009-66

Page 2 of 2 Pages

MEASUREMENT RESULTS : ☒ Without adjustment ☐ With adjustment

CALIBRATION IN THE RANGE OF : 1950 mbar to 1050 mbar

The results of calibration and associated measurement uncertainties are reported in the table below.

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.13	950.8	0.6	0.84
970.04	970.4	0.4	0.60
990.10	990.3	0.2	0.46
1010.08	1010.1	0.0	0.37
1030.10	1029.8	-0.3	0.50
1050.08	1049.5	-0.5	0.73

Note: UUC* Unit Under Calibration

: To convert the result in report unit to Pa should be multiply by 100

*End of certificate



Lot No. : 2486808-1

ANALYZER CALIBRATION DATA

Client : GLOW ENERGY PCL. Location : CTG HRSG (Phase 5)

Date : 12 Sep 24 Test Operator : Sakit P.

O₂ ANALYZER : TELEDYNE API 1803 Serial No. : 81
Model : Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.04	0.04
Low-Level Gas	8.00	8.20	8.04	0.04
Span Gas	16.00	16.20	16.04	0.04

NO_x ANALYZER : HORIBA PG-350 Serial No. : TDBARGKP
Model : Span (ppm) : 200

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.25	0.09	0.16
Low-Level Gas	82.30	82.64	82.44	0.10
Span Gas	164.40	164.66	164.40	0.10

SO₂ ANALYZER : TELEDYNE API 100EH Serial No. : 437
Model : Span (ppm) : 200

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.03	0.01	0.01
Low-Level Gas	78.75	78.72	78.74	0.01
Span Gas	157.50	158.37	158.89	0.01

CO ANALYZER : TELEDYNE API 300EM Serial No. : 451
Model : Span (ppm) : 500

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.01	0.01
Low-Level Gas	78.48	78.43	78.47	0.01
Span Gas	407.40	407.35	407.39	0.01

Calibrated by

Sakit P.

(Mr. Sakit Phaisanphit) Environmental Field Scientist (4)

FORM NO. F 06-062 REVISION NO. : 4 ISSUE DATE: 16/01/24

ALS Laboratory Group

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Lot No. : 2486808-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : GLOW ENERGY PCL. Location : CTG HRSG (Phase 5)

Date : 12 Sep 24 Test Operator : Sakit P.

O₂ ANALYZER : 16.00 Span (%) : 25
Cylinder Conc. (ppm) : 164.40

	O ₂ Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.20	0.20	0.00	0.04	0.04	0.04
Up-scale Gas	16.20	16.20	0.00	16.04	0.04	0.04

NO_x ANALYZER : 164.40 Span (ppm) : 200
Cylinder Conc. (ppm) : 164.40

	NO _x Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.26	0.26	0.00	0.09	0.10	0.10
Up-scale Gas	164.66	164.66	0.00	164.40	0.10	0.10

SO₂ ANALYZER : 158.87 Span (ppm) : 200
Cylinder Conc. (ppm) : 158.87

	SO ₂ Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.03	0.03	0.00	0.01	0.01	0.01
Up-scale Gas	158.87	158.87	0.00	158.89	0.01	0.01

CO ANALYZER : 407.40 Span (ppm) : 500
Cylinder Conc. (ppm) : 407.35

	CO Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.06	0.06	0.00	0.01	0.01	0.01
Up-scale Gas	407.35	407.35	0.00	407.39	0.01	0.01

Calibrated by

Sakit P.

(Mr. Sakit Phaisanphit) Environmental Field Scientist (4)

FORM NO. F 06-063 REVISION NO. : 4 ISSUE DATE: 16/01/24

ALS Laboratory Group

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EMISSION TEST RESULT

Client : GLOW ENERGY PCL. Location : CTG HRSG (Phase 5)
Date : 12 Sep 24 Test Operator : Sakit P.
Start Time : 11:00 Finish Time : 11:30
SO₂ Analyzer Model : TELEDYNE API 100EH Serial No. : 437
NO_x/O₂ Analyzer Model : HORIBA PG-350 Serial No. : TDBARGKP
CO/CO₂ Analyzer Model : TELEDYNE API 300EM Serial No. : 451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:00	13.39	4.18	8.41	0.04	0.54	
11:01	13.39	4.19	8.34	0.04	0.54	
11:02	13.40	4.19	8.39	0.03	0.57	
11:03	13.39	4.19	8.52	0.05	0.54	
11:04	13.40	4.19	8.55	0.06	0.49	
11:05	13.41	4.19	8.42	0.06	0.52	
11:06	13.42	4.19	8.47	0.04	0.46	
11:07	13.42	4.18	8.52	0.06	0.46	
11:08	13.42	4.18	8.69	0.04	0.44	
11:09	13.43	4.19	8.58	0.04	0.43	
11:10	13.44	4.18	8.53	0.05	0.43	
11:11	13.44	4.18	8.40	0.03	0.36	
11:12	13.44	4.18	8.55	0.06	0.38	
11:13	13.43	4.19	8.55	0.05	0.52	
11:14	13.45	4.19	8.48	0.04	0.39	
11:15	13.44	4.18	8.52	0.06	0.28	
11:16	13.45	4.19	8.66	0.06	0.31	
11:17	13.45	4.19	8.52	0.04	0.27	
11:18	13.45	4.17	8.57	0.04	0.29	
11:19	13.45	4.18	8.62	0.05	0.27	
11:20	13.46	4.19	8.53	0.04	0.29	
Average	13.43	4.18	8.52	0.05	0.41	

Sakit P.

(Mr. Sakit Phaisanphit) Environmental Field Scientist (4)

FORM NO. F 06-060 REVISION NO. : 1 ISSUE DATE: 16/01/24

ALS Laboratory Group

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EMISSION TEST RESULT

Client : GLOW ENERGY PCL. Location : CTG HRSG (Phase 5)
Date : 12 Sep 24 Test Operator : Sakit P.
Start Time : 11:31 Finish Time : 11:41
SO₂ Analyzer Model : TELEDYNE API 100EH Serial No. : 437
NO_x/O₂ Analyzer Model : HORIBA PG-350 Serial No. : TDBARGKP
CO/CO₂ Analyzer Model : TELEDYNE API 300EM Serial No. : 451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:31	13.46	4.18	8.53	0.04	0.24	
11:32	13.46	4.17	8.58	0.05	0.17	
11:33	13.46	4.18	8.53	0.03	0.14	
11:34	13.46	4.19	8.55	0.05	0.13	
11:35	13.47	4.18	8.56	0.04	0.16	
11:36	13.47	4.18	8.53	0.05	0.18	
11:37	13.47	4.18	8.10	0.05	0.21	
11:38	13.48	4.19	8.59	0.06	0.15	
11:39	13.48	4.18	8.51	0.06	0.18	
11:40	13.47	4.18	8.59	0.04	0.14	
11:41	13.47	4.19	8.54	0.04	0.20	
11:42	13.47	4.20	8.54	0.05	0.14	
11:43	13.47	4.20	8.62	0.05	0.17	
11:44	13.48	4.19	8.60	0.05	0.14	
11:45	13.48	4.19	8.79	0.04	0.13	
11:46	13.48	4.20	8.79	0.04	0.31	
11:47	13.49	4.19	8.68	0.05	0.26	
11:48	13.50	4.19	8.50	0.05	0.40	
11:49	13.49	4.19	8.65	0.06	0.50	
11:50	13.48	4.18	8.53	0.06	0.40	
11:51	13.50	4.19	8.61	0.06	0.40	
Average	13.48	4.18	8.62	0.05	0.23	

Sakit P.

(Mr. Sakit Phaisanphit) Environmental Field Scientist (4)

FORM NO. F 06-060 REVISION NO. : 1 ISSUE DATE: 16/01/24

ALS Laboratory Group

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EMISSION TEST RESULT

Client : GLOW ENERGY PCL. Location : CTG HRSG (Phase 5)
Date : 12 Sep 24 Test Operator : Sakit P.
Start Time : 11:42 Finish Time : 12:02
SO₂ Analyzer Model : TELEDYNE API 100EH Serial No. : 437
NO_x/O₂ Analyzer Model : HORIBA PG-350 Serial No. : TDBARGKP
CO/CO₂ Analyzer Model : TELEDYNE API 300EM Serial No. : 451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:42	13.48	4.18	8.78	0.03	0.31	
11:43	13.49	4.20	8.69	0.04	0.30	
11:44	13.49	4.19	8.71	0.04	0.30	
11:45	13.49	4.19	8.69	0.05	0.31	
11:46	13.50	4.19	8.59	0.06	0.31	
11:47	13.50	4.19	8.81	0.04	0.25	
11:48	13.51	4.19	8.73	0.05	0.25	
11:49	13.50	4.19	8.79	0.06	0.29	
11:50	13.51	4.18	8.76	0.06	0.30	
11:51	13.50	4.18	8.82	0.06	0.26	
11:52	13.50	4.19	8.80	0.07	0.25	
11:53	13.49	4.18	8.85	0.08	0.19	
11:54	13.50	4.19	8.93	0.04	0.19	
11:55	13.49	4.19	8.87	0.04	0.30	
11:56	13.50	4.19	8.80	0.05	0.30	
11:57	13.49	4.18	8.99	0.06	0.19	
11:58	13.49	4.20	8.85	0.05	0.25	
11:59	13.48	4.19	8.81	0.04	0.26	
12:00	13.50	4.19	8.86	0.04	0.27	
12:01	13.50	4.19	8.78	0.03	0.26	
12:02	13.50	4.19	8.67	0.04	0.19	
Average	13.50	4.18	8.78	0.05	0.26	

Sakit P.

