

ภาคผนวก

ภาคผนวก ก	มาตรฐานน้ำทิ้งจากอาคาร
ภาคผนวก ข	เอกสารการป้องกันและระงับอัคคีภัย
ภาคผนวก ค	อุปกรณ์เก็บตัวอย่างและเครื่องมือตรวจวัด
ภาคผนวก ง	ใบรายงานผลการตรวจวิเคราะห์
ภาคผนวก จ	เอกสารสอบเทียบเครื่องมือ
ภาคผนวก ฉ	หนังสืออนุญาตขึ้นทะเบียน ห้องปฏิบัติการวิเคราะห์เอกชน

ภาคผนวก ก
มาตรฐานน้ำทิ้งจากอาคาร



ประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้ง

จากอาคารบางประเภทและบางขนาด

โดยที่ได้มีการปฏิรูประบบราชการ โดยให้มีการจัดตั้งกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อมขึ้นมา และให้อิโณการกิจของกระทรวงวิทยาศาสตร์ เทคโนโลยีและสิ่งแวดล้อม ในส่วนที่เกี่ยวข้องกับพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ ไปเป็นของกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม ประกอบกันเป็นการสมควรให้คณะกรรมการควบคุมลพิษเป็นผู้พิจารณาเห็นชอบกับวิธีการตรวจหาค่ามาตรฐานการระบายน้ำทิ้ง นอกเหนือจากวิธีการที่กำหนดไว้ เทนกรรมควบคุมลพิษ จึงสมควรแก้ไขปรับปรุงประกาศกระทรวงวิทยาศาสตร์ เทคโนโลยีและสิ่งแวดล้อม เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากอาคารบางประเภทและบางขนาด

อาศัยอำนาจตามความในมาตรา ๕๕ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ แก้ไขโดยมาตรา ๑๑๔ แห่งพระราชกฤษฎีกาแก้ไขบทบัญญัติให้สอดคล้องกับการโอนอำนาจหน้าที่ของส่วนราชการ ให้เป็นไปตามพระราชบัญญัติปรับปรุงกระทรวง ทบวง กรม พ.ศ. ๒๕๔๕ พ.ศ. ๒๕๔๕ อันเป็นพระราชบัญญัติที่มีบทบัญญัติบางประการเกี่ยวกับการจำกัดสิทธิและเสรีภาพของบุคคล ซึ่งมาตรา ๒๕ ประกอบกับมาตรา ๓๕ มาตรา ๔๔ มาตรา ๕๐ และมาตรา ๕๑ ของรัฐธรรมนูญแห่งราชอาณาจักรไทยบัญญัติให้กระทำได้ โดยอาศัยอำนาจตามบทบัญญัติแห่งกฎหมาย รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม โดยคณะนัของคณะกรรมการควบคุมลพิษ และโดยความเห็นชอบของคณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงออกประกาศไว้ ดังต่อไปนี้

ข้อ ๑ ให้ยกเลิกประกาศกระทรวงวิทยาศาสตร์ เทคโนโลยีและสิ่งแวดล้อม เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากอาคารบางประเภทและบางขนาด ลงวันที่ ๑๐ มกราคม พ.ศ. ๒๕๓๗

ข้อ ๒ ในประกาศนี้

“อาคาร” หมายความว่า อาคารที่ก่อสร้างขึ้น ไม่ว่าจะมีลักษณะเป็นอาคารหลังเดียว หรือเป็นกลุ่มของอาคารซึ่งตั้งอยู่ภายในพื้นที่ซึ่งเป็นบริเวณเดียวกัน และไม่ว่าจะมีระยะขนานา่เท่าเดียว หรือมีหลายท่อที่เชื่อมติดต่อกันระหว่างอาคารหรือไม่ก็ตาม ซึ่งได้แก่

(๑) อาคารชุด ตามกฎหมายว่าด้วยอาคารชุด

(๒) โรงแรม ตามกฎหมายว่าด้วยโรงแรม

(๔) อาคารโรงเรียนเอกชน โรงเรียนของทางราชการ สถาบันอุดมศึกษาของเอกชน หรือสถาบันอุดมศึกษาของทางราชการที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๒๕,๐๐๐ ตารางเมตรขึ้นไป

(๕) อาคารที่ทำการของทางราชการ รัฐวิสาหกิจ องค์การระหว่างประเทศ หรือของเอกชนที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๕๕,๐๐๐ ตารางเมตรขึ้นไป

(๖) อาคารของศูนย์การค้าหรือห้างสรรพสินค้าที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๒๕,๐๐๐ ตารางเมตรขึ้นไป

(๗) ตลาดที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๒,๕๐๐ ตารางเมตรขึ้นไป

(๘) กัดาคารหรือร้านอาหารที่มีพื้นที่ให้บริการรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๒,๕๐๐ ตารางเมตรขึ้นไป

ข้อ ๕ อาคารประเภท ข. หมายความว่า อาคารดังต่อไปนี้

(๑) อาคารชุดที่มีจำนวนห้องสำหรับใช้เป็นที่อยู่อาศัยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๑๐๐ ห้องนอน แต่ไม่ถึง ๕๐๐ ห้องนอน

(๒) โรงแรมที่มีจำนวนห้องสำหรับใช้เป็นห้องพักรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๖๐ ห้อง แต่ไม่ถึง ๒๐๐ ห้อง

(๓) หอพักที่มีจำนวนห้องสำหรับใช้เป็นที่อยู่อาศัยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๒๕๐ ห้องขึ้นไป

(๔) สถานบริการที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๕,๐๐๐ ตารางเมตรขึ้นไป

(๕) โรงพยาบาลของทางราชการ รัฐวิสาหกิจ หรือสถานพยาบาล ตามกฎหมายว่าด้วยสถานพยาบาล ที่มีเตียงสำหรับผู้ป่วยไว้ค้างคืนรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๑๐ เตียง แต่ไม่ถึง ๓๐ เตียง

(๖) อาคารโรงเรียนเอกชน โรงเรียนของทางราชการ สถาบันอุดมศึกษาของเอกชน หรือสถาบันอุดมศึกษาของทางราชการที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๕,๐๐๐ ตารางเมตร แต่ไม่ถึง ๒๕,๐๐๐ ตารางเมตร

(๓) หอพัก ตามกฎหมายว่าด้วยหอพัก

(๔) สถานบริการประเภทสถานอาบน้ำ นวดหรืออบตัว ซึ่งมีผู้ให้บริการแก่ลูกค้า ตามกฎหมายว่าด้วยสถานบริการ

(๕) โรงพยาบาลของทางราชการหรือสถานพยาบาล ตามกฎหมายว่าด้วยสถานพยาบาล

(๖) อาคารโรงเรียนเอกชน ตามกฎหมายว่าด้วยโรงเรียนเอกชน โรงเรียนของทางราชการ อาคารสถาบันอุดมศึกษาของเอกชน ตามกฎหมายว่าด้วยสถาบันอุดมศึกษาของเอกชนและสถาบันอุดมศึกษาของทางราชการ

(๗) อาคารที่ทำการของทางราชการ รัฐวิสาหกิจ หรือองค์การระหว่างประเทศและของเอกชน

(๘) อาคารของศูนย์การค้าหรือห้างสรรพสินค้า

(๙) ตลาด ตามกฎหมายว่าด้วยการสาธารณสุข แต่ไม่รวมถึง ท่าเทียบเรือประมง สะพานปลา หรือกิจการแพปลา

(๑๐) กัดาคารหรือร้านอาหาร

“น้ำทิ้ง” หมายความว่า น้ำเสียที่ผ่านระบบบำบัดน้ำเสียแล้วจนเป็นไปตามมาตรฐานควบคุมการระบายน้ำทิ้งตามที่กำหนดไว้ในประกาศนี้

ข้อ ๓ ให้แบ่งประเภทของอาคารตามข้อ ๒ ออกเป็น ๕ ประเภท คือ

(๑) อาคารประเภท ก.

(๒) อาคารประเภท ข.

(๓) อาคารประเภท ค.

(๔) อาคารประเภท ง.

(๕) อาคารประเภท จ.

ข้อ ๔ อาคารประเภท ก. หมายความว่า อาคารดังต่อไปนี้

(๑) อาคารชุดที่มีจำนวนห้องสำหรับใช้เป็นที่อยู่อาศัยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๕๐๐ ห้องนอนขึ้นไป

(๒) โรงแรมที่มีจำนวนห้องสำหรับใช้เป็นห้องพักรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๒๐๐ ห้องขึ้นไป

(๓) โรงพยาบาลของทางราชการ รัฐวิสาหกิจหรือสถานพยาบาล ตามกฎหมายว่าด้วยสถานพยาบาล ที่มีเตียงสำหรับผู้ป่วยไว้ค้างคืนรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๓๐ เตียงขึ้นไป

(๗) อาคารที่ทำการของทางราชการ รัฐวิสาหกิจ องค์การระหว่างประเทศ หรือของเอกชนที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๑๐,๐๐๐ ตารางเมตร แต่ไม่ถึง ๕๕,๐๐๐ ตารางเมตร

(๘) อาคารของศูนย์การค้าหรือห้างสรรพสินค้าที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๕,๐๐๐ ตารางเมตร แต่ไม่ถึง ๒๕,๐๐๐ ตารางเมตร

(๙) ตลาดที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๑,๕๐๐ ตารางเมตร แต่ไม่ถึง ๒,๕๐๐ ตารางเมตร

(๑๐) กัดาคารหรือร้านอาหารที่มีพื้นที่ให้บริการรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๕๐๐ ตารางเมตร แต่ไม่ถึง ๒,๕๐๐ ตารางเมตร

ข้อ ๖ อาคารประเภท ค. หมายความว่า อาคารดังต่อไปนี้

(๑) อาคารชุดที่มีจำนวนห้องสำหรับใช้เป็นที่อยู่อาศัยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารไม่ถึง ๑๐๐ ห้องนอน

(๒) โรงแรมที่มีจำนวนห้องสำหรับใช้เป็นห้องพักรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารไม่ถึง ๖๐ ห้อง

(๓) หอพักที่มีจำนวนห้องสำหรับใช้เป็นที่อยู่อาศัยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๕๐ ห้อง แต่ไม่ถึง ๒๕๐ ห้อง

(๔) สถานบริการที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๑,๐๐๐ ตารางเมตร แต่ไม่ถึง ๕,๐๐๐ ตารางเมตร

(๕) อาคารที่ทำการของทางราชการ รัฐวิสาหกิจ องค์การระหว่างประเทศ หรือของเอกชนที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๕,๐๐๐ ตารางเมตร แต่ไม่ถึง ๑๐,๐๐๐ ตารางเมตร

(๖) ตลาดที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคารหรือกลุ่มของอาคารตั้งแต่ ๑,๐๐๐ ตารางเมตร แต่ไม่ถึง ๑,๕๐๐ ตารางเมตร

(๗) กัดาคารหรือร้านอาหารที่มีพื้นที่ให้บริการรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๒๕๐ ตารางเมตร แต่ไม่ถึง ๕๐๐ ตารางเมตร

ข้อ ๗ อาคารประเภท ง. หมายความว่า อาคารดังต่อไปนี้

(๑) หอยพิคที่มีจำนวนห้องสำหรับใช้เป็นที่อยู่อาศัยร่วมกันทุกชั้นของอาคาร หรือกลุ่มของอาคาร ตั้งแต่ ๑๐ ห้อง แต่ไม่ถึง ๕๐ ห้อง

(๒) ตลาดที่มีพื้นที่ใช้สอยรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคารตั้งแต่ ๕๐๐ ตารางเมตร แต่ไม่ถึง ๑,๐๐๐ ตารางเมตร

(๓) กัดดาการหรือร้านอาหารที่มีพื้นที่ให้บริการรวมกันทุกชั้นของอาคาร หรือกลุ่มของอาคาร ตั้งแต่ ๑๐๐ ตารางเมตร แต่ไม่ถึง ๒๕๐ ตารางเมตร

ข้อ ๘ อาคารประเภท จ. หมายความว่า กัดดาการหรือร้านอาหารที่มีพื้นที่ให้บริการรวมกันทุกชั้นไม่ถึง ๑๐๐ ตารางเมตร

ข้อ ๙ มาตรฐานควบคุมการระบายน้ำทิ้งจากอาคาร ประเภท ก. ต้องมีค่าดังต่อไปนี้

(๑) ความเป็นกรดและด่าง (PH) ต้องมีค่าระหว่าง ๕-๘

(๒) บีโอดี (BOD) ต้องมีค่าไม่เกิน ๒๐ มิลลิกรัมต่อลิตร

(๓) สารแขวนลอย (Suspended Solids) ต้องมีค่าไม่เกิน ๓๐ มิลลิกรัมต่อลิตร

(๔) ซัลไฟด์ (Sulfide) ต้องมีค่าไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร

(๕) สารที่ละลายได้ทั้งหมด (Total Dissolved Solids) ต้องมีค่าเพิ่มขึ้นจากปริมาณสารละลายในน้ำใช้ตามปกติไม่เกิน ๕๐๐ มิลลิกรัมต่อลิตร

(๖) ตะกอนหนัก (Settleable Solids) ต้องมีค่าไม่เกิน ๐.๕ มิลลิตรต่อลิตร

(๗) น้ำมันและไขมัน (Fat Oil and Grease) ต้องมีค่าไม่เกิน ๒๐ มิลลิกรัมต่อลิตร

(๘) ทีเคเอ็น (TKN) ต้องมีค่าไม่เกิน ๓๕ มิลลิกรัมต่อลิตร

ข้อ ๑๐ มาตรฐานควบคุมการระบายน้ำทิ้งจากอาคาร ประเภท ข. ต้องเป็นไปตามข้อ ๘ เว้นแต่

(๑) บีโอดี ต้องมีค่าไม่เกิน ๓๐ มิลลิกรัมต่อลิตร

(๒) สารแขวนลอย ต้องมีค่าไม่เกิน ๔๐ มิลลิกรัมต่อลิตร

ข้อ ๑๑ มาตรฐานควบคุมการระบายน้ำทิ้งจากอาคาร ประเภท ก. ต้องเป็นไปตามข้อ ๘ เว้นแต่

(๑) บีโอดี ต้องมีค่าไม่เกิน ๔๐ มิลลิกรัมต่อลิตร

(๒) สารแขวนลอย ต้องมีค่าไม่เกิน ๕๐ มิลลิกรัมต่อลิตร

(๓) ซัลไฟด์ ต้องมีค่าไม่เกิน ๓.๐ มิลลิกรัมต่อลิตร

(๔) ค่าทีเคเอ็น ต้องมีค่าไม่เกิน ๔๐ มิลลิกรัมต่อลิตร

ข้อ ๑๒ มาตรฐานควบคุมการระบายน้ำทิ้งจากอาคาร ประเภท ง. ต้องเป็นไปตามข้อ ๘ เว้นแต่

(๑) บีโอดี ต้องมีค่าไม่เกิน ๕๐ มิลลิกรัมต่อลิตร

(๒) สารแขวนลอย ต้องมีค่าไม่เกิน ๕๐ มิลลิกรัมต่อลิตร

(๓) ซัลไฟด์ ต้องมีค่าไม่เกิน ๔.๐ มิลลิกรัมต่อลิตร

(๔) ค่าทีเคเอ็น ต้องมีค่าไม่เกิน ๔๐ มิลลิกรัมต่อลิตร

ข้อ ๑๓ มาตรฐานควบคุมการระบายน้ำทิ้งจากอาคาร ประเภท จ. ต้องมีค่าดังต่อไปนี้

(๑) ความเป็นกรดและด่างต้องมีค่าระหว่าง ๕-๘

(๒) บีโอดี ต้องมีค่าไม่เกิน ๒๐๐ มิลลิกรัมต่อลิตร

(๓) สารแขวนลอย ต้องมีค่าไม่เกิน ๖๐ มิลลิกรัมต่อลิตร

(๔) น้ำมันและไขมัน ต้องมีค่าไม่เกิน ๑๐๐ มิลลิกรัมต่อลิตร

ข้อ ๑๔ การตรวจสอบมาตรฐานการระบายน้ำทิ้งจากอาคาร ให้ใช้วิธีการดังต่อไปนี้

(๑) การตรวจสอบค่าความเป็นกรดและด่างให้กระทำโดยใช้เครื่องวัดความเป็นกรดและด่างของน้ำ (PH Meter)