(Mr. Sakit Phaisanphit) Environmental Field Scientist (4)

FORM NO. F 06-060 REVISION NO. : 1 ISSUE DATE: 16/01/24

ALS Laboratory Group

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol STANDARD

Customer: AIR LIQUIDE
(THAILAND) LTD
Part Number: EDAN99E3HA0002
Cylinder Number: GMD27210
Laboratory: 124 - Parsippany - PA
PGVP Number: A12022
Gas Code: CO,NO,NX,SZ,BALN
Reference Number: 82-4010231-1
Cylinder Volume: 247.2 CF
Cylinder Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Feb 11, 2022
Expiration Date: Feb 11, 2023

Certification performed in accordance with EPA Traceability Protocol for Analytical and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12/01, using the assay procedures listed. Analytical uncertainty does not include uncertainty for analytical reference. This report has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration medium. All concentrations are in weight/volume unless otherwise noted.
Do Not Use This Cylinder Before 100 days, 10.7 months

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Total Relative Uncertainty	Assay Dates
NOX	80.00 PPM	82.39 PPM	G1	+/- 1.0% NIST Traceable
CARBON MONOXIDE	80.00 PPM	78.48 PPM	G1	+/- 1.0% NIST Traceable
NITRIC OXIDE	80.00 PPM	82.38 PPM	G1	+/- 1.0% NIST Traceable
SULFUR DIOXIDE	80.00 PPM	78.75 PPM	G1	+/- 0.9% NIST Traceable

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTM	020102	KA204777	58.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%
NTM	200101	CCT32190	58.41 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%
NTM	200104	CCT32190	58.41 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%
NTM	124088138	CCT32190	4.007 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%
NTM	1101010	KA204777	58.48 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.5%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Model 850 FTR AUP210245 CO	FTR	Feb 03, 2022
Model 850 FTR AUP210245 NO	FTR	Feb 10, 2022
Model 850 FTR AUP210245 NO2	FTR	Jan 27, 2022
Model 850 FTR AUP210245 NO2	FTR	Jan 27, 2022

Trid Data Available Upon Request
NOTES/Gross Weight: 48.5 Kg
Net Weight: 8.1 Kg



CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: EDAN99E3HA0002
Cylinder Number: GMD27210
Laboratory: 124 - Parsippany - PA
PGVP Number: A12022
Gas Code: CO,NO,NX,SZ,BALN
Reference Number: 82-4010231-1
Cylinder Volume: 247.2 CF
Cylinder Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Aug 07, 2022
Expiration Date: Aug 07, 2023

Certification performed in accordance with EPA Traceability Protocol for Analytical and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12/01, using the assay procedures listed. Analytical uncertainty does not include uncertainty for analytical reference. This report has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration medium. All concentrations are in weight/volume unless otherwise noted.
Do Not Use This Cylinder Before 100 days, 10.7 months

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Total Relative Uncertainty	Assay Dates
NOX	160.0 PPM	164.4 PPM	G1	+/- 1.1% NIST Traceable
NITRIC OXIDE	160.0 PPM	164.4 PPM	G1	+/- 1.1% NIST Traceable
SULFUR DIOXIDE	160.0 PPM	164.4 PPM	G1	+/- 1.1% NIST Traceable
CARBON MONOXIDE	160.0 PPM	164.4 PPM	G1	+/- 1.1% NIST Traceable

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTM	020102	KA204777	163.9 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
NTM	200101	KA204777	163.9 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
NTM	200104	KA204777	163.9 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
NTM	124088138	KA204777	163.9 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
NTM	1101010	KA204777	163.9 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Model 850 FTR AUP210245 CO	FTR	Jul 28, 2022
Model 850 FTR AUP210245 NO	FTR	Jul 28, 2022
Model 850 FTR AUP210245 NO2	FTR	Aug 01, 2022
Model 850 FTR AUP210245 NO2	FTR	Aug 01, 2022

Trid Data Available Upon Request
NOTES:
Net weight: 41.0 grams
Gross weight: 47.0 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Document EPA-600/4-12/01. All testing procedures and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2015 and shall only be used for items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as indicated on this certificate. This document shall not be reproduced in full without written approval of Airgas.



Approved for Release

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: EDAN99E3HA0002
Cylinder Number: GMD27210
Laboratory: 124 - Parsippany - PA
PGVP Number: A12022
Gas Code: CO,NO,NX,SZ,BALN
Reference Number: 82-4010231-1
Cylinder Volume: 247.2 CF
Cylinder Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Aug 09, 2022
Expiration Date: Aug 09, 2023

Certification performed in accordance with EPA Traceability Protocol for Analytical and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12/01, using the assay procedures listed. Analytical uncertainty does not include uncertainty for analytical reference. This report has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration medium. All concentrations are in weight/volume unless otherwise noted.
Do Not Use This Cylinder Before 100 days, 10.7 months

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Total Relative Uncertainty	Assay Dates
NOX	480.0 PPM	471.8 PPM	G1	+/- 0.8% NIST Traceable
NITRIC OXIDE	480.0 PPM	471.8 PPM	G1	+/- 0.8% NIST Traceable
SULFUR DIOXIDE	480.0 PPM	471.8 PPM	G1	+/- 0.8% NIST Traceable
CARBON MONOXIDE	480.0 PPM	471.8 PPM	G1	+/- 0.8% NIST Traceable

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTM	020102	KA204777	480.0 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%
NTM	200101	KA204777	480.0 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%
NTM	200104	KA204777	480.0 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%
NTM	124088138	KA204777	480.0 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%
NTM	1101010	KA204777	480.0 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Model 850 FTR AUP210245 CO	FTR	Jul 28, 2022
Model 850 FTR AUP210245 NO	FTR	Jul 28, 2022
Model 850 FTR AUP210245 NO2	FTR	Aug 01, 2022
Model 850 FTR AUP210245 NO2	FTR	Aug 01, 2022

Trid Data Available Upon Request
NOTES:
Net weight: 41.0 grams
Gross weight: 47.0 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Document EPA-600/4-12/01. All testing procedures and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2015 and shall only be used for items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as indicated on this certificate. This document shall not be reproduced in full without written approval of Airgas.



Approved for Release

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: EDAN99E3HA0002
Cylinder Number: GMD27210
Laboratory: 124 - Parsippany - PA
PGVP Number: A12022
Gas Code: CO,NO,NX,SZ,BALN
Reference Number: 82-401018725-1
Cylinder Volume: 248.4 CF
Cylinder Pressure: 2214 PSIG
Valve Outlet: 510
Certification Date: Oct 23, 2017
Expiration Date: Oct 23, 2022

Certification performed in accordance with EPA Traceability Protocol for Analytical and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12/01, using the assay procedures listed. Analytical uncertainty does not include uncertainty for analytical reference. This report has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration medium. All concentrations are in weight/volume unless otherwise noted.
Do Not Use This Cylinder Before 100 days, 10.7 months

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Total Relative Uncertainty	Assay Dates
OXYGEN	8.000 %	8.003 %	G1	+/- 0.4% NIST Traceable
NITROGEN	Balance	Balance	G1	+/- 0.4% NIST Traceable

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTM	020102	CCT32190	8.001 % OXYGEN/NITROGEN	+/- 0.3%
NTM	200101	CCT32190	8.001 % OXYGEN/NITROGEN	+/- 0.3%
NTM	200104	CCT32190	8.001 % OXYGEN/NITROGEN	+/- 0.3%
NTM	124088138	CCT32190	8.001 % OXYGEN/NITROGEN	+/- 0.3%
NTM	1101010	CCT32190	8.001 % OXYGEN/NITROGEN	+/- 0.3%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Model 850 FTR AUP210245 CO	FTR	Aug 28, 2017
Model 850 FTR AUP210245 NO	FTR	Aug 28, 2017
Model 850 FTR AUP210245 NO2	FTR	Aug 28, 2017
Model 850 FTR AUP210245 NO2	FTR	Aug 28, 2017

Trid Data Available Upon Request
NOTES:
This calibration std. has been certified in accordance with the May 2012 EPA Traceability Document EPA-600/4-12/01. All testing procedures and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2015 and shall only be used for items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as indicated on this certificate. This document shall not be reproduced in full without written approval of the issuer.



Approved for Release

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CERTIFICATE OF ANALYSIS

Customer Details: ALS Laboratory Group (Thailand)
Material Name: 557260-2-44
Certification Date: 24-Sep-2016
Expiry Date: 24-Sep-2024
Cylinder Description: TITRAT 4 L

The measurement of this reference material is traceable to SI units. The assay of this reference material has been performed in accordance with the EPA Traceability Protocol for Analytical and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12/01, using the assay procedures listed. Analytical uncertainty does not include uncertainty for analytical reference. This report has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration medium. All concentrations are in weight/volume unless otherwise noted.
Do Not Use This Cylinder Before 100 days, 10.7 months

Certificate Number: 287716
Cylinder Number: 36375
Nominal Cylinder Content: 6.500 kg
Nominal Pressure: 145.0 Bar
Valve Outlet: CGA 590 BRASS

Production Order Number: 557260-2-44
Certification Date: 24-Sep-2016
Expiry Date: 24-Sep-2024
Cylinder Description: TITRAT 4 L

Trid Data Available Upon Request
NOTES:
This calibration std. has been certified in accordance with the May 2012 EPA Traceability Document EPA-600/4-12/01. All testing procedures and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2015 and shall only be used for items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as indicated on this certificate. This document shall not be reproduced in full without written approval of the issuer.

Comments: It is recommended that this product be not used below 5% of normal contents or should not be used when the gas pressure is below 150psi. Other impurities that affect by analytical conditions of this measure shall be report if it is more than 10% of maximum value component. Keep and use in well-ventilated and secure area.



Approved for Release

Page 1 of 2

CERTIFICATE OF ANALYSIS

Customer Details: ALS Laboratory Group (Thailand)
Material Name: 557260-2-44
Certification Date: 24-Sep-2016
Expiry Date: 24-Sep-2024
Cylinder Description: TITRAT 4 L

The measurement of this reference material is traceable to SI units. The assay of this reference material has been performed in accordance with the EPA Traceability Protocol for Analytical and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12/01, using the assay procedures listed. Analytical uncertainty does not include uncertainty for analytical reference. This report has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration medium. All concentrations are in weight/volume unless otherwise noted.
Do Not Use This Cylinder Before 100 days, 10.7 months

Certificate Number: 287716
Cylinder Number: 36375
Nominal Cylinder Content: 6.500 kg
Nominal Pressure: 145.0 Bar
Valve Outlet: CGA 590 BRASS

Production Order Number: 557260-2-44
Certification Date: 24-Sep-2016
Expiry Date: 24-Sep-2024
Cylinder Description: TITRAT 4 L

Trid Data Available Upon Request
NOTES:
This calibration std. has been certified in accordance with the May 2012 EPA Traceability Document EPA-600/4-12/01. All testing procedures and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2015 and shall only be used for items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as indicated on this certificate. This document shall not be reproduced in full without written approval of the issuer.

Comments: It is recommended that this product be not used below 5% of normal contents or should not be used when the gas pressure is below 150psi. Other impurities that affect by analytical conditions of this measure shall be report if it is more than 10% of maximum value component. Keep and use in well-ventilated and secure area.



Approved for Release

Page 1 of 2

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT



Calibration of Date : 10-Jul-24 : Barometric Pressure (mmHg) : 749.1
 Next Cal. Date : 10-Jan-25 : Relative Humidity (%) : 46.2
 Temperature (°C) : 33.8
 Console Control Meter Data
 Calibration No. : C-10724-BKK_FS0468 : BKK_FS1122
 Dry Gas Meter ID : BKK_FS0468 : A2032640
 Serial No. : 1302005 : Correction Factor (Y) : 0.9824
 Model No. : XC-572-V : Next Calibration Date : 7-Nov-24

ΔH (mm Hg)	θ (mRad)	Reference Dry Gas Meter Calibration						Console Control Dry Gas Meter						Dry Gas Meter Correction Factor (Y)	Office Calibration Factor (Y)	ΔAvg
		Final		Initial		Total		Final		Initial		Total				
		Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial			
25	11.90	150.00	0.00	150.00	0.00	6.670725	6.670725	147.65	32.0	32.0	32.0	32.0	0.0041	0.0041	41.0000	
25	8.30	150.00	0.00	150.00	0.00	6.670725	6.670725	147.65	32.0	32.0	32.0	32.0	0.0041	0.0041	41.0000	
25	4.94	150.00	0.00	150.00	0.00	6.672827	6.672827	147.65	32.0	32.0	32.0	32.0	0.0041	0.0041	41.0000	
25	4.12	150.00	0.00	150.00	0.00	6.672827	6.672827	147.65	32.0	32.0	32.0	32.0	0.0041	0.0041	41.0000	
															Avg	

Y : Ratio of reading of reference to dry gas meter. Maximum for individual values 2.00 from average.
 ΔAvg : Office pressure differential. Not equals 1/2 of ΔH at 0.5°C and Norm of mercury 1 mmHg balance for individual values 5.00 from average.

Procedure: 40 CFR 60.60 APP. A MET. 38C5.3 & 7

Calibrated by : Saksit Phaisanphit

(Mr. Saksit Phaisanphit)

RYG Field Service Scientist (4)

Approved by :

(Mr. Natthapol Jengwarewong)

RYG Field Service Specialist (1)

Form No. : F-06-124 REVISION NO. : 002 DATE : 8 Jun 22

PROBE NOZZLE DIAMETER
CALIBRATION DATA SHEET

Calibration Date :	10 Jul 24	Nozzle Set ID. :	BKK_FS0474
Calibration Sheet No. :	C-100724-BKK_FS0474	Vernier Caliper ID. :	BKK_FS1123

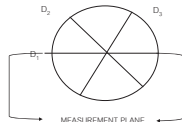
Nozzle ID #	Nozzle Diameter (cm.)			H - Lo	(D ₁ + D ₂ + D ₃) / 3
	D ₁	D ₂	D ₃	ΔD	D _{avg}
1	0.305	0.300	0.305	0.005	0.303
2	0.455	0.455	0.455	0.000	0.455
3	0.604	0.602	0.601	0.003	0.602
4	0.760	0.765	0.770	0.010	0.765
5	0.935	0.945	0.935	0.010	0.938
6	1.095	1.098	1.092	0.006	1.095
7	1.260	1.260	1.260	0.000	1.260
8	1.605	1.600	1.610	0.010	1.605

Where :

D₁, D₂, D₃ : = Three different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD : = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} : = (D₁ + D₂ + D₃) / 3



Calibrated by : Saksit Phaisanphit

(Mr. Saksit Phaisanphit)

RYG Field Services Scientist (4)

Approved by :

(Mr. Natthapol Jengwarewong)

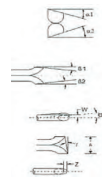
RYG Field Services Specialist

FORM NO. : F-06-124 REVISION NO. : 002 DATE : 8 Jun 22



Type S Pitot Tube Calibration

Date Calibration : 10-Jul-24 : Due Date : 10-Jan-25
 Pitot ID : BKK_FS0473 : Inclinerometer ID : BKK_FS1131
 Pitot SN : - : Vernier ID : RYG_FS0539



Parameter	Value	Allowable Range	Check
α1	2.5	-10° < α1 < +10°	OK
α2	1.4	-10° < α2 < +10°	OK
β1	-0.8	-5° < β1 < +5°	OK
β2	-0.4	-5° < β2 < +5°	OK
γ	0.3	-	-
θ	0.2	-	-
Z = A tan γ	0.005	Z ≤ 0.125"	OK
W = A tan θ	0.003	W ≤ 0.031"	OK
Dt	0.310	0.188" to 0.375"	OK
A/2Dt	1.484	1.05 ≤ PA/Dt ≤ 1.5	OK
A	0.92	2.10t ≤ A ≤ 3.0t	OK

Certify that pitot tube/probe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification fact of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

Calibrated by : Saksit Phaisanphit
 (Mr. Saksit Phaisanphit)
 RYG Field Services Scientist (4)

Approved by : Natthapol Jengwarewong
 (Mr. Natthapol Jengwarewong)
 RYG Field Services Specialist (1)

FORM NO. : F-06-124 REVISION NO. : 002 DATE : 25/12/23



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	10 Jul 24	Ambient Temperature (°C)	33.8
Calibration sheet No. :	C-100724-BKK_FS0469	Relative Humidity (%) :	46.2

Digital Temperature ID :	BKK_FS0469	Reference Temperature ID :	RYG_FS0681
Serial No. :	1302005	Serial No. :	20100014918
Model :	XC-572-V	Model :	Digicon-CC-VT-MS
		Next Calibrate :	13 Nov 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	101	1	±3	Pass
	150	150	0	±3	Pass
	200	201	1	±3	Pass
	250	251	1	±3	Pass
	300	301	1	±3	Pass
	350	351	1	±3	Pass
Probe	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Oven	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Filter	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Exit	0	0	0	±3	Pass
	10	10	0	±3	Pass
	20	20	0	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	49	-1	±3	Pass
AUX	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความคลาดเคลื่อนสูงสุดที่ยอมรับได้

Calibrated by : Saksit Phaisanphit
 (Mr. Saksit Phaisanphit)
 RYG Field Service Scientist (4)

Approved by : Natthapol Jengwarewong
 (Mr. Natthapol Jengwarewong)
 RYG Field Service Specialist (1)
 FORM NO. : F-06-027 REVISION NO. : 2 ISSUE DATE : 16/02/23



Certificate No : 670124
 Date of Issue : 22-Feb-24

Instrument description : : Plus Gas Analyser
 Instrument model : : Testo 340
 Control unit serial no. : :
 Instrument serial no. : : 62150585
 ID no. or control no. : : RYG_FS0465
 Manufacturer : : Testo SE & Co. KGaA
 Probe description : :
 Probe model : :
 Probe serial no. : :
 Customer name : : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
 Customer address : : 124 Phatthanaburi Rd., Phatthanakarn Road, Khwaeng Phatthanakarn, Khet Suan Luang, Bangkok, 10250 Thailand

REVIEW BY :
 APPROVED BY :
 NEXT CAL DATE : 21/2/25

Total pages of certificate : : 2 Pages
 Receiving no. : : 1-240604
 Receiving date : : 19-Feb-24
 Parameter of calibration : : Gas Calibration (Oxygen 2.50, 10.0, 21.0, 21.0, 21.0 %vol, Carbon Monoxide 80, 14, 302, 1003 ppm)
 Nitric Oxide 30.0, 151.5, 222.5 ppm, Sulphur Dioxide 50.36, 100.6, 600.8 ppm
 Condition of UUC. : : Used
 Ambient condition : : All of the Measurement were carried out the stabilized laboratory
 Temperature : : 23 ±5 °C
 Humidity : : 55 ± 15 %RH
 Calibration place : : 17/121 Soi Ngumwongwan 47 Yaek-46, Toongklongthong, Lakki, Bangkok 10210
 Calibration procedure no. : : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CI-39-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.
 This certificate is applied only to item under test Environmental conditions.
 This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
 Calibration certificates without signature and seal are not valid and the results relate only to the items tested/calibrated.
 This calibration certificate documents are traceability to national standards, which relate measurement according to the International System of Units (SI).
 Date of calibration : : 22-Feb-24

Kumwongwan
 Mr. Kwanchai Kumwongwan
 Calibration Technician

D. W. W. W.
 Mrs. Nongkaj Wongsitdee
 Technical Manager

FM-CI-39-C Rev.8

Page 1 of 2

Issued Date 26/02/16

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.58 % Vol	2412/23	Unit	27-Aug-27
Oxygen (O ₂) 10.04 % Vol	CG-0153-21	Nint	18-Nov-26
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nint	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nint	14-Feb-27
Carbon monoxide (CO) 3.02 ppm	1915/23	Unit	16-Jun-25
Carbon monoxide (CO) 1.003 ppm	2584/23	Unit	10-Sep-25
Nitric Oxide (NO) 3.01 ppm	CG-0014-23	Nint	19-Feb-25
Nitric Oxide (NO) 155.5 ppm	0161/23	Unit	12-Jun-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Unit	17-Jul-25
Sulfur Dioxide (SO ₂) 30.26 ppm	2009/23	Unit	17-Jul-25
Sulfur Dioxide (SO ₂) 100.8 ppm	3057/22	Unit	09-Nov-24
Sulfur Dioxide (SO ₂) 100.8 ppm	2003/23	Unit	17-Jul-25

Measured room conditions

Temperature : 22.7 °C Humidity : 60.2 %RH Pressure : 1011.8 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 600 ml/min Gas pressure : 1014.1 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty
O ₂ (%Vol)	2.50	2.44	-0.06	0.15
O ₂ (%Vol)	10.04	9.92	-0.12	0.20
O ₂ (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	302	303	1	6.0
CO (ppm)	1003	1003	0	12
NO (ppm)	30.01	29	-1.01	8.0
NO (ppm)	151.5	151	-0.5	8.0
NO (ppm)	322.5	321	-1.5	12
SO ₂ (ppm)	50.36	52	1.64	6.0
SO ₂ (ppm)	100.8	102	1.2	6.0
SO ₂ (ppm)	600.8	604	3.2	13

Remark : 1 cmol/mol = 1 %vol, 1 μmol/mol = 1 ppm.

End of Report

ENTECH

ENTECH Industrial Solution Co., Ltd.
17/121 Soi Namnongnaw 47, Yuen 48, Toomnongnaw, Luks, Bangkok 10210 THAILAND, Tel: 0-2779-8888, Calibration@entech.co.th
Fax: 0-210539035901 www.entech.co.th

Certificate of Calibration

Model Number : MSU224S-100-DU Certificate No. : 24BC0073
Description : Analytical Balance Issued Date : Friday, February 23, 2024
Serial Number : 0031709552 Reference No. : 229196
ID No. : RYG_EN0003 Page No. : 1 of 2
Manufacturer : Sartorius

Customer Name : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
618/10 Moo 5 T.Maanam Khu, A.Puak Daeng, Rayong 21140, Thailand.

Calibrated Place : ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
618/10 Moo 5 T.Maanam Khu, A.Puak Daeng, Rayong 21140, Thailand.