(๒) การตรวจสอบค่าบีโอดีให้กระทำโดยใช้วิธีการอะไซด์โมดิฟิเคชัน (Azide Modification) ที่อุณหภูมิ ๒๐ องศาเซลเซียส เป็นเวลา ๕ วัน ติดต่อกันหรือวิธีการอื่นที่คณะกรรมการควบคุมมลพิษให้ความเห็นชอบ

(๓) การตรวจสอบค่าสารแขวนลอยให้กระทำโดยใช้วิธีการกรองผ่านกระดาษกรองใยแก้ว (Glass Fibre Filter Disc)

(๔) การตรวจสอบค่าซัลไฟด์ให้กระทำโดยใช้วิธีการไทเตรท (Titrate)

(๕) การตรวจสอบค่าสารที่ละลายได้ทั้งหมดให้กระทำโดยใช้วิธีการระเหยแห้งระหว่างอุณหภูมิ ๑๐๓ องศาเซลเซียส ถึงอุณหภูมิ ๑๐๕ องศาเซลเซียส ในเวลา ๑ ชั่วโมง

(๖) การตรวจสอบค่าตะกอนหนักให้กระทำโดยใช้วิธีการกรวยอิมมอฟฟ์ (Imhoff cone) ขนาดบรรจุ ๑,๐๐๐ ลูกบาศก์เซนติเมตร ในเวลา ๑ ชั่วโมง

(๑) การตรวจสอบค่าน้ำมันและไขมันให้กระทำโดยใช้วิธีการสกัดด้วยตัวทำละลาย แอลกอฮอล์ น้ำหนักของน้ำมันและไขมัน

(๘) การตรวจสอบค่าทีเคเอ็นให้กระทำโดยใช้วิธีการเจลดาล์ด (Kjeldahl)

ข้อ ๑๕ การคิดคำนวณพื้นที่ใช้สอย จำนวนอาคารและจำนวนห้องของอาคาร หรือกลุ่มของอาคาร ให้เป็นไปตามวิธีการที่คณะกรรมการควบคุมมลพิษกำหนด โดยประกาศในราชกิจจานุเบกษา

ข้อ ๑๖ วิธีการเก็บตัวอย่างน้ำ ความถี่ และระยะเวลาในการเก็บตัวอย่างน้ำ ให้เป็นไปตามที่คณะกรรมการควบคุมมลพิษกำหนด โดยประกาศในราชกิจจานุเบกษา

ข้อ ๑๗ ประกาศนี้ให้ใช้บังคับตั้งแต่วันถัดจากวันประกาศในราชกิจจานุเบกษาเป็นต้นไป

ประกาศ ณ วันที่ ๑๗ พฤศจิกายน พ.ศ. ๒๕๔๔

ยงยุทธ ดิยะไพรัช

รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

ภาคผนวก ข
เอกสารการป้องกันและระงับอัคคีภัย





ที่ กท ๑๘๐๕/๕๖๒

สำนักป้องกันและบรรเทาสาธารณภัย
๗๗/๑ ถนนพระรามที่ ๖ กทม. ๑๐๕๐๐

๑๗ กุมภาพันธ์ ๒๕๖๔

เรื่อง การฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ

เรียน ผู้จัดการโรงแรมเชงกรีล่า กรุงเทพฯ

สิ่งที่ส่งมาด้วย หนังสือรับรองการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ

ตามที่ โรงแรมเชงกรีล่า กรุงเทพฯ ขอรับการสนับสนุนวิทยากรทำการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ให้แก่พนักงานภายใน โรงแรมเชงกรีล่า กรุงเทพฯ นั้น

กองปฏิบัติการดับเพลิงและกู้ภัย ๒ สำนักป้องกันและบรรเทาสาธารณภัย ได้จัดวิทยากรพร้อมอุปกรณ์ไปดำเนินการฝึกซ้อม ตามที่ขอรับการสนับสนุนแล้ว โดยทำการฝึกซ้อม ณ โรงแรมเชงกรีล่า กรุงเทพฯ เมื่อวันที่ ๔ ธันวาคม ๒๕๖๓ และได้รับรายงานจาก พ.อ.อ.มานพ ชื่นธงพงษ์ ตำแหน่งเจ้าพนักงานป้องกันและบรรเทาสาธารณภัยชำนาญการ วิทยากร ว่าพนักงานภายใน โรงแรมเชงกรีล่า กรุงเทพฯ จำนวน ๑๑๔๔ คน ได้ผ่านการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ตามกฎกระทรวงแรงงาน กำหนดมาตรฐานในการบริหารจัดการและดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม ในการทำงานเกี่ยวกับการป้องกันและระงับอัคคีภัย พุทธศักราช ๒๕๕๕ แล้ว

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

พันตำรวจโท

(สมเกียรติ นนทแก้ว)

ผู้อำนวยการสำนักป้องกันและบรรเทาสาธารณภัย

สำนักป้องกันและบรรเทาสาธารณภัย
โทร. ๐ ๒๓๕๔ ๖๘๔๖



ที่ กท ๑๘๐๕/๕๖๓

สำนักป้องกันและบรรเทาสาธารณภัย
๗๗/๑ ถนนพระรามที่ ๖ กทม. ๑๐๕๐๐

หนังสือฉบับนี้ให้ไว้เพื่อรับรองว่าพนักงานภายใน โรงแรมเชงกรีล่า กรุงเทพฯ ที่ตั้งเลขที่ ๘๘ ซอยวัดสวนพลู แขวงบางรัก เขตบางรัก กรุงเทพมหานคร ๑๐๕๐๐ โดยมี นายสันต์ เอี่ยมเทียม กับพวกรวม ๑๑๔๔ คน (ตามบัญชีรายชื่อแนบท้ายหนังสือฉบับนี้) ได้ผ่านการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ตามกฎกระทรวงแรงงาน กำหนดมาตรฐานในการบริหารจัดการและดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับการป้องกันและระงับอัคคีภัย พุทธศักราช ๒๕๕๕ เมื่อวันที่ ๔ ธันวาคม ๒๕๖๓ โดยทำการฝึกซ้อม ณ โรงแรมเชงกรีล่า กรุงเทพฯ และได้รับการสนับสนุนวิทยากรจากสำนักป้องกันและบรรเทาสาธารณภัย ซึ่งเป็นหน่วยงานฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ได้รับอนุญาตจากกรมสวัสดิการและคุ้มครองแรงงาน ใบอนุญาต เลขที่ ดพฝ.-ร ๒๐๒ ผลการฝึกอบรม ดี

ให้ไว้ ณ วันที่ ๑๗ กุมภาพันธ์ พุทธศักราช ๒๕๖๔

พันตำรวจโท

(สมเกียรติ นนทแก้ว)

ผู้อำนวยการสำนักป้องกันและบรรเทาสาธารณภัย

รายงานผลการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ
(สำหรับหน่วยงานที่ได้รับอนุญาตเท่านั้น)

ชื่อหน่วยงานที่ได้รับใบอนุญาต กรุงเทพมหานคร
หมายเลขใบอนุญาตตฟป.-ร. ๒๐๒๒หมดอายุ ๑๐ พฤษภาคม พ.ศ. ๒๕๖๔
อ้างอิงหนังสือแจ้งการฝึก เลขที่ ลงวันที่

ส่วนที่ ๑ รายงานการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ

- ข้อมูลสถานประกอบกิจการที่เข้ารับการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ
ชื่อสถานประกอบกิจการ โรงแรมเซกักร้า กรุงเทพมหานคร
ประเภทกิจการ โรงแรมเซกักร้า
เลขที่ ๘๘ หมู่ที่ ๑๑ ซอย วัดดอนพลู ถนนเจริญกรุง
ตำบล/แขวง บางรัก อำเภอ/เขต บางรัก จังหวัด กรุงเทพมหานคร
โทรศัพท์ ๐๒-๒๓๖๗๗๗ โทรสาร
- วัน เดือน ปี ที่ฝึกซ้อม ๔ ธันวาคม ๒๕๖๓
- จำนวนผู้เข้ารับการฝึกซ้อมดับเพลิง คน หญิง คน ชาย คน
- จำนวนผู้เข้ารับการฝึกซ้อมอพยพหนีไฟ ๑๑๔๙ คน หญิง ๕๙๒ คนชาย ๕๕๗ คน
- ระยะเวลาในการฝึกซ้อมอพยพหนีไฟ ๕.๐๐ นาที
(เริ่มตั้งแต่สัญญาณอพยพหนีไฟดังขึ้น จนถึงคนสุดท้ายมาถึงจุดรวมพล)
- ชื่อวิทยากรผู้ดำเนินการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ
๖.๑ พ.อ.อ.มานพ ชื่นพงษ์ ๖.๒ นายนิพนธ์ ราชคง
๖.๓ นายอำนาจ จานสี ๖.๔
- ชื่อผู้ดูแลการฝึกซ้อม
๗.๑ พ.อ.อ.มานพ ชื่นพงษ์ ๗.๒
๗.๓ ๗.๔

ลงชื่อ (พ.อ.อ.มานพ ชื่นพงษ์)
ผู้จัดทำรายงาน
วัน/เดือน/ปี ที่รายงาน

ลงชื่อ พันตำรวจโท (สมเกียรติ นนทแก้ว)
ผู้มีอำนาจกระทำการให้องค์หน่วยงานนี้ขอรับ
ฝึกซ้อมดับเพลิงและหนีไฟ
พร้อมประทับตรา (ถ้ามี)

ส่วนที่ ๒ การรับรอง

ข้าพเจ้าขอรับรองว่าได้รับการฝึกซ้อมดับเพลิงและหนีไฟตามรายละเอียดข้างต้นจริง

ลงชื่อ (พ.อ.อ.มานพ ชื่นพงษ์) วิทยากร ลงชื่อ (นายนิพนธ์ ราชคง) วิทยากร
ลงชื่อ (นายอำนาจ จานสี) วิทยากร ลงชื่อ () วิทยากร

ลงชื่อ นายจ้าง/เจ้าของสถานประกอบกิจการที่ได้รับการฝึกซ้อม
(ดับเพลิงและฝึกซ้อมอพยพหนีไฟ หรือผู้มีอำนาจกระทำการแทน)

ตามกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับความปลอดภัยและระงับอัคคีภัย พ.ศ. ๒๕๕๕ ลงวันที่ ๗ ธันวาคม พ.ศ. ๒๕๕๕
มีผู้เข้ารับการฝึกอบรม จำนวน ๑๑๔๙ คน

เมื่อวันที่ ๔ ธันวาคม พุทธศักราช ๒๕๖๓

ในวันที่ ๑๕ กพ ๒๕๖๔

ที่สำนักงาน

(สมเกียรติ นนทแก้ว)

ผู้อำนวยการสำนักป้องกันและบรรเทาสาธารณภัย

ปฏิบัติราชการแทนผู้ว่าราชการกรุงเทพมหานคร



กรุงเทพมหานคร



คู่มือฉบับที่ ๓/๒๕๖๓

ได้รับใบอนุญาตจากกรมสวัสดิการและคุ้มครองแรงงาน ใบอนุญาตเลขที่ ตฟป.-ร ๒๐๒

ขอรับรองว่า

โรงแรมเซกักร้า กรุงเทพมหานคร

ตั้งอยู่เลขที่ ๘๘ ซอยวัดดอนพลู บางรัก เขตบางรัก กรุงเทพมหานคร ๑๐๕๐๐

ได้ดำเนินการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ

Type 3 Fire Evacuation Drill Report

Date : December 03, 2020
Location : MW and CPT
Observer : 8 pax

Fire department 5 person to be observer at:

- | | | |
|---|---|--|
| 1. Fire scene
2. MW lobby & Assembly point
3. CPT level 1 & Assembly point
4. CPT level 8
5. MW level 1 corridor
6. MW level 19
7. MW level 21
8. KTW level 22 | } | Fire department

Hotel staff |
|---|---|--|

Scenario:

Code 1

- Fire alarm activated at MW guest room#1818. FCC Operator informed via walkie-Talkie to ERT and group SMS Code 1.
- ERT 1 proceeds to scene to rectify the root cause.
- ERT 2 after got code 1 should prepares & stand-by at fire cart with proper fire man suit.
- ERT 1 arrives at scene found smoke spread in the room
- ERT 1 found a lot smoke and found out one guest lay down on the floor with cigarette butt and tray
- ERT 1 confirms presence of fire with FCC.
- ERT 1 try to rescue the casualties inside the room (Scenario 1 casualty at fire scene)
- ERT Leader (DM) informs Fire Command Center Operator to escalate situation to Code 2. Fire Command Center Operator activates group SMS Code 2 and via walkie-talkie to call Support team.

Code 2

- ERT 1 continues to fighting the fire with appropriated equipment (Used fire hose reel to control fire from outside the room to prevent fire spread out. Do not enter the room without PPE)
- ERT 2 proceeds to fire scene with full gear of firefighting equipment and fire cart to assist ERT 1.
- Code 2 was raised then GM and other CMT proceeds to Fire Command Center and all stay alert (where relevant) for possible evacuation (Refer to Crisis Team role & responsibility.) Then follow the CMT checklist and updated the present situation of their own staff & area to GM.
- Waiting further instruction
- Fire wardens/Evacuation Team prepares to sweep the floors.
- All Outlet Manager prepares for evacuation.
- 4 minutes after activation of Code 1, it escalated to Code 2. Fire alarm Bell & Emergency PA activates; 2 floors above and 1 floor below (Partial evacuation).
- Guest room Fire warden Team start to sweep all guest rooms. Fire Warden Team will hang "ALL CLEAR" tags on room door and assist guest to evacuate.
- ERT Leader continuously update/informs/brief to GM via Walkie Talkie/ Others communication devices. (Make decision to call fire Bangrak fire department)
- Front Office & Concierge prepare themselves to assist guests.

Type 3 Fire Evacuation Drill Report

- Lifts automatically home (Guest lift on level 2, Service lift on level 1).
- Security will inform ERT 1 to activate fire man lift.
- Bangrak fire department fire fighter team arrive at fire scene and continue to extinguish the fire.