Calibrated By : Mr.Chonchai Inthana

Calibration Date : Thursday, February 22, 2024

Metrological data :

Capacity : 220 g Readability : 0.0001 g

Reasons for calibration

☐ New Installation ☐ Service / Repair ☒ Re-calibration / Maintenance

Equipment Condition: ☒ Good Operation ☐ Fail

Measurement Method : UKAS Publication Ref: Lab 14

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realizes the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from form of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YC8011-522-00	Sartorius weight set 100g - 5000g E2-YC5011-522-00	TCS	M23081975	23-Aug-2025
MHB-382SD	Humidity/Balometer/Temp. Lutron MHB-382SD	DKSH	C19231846	23-Aug-2024

This certificate relates and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division Sartorius (Thailand) Co., Ltd.

SOP FM 33 03 February 2022

Mr.Chonchai Inthana(Technical Manager)



Certificate of Calibration

Model Number : MSU224S-100-DU Certificate No. : 24BC0073
Description : Analytical Balance Issued Date : Friday, February 23, 2024
Serial Number : 0031709552 Reference No. : 229196
ID No. : RYG_EN0003 Page No. : 2 of 2
Manufacturer : Sartorius

Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The repeatability is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same load within a measurement capacity is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.	The off-center loading error is judged by the difference between the results of the load, i.e. 10 g or 10 g of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to GUM, 87%.
Nominal Value (Low Load) 20 g Tolerance 0.0001 g	20.0000 200.0001 20.0000 200.0001 20.0001 200.0001 20.0000 200.0001 20.0000 200.0001 19.9999 200.0001 20.0000 200.0000 20.0000 200.0001 20.0000 200.0001 Standard Deviation 0.00005 0.00005
Nominal Value (High Load) 200 g Tolerance 0.0001 g	200.0000 200.0001 200.0000 200.0001 200.0000 200.0001 200.0000 200.0001 200.0000 200.0001 200.0000 200.0001 200.0000 200.0001 200.0000 200.0001 Standard Deviation 0.00005 0.00005

Linearity
The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.
Tolerance 0.0002 g
Nominal Value Conventional Mass Value Displayed Value Deviation Uncertainty
0.02 0.0100 0.0100 0.0000 0.00013
0.1 0.1000 0.1000 0.0000 0.00013
0.5 0.5000 0.5000 0.0000 0.00013
1 1.0000 1.0000 0.0000 0.00013
5 5.0000 5.0000 0.0000 0.00013
10 10.0000 10.0000 0.0000 0.00013
20 20.0000 20.0000 0.0000 0.00013
50 50.0000 50.0000 0.0000 0.00024
100 100.0000 99.9999 -0.0001 0.00048
200 200.0000 199.9999 -0.0001 0.00096

SOP FM 33 03 February 2022

CALIBRATION CERTIFICATE

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Address : 104 Phatthakan 40, Khwaeng Phatthakan, Khut Suan Luang, Bangkok, 10250.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre, Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated : Ambient Environment
Description : Sound Calibrator Temperature : (23 ± 3) °C
Manufacturer : Rion Relative Humidity : (50 ± 15) %
Model : NC-74 Ambient Pressure : (101.325 ± 1.500) kPa
Serial No. : 34178121 (ID-RYG_FS0213)
Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OE 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N4106495.
7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.
This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.
Date of Receipt : 19 Feb. 2024
Date of Calibration : 28 Feb. 2024

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office 35 Mu 3 Tambon Khlong Yu, Amphoe Khlong Luang, Changwat Pathumthani 12220, Thailand
Tel: (66) 0 2577 9036
Fax: (66) 0 2577 9039
E-mail : info@tistr.go.th Website : www.tistr.go.th
Office Laboratory 468 Mu 2 Tambon Bangpoo, Amphoe Muang Samutprakan, Changwat Samutprakan 10280, Thailand
Tel: (66) 0 2577 9036
Fax: (66) 0 2577 9039
E-mail : info@tistr.go.th Website : www.tistr.go.th
Office 196 Phahonyothin Road, Laksien, Chaitachak, Bangkok 10000, Thailand
Tel: (66) 0 2577 9036
Fax: (66) 0 2577 9039
E-mail : info@tistr.go.th Website : www.tistr.go.th

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20μPa at 1000 Hz
Acoustic Output in dB re 20μPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level				
Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	94.01	0.01	± 0.10	±0.40 dB
2. Frequency				
Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1003.1	3.1	± 1.5	±1.0%
3. Total Distortion				
Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1	
1/2 inch Bruel&Kjaer 4180	1.80	± 0.50	±3.0%	

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at level of 0.16 dB from manual.

Calibrated by : (Mr.Werachai Deechaiyae)
Approved by : (Mr.Chonchai Inthana)
Date of Calibration : 28 Feb. 2024
Date of Issue : 29 Feb. 2024
Ref : 2011267021900719001
End of Certificate 2/2

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office 35 Mu 3 Tambon Khlong Yu, Amphoe Khlong Luang, Changwat Pathumthani 12220, Thailand
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Tel: (66) 0 2577 9036
Fax: (66) 0 2577 9039
E-mail : info@tistr.go.th Website : www.tistr.go.th
Office 196 Phahonyothin Road, Laksien, Chaitachak, Bangkok 10000, Thailand
Tel: (66) 0 2577 9036
Fax: (66) 0 2577 9039
E-mail : info@tistr.go.th Website : www.tistr.go.th

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00873057 / 171591 / 73333
ID No. : RYG_F30381

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHAKAN 40, PHATTHAKAN ROAD,
KHAENG PHATTHAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 2.0) %
Received Date : 11 OCTOBER 2023
Calibration Date : 19-20 OCTOBER 2023
Date of Issue : 24 OCTOBER 2023

Calibrated by : Nathakorn Pisutapian
Approved by : (Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QE-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024373	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	12.0
C - weight	18.2
Flat	24.0

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.5	0.6	0.6	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	±0.2
C - weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	±0.3

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.8	-0.2	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.8	-0.2	±1.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0011
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

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Cert. No. : ACL24012
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00623390 / 198637 / 26418
ID No. : RYG JS0615

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHWAENG PHATTANAKAN, KHET SIUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 19 DECEMBER 2023
Calibration Date : 05-08 JANUARY 2024
Date of Issue : 09 JANUARY 2024

Calibrated by : Nathakorn Pisupatien

Approved by : *T. Petchu.*
(Thanakul Petchurai)

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Cert. No. : ACL24012
Job No. : VC67AC0044
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 300266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 290266	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL-BP 310266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

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Cert. No. : ACL24012
Job No. : VC67AC0044
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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Cert. No. : ACL24012
Job No. : VC67AC0044
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	12.6
C-weight	19.2
Flat	24.8

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	1.0	1.1	1.1	±5.0

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Cert. No. : ACL24012
Job No. : VC67AC0044
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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Cert. No. : ACL24012
Job No. : VC67AC0044
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	34.0	0.0	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.8	-0.2	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

T. Petchur

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Cert. No. : ACL24012
Job No. : VC67AC0044
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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Cert. No. : ACL24012
Job No. : VC67AC0044
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.7	89.5	-0.2 ±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

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Cert. No. : ACL24093
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00734225 / 145272 / 34370
ID No. : RYG_FS0030

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 19 JANUARY 2024
Calibration Date : 25-26 JANUARY 2024
Date of Issue : 29 JANUARY 2024



Calibrated by : Nathakorn Pichuraisan

Approved by : T. Petchur
(Thanakul Petchurai)

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Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

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Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

401-401/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
21.4

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.9
Flat	23.6

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.1	-0.9	-0.9	±5.0

T. Petch

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Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

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Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

T. Petch

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Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepack (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petch

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Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.8	0.2	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$

or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petch

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **15 December 2023** CERTIFICATE NUMBER **205046**

Cirrus Research plc
Acoustic House
Bridlington Road
Hunnamby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N.Smith
Electronically signed:

doseBadge Reader : IEC 60942:2003

Instrument information

Manufacturer: **Cirrus Research plc**

Model: **RC 110A**

Serial number: **76996**

Class: **2**

Notes:

Test summary

Date of calibration: **15 December 2023**

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942:2003 Annex B - Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a V52F condenser microphone type MK224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number: 205046
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 102.46 kPa	Temperature: 23.4 °C	Humidity: 34 %
After	Pressure: 102.46 kPa	Temperature: 23.4 °C	Humidity: 35 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Kelthley	2015	0994818
Acoustic Calibrator	Briel and Kjaer	4231	2610257
Environmental Monitor	Comet	T7510	21962628

Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	114.17	114.16	114.17	114.17	0.17	±0.75	0.11 dB
Distortion (%)	< 4.00	0.28	0.25	0.23	0.25	0.25	+4.00	0.13 %
Frequency (Hz)	1000.0	1004.0	1004.0	1004.0	1004.0	4.0	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	114.02	114.01	114.01	114.01	0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.23	0.26	0.25	0.25	0.25	+4.00	0.13 %
Frequency (Hz)	1000.0	1004.1	1004.0	1004.0	1004.0	4.0	±20.0	0.1 Hz

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

End of results

J NAC

JIRANATEE ASSOCIATES CO.,LTD.

Accredited calibration laboratory

ISO/IEC 17025:2017

NAC-TSI-TS 17025

CALIBRATION 0367

Branch: Associates Co.,Ltd

63/14-15, 67/39-38

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Temperature measurement laboratory

Calibration services department

ILAC-MRA

NAC-TSI-TS 17025

CALIBRATION 0367

Certificate No. : COT-021-67

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Heat Stress Monitor

Delta OHM

HD32.2

18018314

HYG_P20359

Used item

ALS laboratory group (thailand) Co., Ltd.

154 Phuthonkan 40, Phuthonkan Rd.,

Khweng Suan Luang, Khet Suan Luang,

Bangkok 10250 Thailand.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

11 Jan 2024

15 Jan 2024

17 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

Relative Humidity

23.0 ± 3.0 °C

55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Approved signature:

Mr. Sagarach Thachalad

Mr. Parinya Booncharon

Mr. Nitiporn Lertsomphol

Calibration Department Manager

Mr. Nitiporn Lertsomphol

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED

IN WRITING FROM THE LABORATORY

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Accredited calibration laboratory

ISO/IEC 17025:2017

NAC-TSI-TS 17025

CALIBRATION 0367

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Temperature measurement laboratory

Calibration services department

ILAC-MRA

NAC-TSI-TS 17025

CALIBRATION 0367

Continuation of Certificate of Calibration Number COT-021-67

Page 2 of 2 Pages

Result of Calibration:

Calibration Range:

Function:

☒ Without Adjustment

☐ With Adjustment

20 ~ 40 °C

Table 1: This equipment was connected with wet bulb probe Model: TP3201.2 5/N: 18021465.

Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.038	20.0	0.0	0.099
80	25.047	25.0	0.0	0.099
80	30.042	30.0	0.0	0.099
80	35.037	35.0	0.0	0.099
80	40.030	40.0	-0.1	0.14

Table 1: This equipment was connected with Globe thermometer probe Model: TP3276.2 5/N: 20082380.

Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.038	20.0	0.0	0.099
110	25.047	25.0	0.0	0.14
110	30.042	30.0	0.1	0.099
110	35.037	35.1	0.1	0.099
110	40.031	40.1	0.1	0.099

Table 1: This equipment was connected with temperature probe Model: TP3207.2 5/N: 18021262.

Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.038	20.1	0.0	0.14
75	25.047	24.9	-0.1	0.099
75	30.042	29.8	-0.2	0.099
75	35.037	34.8	-0.2	0.099
75	40.031	39.7	-0.3	0.099

UUC: Long Under Calibration

Remark: The reported uncertainty of measurement is 0.14, based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

End of Certificate of Calibration

Calibrated by:

Approved signature:

Mr. Sagarach Thachalad

Mr. Parinya Booncharon

Mr. Nitiporn Lertsomphol

Calibration Department Manager

Mr. Nitiporn Lertsomphol

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED

IN WRITING FROM THE LABORATORY

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Accredited calibration laboratory

ISO/IEC 17025:2017

NAC-TSI-TS 17025

CALIBRATION 0367

Branch: Associates Co.,Ltd

63/14-15, 67/39-38

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Temperature measurement laboratory

Calibration services department

ILAC-MRA

NAC-TSI-TS 17025

CALIBRATION 0367

Certificate No. : COT-022-67

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Heat Stress Monitor

Delta OHM

HD32.2

18018315

HYG_P20360

Used item

ALS laboratory group (thailand) Co., Ltd.

154 Phuthonkan 40, Phuthonkan Rd.,

Khweng Suan Luang, Khet Suan Luang,

Bangkok 10250 Thailand.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

11 Jan 2024

15 Jan 2024

17 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

Relative Humidity

23.0 ± 3.0 °C

55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Approved signature:

Mr. Sagarach Thachalad

Mr. Parinya Booncharon

Mr. Nitiporn Lertsomphol

Calibration Department Manager

Mr. Nitiporn Lertsomphol

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Accredited calibration laboratory

ISO/IEC 17025:2017

NAC-TSI-TS 17025

CALIBRATION 0367

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Temperature measurement laboratory

Calibration services department

ILAC-MRA

NAC-TSI-TS 17025

CALIBRATION 0367

Continuation of Certificate of Calibration Number COT-022-67

Page 2 of 2 Pages

Result of Calibration:

Calibration Range:

Function:

☒ Without Adjustment

☐ With Adjustment

20 ~ 40 °C

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 5/N: 18021471.

Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.060	20.0	-0.1	0.099
80	25.051	25.0	-0.1	0.099
80	30.041	30.0	0.0	0.099
80	35.035	35.0	0.0	0.099
80	40.024	40.0	0.0	0.099

Table 1: This equipment was connected with Globe thermometer probe Model: TP3276.2 5/N: 18020592.

Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.060	20.1	0.0	0.099
110	25.051	25.1	0.0	0.099
110	30.041	30.1	0.1	0.099
110	35.036	35.1	0.1	0.099
110	40.025	40.1	0.1	0.099

Table 1: This equipment was connected with temperature probe Model: TP3207.2 5/N: 18021266.

Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.060	20.1	0.0	0.099
75	25.051	25.0	-0.1	0.099
75	30.041	29.8	-0.2	0.099
75	35.036	34.7	-0.3	0.099
75	40.025	39.6	-0.4	0.099

UUC: Long Under Calibration

End of Certificate of Calibration

Calibrated by:

Approved signature:

Mr. Sagarach Thachalad

Mr. Parinya Booncharon

Mr. Nitiporn Lertsomphol

Calibration Department Manager

Mr. Nitiporn Lertsomphol

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NAC-TSI-TS 17025

CALIBRATION 0367

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Web site: www.jiranatee.com

Temperature measurement laboratory

Calibration services department

ILAC-MRA

NAC-TSI-TS 17025

CALIBRATION 0367

Certificate No. : COT-029-67

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Heat Stress Monitor

Delta OHM

HD32.2

20032241

HYG_P20321

Used item

ALS laboratory group (thailand) Co., Ltd.

154 Phuthonkan 40, Phuthonkan Rd.,

Khweng Suan Luang, Khet Suan Luang,

Bangkok 10250 Thailand.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

24 Jan 2024

25 Jan 2024

30 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

Relative Humidity

23.0 ± 3.0 °C

55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Approved signature:

Mr. Sagarach Thachalad

Mr. Parinya Booncharon

Mr. Nitiporn Lertsomphol

Calibration Department Manager

Mr. Nitiporn Lertsomphol

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED

IN WRITING FROM THE LABORATORY

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001217.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.052	20.1	0.0	0.099
80	25.054	25.1	0.0	0.099
80	30.047	30.1	0.1	0.099
80	35.041	35.1	0.1	0.099
80	40.035	40.1	0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001242.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.052	20.0	-0.1	0.099
110	25.055	25.0	-0.1	0.099
110	30.047	30.0	0.0	0.099
110	35.041	35.0	0.0	0.099
110	40.035	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001783.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.052	20.1	0.0	0.099
75	25.054	25.1	0.0	0.099
75	30.047	30.0	0.0	0.099
75	35.041	34.9	-0.1	0.099
75	40.035	39.8	-0.2	0.099

UUC* Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-030-67

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS-RECEIVED
CUSTOMER

Heat Stress Monitor
Delta OMA
HD32.2
20032242
RYG_F52522
Used item
ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 24 Jan 2024
MEASUREMENT DATE : 25 Jan 2024
ISSUE DATE : 30 Jan 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:
The table on next page give the measured values.

REVIEW BY : *Phanisa P.*
APPROVED BY : *he t*
NEXT CAL DATE : 24/1/24

Calibrated by:
Chap. Sanyuth Thachalad
Ning Zillagorn Lertsomphol
Mitg Buangpumpal Phoommit



Approved signature: *Phanisa P.*
Mr. Phanisa Booncharoen
Calibration Department Manager

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED
IN WRITING FROM THE LABORATORY.

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001206.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.055	20.0	-0.1	0.099
80	25.051	25.0	-0.1	0.099
80	30.040	30.1	0.1	0.099
80	35.032	35.1	0.1	0.099
80	40.022	40.1	0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001250.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.055	20.0	-0.1	0.099
110	25.051	25.0	-0.1	0.099
110	30.040	30.1	0.1	0.099
110	35.032	35.1	0.1	0.099
110	40.022	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001796.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.055	20.1	0.0	0.099
75	25.051	25.0	-0.1	0.099
75	30.040	30.0	0.0	0.099
75	35.032	34.9	-0.1	0.099
75	40.022	39.8	-0.2	0.099

UUC* Unit Under Calibration

End of Certificate of Calibration



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5144 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2775-3000-24 FAX: 0-2775-9484

Certificate of Calibration Certificate No.: 24PH241
Page: 1 of 2

This Certificate was issued to replace to the Certificate No. 24PH24

Equipment: Lux Meter
Manufacturer: Delta OMA
Model: HD3102.2
Serial No.: 16002032
ID No.: RYG_FS2020
Condition As-Received: Used Item
Received Date: 11 January 2024
Calibration Date: 16 January 2024
Reference: 2401-0330WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Procedure used: Calibration were conducted using calibration procedure No. CP-PH01 based on inverse square law technique.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Photometry & Encoder	LMGuide 9.8 m	120RC003	DL-0064-22	20 Jul 2025
2) High-recency Irradiance Standard	OL-FEL-U	F-1473	TP-1028-23	14 Feb 2024

2. This result of calibration was made on requested at the point specified by customer.

3. Test Equipment: Programmable Voltage/Current Source (Model : OLISA, SN : 16221394).

4. Test Equipment: Illuminance Meter (Model : S1002, SN : 080129).

5. The certificate is valid only to the item calibrated on date and place of calibration.

6. This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)
-National Institute of Metrology (Thailand), NSC-ONSAC Accredited No. Calibration 0144

REVIEW BY : *Phanisa P.*
APPROVED BY : *he t*
NEXT CAL DATE : 16/01/25

Calibrated by: Nivat Nitas
Issue Date: 28 November 2024

Approved Signatory: *Phanisa P.*
[] Phatthana Pratsapal
[] Chatchawan Khunplak
[] Nuntawat Khanchai

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5144 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2775-3000-24 FAX: 0-2775-9484

Certificate of Calibration Certificate No.: 24PH241
Page: 2 of 2

Result of calibration: (*) Without adjustment () After adjustment

Function: Illuminance Measurement Range: Auto-range

Standard Value (lx)	UUC Reading (lx)	Error (lx)	Uncertainty (± lx)
0	0.00	0.00	-
15	14.87	-0.13	0.20
100	98.81	-1.19	1.3
500	492.8	-7.2	6.5
1000	992.1	-7.9	13
2000	2011	11	26
3000	3049	49	39
4000	4098	98	52
5000	5153	153	65

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %

Calibration with probe sensor s/n. 22038597
UUC* = Unit Under Calibration.