Code 3 – Few minutes later (Depend on GM/ERT Leader Command) .

- DM with the approval of GM activate Code 3.
- DM informed FCC to activate alarm to entire of Hotel building. (MW&CPT)
- Fire Warden at all areas assists guest and employees to evacuate building.
- All staffs evacuated to assembly point, MW at staff entrance and CPT at lobby driveway then report head count to their Div/Dept Head.
- All staffs from CPT evacuated from the building after the bell and public announce broadcasted.
- Div/Dept Head performed headcount and report missing staff to DOHR.
- All tenant staff check their own member and report to Leasing Mgr.
- CMT report fire scene situation, evacuation process, areas inspection and report staff missing to GM.
- Fire department arrived at fire scene then continues fighting with the fire and ask ERT member leave the scene.
- CMT member follow the CMT checklist according to code3 evacuation to GM.
- GM declares evacuation drill over upon receiving "ALL CLEAR" from Evacuation Team Leader / GM deliver a short speech emphasizing on the importance of this drill, and thanks everyone, including the guests and contractors (if any), for participating in this drill.
- Group Photo with fire department
- All staff and guests return to the building and resume their activities.
- Post Mortem of Fire Drill at level 3 meeting room.
- Observation/Area for Improvement
- Overview from **Management - Fire brigade**
- Drill exercise key information record
- Total staffs that participants in this drill
- M&E equipment interface & interlock check
- Submit report to DOE/RM/GM
- Final submit report to Fire department and labour department.

Type 3 Fire Evacuation Drill Report

Observation/Area for Improvement	Action Plan	Action By
<u>Khun Manop fire department – Fire Scene</u>		
- ERT1 fast responded	info	ERT
- ERT1 should enter the room even found smoke inside. A short of time fire is not a big that may can save casualty inside the room.	ERT training	FLSM/ERT
- Operator does not inform fire department to request fire engine to support.	Communication	GSC/DM
- ERT well improve to organize fire hose and first team & support team.	info	Info
<u>Fire department – MW Assembly point level 1</u>		
- Well organize staff roll call at assembly point.	Info	Info
- Information of missing staff should inform to fire department to future process	Info	HRD/FO
<u>Fire department – KTW Assembly point level 1</u>		
- There were Kerry staff around 30 persons at assembly area.	Info	Info
- Can not hear bell & PA announcement	Systems rectifies	FLSM
<u>Fire department – CPT Level 8 - 9</u>		
- Bell & PA does not activate.	System rectifies	FLSM
<u>Overview from Management -</u>		
<u>GM</u>		
- GM was not received SMS for code 1 & 2, SMS Timing is delay	Check SMS system	FLSM/IT Mgr.
- Upon activation code 2, Duty manager should update present situation to GM	ERT Briefing	ERT
- HR department is handling staff roll call however do not see guest roll call from FO	FO	FO
<u>DOE</u>		
- Bell & PA were not function must rectify and re-conducting at CPT building	Info	Info

Type 3 Fire Evacuation Drill Report

<u>DOR</u>		
- KTW building bell was rang a few minutes, there was guest room# 763 called the operator for information.	info	FLSM
<u>Dir. of Security</u>		
- Missing staff name list must immediately action & inform to concerns as per fire department suggestion,	Training	Fire warden

1) DRILL EXERCISE KEY INFORMATION:

1	Date & Time:	December 3 rd , 2020 at 13:46 hrs
2	Incident	Electrical short circuit cause Ignited bed and fire eventually spread inside the room
3	Activation Type :	Code 1 Smoke detector in MW Level 18 Room#1818
4	Emergency Signals	
	In-house m/p Signal to ERT	Code 1 13:46 hrs (Via Walkie-Talkie)
	SMS Signal to CMT	Code 1 13:48 hrs. (SMS)
	In-house m/p Signal to ERT	Code 2 13:48 hrs (Via Walkie-Talkie)
	SMS Signal to CMT	Code 2 13:54 hrs. (SMS)
	In-house m/p Signal to ERT	Code 3 13:54 hrs. (Bell rang entire the building)
	SMS Signal to CMT	Code 3 13:59 hrs.
5	ERT Arrival Time:	13:48 hrs.
6	ERT Command Post Set Up:	Time 13:49 hrs.
7	Fire Fighting Equipment used:	Extinguishers, Fire hose & Hydrant, Fire cart, SCBA
8	Inform GM/ HM:	Time 13:49 hrs. (DM informed GM via mobile phone)
9	CMT activated	Time 13:51 hrs.
10	Evacuation Order Approved / Floors :	Time 13:50 hrs. Partial evacuation (System) 13:54 hrs. Entire building evacuation.
11	Emergency Alarms Activated:	Yes
	- Flashing Evacuation Light activated	Yes in Disable guest room
	- Alarm Bell activated	Yes
	- PA Announcement	Yes
	- Lift homing	Yes
12	Fire Department arrival on scene:	Time 13:56 hrs.
13	Evacuation Plan Activated	Time 13:50 hrs.
	Fire Marshal Point 1 Lobby	Yes
	Fire Marshal Point 2 Basement	Yes

Type 3 Fire Evacuation Drill Report

Fire Marshal Point 3 Assembly	Yes
Fire Marshal Point 4 All outlet	Yes
14 Staff List Obtained – Print Out	Yes
15 In House Guest List Obtained	NO
16 Assembly Pt Organized & Orderly	Yes
17 Duty Rosters obtained	Yes (Sign in-out log)
18 Roll Call Finished	Time 13:58 hrs.
19 Lift Homing (Automatic)	Time Yes at 13:50 hrs.
20 Injured Parties	: No casualty
21 Crisis Management Team Set Up (Location/Time):	
22 Drill Completed Time:	14:08 hrs.

Total staffs participants in this drill

Shangri- la Hotel Staff Total: 318 persons.

CPT Building (Kerry Staff) Total: 828 persons

M&E equipment fire alarm interlock check sheet

Magnetic door holder release

Location	Magnetic release	Door close properly	Reset back to normal	Remarks
MW Basement front ST-12	Yes	Yes	Yes	
MW Basement Front pump room	Yes	Yes	Yes	
MW L1 Next2 kitchen to BBQ	Yes	Yes	Yes	
MW L1 Next2 kitchen to restaurant	Yes	Yes	Yes	
MW L1 Next2 kitchen to restaurant	Yes	Yes	Yes	
MW L1 Front Room service	Yes	Yes	Yes	
MW L1 Service lift area	Yes	Yes	Yes	
MW L1 corridor front laundry room	Yes	Yes	Yes	
MW L1 near guest lift	Yes	Yes	Yes	
MW L1 front business center	Yes	No	Yes	
MW L1 Main kitchen front	Yes	Yes	Yes	
MW L1 corridor receiving	Yes	Yes	Yes	
MW L1 corridor to function room roller shutter	Yes	Yes	Yes	

Type 3 Fire Evacuation Drill Report

MW L1 staff corridor linen storage #1 roller shutter	Yes	Yes	Yes	
MW L1 staff corridor linen storage #2 roller shutter	Yes	Yes	Yes	
MW L1 Volti roller shutter	Yes	Yes	Yes	
MW L2 Service lift area	Yes	Yes	Yes	
MW L2 Lobby front Volti restaurant	Yes	Yes	Yes	
MW L2 Lobby corridor front ballroom	Yes	Yes	Yes	
MW L2 Volti restaurant Entrance roller shutter	Yes	Yes	Yes	
MW L2 front ballroom roller shutter	Yes	Yes	Yes	
MW L2 ballroom escalator roller shutter	Yes	Yes	Yes	
MW L2 Shang palace shutter	No	No	No	
MW L3 Service lift area	Yes	Yes	Yes	
MW L3 Corridor clock tower	Yes	Yes	Yes	
MW L3 Escalator roller shutter	Yes	Yes	Yes	
MW L4 Service lift area	Yes	Yes	Yes	

Cut-off AHUs

Location	Floor																							
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
Guest floor AHUs shut-off	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
Reset back to normal	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			

Pressurization fans

Location	Automatic start	Reset back to normal	Remarks
MW ST-07	Yes	Yes	
MW ST-09	Yes	Yes	
MW ST-12	Yes	Yes	
CPT ST - 6	Yes	Yes	
CPT ST - 8	Yes	Yes	

Lift Homing

Location	Sandwich alarm Lift Landing	Reset back to normal	Remarks
Guest lift no. 1 – 7 at level 2	Y	Y	
Service lift no. 8 – 11 at level 1	Y	Y	
Car park lift no. 12 – 13 at level 2	Y	Y	
Podium lift no. 14 – 18 at level 1	Y	Y	
CPT lift no.8 – 12 at level 1	Y	Y	

Type 3 Fire Evacuation Drill Report

Fire Drill Conducted



(Wasan Iamtiam)
ADOE

Reviewed By:



(Woon Swee Tong)
DOE

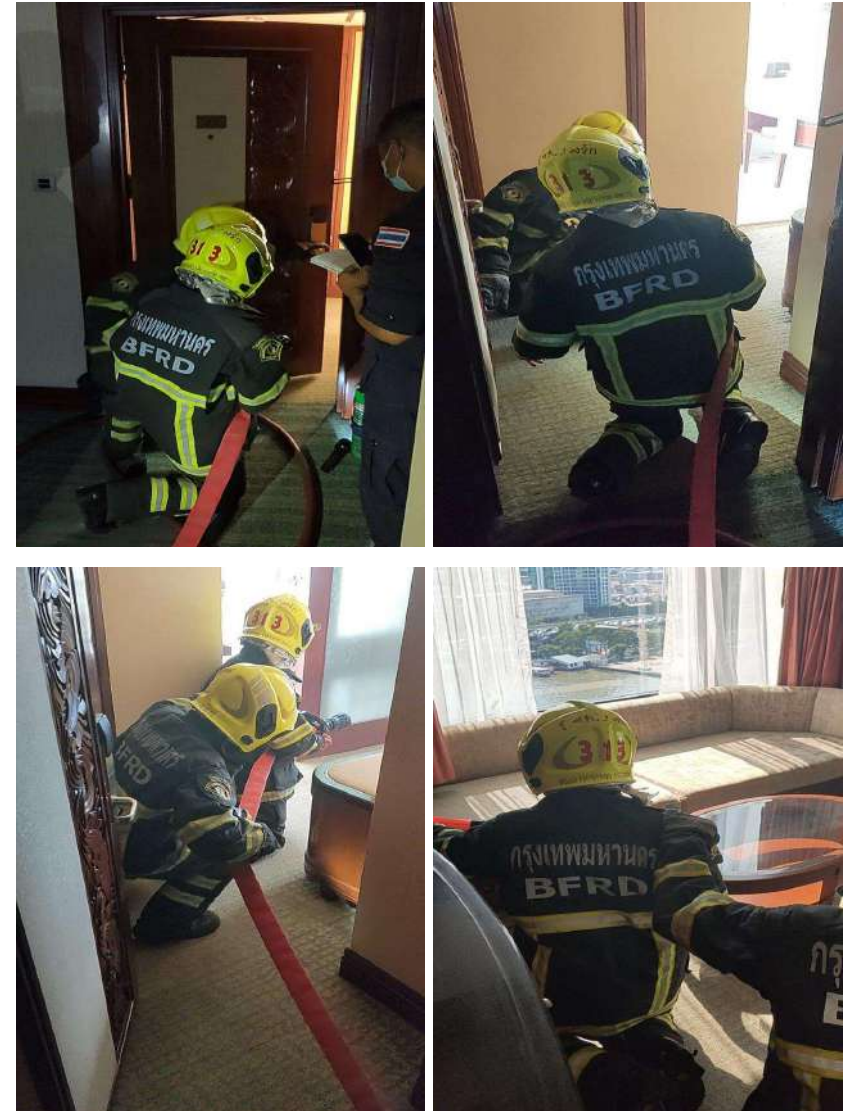
Type 3 Fire Evacuation Drill Report



Type 3 Fire Evacuation Drill Report



Type 3 Fire Evacuation Drill Report



Type 3 Fire Evacuation Drill Report



ภาคผนวก ค
อุปกรณ์เก็บตัวอย่างและเครื่องมือตรวจวัด





(ก) เครื่องวัดค่าความเป็นกรด-ด่าง (pH Meter)



(ข) อุปกรณ์เก็บตัวอย่างแบบเข็อก



(ค) ถุงมือยาง



(ง) ภาชนะบรรจุตัวอย่าง

อุปกรณ์เก็บตัวอย่าง และเครื่องมือตรวจวัด

ภาคผนวก ง
ใบรายงานผลการตรวจวิเคราะห์



ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHARDENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : WASTEWATER TREATMENT PLANT
SAMPLE TYPE : WASTEWATER
SAMPLING DATE : JANUARY 28, 2021
SAMPLING TIME : 1/
SAMPLING METHOD : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY : MR APISIT SRIKONGKAEW
ANALYZED BY : MISS AMONRAT PUTTALAE

RECEIVED DATE : JANUARY 28, 2021
ANALYTICAL DATE : JANUARY 28 - FEBRUARY 8, 2021
REPORT NO. : 2021-U07750
WORK NO. : 2020-002918
ANALYSIS NO. : T21AB352-0003, T21AB352-0005

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 14:00 HOUR U/ T21AB352-0003	2 13:50 HOUR U/ T21AB352-0005		
pH ^a	-	ELECTROMETRIC METHOD AT SITE (SM 4500-H ⁺ B)	6.9 (28°C)	7.2 (29°C)	5-9	-
TEMPERATURE ^c	°C	THERMOMETER AT SITE (SM 2550 B)	-	29	-	-
BIOCHEMICAL OXYGEN DEMAND ^d	mg/L	AZIDE MODIFICATION METHOD (SM: 4500-O C AND 5210 B)	223	ND	≤ 20	2.0
CHEMICAL OXYGEN DEMAND ^e	mg/L	CLOSED REFLEX, COLOURIMETRIC METHOD (SM 5220 D)	-	34.5	-	25.0
SUSPENDED SOLIDS ^a	mg/L	SUSPENDED SOLIDS DRIED AT 103-105 °C (SM 2540 D)	70.5	8.2	≤ 30	5.0
TOTAL DISSOLVED SOLIDS ^a	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 103-105 °C (SM 2540 C)	709	520	500 ^a	25
SETTLABLE SOLIDS ^d	ml/L	IMHOFF CONE (SM 2540 F)	0.8	< 0.1	≤ 0.5	0.1
RESIDUAL CHLORINE ^e	mg/L Cl ₂	IODO-METRIC METHOD (SM 4500-Cl B)	-	1.0	-	0.1
SULPHIDE ^a	mg/L	IODO-METRIC METHOD (SM: 4500-S ²⁻ F)	0.77	ND	≤ 1.0	0.13
TOTAL KJELDAHL NITROGEN ^d	mg/L	IN-HOUSE METHOD UAE.TP.TN.02 (KJELDAHL METHOD); SM 4500-Norg C	17.7	6.8	≤ 35	1.5
FAT, OIL AND GREASE ^a	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM 5520 B)	15	ND	≤ 20	3



ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHARDENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : AERATION TANK
SAMPLE TYPE : SLURRY IN AERATION TANK
SAMPLING DATE : JANUARY 28, 2021
SAMPLING TIME : 13:55 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR APISIT SRIKONGKAEW
ANALYZED BY : MISS AMONRAT PUTTALAE

RECEIVED DATE : JANUARY 28, 2021
ANALYTICAL DATE : JANUARY 28 - FEBRUARY 2, 2021
REPORT NO. : 2021-U07751
WORK NO. : 2020-002918
ANALYSIS NO. : T21AB352-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		DETECTION LIMIT
			AERATION TANK T21AB352-0004		
pH ^a	-	ELECTROMETRIC METHOD AT SITE (SM 4500-H ⁺ B)	7.4 (28°C)	-	-
DISSOLVED OXYGEN	mg/L	AZIDE MODIFICATION METHOD AT SITE (SM 4500-O C)	2.5		0.5
MIXED LIQUOR SUSPENDED SOLIDS	mg/L	MIXED LIQUOR SUSPENDED SOLIDS DRIED AT 103-105 °C (SM 2540 D)	117		5.0
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID BROWN		

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.



PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1	2		
			14:00 HOUR U/ T21AB352-0003	13:50 HOUR U/ T21AB352-0005		
MICROBIOLOGY						
FAECAL COLIFORM BACTERIA ^b	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM: 9221 E)	-	4,900	-	1.8
SAMPLE CONDITION						
WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID GREY	YELLOW/CLEAR YELLOW		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)
^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)
^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.
SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

RESULT 1 : INFLUENT
RESULT 2 : EFFLUENT

REGULATORY STANDARD : RANGE OR MAXIMUM PERMITTED VALUE FOR BUILDING EFFLUENT STANDARDS CLASS A, NOTIFICATION OF THE MINISTRY OF RESOURCES AND ENVIRONMENT, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 122, PART 125 D, DATED DECEMBER 28, 2008.

500^a : PERMITTED EXCESS VALUE TO TOTAL DISSOLVED SOLIDS OF ACTUAL TAP WATER USED (TOTAL DISSOLVED SOLIDS STANDARD VALUE OF TAP WATER QUALITY IS 1000 mg/L.)

ND : NON DETECTABLE.

COMMENT : ALL TESTED PARAMETERS ARE COMPLIED WITH REGULATORY STANDARD FOR FAECAL COLIFORM BACTERIA. IT SHOULD BE DISINFECTED BEFORE DISCHARGING INTO THE PUBLIC WATERWAY ALTHOUGH REGULATORY STANDARD IS NOT NOTIFIED.

Piyapat S.
(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

FEBRUARY 11, 2021

ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHARDENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : WASTEWATER TREATMENT PLANT
SAMPLE TYPE : WASTEWATER
SAMPLING DATE : FEBRUARY 25, 2021
SAMPLING TIME : 1/
SAMPLING METHOD : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY : MISS THATSANE CHAIHAN
ANALYZED BY : MISS AMONRAT PUTTALAE

RECEIVED DATE : FEBRUARY 25, 2021
ANALYTICAL DATE : FEBRUARY 25 - MARCH 8, 2021
REPORT NO. : 2021-U14132
WORK NO. : 2020-002918
ANALYSIS NO. : T21AC999-0002, T21AC999-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 13:55 HOUR U/ T21AC999-0002	2 13:50 HOUR U/ T21AC999-0004		
pH ^a	-	ELECTROMETRIC METHOD AT SITE (SM 4500-H ⁺ B)	7.0 (28°C)	7.5 (29°C)	5-9	-
TEMPERATURE ^b	°C	THERMOMETER AT SITE (SM 2550 B)	-	29	-	-
BIOCHEMICAL OXYGEN DEMAND ^c	mg/L	AZIDE MODIFICATION METHOD (SM: 4500-O C AND 5210 B)	175	12.0	≤ 20	2.0
CHEMICAL OXYGEN DEMAND ^d	mg/L	CLOSED REFLEX, COLOURIMETRIC METHOD (SM 5220 D)	-	32.4	-	25.0
TOTAL SUSPENDED SOLIDS ^a	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM 2540 D)	54.9	12.3	≤ 30	5.0
TOTAL DISSOLVED SOLIDS ^c	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 103-105 °C (SM 2540 C)	544	426	500 ^a	25
SETTLABLE SOLIDS ^d	ml/L	IMHOFF CONE (SM 2540 F)	0.7	< 0.1	≤ 0.5	0.1
RESIDUAL CHLORINE ^e	mg/L Cl ₂	IODO-METRIC METHOD (SM 4500-Cl B)	-	0.1	-	0.1
SULPHIDE ^a	mg/L	IODO-METRIC METHOD (SM: 4500-S ²⁻ F)	1.51	ND	≤ 1.0	0.13
TOTAL KJELDAHL NITROGEN ^d	mg/L	IN-HOUSE METHOD UAE.TP.TN.02 (KJELDAHL METHOD); SM 4500-Norg C	7.0	ND	≤ 35	1.5
FAT, OIL AND GREASE ^a	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM 5520 B)	13	ND	≤ 20	3

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 13:55 HOUR U T21AC999-0002	2 13:55 HOUR U T21AC999-0004		
MICROBIOLOGY						
FAECAL COLIFORM BACTERIA ^a	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM 9221E)	-	24,000	-	1.8
SAMPLE CONDITION						
WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID GREY	YELLOW/CLEAR YELLOW		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

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^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

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RESULT 1 : INFLUENT

RESULT 2 : EFFLUENT

REGULATORY STANDARD : RANGE OR MAXIMUM PERMITTED VALUE FOR BUILDING EFFLUENT STANDARDS CLASS A, NOTIFICATION OF THE MINISTRY OF RESOURCES AND ENVIRONMENT, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 122, PART 125 D, DATED DECEMBER 28, 2005.

500° : PERMITTED EXCESS VALUE TO TOTAL DISSOLVED SOLIDS OF ACTUAL TAP WATER USED

(TOTAL DISSOLVED SOLIDS STANDARD VALUE OF TAP WATER QUALITY IS 1000 mg/L).

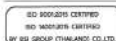
ND : NON-DETECTABLE.

COMMENT : ALL TESTED PARAMETERS ARE COMPLIED WITH REGULATORY STANDARD. FOR FAECAL COLIFORM BACTERIA, IT SHOULD BE DISINFECTED BEFORE DISCHARGING INTO THE PUBLIC WATERWAY ALTHOUGH REGULATORY STANDARD IS NOT NOTIFIED.

Piyapal S.

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

MARCH 11, 2021



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2021-U14132

ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : AERATION TANK
SAMPLE TYPE : SLURRY IN AERATION TANK
SAMPLING DATE : FEBRUARY 25, 2021
SAMPLING TIME : 13:45 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MISS THATSANE CHAIHAN
ANALYZED BY : MISS AMONRAT PUTTALEE

RECEIVED DATE : FEBRUARY 25, 2021
ANALYTICAL DATE : FEBRUARY 25 - MARCH 8, 2021
REPORT NO. : 2021-U14133
WORK NO. : 2020-002918
ANALYSIS NO. : T21AC999-0003

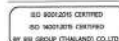
PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			AERATION TANK T21AC999-0003	
pH	-	ELECTROMETRIC METHOD AT SITE (SM4500-H ⁺ B)	7.7 (29°C)	-
DISSOLVED OXYGEN	mg/L	AZIDE MODIFICATION METHOD (SM 4500-O C)	5.2	0.5
MIXED LIQUOR SUSPENDED SOLIDS	mg/L	MIXED LIQUOR SUSPENDED SOLIDS DRIED AT 103-105 °C (SM 2540 D)	249	5.0
SAMPLE CONDITION				
WATER'S COLOUR/TURBID SEDIMENT			YELLOW/CLEAR BROWN	

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

Piyapal S.

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

MARCH 11, 2021



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ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : WASTEWATER TREATMENT PLANT
SAMPLE TYPE : WASTEWATER
SAMPLING DATE : MARCH 29, 2021
SAMPLING TIME : 1/
SAMPLING METHOD : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY : MISS THATSANE CHAIHAN
ANALYZED BY : MISS AMONRAT PUTTALEE

RECEIVED DATE : MARCH 29, 2021
ANALYTICAL DATE : MARCH 29 - APRIL 5, 2021
REPORT NO. : 2021-U22801
WORK NO. : 2020-002918
ANALYSIS NO. : T21AF304-0003, T21AF304-0005

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 13:45 HOUR U T21AF304-0003	2 13:35 HOUR U T21AF304-0005		
pH ^a	-	ELECTROMETRIC METHOD AT SITE (SM4500-H ⁺ B)	9.0 (31°C)	7.3 (31°C)	5-9	-
TEMPERATURE ^b	°C	THERMOMETER AT SITE (SM 2550 B)	-	31	-	-
BIOCHEMICAL OXYGEN DEMAND ^c	mg/L	AZIDE MODIFICATION METHOD (SM 4500-O C AND 5210 B)	320	4.3	≤ 20	2.0
CHEMICAL OXYGEN DEMAND ^a	mg/L	CLOSED REFLEX, COLOURIMETRIC METHOD (SM 5220 D)	-	64.6	-	25.0
TOTAL SUSPENDED SOLIDS ^a	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105°C (SM 2540 D)	84.7	32.9	≤ 30	5.0
TOTAL DISSOLVED SOLIDS ^c	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 103-105 °C (SM 2540 C)	778	374	500°	25
SETTLABLE SOLIDS ^c	mL/L	IMHOFF CONE (SM 2540 F)	2.0	0.5	≤ 0.5	0.1
RESIDUAL CHLORINE ^c	mg/L Cl ₂	IODOMETRIC METHOD I (SM4500-Cl B)	-	0.5	-	0.1
SULPHIDE ^c	mg/L	IODOMETRIC METHOD (SM 4500-S ²⁻ F)	0.19	ND	≤ 10	0.13
TOTAL KJELDAHL NITROGEN ^c	mg/L	IN-HOUSE METHOD UAE.TP.TN.02 (KJELDAHL METHOD); SM 4500-Norg C	416	< LOQ	≤ 35	1.5
FAT, OIL AND GREASE ^a	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM 5520 B)	54	ND	≤ 20	3

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 13:45 HOUR U T21AF304-0003	2 13:35 HOUR U T21AF304-0005		
MICROBIOLOGY						
FAECAL COLIFORM BACTERIA ^a	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM 9221E)	-	2,200	-	1.8
SAMPLE CONDITION						
WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID BROWN	YELLOW/TURBID YELLOW		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

RESULT 1 : INFLUENT

RESULT 2 : EFFLUENT

REGULATORY STANDARD : RANGE OR MAXIMUM PERMITTED VALUE FOR BUILDING EFFLUENT STANDARDS CLASS A, NOTIFICATION OF THE MINISTRY OF RESOURCES AND ENVIRONMENT, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 122, PART 125 D, DATED DECEMBER 28, 2005.

500° : PERMITTED EXCESS VALUE TO TOTAL DISSOLVED SOLIDS OF ACTUAL TAP WATER USED

(TOTAL DISSOLVED SOLIDS STANDARD VALUE OF TAP WATER QUALITY IS 1000 mg/L).

ND : NON-DETECTABLE.

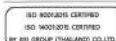
< LOQ : < LEVEL OF QUANTIFICATION (TOTAL KJELDAHL NITROGEN ≥ 15 AND < 5.0 mg/L).

COMMENT : ALL TESTED PARAMETERS ARE COMPLIED WITH REGULATORY STANDARD EXCEPT TOTAL SUSPENDED SOLIDS FOR FAECAL COLIFORM BACTERIA, IT SHOULD BE DISINFECTED BEFORE DISCHARGING INTO THE PUBLIC WATERWAY ALTHOUGH REGULATORY STANDARD IS NOT NOTIFIED.

Piyapal S.

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

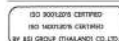
APRIL 16, 2021



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2021-U22801

ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUNPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : AERATION TANK
SAMPLE TYPE : SLURRY IN AERATION TANK
SAMPLING DATE : MARCH 29, 2021
SAMPLING TIME : 13:40 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MISS THATSANE CHAIHAN
ANALYZED BY : MISS AMONRAT PUTTALEE

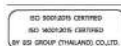
RECEIVED DATE : MARCH 29, 2021
ANALYTICAL DATE : MARCH 29 - APRIL 1, 2021
REPORT NO. : 2021-U22804
WORK NO. : 2020-002918
ANALYSIS NO. : T21AH304-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			AERATION TANK T21AH304-0004	
pH	-	ELECTROMETRIC METHOD AT SITE (SM-4500-H ⁺ B)	7.7 (30°C)	-
DISSOLVED OXYGEN	mg/L	AZIDE MODIFICATION METHOD (SM-4500-O ₂ C)	3.1	0.5
MIXED LIQUOR SUSPENDED SOLIDS	mg/L	MIXED LIQUOR SUSPENDED SOLIDS DRIED AT 103-105 °C (SM-2540 D)	178	5.0
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID BROWN	

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

Piyapat S.
(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

APRIL 16, 2021



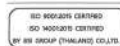
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CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUNPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : WASTEWATER TREATMENT PLANT
SAMPLE TYPE : WASTEWATER
SAMPLING DATE : APRIL 28, 2021
SAMPLING TIME : 1/
SAMPLING METHOD : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY : MR SOMCHART UTHUMRAT
ANALYZED BY : MISS AMONRAT PUTTALEE

RECEIVED DATE : APRIL 28, 2021
ANALYTICAL DATE : APRIL 28 - MAY 10, 2021
REPORT NO. : 2021-U30124
WORK NO. : 2020-002918
ANALYSIS NO. : T21AH127-0003, T21AH127-0005

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 13:50 HOUR L T21AH127-0003	2 13:40 HOUR L T21AH127-0005		
pH	-	ELECTROMETRIC METHOD AT SITE (SM-4500-H ⁺ B)	7.0 (30°C)	7.3 (30°C)	5-9	-
TEMPERATURE	°C	THERMOMETER AT SITE (SM-2550 B)	-	30	-	-
BIOCHEMICAL OXYGEN DEMAND	mg/L	AZIDE MODIFICATION METHOD (SM-4500-O ₂ C AND 5210 B)	59.0	118	≤ 20	2.0
CHEMICAL OXYGEN DEMAND	mg/L	CLOSED REFLUX, COLOURIMETRIC METHOD (SM-5220 D)	-	312	-	25.0
TOTAL SUSPENDED SOLIDS	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105°C (SM-2540 D)	28.1	10.6	≤ 30	5.0
TOTAL DISSOLVED SOLIDS	mg/L	IN-HOUSE METHOD: UAE.TP.WAO.007 (TOTAL DISSOLVED SOLIDS DRIED AT 103-105°C) SM-2540 C	354	304	500*	25
SETTLABLE SOLIDS	mL/L	IMHOFF CONE (SM-2540 F)	< 0.1	< 0.1	≤ 0.5	0.1
RESIDUAL CHLORINE	mg/L Cl ₂	IODOMETRIC METHOD I (SM-4500-Cl B)	-	0.5	-	0.1
SULPHIDE	mg/L	IODOMETRIC METHOD (SM-4500-S ²⁻ C)	0.82	ND	≤ 1.0	0.13
TOTAL KJELDAHL NITROGEN	mg/L	IN-HOUSE METHOD: UAE.TP.TN.02 (KJELDAHL METHOD); SM-4500-Norg C	15.4	7.8	≤ 35	1.5
FAT, OIL AND GREASE	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM-5520 B)	10	ND	≤ 20	3



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ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUNPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : AERATION TANK
SAMPLE TYPE : SLURRY IN AERATION TANK
SAMPLING DATE : APRIL 28, 2021
SAMPLING TIME : 13:45 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR SOMCHART UTHUMRAT
ANALYZED BY : MISS AMONRAT PUTTALEE

RECEIVED DATE : APRIL 28, 2021
ANALYTICAL DATE : APRIL 28-MAY 6, 2021
REPORT NO. : 2021-U30125
WORK NO. : 2020-002918
ANALYSIS NO. : T21AH127-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			AERATION TANK T21AH127-0004	
pH	-	ELECTROMETRIC METHOD AT SITE (SM-4500-H ⁺ B)	7.9 (30°C)	-
DISSOLVED OXYGEN	mg/L	MEMBRANE ELECTRODE METHOD AT SITE (SM-4500-O ₂ C)	2.0	0.5
MIXED LIQUOR SUSPENDED SOLIDS	mg/L	MIXED LIQUOR SUSPENDED SOLIDS DRIED AT 103-105 °C (SM-2540 D)	160	5.0
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID BROWN	

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 13:50 HOUR L T21AH127-0003	2 13:40 HOUR L T21AH127-0005		
MICROBIOLOGY						
FAECAL COLIFORM BACTERIA	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM-9221 E)	-	92,000	-	1.8
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID GREY	YELLOW/TURBID YELLOW		

* : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)
* : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)
* : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

RESULT 1 : INFLUENT
RESULT 2 : EFFLUENT

REGULATORY STANDARD : RANGE OR MAXIMUM PERMITTED VALUE FOR BUILDING EFFLUENT STANDARDS CLASS A, NOTIFICATION OF THE MINISTRY OF RESOURCES AND ENVIRONMENT, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 122, PART 125 D, DATED DECEMBER 26, 2005.

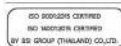
500* : PERMITTED EXCESS VALUE TO TOTAL DISSOLVED SOLIDS OF ACTUAL TAP WATER USED (TOTAL DISSOLVED SOLIDS STANDARD VALUE OF TAP WATER QUALITY IS 1000 mg/L).

ND : NON-DETECTABLE.

COMMENT : ALL TESTED PARAMETERS ARE COMPLIED WITH REGULATORY STANDARD. FOR FAECAL COLIFORM BACTERIA, IT SHOULD BE DISINFECTED BEFORE DISCHARGING INTO THE PUBLIC WATERWAY ALTHOUGH REGULATORY STANDARD IS NOT NOTIFIED.

Piyapat S.
(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

MAY 17, 2021

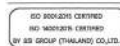


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2021-U30124

Piyapat S.
(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

MAY 17, 2021



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ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kullayut@shangri-la.com
SAMPLING SOURCE : WASTEWATER TREATMENT PLANT
SAMPLE TYPE : WASTEWATER
SAMPLING DATE : MAY 31, 2021
SAMPLING TIME : 1/
SAMPLING METHOD : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY : MR WEERAYUT MOKKAEW
ANALYZED BY : MISS AMONRAT PUTTALEE

RECEIVED DATE : MAY 31, 2021
ANALYTICAL DATE : MAY 31 - JUNE 9, 2021
REPORT NO. : 2021-U38291
WORK NO. : 2021-002932
ANALYSIS NO. : T21A154-0002, T21A154-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 15:00 HOUR (1) T21A154-0002	2 14:50 HOUR (1) T21A154-0004		
pH ^a	-	ELECTROMETRIC METHOD AT SITE (SM4500-H ⁺ B)	7.3 (30°C)	7.7 (30°C)	5-9	-
TEMPERATURE ^c	°C	THERMOMETER AT SITE (SM-2560 B)	-	30	-	-
BIOCHEMICAL OXYGEN DEMAND ^d	mg/L	AZIDE MODIFICATION METHOD (SM-4500-O ₂ C AND 5210 B)	147	ND	≤ 20	2.0
CHEMICAL OXYGEN DEMAND ^e	mg/L	CLOSED REFLEX, COLOURIMETRIC METHOD (SM-5220 D)	-	34.3	-	25.0
SUSPENDED SOLIDS ^f	mg/L	SUSPENDED SOLIDS DRIED AT 103-105 °C (SM-2540 D)	85.6	23.7	≤ 30	5.0
TOTAL DISSOLVED SOLIDS ^h	mg/L	IN-HOUSE METHOD: UAE-TP-WAO.007 (TOTAL DISSOLVED SOLIDS DRIED AT 103-105°C); SM-2540 C	438	312	500 ^g	25
SETTLABLE SOLIDS ⁱ	mL/L	IMHOFF CONE (SM-2540 F)	0.6	< 0.1	≤ 0.5	0.1
RESIDUAL CHLORINE ^g	mg/L Cl ₂	IODOMETRIC METHOD I (SM4500-Cl B)	-	0.2	-	0.1
SULPHIDE ^h	mg/L	IODOMETRIC METHOD (SM-4500-S ²⁻ F)	0.42	ND	≤ 1.0	0.13
TOTAL KJELDAHL NITROGEN ⁱ	mg/L	IN-HOUSE METHOD: UAE-TP-WAS.001 (KJELDAHL METHOD); SM-4500-Norg C	13.5	< LOQ	≤ 35	1.5
FAT, OIL AND GREASE ^a	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM-5520 B)	24	ND	≤ 20	3

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 15:00 HOUR (1) T21A154-0002	2 14:50 HOUR (1) T21A154-0004		
MICROBIOLOGY						
FAECAL COLIFORM BACTERIA ^b	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM-9221 E)	-	54,000	-	18
SAMPLE CONDITION						
WATER'S COLOUR/TURBID SEDIMENT			YELLOW/CLEAR GREY	YELLOW/CLEAR BROWN		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)
^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)
^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.
SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

RESULT 1 : INFLUENT
RESULT 2 : EFFLUENT

REGULATORY STANDARD : RANGE OR MAXIMUM PERMITTED VALUE FOR BUILDING EFFLUENT STANDARDS CLASS A, NOTIFICATION OF THE MINISTRY OF RESOURCES AND ENVIRONMENT, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 122, PART 125 D, DATED DECEMBER 29, 2005.

500^g : PERMITTED EXCESS VALUE TO TOTAL DISSOLVED SOLIDS OF ACTUAL TAP WATER USED (TOTAL DISSOLVED SOLIDS STANDARD VALUE OF TAP WATER QUALITY IS 1000 mg/L).

ND : NON-DETECTABLE.

< LOQ : < LEVEL OF QUANTIFICATION (TOTAL KJELDAHL NITROGEN ≥ 15 AND < 5.0 mg/L).

COMMENT : ALL TESTED PARAMETERS ARE COMPLIED WITH REGULATORY STANDARD. FOR FAECAL COLIFORM BACTERIA, IT SHOULD BE DISINFECTED BEFORE DISCHARGING INTO THE PUBLIC WATERWAY ALTHOUGH REGULATORY STANDARD IS NOT NOTIFIED.

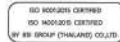
Piyapal S.
(MRS PIYAPAT SUTTANAUWONG)
LABORATORY SUPERVISOR

JUNE 16, 2021



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2021-U38291

ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kullayut@shangri-la.com
SAMPLING SOURCE : AERATION TANK
SAMPLE TYPE : SLURRY IN AERATION TANK
SAMPLING DATE : MAY 31, 2021
SAMPLING TIME : 14:55 HOUR
SAMPLING METHOD : GRAB
SAMPLING BY : MR WEERAYUT MOKKAEW
ANALYZED BY : MISS AMONRAT PUTTALEE

RECEIVED DATE : MAY 31, 2021
ANALYTICAL DATE : MAY 31 - JUNE 7, 2021
REPORT NO. : 2021-U38292
WORK NO. : 2021-002932
ANALYSIS NO. : T21A154-0003

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		DETECTION LIMIT
			AERATION TANK T21A154-0003		
pH	-	ELECTROMETRIC METHOD AT SITE (SM4500-H ⁺ B)	7.6 (30°C)	-	-
DISSOLVED OXYGEN	mg/L	AZIDE MODIFICATION METHOD AT SITE (SM-4500-O ₂ C)	2.0	-	0.5
MIXED LIQUOR SUSPENDED SOLIDS	mg/L	MIXED LIQUOR SUSPENDED SOLIDS DRIED AT 103-105 °C (SM-2540 D)	140	-	5.0
SAMPLE CONDITION			YELLOW/TURBID BROWN		

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

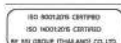
CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kullayut@shangri-la.com
SAMPLING SOURCE : WASTEWATER TREATMENT PLANT
SAMPLE TYPE : WASTEWATER
SAMPLING DATE : JUNE 28, 2021
SAMPLING TIME : 1/
SAMPLING METHOD : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY : MR WEERAYUT MOKKAEW
ANALYZED BY : MISS AMONRAT PUTTALEE

RECEIVED DATE : JUNE 28, 2021
ANALYTICAL DATE : JUNE 28 - JULY 4, 2021
REPORT NO. : 2021-U47082
WORK NO. : 2021-002932
ANALYSIS NO. : T21A154-0002, T21A154-0004

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 14:55 HOUR (1) T21A154-0002	2 14:45 HOUR (1) T21A154-0004		
pH ^a	-	ELECTROMETRIC METHOD AT SITE (SM4500-H ⁺ B)	7.2 (31°C)	7.6 (30°C)	5-9	-
TEMPERATURE ^c	°C	THERMOMETER AT SITE (SM-2560 B)	-	30	-	-
BIOCHEMICAL OXYGEN DEMAND ^d	mg/L	AZIDE MODIFICATION METHOD (SM-4500-O ₂ C AND 5210 B)	180	11.5	≤ 20	2.0
CHEMICAL OXYGEN DEMAND ^e	mg/L	CLOSED REFLEX, COLOURIMETRIC METHOD (SM-5220 D)	-	314	-	25.0
SUSPENDED SOLIDS ^f	mg/L	SUSPENDED SOLIDS DRIED AT 103-105 °C (SM-2540 D)	54.4	12.0	≤ 30	5.0
TOTAL DISSOLVED SOLIDS ^h	mg/L	IN-HOUSE METHOD: UAE-TP-WAO.007 (TOTAL DISSOLVED SOLIDS DRIED AT 103-105°C); SM-2540 C	623	428	500 ^g	25
SETTLABLE SOLIDS ⁱ	mL/L	IMHOFF CONE (SM-2540 F)	< 0.1	< 0.1	≤ 0.5	0.1
RESIDUAL CHLORINE ^g	mg/L Cl ₂	IODOMETRIC METHOD I (SM4500-Cl B)	-	0.2	-	0.1
SULPHIDE ^h	mg/L	IODOMETRIC METHOD (SM-4500-S ²⁻ F)	0.40	ND	≤ 1.0	0.50
TOTAL KJELDAHL NITROGEN ⁱ	mg/L	IN-HOUSE METHOD: UAE-TP-WAS.001 (KJELDAHL METHOD); SM-4500-Norg C	14.6	< LOQ	≤ 35	1.5
FAT, OIL AND GREASE ^a	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM-5520 B)	ND	ND	≤ 20	3

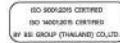
Piyapal S.
(MRS PIYAPAT SUTTANAUWONG)
LABORATORY SUPERVISOR

JUNE 16, 2021



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1/1



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1/2



PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD	DETECTION LIMIT
			1 14:55 HOUR (1) T21A1262-0002	2 14:45 HOUR (1) T21A1262-0004		
MICROBIOLOGY						
FAECAL COLIFORM BACTERIA ^a	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM 9221 E)	-	160,000	-	1B
SAMPLE CONDITION						
WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID GREY	YELLOW/TURBID YELLOW		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)
^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)
^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.
SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.
RESULT 1 : INFLUENT
RESULT 2 : EFFLUENT

REGULATORY STANDARD : RANGE OR MAXIMUM PERMITTED VALUE FOR BUILDING EFFLUENT STANDARDS CLASS A, NOTIFICATION OF THE MINISTRY OF RESOURCES AND ENVIRONMENT, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 122, PART 125 D, DATED DECEMBER 28, 2005.
800[°] : PERMITTED EXCESS VALUE TO TOTAL DISSOLVED SOLIDS OF ACTUAL TAP WATER USED (TOTAL DISSOLVED SOLIDS STANDARD VALUE OF TAP WATER QUALITY IS 1,000 mg/L).

ND : NON-DETECTABLE

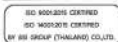
<LOQ : <LEVEL OF QUANTITATION (TOTAL KJELDAHL NITROGEN ≥ 15 AND < 5.0 mg/L).

COMMENT : ALL TESTED PARAMETERS ARE COMPLIED WITH REGULATORY STANDARD. FOR FAECAL COLIFORM BACTERIA, IT SHOULD BE DISINFECTED BEFORE DISCHARGING INTO THE PUBLIC WATERWAY ALTHOUGH REGULATORY STANDARD IS NOT NOTIFIED.

Piyapat S.

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

JULY 15, 2021



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2/2

2021-U47082

ANALYSIS REPORT

CUSTOMER NAME : SHANGRI-LA HOTEL
ADDRESS : 89 SOI WATSUANPLU CHAROENKRUNG BANG RAK BANG RAK BANGKOK 10500
CONTACT INFORMATION : TEL : 0 2236 7777 e-mail : boonjung.kulayut@shangri-la.com
SAMPLING SOURCE : AERATION TANK
SAMPLE TYPE : SLURRY IN AERATION TANK
SAMPLING DATE : JUNE 28, 2021
SAMPLING TIME : 14:50 HOUR
SAMPLING METHOD : GRAB
ANALYZED BY : MISS AMONRAT PUTTALEE
RECEIVED DATE : JUNE 28, 2021
ANALYTICAL DATE : JUNE 28 - JULY 1, 2021
REPORT NO. : 2021-U47083
WORK NO. : 2021-002932
ANALYSIS NO. : T21A1262-0003

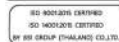
PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			AERATION TANK T21A1262-0003	
pH	-	ELECTROMETRIC METHOD AT SITE (SM 4500-H ⁺ B)	7.9 (30°C)	-
DISSOLVED OXYGEN	mg/L	AZIDE MODIFICATION METHOD AT SITE (SM 4500-O ₂ C)	3.1	0.5
MIXED LIQUOR SUSPENDED SOLIDS	mg/L	MIXED LIQUOR SUSPENDED SOLIDS DRIED AT 103-105 °C (SM 2540 D)	75.7	5.0
SAMPLE CONDITION				
WATER'S COLOUR/TURBID SEDIMENT			YELLOW/TURBID BROWN	

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

Piyapat S.