Calibrated by: Nivat Nitas
Issue Date: 19 March 2024

Approved Signatory: *Phanisa P.*
[] Phatthana Pratsapal
[] Winitap Larpsem
[] Nuntawat Khanchai

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5144 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2775-3000-24 FAX: 0-2775-9484

Certificate of Calibration Certificate No.: 24PH146
Page: 1 of 2

Equipment: Lux Meter
Manufacturer: TENMARS
Model: TM-201L
Serial No.: 200300974
ID No.: RYG_FS0474
Condition As-Received: Used Item
Received Date: 12 March 2024
Calibration Date: 14 March 2024
Reference: 2403-0302WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Procedure used: Calibration were conducted using calibration procedure No. CP-PH01 based on inverse square law technique.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Photometry & Encoder	LMGuide 9.8 m	120RC003	DL-0064-22	20 Jul 2025
2) Luminous intensity standard lamp	OL-FEL-U	F-1543	TP-1030-23	08 Jun 2024

2. This result of calibration was made on requested at the point specified by customer.

3. Test Equipment: Programmable Voltage/Current Source (Model : OLISA, SN : 16221394).

4. Test Equipment: Illuminance Meter (Model : S1002, SN : 080129).

5. The certificate is valid only to the item calibrated on date and place of calibration.

6. This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)
-National Institute of Metrology (Thailand), NSC-ONSAC Accredited No. Calibration 0144

REVIEW BY : *Phanisa P.*
APPROVED BY : *he t*
NEXT CAL DATE : 13/3/25

Calibrated by: Nivat Nitas
Issue Date: 19 March 2024

Approved Signatory: *Phanisa P.*
[] Phatthana Pratsapal
[] Winitap Larpsem
[] Nuntawat Khanchai

Cert. No.: 24PH146
Page: 2 of 2

Result of calibration:- (*) Without adjustment () After adjustment

Function : Illuminance Measurement Range : 200 lx

Standard Value	UUC* Reading	Error	Uncertainty
(lx)	(lx)	(lx)	(± lx)
0	0.0	0.0	-
20	20.1	0.1	0.26
50	50.1	0.1	0.65
100	100.1	0.1	1.3
150	150.1	0.1	2.0
190	190.1	0.1	2.5

Function : Illuminance Measurement Range : 2000 lx

Standard Value	UUC* Reading	Error	Uncertainty
(lx)	(lx)	(lx)	(± lx)
200	200	0	2.6
500	500	0	6.5
1000	1000	0	13
1500	1500	0	20
1900	1900	0	25

Function : Illuminance Measurement Range : 20000 lx

Standard Value	UUC* Reading	Error	Uncertainty
(lx)	(lx)	(lx)	(± lx)
2000	1990	-10	26
3000	3000	0	39
4000	4000	0	52
5000	5000	0	65

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %

UUC* = Unit Under Calibration.

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a 1206569

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD NO.18, SUANLIANG, SUANLIANG, BANGKOK, 10250
TEL.: 0-2717-3000-24 FAX: 0-2719-9484

Certificate of Calibration

Certificate No.: 23E3824
Page: 1 of 2

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No.: B834291445
ID No.: RYQ_EN0152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 14 December 2023

Reference: 2312-0151DSC
Ambient Temperature: (29 ± 2) °C
Relative Humidity: (50 ± 10) %

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

Procedure used: Calibration was conducted using calibration procedure No. CP-E17 according to EURAMET cg-15.

Condition of this result of calibration

1. Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5502A	2435002	EE-0041-23	28 Apr 2024

2) This result of calibration was made on requested at the point specified by customer.
3) The certificate is valid only to the item calibrated on date and place of calibration.
4) This Certification is traceable to the International System of Unit maintained through:-
National Institute of Metrology Thailand (NIMT)

Calibrated by: Nipachonk Prasomsoont
Issue Date: 15 December 2023

Approved Signatory :
[Signature]
[Signature]
[Signature]

REVIEW BY: N. Bannit
APPROVED BY: [Signature]
NEXT CAL. DATE: 14 Dec 2024
MICELIS (S.M.)

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a 0331106

Cert. No.: 23E3824
Page: 2 of 2

Result of calibration:- (*) Without adjustment () After adjustment

Function: DC voltage measurement Range: 2000 mV

Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(± mV)
-200.0000	-199.9	0.1	68
-150.0000	-150.0	0.0	65
-100.0000	-100.0	0.0	63
-50.0000	-50.0	0.0	61
0.0000	0.0	0.0	58
50.0000	50.0	0.0	61
100.0000	100.0	0.0	63
150.0000	150.0	0.0	65
200.0000	199.9	-0.1	68

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95 %

UUC* = Unit Under Calibration.

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a 1193422

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD NO.18, SUANLIANG, SUANLIANG, BANGKOK, 10250
TEL.: 0-2717-3000-24 FAX: 0-2719-9484

Certificate of Calibration

Cert.No.: 23CH1574
Page: 1 of 3

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No.: B834291445
ID No.: RYQ_EN0152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 15 December 2023
Reference: 2312-0151DSC-3
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In-house method:
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by: Warakorn Lemngagrakul
Approved by: [Signature]
[Signature]
[Signature]
Issue Date: 19 December 2023

The uncertainties are for a confidence probability of approximately 95 %

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a 0061696

Cert.No.: 23CH1574
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	231808	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSQ-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	913598	14 July 2025
pH 6.868	CPA chem	931959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	(mV) k
pH Meter	4.000	177.48	177.3	4.000	0.058 2.00
S/N: B834291445	7.000	0.00	-0.1	7.000	0.058 2.00
	10.000	-177.48	-177.5	10.000	0.058 2.00

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a 1193852

Cert.No.: 23CH1574
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode	4.008	4.013	184.1	0.0045	2.00
S/N: 3225368	6.868	6.998	8.7	0.0084	2.00
	9.997	10.002	-164.7	0.0088	2.11

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model : InLab®Expert Pro-ISM
- Serial No.: 3225368
- Dimension of probe:
- Length: 120 mm
- Diameter: 12 mm
- Immersion Depth: 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.003	24.3	-0.703	0.13	2.00

Remark : UUC* = Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.

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a 1193851



Certificate No. T241120

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cold Room)
Manufacturer : MODULAR
Model : IREVCOHCOO
Serial No. : C00351459
Customer Code : RYG_EN0184
ID No. : T1939A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluaakdaeng, Rayong 21140



Customer Location : Laboratory

Date of Receipt : 5 June 2024

Calibrated By : Sujjar Nakkred (Site Calibration Manager)

Approved By : Preecha Phisassuthikul (Temperature Calibration Manager)

Date of Issue : 12 JUN 2024

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L15.118.18-08-66



Certificate No. T241120

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 11 June 2024
Environment : Temperature : 23.1-24.1 °C
Line Voltage : 222.3-226.3 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to W1-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986). All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T240713	19 April 2025
TC	TYPE T	TN171-TN180	T240713	19 April 2025
DATA LOGGER	34970A	T149	T240713	19 April 2025

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244)

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 3 Hour 30 Minute At : 3 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By : [Signature]

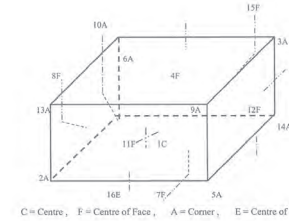
FM-L15.118.18-08-66



Certificate No. T241120

Page 3 of 4

Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C	=	TN161
2A	=	TN162
3A	=	TN163
4F	=	TN164
5A	=	TN165
6A	=	TN166
7F	=	TN167
8F	=	TN168
9A	=	TN169
10A	=	TN170

11F	=	TN171
12F	=	TN172
13A	=	TN173
14A	=	TN174
15F	=	TN175
16E	=	TN176

Approved By : [Signature]

FM-L15.118.18-08-66



Certificate No. T241120

Page 4 of 4

Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)								
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169
3	2.73	2.70	2.77	2.78	2.99	2.35	3.09	3.21	3.08
	TN171	TN172	TN173	TN174	TN175	TN176			
	3.39	3.01	2.92	2.81	3.42	3.42			

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
3.0	2.9	4.4	3.7	2.97	1.32	1.13	2.02

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a 1-distribution, providing a level of confidence of approximately 95 %

Approved By : [Signature]

FM-L15.118.18-08-66



Cert.No.: 23TW168

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 21 July 2023
Test Date : 24 July 2023
Reference : 2307-0713DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluaakdaeng,
Rayong 21140, Thailand

Laboratory Condition :

Temperature (25 ± 5) °C
Humidity (50 ± 20) %
In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Test Procedure :

Walailak Sirthean

Tested by :

[Signature]

Approved by :

[Signature]

() Maloo Butkruee
(x) Salhip Meangmai
() Warakorn Lemgatrakul

Issue Date :

26 July 2023

B 0320211



Cert.No.: 23TW168
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	-	130BU10	23CG1172	22 Mar 2025
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

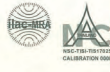
Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.17	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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a 1172155



Cert. No.: 23LM125
Page: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,
Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 25 July 2023
Calibrated Date : 27 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Praescha Hahib

Approved by :
() Pombtipa Tameyakul
() Malee Bulkruea
(x) Suwit Injai

Issue Date : 31 July 2023

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full, except with the prior written
Approval of the Head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0053616



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2307-0713DSC-2
Cert. No.: 23LM125
Page: 2 of 2

Procedure Used :-
Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with
Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188089	221285	TPA	21 Oct 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (°) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N: 1228475367

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty k	Coverage Factor
20.00	100	20.011	19.91	-0.101	0.15	2.00

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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a 1159515



Cert. No.: 23TM962
Page: 1 of 3

Certificate of Calibration

Equipment : Low Temp. Incubator
Manufacturer : Memmert
Model : IPP750
Serial No. : V818.0084
ID No. : RYG_EN0154
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140 Thailand
BOD Room
Location :
Received Order : 29 May 2023
Calibration Date : 29 May 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanasongpaiboon

Approved by :
() Pombtipa Tameyakul
() Malee Bulkruea
(x) Suwit Injai

Issue Date : 7 June 2023

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full, except with the prior written
Approval of the Head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0054967



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2305-0980C-2
Cert. No.: 23TM962
Page: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement
method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	22LM03	02 Jul 2023

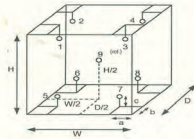
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (°) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 10 cm D = 0.60 m
b = 10 cm W = 1.0 m
c = 10 cm H = 1.2 m
Capacity = 0.75 m³

Environment during calibration		
Temp. (°C)	Beginning	Finished
REL.Humid. (%)	54	56
AC Supply (Volt)	223	222

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	22-18RTD-08
9 (ref.)	18-18RTD-09

a 1165130



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2305-0980C-2
Cert. No.: 23TM962
Page: 3 of 3

Result of Calibration :-

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (°C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
20.0	20.0	20.0	0.019	0.72	1.0	2

Measured Temperature (°C)										Uncertainty (°C)
Position	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	19.547	19.780	19.487	19.529	19.408	20.139	20.112	20.406	20.116	0.30

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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a 1165129



Certificate of Calibration

Cert. No.: 24TM1663
Page: 1 of 3

Equipment : Low Temp. Incubator
Manufacturer : Memmert
Model : IPP750
Serial No. : V818.0084
ID No. : RYG_EN0154
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140, Thailand
BOD Room
Location :
Received Order : 01 November 2024
Calibration Date : 01 November 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Kriada Malee

Approved Signatory

() Porpan Paipin
() Suwit Injai
(x) Kunchit Promrat

Issue Date : 07 November 2024

The Uncertainties are for a confidence probability of approximately 95%
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Approval of the Head of Corporate Services 3: Equipment Calibration and Testing Services.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2403-0563OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM632
Page : 3 of 3

Calibration Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.051	0.59	0.62	2
180.0	180.0	180.0	0.15	1.3	1.7	2

Calibration Point (°C)	Measured Temperature (°C) Position									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	103.921	103.786	103.757	103.759	103.950	103.817	104.213	103.672	103.673	0.42
180.0	179.614	179.270	179.145	179.599	180.001	180.423	180.293	180.629	179.429	1.1

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL. 0-2717-3060-29 FAX. 0-2719-9484



Cert.No.: 23CH1088
Page: 1 of 2

Certificate of Calibration

Equipment : Conductivity Meter
Manufacturer : Mettler Toledo
Model : S230
Serial No. : B241407147
ID No. : RYG_EN0029
Condition As-Received : Used Item
Received Date : 01 September 2023
Calibration Date : 04 September 2023
Reference : 2309-0010DSC-7
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH6 : based on direct measurement by using certified reference material (CRM)

Calibrated by : Warakorn Lemgagrakul

Approved by :
(✓) Sathip Meangmai
() Warakorn Lemgagrakul
() Ponpan Paipim

Issue Date : 7 September 2023

The Uncertainties are for a confidence probability of approximately 95%.