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

JULY 15, 2021



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ภาคผนวก จ
เอกสารสอบเทียบเครื่องมือ



ภาคผนวก จ-1
เอกสารสอบเทียบเครื่องมือวิเคราะห์



รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม

โครงการโรงแรมแห่งกรีน-ลา กรุงเทพฯ

ระหว่างเดือนมกราคม - มิถุนายน พ.ศ.2564

รายการใบรับรองสอบเทียบ ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์สำหรับคุณภาพน้ำ									
1	pH Meter	อุณหภูมิ (Temperature) ความเป็นกรดและด่าง (pH)	Hanna Instrument	HI 2211 / 8165345	Technology Promotion Association (Thailand-Japan)	2102015-001-01	17 Mar 21	17 Mar 22	-
2	pH Meter		Hanna Instrument	HI 2211 / 8165345	National Food Institute, Ministry of Industry, Thailand	2001929-001-01	13 Mar 20	13 Mar 21	-
3	UV-VIS Spectrophotometer	ซัลไฟด์ (Sulphide), ซีโอดี (COD)	Hitachi	U-1900 / 2021-064	DQE service Co.,Ltd.	SP20-005	25 Jan 21	24 Jan 22	-
4	UV-VIS Spectrophotometer		Merck	pharo 100 / 12390016	DQE service Co.,Ltd.	UAE.WAT009/ 2556	26 Jan 21	25 Jan 22	-
5	UV-VIS Spectrophotometer		Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP20-007	9 Aug 20	9 Aug 21	-
6	Analytical Balance (Repeatability 0.01 mg)	สารแขวนลอย (Total Suspended Solids) สารที่ละลายได้ทั้งหมด (TDS)	Mettler-Toledo	XSR205DU / C009071872	Calibration Laboratory Mettler-Toledo (Thailand) Limited	TH2058-001-042920 -ACC-TH	29 Apr 20	28 Apr 21	-
7	Hot Air Oven		Memmert	UF110 / B146.1008	SPC Calibration Center	C31201525	29 Jul 20	28 Jul 21	-
8	Analytical Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน (Fat,Oil & Grease)	Mettler-Toledo	AB-204S/FACT / B108115858	National Food Institute, Ministry of Industry, Thailand	UAE.AIR.016/ 2555	16 Apr 21	15 Apr 22	-
9	BOD Incubator	บีโอดี (BOD)	Arco	UR-1320 (UAE.WAO.018/2553)	Technology Promotion Association (Thailand-Japan)	21TM811	21 Apr 21	20 Apr 22	-
10	BOD Incubator		Arco	UR-1320 (UAE.WAO.006/2553)	Technology Promotion Association (Thailand-Japan)	21TM812	21 Apr 21	20 Apr 22	-
11	BOD Incubator		Arco	UC4-1320 / (UAE.LAB002/2550)	Technology Promotion Association (Thailand-Japan)	20TM1612	18 Aug 20	18 Aug 21	-
12	COD Reactor (Heating Block)	ซีโอดี (COD)	Hanna	HI839800-02 / H018500I	Technology Promotion Association (Thailand-Japan)	210TM364	22 Feb 21	21 Feb 22	-
13	COD Reactor (Heating Block)		Hanna	HI839800-02 / 4500052101	Hanna Instruments (Thailand) Ltd.	HIT-2121-0516	17 May 21	17 May 22	-

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม

โครงการโรงแรมแห่งกรีน-ลา กรุงเทพฯ

ระหว่างเดือนมกราคม - มิถุนายน พ.ศ.2564

รายการใบรับรองสอบเทียบ ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์สำหรับคุณภาพน้ำ									
14	Digester Unit	ทีเคเอ็น (Total Kjeldahl Nitrogen)	Velp	DKL20 / 213517	National Food Institute, Ministry of Industry, Thailand	2103014-001-02	2 Jun 21	2 Jun 22	-
15	Digester Unit		FOSS	2520 Auto / 91794495	Sithiporn Associates Co.,Ltd.	MS63FOT0084B	25 Feb 21	24 Feb 22	-
16	Distillation Unit (Kjeldahl Method)		FOSS	2100 / 520001424	Sithiporn Associates Co.,Ltd.	MS63FOT0084B	25 Feb 21	24 Feb 22	-
17	Distillation Unit (Kjeldahl Method)	ทีเคเอ็น (Total Kjeldahl Nitrogen)	FOSS	KT200 / 91790524	Sithiporn Associates Co.,Ltd.	MS63FOT0084B	25 Feb 21	24 Feb 22	-
18	Incubator (Cooled Incubator)	แบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม (Fecal Coliform Bacteria)	Memmert	IPP 260 / V613.0095	Technology Promotion Association (Thailand-Japan)	20TM841	7 May 20	6 May 21	-
19	Incubator (Cooled Incubator)		Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	21TM706	21 Apr 21	20 Apr 22	-
20	Incubator		Memmert	IF 75 / D317.0305	Technology Promotion Association (Thailand-Japan)	21TM832	18 May 21	18 May 22	-
21	Incubator		Memmert	IN75 / D317.0307	Technology Promotion Association (Thailand-Japan)	21TM833	18 May 21	18 May 22	-
22	Water Bath		Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	21TM422	3 Mar 21	3 Mar 22	-
23	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	21TM423	3 Mar 21	3 Mar 22	-
24	Water Bath		Memmert	WNE 14 / L414.1407	Technology Promotion Association (Thailand-Japan)	21TM708	5 May 21	5 May 22	-
25	Water Bath		Memmert	WNE 14 / L414.1410	Technology Promotion Association (Thailand-Japan)	21TM707	5 May 21	5 May 22	-
26	Water Bath		Memmert	WNE 14 / L416.0614	Technology Promotion Association (Thailand-Japan)	21TM424	3 Mar 21	3 Mar 22	-

บริษัท ฟูโนดี้ แอนาไลส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

ห้องปฏิบัติการทดสอบมาตรฐาน ISO/IEC 17025:2017 by TSI, 17025:2017 by DSS

ได้รับการรับรอง ISO 9001:2015 และ ISO 14001:2015 จากสถาบันมาตรฐานอังกฤษ

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
โครงการโรงแรมแห่งกรีก-ลา กรุงเทพฯ
ระหว่างเดือนมกราคม - มิถุนายน พ.ศ.2564

รายการใบรับรองสอบเทียบ ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์สำหรับคุณภาพน้ำ									
27	Analytical Balance	แบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม (Fecal Coliform Bacteria)	Mettler-Toledo	M5603S / B0070110311	National Food Institute, Ministry of Industry, Thailand	2000970-001-01	25 Dec 20	24 Dec 21	-
28	Autoclave		ALP	CL-40L / 807298	Technology Promotion Association (Thailand-Japan)	21TM831	18 May 21	17 May 22	-
29	Autoclave		ALP	CL-40L / 802664	Technology Promotion Association (Thailand-Japan)	21TM425	3 Mar 21	2 Mar 22	-
30	Refrigerator	เก็บรักษาตัวอย่างสำหรับวิเคราะห์ทางจุลชีววิทยา	Sanyo	SBC-337KD(GYN) / 71100607	Technology Promotion Association (Thailand-Japan)	21TM710	5 May 21	5 May 22	-

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.

Calibration Certificate

Certificate No.: 2102015-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI 2211
Serial No.: 08165345
ID No.: UAE.WAT.004/2556
Order No.: 2102015
Operation No.: 2102015-001
Date of Receipt: 16 March 2021
Date of Calibration: 17 March 2021

Calibrated by Mr.Manas Somsak Expert Approved by (Mr.Pheraphat Tuanjit) Manager, Division of Calibration Laboratory
Date of issue: 19 March 2021 Responsible for the Technical Management Team

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102015-001-01
Equipment: pH Meter Resolution: 0.01 pH ; 0.1 mV
Manufacturer: HANNA INSTRUMENTS Model: HI 2211
Serial No.: 08165345 Type: Bench top
ID No.: UAE.WAT.004/2556

Date of Calibration: 17 March 2021 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: { 23.3 ± 1.5 } °C Relative Humidity: { 53.5 ± 5 } %
Condition of Equipment: Good Condition
Condition of this Results of Calibration

1. Calibration Method: In house method: W-CC-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)
2. Reference Standards: / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fuke	SDL-20F-0682	17 June 2021
2.2 Digital Thermometer	2709007	Fuke	CC 63909-01	30 October 2021
2.3 Thermo-Hygro Meter	NFI.BTH003/17	PONPE	QR20-1578	21 September 2021

Certified Reference Material	Lot No.	Manufacturer	Ref N	Expiry Date
2.4 pH buffer 4.006 (Primary pH buffer Solution)	710048	CPAchem	PH216.L5	2 October 2022
2.5 pH buffer 6.866 (Primary pH buffer Solution)	710048	CPAchem	PH217.L5	2 October 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	710050	CPAchem	PH220.L5	2 October 2021
2.7 pH buffer 7.00 (Standard pH buffer Solution)	710051	CPAchem	PH197.L5	2 October 2021

3. This certification is traceable to The International System of Unit (SI Unit)
3.1 Instruments No.2.1 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0015
3.2 Instruments No.2.2 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.8 traceable to Primary measurement method- Harned cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No. 2.7 traceable to BSM ReN Hi-7 Lot# 30.04.2020; BSM ReN Hi-6 Lot# 28.05.2020; BSM ReN Hi-8 Lot# 30.04.2020; BSM ReN Hi-10 Lot# 26.05.2020. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102015-001-01
Equipment: pH Meter Resolution: 0.01 pH ; 0.1 mV
Manufacturer: HANNA INSTRUMENTS Model: HI 2211
Serial No.: 08165345 Type: Bench top
ID No.: UAE.WAT.004/2556

Date of Calibration: 17 March 2021 Page 3 of 5

Calibration Results: 1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (mV)	Coverage Factor (k)
		mV	pH		
0.00	414.118	414	0.00	0.58	2.00
2.00	295.811	295.7	2.00	0.063	2.00
4.00	177.461	177.5	4.00	0.063	2.00
6.00	59.160	59.2	6.00	0.063	2.00
7.00	0.000	0.1	7.00	0.063	2.00
8.00	-59.158	-59.1	8.00	0.063	2.00
10.00	-177.461	-177.3	10.00	0.063	2.00
12.00	-295.812	-295.8	12.00	0.063	2.00
14.00	-414.118	-414	14.00	0.58	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode Type: Combined Electrode
Manufacturer: HANNA INSTRUMENTS Model: HI 1131
Serial No.: 05512F2N ID No. N/A

Performance of Electrode system (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value (25 °C (pH))	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	165.0	96.8	0.0071	2.00
6.866	6.87	3.9		0.0075	2.00
9.866	9.87	2.9	94.5	0.0075	2.00
10.008	10.01	-172.7		0.0093	2.00
6.985	6.99	-4.0		0.0093	2.00

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102015-001-01
Equipment: Digital Thermometer with RTD (pH Meter) Resolution: 0.1 °C Model: HI 2211
Serial No.: 08165345 ID No.: UAE.WAT.004/2556
Manufacturer: HANNA INSTRUMENTS

Date of Calibration: 17 March 2021 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature 23 °C ± 1 °C
Relative Humidity 54 % ± 2 %

Condition of this results of Calibration:

- Calibration Method:
 - In house method: W-TE-025 by comparison with standard thermometer.
 - The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
 - The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).
- Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1523	2118154	PSL-T 767/63	04-Jun-21	TISTR
Platinum Resistance Thermometer (PRT)	562TA	877332			

Support Equipment: - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 34159212

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of Calibrated item: Good
7. Result of Calibration: ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102015-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: HI 2211
Serial No.: 08165345 ID No.: UAE.WAT.004/2556
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 17 March 2021 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C
Calibration result:

- The probe was immersed in liquid bath to a minimum depth of 100 mm.
- Description of probe, model : S/N :
Dimension of probe : Diameter 3.5 mm, Length 100 mm.
Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
14.9	15.003	0.1	0.099
25.0	25.003	0.0	0.099
35.0	35.007	0.0	0.099

Note
* UUC*: Unit Under Calibration

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

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2001929-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI 2211
Serial No.: 08165345
ID No.: UAE.LAB.004/2556
Order No.: 2001929
Operation No.: 2001929-001
Date of Receipt: 12 March 2020
Date of Calibration: 13 March 2020

Calibrated by Mr.Manas Somsak Senior Analyst
Approved by (Mr.Pheraphat Tuanjit) Manager, Division of Calibration Laboratory
Date of Issue: 13 March 2020 Responsible for the Technical Management Team

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 standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2001929-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 0.1 mV
Manufacturer: HANNA INSTRUMENTS Model: HI 2211
Serial No.: 08165345 Type: Bench top
ID No.: UAE.LAB.004/2556

Date of Calibration: 13 March 2020 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temp (23.5 ± 1.5) °C Relative Humidity: (55 ± 5) %
Condition of Equipment: Good Condition
Condition of this Results of Calibration
1. Calibration Method In house method : W816 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-19E-9884	10 June 2020
2.2 Digital Thermometer	2709007	Fluke	CC 630042	31 October 2020
2.3 Thermo-Hygro Meter	ana.kh.BTH 001/58	AMTAST	QR19-1406	19 August 2020

Certified Reference Material	Lot No.	Manufacturer	Ref No.	Expires Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	679461	CPAchem	PH216.L5	12 March 2022
2.5 pH buffer 6.865 (Primary pH buffer Solution)	677228	CPAchem	PH217.L5	16 February 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	677230	CPAchem	PH220.L5	9 November 2020
2.7 pH buffer 7.01 (Secondary pH buffer Solution)	280119	TRM	TRM-S-2005	8 October 2020

3. This certification is traceable to The International System of Unit (SI Unit)
3.1 Instruments No.2.1 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
3.2 Instruments No.2.2 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method- Prepared off using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No. 2.7 traceable to NMJ CRM 5103-a. The Standard Solution preparation and certified by National Institute of Metrology (Thailand)

4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2001929-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 0.1 mV
Manufacturer: HANNA INSTRUMENTS Model: HI 2211
Serial No.: 08165345 Type: Bench top
ID No.: UAE.LAB.004/2556

Date of Calibration: 13 March 2020 Page 3 of 5

Calibration Results:
1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±)	Coverage Factor (K)
		mV	pH		
0.00	414.118	414.0	0.00	0.070	2.00
2.00	295.811	295.7	2.00	0.070	2.00
4.00	177.481	177.4	4.00	0.070	2.00
6.00	59.169	59.2	6.00	0.070	2.00
7.00	0.000	0.0	7.00	0.070	2.00
8.00	-59.158	-59.2	8.00	0.070	2.00
10.00	-177.481	-177.4	10.00	0.070	2.00
12.00	-295.812	-295.7	12.00	0.070	2.00
14.00	-414.118	-414.0	14.00	0.070	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode Type: Combined Electrode
Manufacturer: HANNA INSTRUMENTS Model: HI 1131
Serial No.: 05512F2N ID No: N/A

Performance of Electrode system (Two-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (K)
	pH	mV			
4.008	4.01	109.2	98.8	0.0071	2.00
6.866	6.87	-8.0	98.3	0.0075	2.00
6.866	6.87	-8.1		0.0093	2.00
10.009	10.01	-187.0		0.0087	2.00
7.025	7.03	-16.2	-		

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2001929-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: HI 2211
Serial No.: 08165345 ID No.: UAE.LAB.004/2556
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 13 March 2020 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature 25.9 °C ± 1.5 °C
Relative Humidity 55.5 % ± 5 %

Condition of this results of Calibration:

- Calibration Method : - NFI Method W 834 in house method by Comparison with Standard thermometer.
- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
- The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A58157	119-2027	24-Jul-20	Thai Airways International Public Co.,Ltd.
Platinum Resistance Thermometer (PRT)	5627-12	743441			

Support Equipment: - Low Temperature Bath (AMETEK RTC-167), Model: RTC-167C, S/N: 870930-00018

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good
- Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2001929-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: HI 2211
Serial No.: 08165345 ID No.: UAE.LAB.004/2556
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 13 March 2020 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model: N/A S/N: N/A
- Dimension of probe: Diameter 1.5 mm, Length 140 mm.
- Sheath material: Stainless Steel

UUC Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.0	15.000	0.0	0.099
25.0	25.000	0.0	0.099
35.0	35.001	0.0	0.099

Note


- UUC : Unit Under Calibration

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

----- End -----



F-CS-012 Revision: 00 Date: 14-12-61

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 DQE Services Co.,Ltd.
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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com
NYC-718-713 1702 CALIBRATION 0140


CERTIFICATE OF CALIBRATION

Certificate No.: SP21-008 Page 1 of 5
Customer: United Analyst and Engineering Consultant Co.,Ltd. (Head Office)
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Location of calibration: Laboratory 315
Equipment: Spectrophotometer
Manufacturer: Hitachi
Model: U-1900
Serial No.: 2021-064
ID No.: UAE.WAS.006/2552
Received Date: 25 January 2564
Calibration Date: 25 January 2564
Issue Date: 26 January 2564
Condition of Instrument: Used

Calibrated by:  Approved by: 
(Mr. Tanawat Ritidach) (Miss Chonthicha Sangngern)
Technical Manager Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.
The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com
NYC-718-713 1702 CALIBRATION 0140


REPORT OF CALIBRATION

Certificate No.: SP21-008 Page 2 of 5
Environment Condition: Ambient Temperature 25 ± 5 °C
Relative humidity 50 ± 15 %RH
Calibration method: In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08
Certified Reference Materials:


Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability: This certification is traceable to the International System of Unit maintained at National Institute of Standards and Technology (NIST) through Stama Scientific Limited
Spectral Band Width of UUC: 4.0 nm.
Scan Speed of UUC: 200 nm./min
Scan Interval of UUC: 0.1 nm.
Resolution of UUC: Photometric 0.001 Abs.
Wavelength 0.1 nm.

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REPORT OF CALIBRATION


Certificate No. : SP21-008 Page 3 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	240.8	0.74	0.19	2.00
279.40	278.6	0.80	0.19	2.00
288.70	287.6	1.10	0.19	2.00
334.22	333.6	0.62	0.19	2.00
361.26	360.6	0.66	0.19	2.00
418.48	418.0	0.48	0.19	2.00
446.70	445.8	0.90	0.19	2.00
453.20	452.8	0.40	0.19	2.00
460.06	459.6	0.46	0.19	2.00
536.90	536.2	0.70	0.19	2.00
637.94	637.4	0.54	0.19	2.00
440.74	440.2	0.54	0.19	2.00
472.22	471.8	0.42	0.19	2.00
513.70	513.0	0.70	0.19	2.00
528.72	528.2	0.52	0.19	2.00
574.60	574.0	0.60	0.19	2.00
585.48	584.8	0.68	0.19	2.00
684.63	684.0	0.63	0.19	2.00
740.27	739.8	0.47	0.19	2.00
748.28	747.8	0.48	0.19	2.00
807.16	806.6	0.56	0.19	2.00
879.70	879.0	0.70	0.19	2.00



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REPORT OF CALIBRATION

Certificate No. : SP21-008 Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0042	2.00
	0.5791	0.577	0.0021	0.0042	2.00
	1.0488	1.045	0.0038	0.0042	2.00
	2.1914	2.183	0.0084	0.0092	2.00
440	0.0000	0.000	0.0000	0.0042	2.00
	0.5618	0.560	0.0018	0.0042	2.00
	1.0260	1.025	0.0010	0.0042	2.00
	2.1259	2.122	0.0039	0.0091	2.00
465	0.0000	0.000	0.0000	0.0042	2.00
	0.5240	0.522	0.0020	0.0042	2.00
	0.9639	0.965	-0.0011	0.0042	2.00
	1.9788	1.978	0.0008	0.0092	2.00
546.1	0.0000	0.000	0.0000	0.0042	2.00
	0.5194	0.519	0.0004	0.0042	2.00
	0.9991	1.001	-0.0019	0.0042	2.00
	1.9970	1.998	-0.0010	0.0092	2.00
590	0.0000	0.000	0.0000	0.0042	2.00
	0.5523	0.553	-0.0007	0.0042	2.00
	1.0810	1.082	-0.0010	0.0042	2.00
	2.0369	2.035	0.0019	0.0092	2.00
635	0.0000	0.000	0.0000	0.0042	2.00
	0.5596	0.561	-0.0014	0.0042	2.00
	1.0513	1.052	-0.0007	0.0042	2.00
	1.9268	1.925	0.0018	0.0092	2.00

FM-510-02 R03 11/03/2019


FM-510-02 R03 11/03/2019

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REPORT OF CALIBRATION

Certificate No. : SP21-008 Page 5 of 5


Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0076	2.00
	0.7498	0.745	0.0048	0.0076	2.00
257	0.0000	0.000	0.0000	0.0076	2.00
	0.8712	0.864	0.0072	0.0076	2.00
313	0.0000	0.000	0.0000	0.0076	2.00
	0.2920	0.290	0.0020	0.0076	2.00
350	0.0000	0.000	0.0000	0.0076	2.00
	0.6459	0.632	0.0139	0.0076	2.00

Remark : - UUC = Unit Under Calibration
- N/A = Not Available
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%
- End of Certificate -



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CERTIFICATE OF CALIBRATION

Certificate No. : SP21-009 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration : Laboratory 213

Equipment : Spectrophotometer

Manufacturer : Merck

Model : Pharo 100

Serial No. : 12390016


ID No. : UAE.WAT.009/2556


Received Date 25 January 2021

Calibration Date 25 January 2021

Issue Date : 26 January 2021

Condition of Instrument Used

Calibrated by :  (Mr. Tanawat Rittidach) Technical Manager

Approved by :  (Miss Chonlacha Sangsena) Quality Manager


The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.
The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

FM-510-02 R03 11/03/2019


FM-510-02 R03 11/03/2019

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REPORT OF CALIBRATION

Certificate No. : SP21-009
Page 2 of 5

Environment Condition: Ambient Temperature 25 ± 5 °C

Relative humidity 50 ± 15 %RH

Calibration method In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute of Standards and Technology (NIST) through Starna Scientific Limited


Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : N/A


Scan Interval of UUC : N/A nm.

Resolution of UUC: Photometric 0.001 Abs.

Wavelength 1.0 nm.



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REPORT OF CALIBRATION

Certificate No. SP21-009
Page 3 of 5

Wavelength Accuracy :


CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	N/A	N/A	N/A	2.00
279.40	N/A	N/A	N/A	2.00
288.70	N/A	N/A	N/A	2.00
334.22	332	2.22	0.61	2.00
361.26	360	1.26	0.61	2.00
418.48	418	0.48	0.61	2.00
446.70	447	-0.30	0.61	2.00
453.20	453	0.20	0.61	2.00
460.06	459	1.06	0.61	2.00
536.90	537	-0.10	0.61	2.00
637.94	638	-0.06	0.61	2.00
440.74	441	-0.26	0.61	2.00
472.22	471	1.22	0.61	2.00
513.70	514	-0.30	0.61	2.00
528.72	529	-0.28	0.61	2.00
574.60	575	-0.40	0.61	2.00
585.48	586	-0.52	0.61	2.00
684.63	685	-0.37	0.61	2.00
740.27	739	1.27	0.61	2.00
748.28	747	1.28	0.61	2.00
807.16	805	2.16	0.61	2.00
879.70	878	1.70	0.61	2.00

FM-510-02 R03 11/03/2019


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FM-510-02 R03 11/03/2019

เอกสารไม่ควบคุม



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REPORT OF CALIBRATION

Certificate No. SP21-009
Page 4 of 5


Calibration Results Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0042	2.00
	0.5791	0.576	0.0031	0.0042	2.00
	1.0488	1.045	0.0038	0.0042	2.00
	2.1914	2.192	-0.0006	0.0092	2.00
440	0.0000	0.000	0.0000	0.0042	2.00
	0.5618	0.559	0.0028	0.0042	2.00
	1.0260	1.024	0.0020	0.0042	2.00
	2.1259	2.125	0.0009	0.0092	2.00
465	0.0000	0.000	0.0000	0.0042	2.00
	0.5240	0.520	0.0040	0.0042	2.00
	0.9639	0.965	-0.0011	0.0042	2.00
	1.9788	1.982	-0.0032	0.0092	2.00
546.1	0.0000	0.000	0.0000	0.0042	2.00
	0.5194	0.518	0.0014	0.0042	2.00
	0.9991	0.999	0.0001	0.0042	2.00
	1.9970	1.995	0.0020	0.0092	2.00
590	0.0000	0.000	0.0000	0.0042	2.00
	0.5523	0.551	0.0013	0.0042	2.00
	1.0810	1.080	0.0010	0.0042	2.00
	2.0369	2.033	0.0039	0.0092	2.00
635	0.0000	0.000	0.0000	0.0042	2.00
	0.5596	0.558	0.0016	0.0042	2.00
	1.0513	1.050	0.0013	0.0042	2.00
	1.9268	1.925	0.0018	0.0092	2.00



DQE Services Co.,Ltd.
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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. SP21-009
Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	N/A	N/A	N/A	2.00
	0.7498	N/A	N/A	N/A	2.00
257	0.0000	N/A	N/A	N/A	2.00
	0.8712	N/A	N/A	N/A	2.00
313	0.0000	N/A	N/A	N/A	2.00
	0.2920	N/A	N/A	N/A	2.00
350	0.0000	N/A	N/A	N/A	2.00
	0.6459	N/A	N/A	N/A	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

FM-510-02 R03 11/03/2019

เอกสารไม่ควบคุม

FM-510-02 R03 11/03/2019

เอกสารไม่ควบคุม

CERTIFICATE OF CALIBRATION

Certificate No. :
SP20-007

Page 1 of 5

Customer :
United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address :
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration
Laboratory 315

Equipment :
Spectrophotometer

Manufacturer :
Agilent Technologies

Model :
Cary 60

Serial No. :
MY15410009

ID No. :
N/A

Received Date :
9 August 2020

Calibration Date :
9 August 2020

Issue Date :
11 August 2020

Condition of Instrument :
Used

Calibrated by :


(Mr.Tanawut Rittidach)

Approved by :


(Miss Chonthicha Sangnern)

Technical Manager

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

เอกสารควบคุม

FM-510-02 R01 9/03/2019

REPORT OF CALIBRATION

Certificate No. :
SP20-007

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Environment Condition :
Ambient Temperature 25 ± 5 °C

Relative humidity
50 ± 15 %RH

Calibration method :
In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 100 nm./min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

เอกสารควบคุม

FM-510-02 R01 9/03/2019

REPORT OF CALIBRATION

Certificate No. :SP20-007

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.8	-0.08	0.19	2.00
279.45	279.3	0.15	0.19	2.00
287.81	287.7	0.11	0.19	2.00
334.06	333.7	0.36	0.19	2.00
360.93	360.6	0.33	0.19	2.00
418.59	418.2	0.39	0.19	2.00
445.94	445.6	0.34	0.19	2.00
453.66	453.4	0.26	0.19	2.00
460.02	459.6	0.42	0.19	2.00
536.59	536.4	0.19	0.19	2.00
637.98	638.2	-0.22	0.19	2.00
431.38	431.0	0.38	0.19	2.00
472.50	472.4	0.10	0.19	2.00
513.47	513.3	0.17	0.19	2.00
528.88	528.9	-0.02	0.19	2.00
573.17	573.4	-0.23	0.19	2.00
585.35	585.5	-0.15	0.19	2.00
684.40	684.7	-0.30	0.19	2.00
740.72	740.5	0.22	0.21	2.00
748.55	748.8	-0.25	0.19	2.00
807.03	807.0	0.03	0.19	2.00
879.28	879.1	0.18	0.19	2.00

เอกสารควบคุม

FM-510-02 R01 9/03/2019

REPORT OF CALIBRATION

Certificate No. :SP20-007

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Calibration Results :
Without adjustment

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0001	-0.0001	0.0042	2.00
	0.5791	0.5762	0.0029	0.0042	2.00
	1.0488	1.0441	0.0047	0.0042	2.00
	2.1914	2.1828	0.0086	0.0098	2.00
440	0.0000	0.0000	0.0000	0.0042	2.00
	0.5618	0.5604	0.0014	0.0042	2.00
	1.0260	1.0248	0.0012	0.0042	2.00
	2.1259	2.1149	0.0110	0.0097	2.00
465	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5240	0.5215	0.0025	0.0042	2.00
	0.9639	0.9643	-0.0004	0.0042	2.00
	1.9788	1.9714	0.0074	0.0093	2.00
546.1	0.0000	0.0000	0.0000	0.0042	2.00
	0.5194	0.5188	0.0006	0.0042	2.00
	0.9991	0.9996	-0.0005	0.0042	2.00
	1.9970	1.9959	0.0011	0.0097	2.00
590	0.0000	0.0000	0.0000	0.0042	2.00
	0.5523	0.5523	0.0000	0.0042	2.00
	1.0810	1.0806	0.0004	0.0043	2.00
	2.0369	2.0365	0.0004	0.0092	2.00
635	0.0000	0.0000	0.0000	0.0042	2.00
	0.5596	0.5596	0.0000	0.0042	2.00
	1.0513	1.0518	-0.0005	0.0042	2.00
	1.9268	1.9238	0.0030	0.0092	2.00

เอกสารควบคุม

FM-510-02 R01 9/03/2019

DQEServices

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



NSC-TH-176 17025
CALIBRATION 0062

REPORT OF CALIBRATION

Certificate No. : SP20-007

Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0001	-0.0001	0.0076	2.00
	0.7498	0.7493	0.0005	0.0076	2.00
257	0.0000	0.0000	0.0000	0.0076	2.00
	0.8712	0.8690	0.0022	0.0076	2.00
313	0.0000	0.0000	0.0000	0.0076	2.00
	0.2920	0.2917	0.0003	0.0076	2.00
350	0.0000	0.0000	0.0000	0.0076	2.00
	0.6459	0.6416	0.0043	0.0076	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

Accuracy Calibration Certificate

Customer

Company: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangkok

City: Phrakhanong

Zip / Postal: 10260

State / Province: BANGKOK

Order Number:

Contact: Amonrat Puttalee

Manufacturer: Mettler Toledo

Model: XSR205DU

Serial No.: C009071872

Building: N/A

Floor: 2

Room: Balance Room

Instrument Type: Weighing Instrument

Asset Number: N/A

Terminal Model: SRAT

Terminal Serial No.: C009071872

Terminal Asset No.: N/A

Range	Max. Capacity	Readability (d)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)

METTLER TOLEDO Work Instruction: CPM003/16

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found. The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

	Temperature	Humidity
As Found	Start: 23.1 °C End: 23.2 °C	Start: 46.1 % End: 47.4 %

As Found Calibration Date: 29-Apr-2020

As Left Calibration Date: N/A

Issue Date:

Calibrator:

Approved Signatory:

Sirawit Chamchan

☐ Kassakorn Tassanachaisakul

☐ Santi Jiniyom

☐ Surachet Sukkale


Software Version: 1.22.0.178
Report Version: 2.5.47
Form Number: F103C

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เอกสารไม่ควบคุม

Calibration Certificate ID
TH2058-001-042920-ACC-TH



Measurement Results

Repeatability

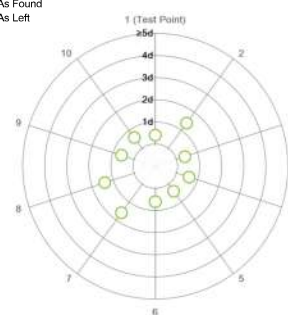
Test Load: 70 g

	As Found	As Left
1	70.00013 g	N/A
2	70.00014 g	N/A
3	70.00013 g	N/A
4	70.00012 g	N/A
5	70.00013 g	N/A
6	70.00012 g	N/A
7	70.00011 g	N/A
8	70.00014 g	N/A
9	70.00012 g	N/A
10	70.00012 g	N/A

Standard Deviation

0.000010 g

N/A



The "d" in the graph represents the readability of the range/interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

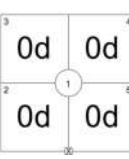
Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0000 g	N/A
3	100.0000 g	N/A
4	100.0000 g	N/A
5	100.0000 g	N/A

Maximum Deviation


0.0000 g

N/A



The "d" in the graph represents the readability of the range/interval in which the test was performed.