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A 0058059



Cert.No.: 23CH1088
Page: 2 of 2

Condition of this result of calibration

1. Reference Standard Instrument :
Instrument : 9540224 130RC003 23435 10 Apr 2024
- This Certification is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :
- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
84.000 µS/cm	CPA Chem	885120	28 Mar 2024
1413.0 µS/cm	CPA Chem	913596	14 July 2024
12.880 mS/cm	CPA Chem	885123	28 Mar 2024

- Control Conductivity calibration solution temperature by Water bath (25.0.1) °C
3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 1413.0 µS/cm

Conductivity Electrode Serial No.: 5823251000

Standard Conductivity Solution	Before Adjustment UUC Reading	After Adjustment UUC Reading	Uncertainty of Measurement (±)	Coverage factor k
84.000 µS/cm	83.8 µS/cm	85.3 µS/cm	0.82 µS/cm	2.00
1413.0 µS/cm	1385 µS/cm	1413 µS/cm	9.2 µS/cm	2.00
12.880 mS/cm	12.41 mS/cm	12.63 mS/cm	0.086 mS/cm	2.00

Remark : - UUC = Unit Under Calibration
- Cell constant = 0.545371 cm⁻¹

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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Sathip

a 1178950



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL. 0-2717-3060-29 FAX. 0-2719-9484



Certificate of Calibration

Cert.No.: 24CH771
Page: 1 of 2

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : B712869291
ID No. : RYG_F50296
Condition As-Received : Used Item
Received Date : 28 June 2024
Calibration Date : 01 July 2024
Reference : 2406-0989DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)

Calibrated by : Warakorn Lemgagrakul

Approved by :
() Unnopphol Harachai
() Ponpan Paipim
(✓) Sathip Meangmai

Issue Date : 03 July 2024

The Uncertainties are for a confidence probability of approximately 95%.

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Cert.No.: 24CH771
Page: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument :
Instrument : Document Process Calibrator
Serial No. : 54030049 130RC116 23E2802 27 Aug 2024

- This Certification is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	970851	25 Apr 2026
pH 6.986	CPA chem	970852	25 Apr 2025
pH 9.997	CPA chem	970853	25 Apr 2025

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor k
	pH	mV	mV	pH	(±mV)	
pH Meter	4.00	177.48	177	4.00	0.58	2.00
S/N: B712869291	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode	4.008	4.01	166	0.0079	2.00
S/N: 2255995	6.986	6.99	-8	0.011	2.00
	9.997	10.00	-182	0.0095	2.00

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3060-29 FAX. 0-2719-9484



Certificate of Calibration

Cert. No.: 24LM106
Page: 1 of 2

Equipment : pH Meter with Sensor
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : B712869291
ID No. : RYG_F50296
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory

Received Order : 28 June 2024
Calibrated Date : 01 July 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lemgagrakul

Approved by :
(✓) Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Prompratt

Issue Date : 03 July 2024

The Uncertainties are for a confidence probability of approximately 95%.

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Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2406-0069DSC-2

Cert. No.: 24LM106
Page: 2 of 2

Procedure Used :-
Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2168060	2301216	TPA	11 Oct 2024
2. This certificate is valid only to the item calibrated on date and place of calibration.				
3. This certification is traceable to the International System of Unit.				

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N: 2285965

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	100	25.004	25.2	0.196	0.16	2.00
30.0	100	30.002	30.3	0.298	0.16	2.00
40.0	100	40.003	40.3	0.297	0.16	2.00
50.0	100	50.004	50.3	0.296	0.16	2.00

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100
Bangkok Tel : +669 9205 6851, +669 9247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.com



NSC-TIS-TIS 17025
CALIBRATION 0244

Certificate No. T241121

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cold Room)
Manufacturer : MODULAR
Model : IREYCOHCOO
Serial No. : C00332176
Customer Code : RYG_EN0185
ID No. : T1938A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Phuakdaeng, Rayong 21140



Customer Location : Laboratory

Date of Receipt : 5 June 2024

Calibrated By : Sujjar Nakhakred (Site Calibration Manager)

Approved By : Preecha Phisassuthikul (Temperature Calibration Manager)

Date of Issue : 12 JUN 2024

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards, and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L14 110/18-06-66



Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



NSC-TIS-TIS 17025
CALIBRATION 0244

Certificate No. T241121

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 11 June 2024
Environment : Temperature : 23.1-24.1 °C
Line Voltage : 222.3-226.3 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986).
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN141-TN150	T240402	16 March 2025
TC	TYPE T	TN151-TN160	T240402	16 March 2025
DATA LOGGER	34970A	T193	T240402	16 March 2025

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244).

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 3 Hour 19 Minute AI : 3 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By: [Signature]

FM-L15 118/18-06-66



Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.

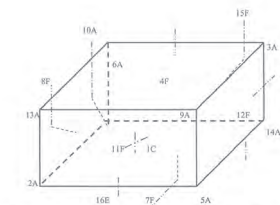


NSC-TIS-TIS 17025
CALIBRATION 0244

Certificate No. T241121

Page 3 of 4

Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C = TN141	11F = TN151
2A = TN142	12F = TN152
3A = TN143	13A = TN153
4F = TN144	14A = TN154
5A = TN145	15F = TN155
6A = TN146	16E = TN156
7F = TN147	
8F = TN148	
9A = TN149	
10A = TN150	

Approved By: _____

FM-L15 118/18-06-66



Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



NSC-TIS-TIS 17025
CALIBRATION 0244

Certificate No. T241121

Page 4 of 4

Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)									
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150
3	2.49	2.79	3.60	2.75	3.28	3.12	3.09	3.08	3.41	2.78
	TN181	TN182	TN183	TN184	TN185	TN186				
	2.77	2.89	2.78	2.90	2.61	3.23				

Chamber (Cold Room)			Temperature Distribution				
Settling (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor
	Min , Max	Average					
3.0	2.9 , 4.3	3.7	2.97	1.23	1.85	1.96	2.00

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By: [Signature]

FM-L15 118/18-06-66

ภาคผนวก จ

สำเนาหนังสือใบอนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

(๓๓๔) นายอนันต์ชัย

๑๕๗) นางสาวอาน

Four

19 Copper...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
20	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Formaldehyde	Distillation, Colorimetric Method ⁽³⁾
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ⁽³⁾ 2) DPD Colorimetric Method ⁽⁴⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
36	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Hexavalent Chromium	Colorimetric Method ⁽⁴⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁴⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

40 Manganese...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	Methomyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
47	Oxamyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
48	Propoxur	High-Performance Liquid Chromatographic Method ⁽⁴⁾
49	pH	Electrometric Method ⁽³⁾
50	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
52	Sulfide	Iodometric Method ⁽⁴⁾
53	Temperature	Laboratory and Field Methods ⁽⁴⁾
54	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ⁽⁴⁾
56	Total Phosphorous	Digestion, Colorimetric Method ⁽⁴⁾
57	Total Suspended Solids	Dried from 103-105 °C ⁽⁴⁾
58	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
60	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

18 Bis(2-ethylhexyl)phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

56 1,3-Dichloropropene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
63	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

76 γ-HCH...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
83	Mercury	1) Digestion, Cold Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
84	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
86	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
87	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

94 N-Nitrosodiphenylamine...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾ 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₉ -C ₁₄)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(4,25)

110 TPH (C₁₀-C₁₅)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C ₁₀ -C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
111	TPH (C ₁₁ -C ₁₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾

จากผลเสีย

จากผลเสีย (ปล่อยรวม) จำนวน 28 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
2	Arsenic	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
3	Beryllium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
4	Cadmium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
5	Carbon Monoxide	1) Instrumental Analyzer Method ⁽⁵⁾ 2) Sampling Bag Non-Dispersive Infrared Method ⁽⁵⁾
6	Chlorine	1) Adsorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
7	Chromium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
8	Cobalt	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
9	Copper	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
10	Cresol	Adsorption Sampling, Gas Chromatographic Method ⁽⁵⁾
11	Dioxins	Isokinetic Sampling ⁽⁵⁾
12	Hydrogen Chloride	1) Adsorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
13	Hydrogen Fluoride	1) Adsorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽⁵⁾

15 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
16	Manganese	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
17	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽⁵⁾
18	Nickel	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
19	Opacity	Ringelmann's Method ⁽⁵⁾
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁽⁵⁾ 2) Absorption Sampling, Alkaline Permanganate/Colorimetric Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽⁵⁾
23	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾
24	Tellurium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
25	Tin	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
26	Total Suspended Particulate	1) Isokinetic Sampling, Gravimetric Method ⁽⁵⁾ 2) Paired Train, Isokinetic Sampling, Gravimetric Method ⁽⁵⁾

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
28	Xylene	Adsorption Sampling, Gas Chromatographic Method ⁽⁵⁾

สิ่งปกคลุมหรือวัสดุที่ไม่ใช่พื้นผิว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,26)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

5 Beryllium...

ลำดับที่	สารพิษ	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,26)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,6,16,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,6,17,19) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,16,19) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method, Calculation Method ^(7,8,17,19)

10 Chromium (VI)...

ลำดับที่	สารมลพิษ	วิธีการตรวจ
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1,6,19) 2) Alkaline Digestion, Colorimetric Method ^(8,40)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,11) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26)

2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

22 Mercury..

ลำดับที่	สารพิษ	วิธีการหา
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(8,6,20) 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1,6,30) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽²⁰⁾ 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽³⁰⁾ 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽²¹⁾
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,28) 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(9,28) 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,26)
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,28) 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(9,28) 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,26)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,29) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1,26)

- 2-ChlorobiphenylL...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	- 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26) Electrometric Method ^(25,25) 4) Digestion, Inductively Coupled Plasma Method ^(1,6,16) 5) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 6) Digestion, Inductively Coupled Plasma Method ^(7,16) 7) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
29	pH	
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

31 Silver...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
35	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

31...

สืบ จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(13,23)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)

11 Benzol(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzol(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
12	Benzol(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
15	Benzo(g,h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(13,23)
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)

23 Cadmium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
24	Carbazole	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
28	p-Chloroaniline	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
32	2-Chlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,16,19) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,17,19)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,19)

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(27,28,29)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)

49 1,2-Dichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

63 Di-n-Octyl Phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽¹³⁾

73 n-Hexane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	α -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
75	β -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
76	γ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽²⁰⁾ 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽²¹⁾ 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾

85 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

96 Polychlorinated biphenyls (PCBs)

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,2',3,4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
97	Pentachlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
98	Phenanthrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

99 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
108	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
109	TPH (C ₈ -C ₁₅)	1) Automate Extraction, Gas Chromatographic Method ^(11,22) 2) Solvent Extraction, Gas Chromatographic Method ^(12,22) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(22,3)
110	TPH (C ₁₅ -C ₃₅)	1) Automate Extraction, Gas Chromatographic Method ^(11,22) 2) Solvent Extraction, Gas Chromatographic Method ^(12,22) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(22,3)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)

115 2,4,5-Trichlorophenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
115	2,4,5-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,16) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,20)
116	2,4,6-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,20) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,20)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,21)
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,21)
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,21)
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,21)
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,21)
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,21)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,21)
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)

เอกสารอ้างอิง

- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2566. เรื่อง การจัดการสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว. ราชกิจจานุเบกษา. 31 พฤษภาคม 2566. เล่มที่ 140 ตอนที่ 126 ง.
- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณ/เกณฑ์ครั้นที่เจือปนในอากาศที่ระเหยออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้แก๊สเป็นเชื้อเพลิง. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนที่ 128.
- สมาคมนักวิชาการสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์. 2547.
- APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24th ed. Washington, DC: APHA, 2023.

5. United States...

- United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2023.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. SW-846, 2014.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Acid Digestion of Sludges and Sediments and Soils. SW-846 Method 3050B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Alkaline Digestion for Hexavalent Chromium. SW-846 Method 3060A, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Separatory Funnel Liquid-Liquid Extraction. SW-846 Method 3510C, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Soxhlet Extraction. SW-846 Method 3540C, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Automated Soxhlet Extraction. SW-846 Method 3541, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Microscale Solvent Extraction (MSE). SW-846 Method 3570, 2002.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Volatile Organic Compounds (VOCs) in Various Sample Matrices Using Equilibrium Headspace Analysis. SW-846 Method 5021A, 2014.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Purge-and-Trap for Aqueous Samples. SW-846 Method 5030B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. SW-846 Method 5035, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Inductively Coupled Plasma-Atomic Emission Spectrometry. SW-846 Method 6010B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Inductively Coupled Plasma-Mass Spectrometry. SW-846 Method 6020A, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Antimony and Arsenic (Atomic Absorption, Borohydride Reduction). SW-846 Method 7062, 1994. (แก้ไข)
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Chromium, Hexavalent (Colorimetric). SW-846 Method 7196A, 1992.

20. United States...

20. United States...

- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique). SW-846 Method 7471B, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry. SW-846 Method 7473, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Nonhalogenated Organics by Gas Chromatography. SW-846 Method 8015C, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. pH Electrometric Measurement. SW-846 Method 9040C, 2004.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Soil and Waste pH. SW-846 Method 9045D, 2004.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8260D, 2018.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8270E, 2018.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Total and Amenable Cyanide: Distillation SW-846 Method 9010B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Cyanide Extraction Procedure for Solids and Oil. SW-846 Method 9013A, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Cyanide in Waters and Extracts Using Titrimetric and Manual Spectrophotometric Procedures. SW-846 Method 9014, 2014.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Mercury in Sediment and Tissue Samples by Atomic Fluorescence Spectrometry. SW-846 Method 7474, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Ultrasonic Extraction. SW-846 Method 3550C, 2007.

31



ที่ ๒๓ ๐๓๐๑๒/ ๔๑๒๑

กรมโรงงานอุตสาหกรรม
ถนนพหลโยธินที่ ๒ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ เมษายน ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท แอลแอล แลบราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอขึ้นรายการของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๔ มีนาคม ๒๕๖๗

พจนาคำขออ้างถึง บริษัท แอลแอล แลบราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔-๙-๐๑๔๓๓-๑๐๔ ขอพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ
เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

๑) นางสาวพรณิศา หุ่นคง ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๒๕๕

๒) นายกำชัย สุทธะ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๒๒๓

๓) นางสาวศุภรดา ปิ่นมูรา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๓๘๘

๒. ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๒ ราย

๑) นางสาวฐานิดา กสินเขียว ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๒๒

๒) นางสาวกัญญ์วิมล สายคำ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๓๓

๓) นางสาวณัฐนันทน์ กิตติวงค์ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๔๔

๔) นายธนากร วงษาเคน ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๕๕

๕) นายอชุตผล ปัญญาวงศ์ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๖๖

๖) นายณชากร หาราชา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๗๗

๗) นายวิรัตน์ ผ่องใสสวน ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๘๘

๘) นายณัฐพงศ์ โสภา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๘๘

๙) นายดิเรกพร ปานเพ็ง ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๙๙

๑๐) นายณัฐพล ชุ่มชื่น ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๕๐๐

๑๑) นายธนา สุภาพบุรินทร์ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๕๐๑

๑๒) นายณรต คุ้มวงศ์ชา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๕๐๒

อนึ่ง หนังสือฉบับนี้

(๕๖) นายพชรกร...

(๕๒) นายพรกร เจ็งเจริญ
(๕๓) นายวิภากร เขื่อนมาก
(๕๔) นายอนุรักษ์ ทองขจรศักดิ์
(๕๕) นายอภิชาติ วิลาศ
(๕๖) นายจรัสศรี ศรีรักษา
(๕๗) นายประสาธน์ มั่นเอนเพชร
(๕๘) นายภาณุวัฒน์ วัชร
(๖๐) นายสันติ ชัยชนะ
(๖๑) นายทินกร กุลชาติ

ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๕๔
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๕๕
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๕๖
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๕๗
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๕๘
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๕๙
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๖๐
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๖๑
ทะเบียนเลขที่ ว-๑๒๓-จ-๐๐๖๒

ค. ขอบข่ายชนิดสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒๘ มิถุนายน ๒๕๖๓ หากประสงค์จะต่ออายุหนังสือ รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายพรศร กัณกรสง)
รองเลขาธิการ
สำนักงานโรงงานอุตสาหกรรม

ศูนย์วิจัยและเคอานกัณกรสงโรงงานภาคตะวันออก
โทร. ๐ ๓๓๓๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒
ไปรษณีย์อิเล็กทรอนิกส์ eww@dw.mae.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวทันฯ ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แล็บอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๑๒๓
ที่ กก ๐๓๒๐/ ๗๕๓๘ ลงวันที่ ๐๔ สิงหาคม ๒๕๖๗

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
น้ำเสีย จำนวน 14 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method ^[2] 2) Closed Reflux, Colorimetric Method ^[2] 3) Closed Reflux, Titrimetric Method ^[2]
3	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[2]
4	Cyanide	Distillation, Colorimetric Method ^[2]
5	Formaldehyde	Distillation, Colorimetric Method ^[1]
6	Free Chlorine	DPD Ferrous Titrimetric Method ^[2]
7	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ^[2]
8	pH	Electrometric Method ^[2]
9	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
10	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
11	Temperature	Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Macro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ^[2]
2	pH	Electrometric Method ^[2]
3	Phenols	Distillation, Direct Photometric Method ^[2]

อากาศเสีย...

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[3] 2) Instrumental Analyzer Method ^[2]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[2]
3	Opacity	Ringelmann's Method ^[4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[4] 2) Instrumental Analyzer Method ^[10]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Acid Method ^[9] 2) Instrumental Analyzer Method ^[11]
6	Sulfuric Acid	Isokinetic Sampling, Barium-Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

เอกสารอ้างอิง

1. ธงชัย พรณวลวิทย์ และวิบูลย์ลักษณ์ วิสสุทธีศักดิ์, บรรณาธิการ, (2547) คู่มือวิเคราะห์น้ำเสีย, พิมพ์ครั้งที่ 4, กรุงเทพฯ: สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย
2. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24th ed. Washington, DC : APHA, 2023
3. กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549, เรื่อง กำหนดค่าปริมาณเพิ่มมากขึ้นที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้แก๊สเป็นเชื้อเพลิง, ราชกิจจานุเบกษา, 4 ธันวาคม 2549, เล่มที่ 123 ตอนพิเศษ 1254
4. กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549, เรื่อง กำหนดค่าปริมาณเพิ่มมากขึ้นที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำของโรงงาน, ราชกิจจานุเบกษา, 4 ธันวาคม 2549, เล่มที่ 123 ตอนพิเศษ 1254
5. United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60, Appendix A, 2017.
6. United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60, Appendix A, 2019.

7. United States...

7. United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60, Appendix A, 2020.
8. United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60, Appendix A, 2023.
9. United States Environmental Protection Agency. Determination of Carbon Monoxide Emission from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60, Appendix A Method 10, 2017.
10. United States Environmental Protection Agency. Determination of Oxide of Nitrogen Emission from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60, Appendix A Method 7E, 2023.
11. United States Environmental Protection Agency. Determination of Sulfur dioxide Emission from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60, Appendix A Method 6C, 2017.



๐๙ ตุลาคม ๒๕๖๗

เรื่อง แก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง หนังสือ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขที่ Env.2024/005
ลงวันที่ ๓๐ สิงหาคม ๒๕๖๗

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ
วิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ ต.อำเภอปลวกแดง
จังหวัดระยอง ขอแก้ไขเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน เนื่องจากมีความคลาดเคลื่อน ความละเอียด
แจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรม ได้รับทราบและดำเนินการแก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการ
วิเคราะห์เอกชน จำนวน ๕ ราย ตามที่แจ้งเรียบร้อยแล้ว เป็นดังนี้

- ลำดับที่ ๒๗ นางพจนา สีดา
- ลำดับที่ ๒๘ นางสาวธนิศา กุลสุริวงศ์
- ลำดับที่ ๓๐ นางชลธิชา สิบงกช
- ลำดับที่ ๓๖ นายสุทธิศักดิ์ โชคปิณฑินท์
- ลำดับที่ ๔๖ นายกันตณณ มณีสัมพันธ์

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายพรยศ กลิ่นกรอง)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

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โทร. ๐ ๓๓๓๓ ๖๐๕๔ ต่อ ๕๐๐๑-๒
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