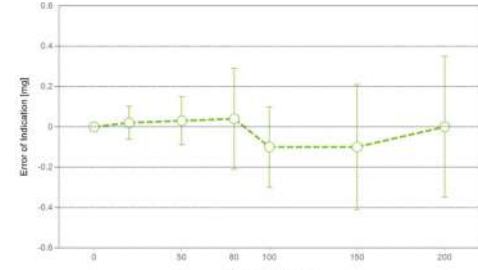
Calibration Certificate ID
TH2058-001-042920-ACC-TH



Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.020 mg	2
2	0.05000 g	0.05001 g	0.00001 g	0.024 mg	2
3	0.10001 g	0.10000 g	-0.00001 g	0.025 mg	2
4	1.00000 g	1.00003 g	0.00003 g	0.034 mg	2
5	5.00002 g	5.00002 g	0.00000 g	0.049 mg	2
6	20.00004 g	20.00006 g	0.00002 g	0.082 mg	2
7	50.00003 g	50.00006 g	0.00003 g	0.12 mg	2
8	80.00009 g	80.00013 g	0.00004 g	0.25 mg	2
9	100.0001 g	100.0000 g	-0.0001 g	0.20 mg	2
10	150.0001 g	150.0000 g	-0.0001 g	0.31 mg	2
11	200.0000 g	200.0000 g	0.0000 g	0.35 mg	2



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.: WS54

Certificate Number: B924817507

Thermo Hygrometer

Equipment No.: IN222

Certificate Number: 20H719

Date of Issue: 17-Jun-2019

Calibration Due Date: 12-Dec-2020

Date of Issue: 27-Mar-2020

Calibration Due Date: 24-Mar-2021

Software Version: 1.22.0.178
Report Version: 2.5.47
Form Number: F103C

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เอกสารไม่ควบคุม

Software Version: 1.22.0.178
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เอกสารไม่ควบคุม

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-3} / K$
Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

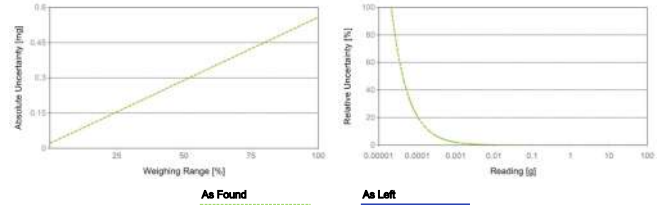
Linearization of Uncertainty Equation

Range	As Found	As Left
1 0 g - 81 g	$U_1 = 0.021 \text{ mg} + 0.00663 \text{ mg/g} \cdot R$	N/A
2 81 g - 220 g	$U_2 = 0.56 \text{ mg} + 0.00687 \text{ mg/g} \cdot (R - 81 \text{ g})$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.00220 g	0.021 mg	0.96%	N/A	N/A
0.02200 g	0.021 mg	0.096%	N/A	N/A
0.22000 g	0.022 mg	0.010%	N/A	N/A
2.20000 g	0.036 mg	0.0016%	N/A	N/A
220.0000 g	1.5 mg	0.00069%	N/A	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

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Software Version: 1.22.0.178
Report Version: 2.5.47
Form Number: F103C

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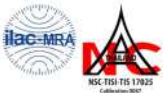
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เอกสารไม่ควบคุม

SPC Calibration Center

SERT SPC Calibration Center

SERT



Certificate of Calibration

Equipment: Hot Air Oven
Model: UF 110
Serial No.(or ID): B146.1008 (UAE.LAB.029/2559)
Manufacturer: Memmert
Condition: In Condition
Shelves(pc.): 2
Certificate No.: C31201525
Issued Date: 29 July 2020
Job No.: KSPR2010308
Page: 1 of 4
Ventilation Valve: Closed

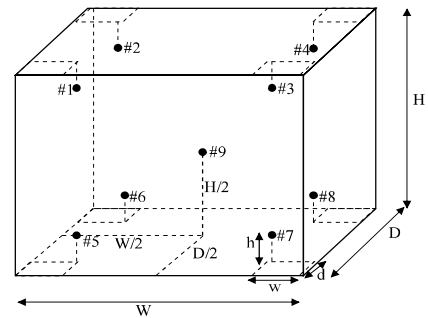
Customer: United Analyst and Engineering Consultant Company Limited
3 Soi Udomsuk 41 Sukhumvit Road,
Bangckak, Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature: $33 \text{ }^{\circ}\text{C} \pm 1.4 \text{ }^{\circ}\text{C}$
Humidity: $54 \% \text{RH} \pm 5.3 \% \text{RH}$
Voltage: $225 \text{ VAC} \pm 1.8 \text{ VAC}$

Calibration Place: United Analyst and Engineering Consultant Company Limited (ห้อง 323)
3 Soi Udomsuk 41 Sukhumvit Road,
Bangckak, Prakanong, Bangkok 10260 Thailand

Calibration By: Mr. Jetsada Poonaklom
Calibration Date: 29 July 2020
The Method used: In house method, SPCC-WI-16, base on TLAS-G20
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10200006

Certificate No.: C31201525 Page 2 of 4



Standard Installation Locations

Volume (Calibration Zone)= 58 (Liters)

Inside chamber: $W = 56 \text{ (cm)}$ $D = 40 \text{ (cm)}$ $H = 56 \text{ (cm)}$
Standard Locations (#1, #2, #3, #4): $w = 6 \text{ (cm)}$ $d = 5 \text{ (cm)}$ $h = 6 \text{ (cm)}$
Standard Locations (#5, #6, #7, #8): $w = 6 \text{ (cm)}$ $d = 5 \text{ (cm)}$ $h = 6 \text{ (cm)}$

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

(Mr. Jetsada Poonaklom)
Person in charge

(Mr. Udon Srichana)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

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).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Certificate No.: C31201525 Page 3 of 4

Calibration Results:

Before adjustment

Setting: 170.0 Indicating: 170.0 #1: 172.60 #2: 171.08 #3: 173.35 #4: 172.28 #5: 173.08 #6: 172.13 #7: 170.15 #8: 170.84 #9: 172.65

After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 105.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.98	-0.02	0.44
#2	104.40	-0.60	0.44
#3	105.31	0.31	0.44
#4	104.92	-0.08	0.44
#5	105.21	0.21	0.44
#6	104.83	-0.17	0.44
#7	103.88	-1.12	0.45
#8	104.27	-0.73	0.44
#9	105.07	0.07	0.44

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
105.0	105.0	105.0	104.98	104.40	105.31	104.92	105.21	104.83	103.88	104.27	105.07	0.45

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
105.0	1.31	0.12	1.60

Note: * Maximum uncertainty of the each position

Certificate No.: C31201525 Page 4 of 4

After adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 170.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	170.78	0.78	0.70
#2	169.31	-0.69	0.69
#3	171.37	1.37	0.69
#4	170.40	0.40	0.69
#5	171.18	1.18	0.69
#6	170.30	0.30	0.69
#7	168.40	-1.60	0.72
#8	169.14	-0.86	0.69
#9	170.83	0.83	0.69

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
170.0	170.0	170.0	170.78	169.31	171.37	170.40	171.18	170.30	168.40	169.14	170.83	0.72

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
170.0	2.66	0.19	3.28

Note: * Maximum uncertainty of the each position

The End of Certificate

บริษัท เอสซีซี อาร์ท จำกัด
SPC RT CO., LTD.
สาขาที่ 00003 : 1194 ซอยเชจิวรามเตโช 57 ถนนสุขุมวิท 101/1 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Branch 00003 : 1194 Soi Chejwaramtecho 57, Sukhumvit 101/1 Road, Sungsong, Phraeklong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Ext. 3300-3306 Fax: 0 2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

Your satisfaction is our promise @ SPCRT

เอกสารไม่ควบคุม

SPCC-FM-C31-05: 11 Feb 2020

บริษัท เอสซีซี อาร์ท จำกัด
SPC RT CO., LTD.
สาขาที่ 00003 : 1194 ซอยเชจิวรามเตโช 57 ถนนสุขุมวิท 101/1 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Branch 00003 : 1194 Soi Chejwaramtecho 57, Sukhumvit 101/1 Road, Sungsong, Phraeklong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Ext. 3300-3306 Fax: 0 2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

Your satisfaction is our promise @ SPCRT

SPC Calibration Center

เอกสารไม่ควบคุม

SPCC-FM-C31-05: 11 Feb 2020

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2010308

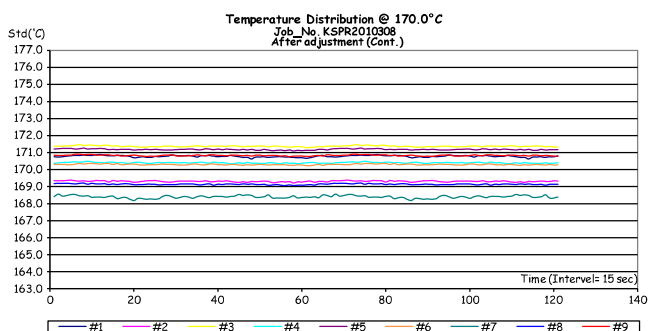
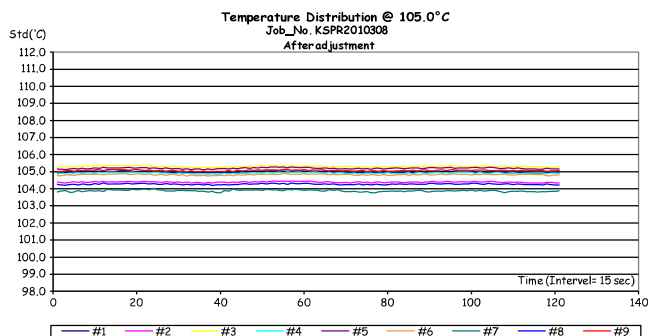
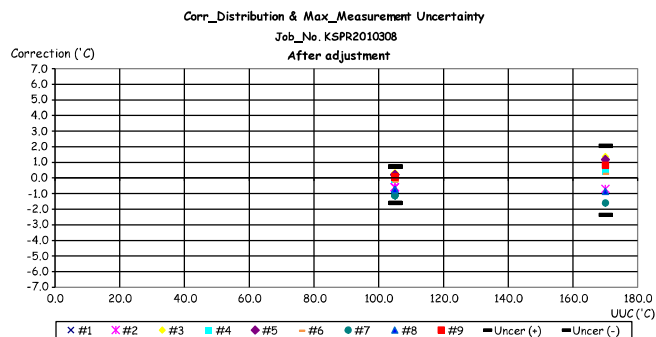
ชนิดเครื่อง: Hot Air Oven รุ่น: UF 110

หมายเลขเครื่อง: B146.1008 (UAE.LAB.029/2559)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
29 Jul 2020			29 Jul 2020		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation Slide	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Jetsada Poonaklom
Service Engineer



เอกสารไม่ควบคุม

บริษัท เอสซีซี อาร์ท จำกัด
SPC RT CO., LTD.
สาขาที่ 00003 : 1194 ซอยเชจิวรามเตโช 57 ถนนสุขุมวิท 101/1 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Branch 00003 : 1194 Soi Chejwaramtecho 57, Sukhumvit 101/1 Road, Sungsong, Phraeklong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Ext. 3300-3306 Fax: 0 2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

Your satisfaction is our promise @ SPCRT

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2102572-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115858

ID No.: UAE.AIR.016/2555

Order No.: 2102572

Operation No.: 2102572-001

Date of Receipt: 26 April 2021

Date of Calibration: 26 April 2021

Calibrated by Mr. Manas Somsak
Expert

Approved by 
(Mr. Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 29 April 2021

Responsible for the Technical Management Team

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 standards laboratory. This certificate is valid only for the purpose stated and is not valid in full except with the prior written approval of the National Food Institute.

เอกสารไม่ควบคุม

F-CS-012 Revision: 00 Date: 14-12-61

Calibration Report

Certificate No.: 2102572-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Page 2 of 5

Date of Calibration: 26 April 2021
Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Standard Weight Class E2 1-500mg 15880 TCS M20111955 28 November 2021

Standard Weight Class E2 1-500g 15882 TCS M20111965 28 November 2021

Instrument **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Thermo-Hygro Meter POMPE 490 NFI.BTH 004/18 Quality Return QR21-0300 15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000000
200	0.000042

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
50.0001	50.0001	50.0001	50.0002	50.0002	50.0001	0.0001

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Page 3 of 5

Date of Calibration: 26 April 2021

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor K
Unladen	0.00000	0.0000	0.0000	0.000002	2.00
0.1	0.10000	0.1000	0.0000	0.000002	2.00
0.5	0.49999	0.5000	0.0000	0.000003	2.00
1	0.99999	1.0000	0.0000	0.000006	2.00
2	1.99999	2.0000	0.0000	0.000004	2.00
5	4.99998	5.0000	0.0000	0.000004	2.00
10	9.99997	10.0000	0.0000	0.000011	2.00
15	14.99997	15.0000	0.0000	0.000012	2.00
20	19.99997	20.0000	0.0000	0.000013	2.00
30	29.99996	30.0001	0.0000	0.000015	2.00
40	39.99996	40.0001	-0.0001	0.000014	2.00
50	49.99995	50.0002	-0.0002	0.000015	2.00
70	69.99993	70.0002	-0.0002	0.000019	2.00
100	99.99997	100.0003	-0.0003	0.000020	2.00
150	149.99997	150.0004	-0.0004	0.000027	2.00
200	199.99999	200.0005	-0.0005	0.000043	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 %.

เอกสารไม่ควบคุม

F-CS-012 Revision: 00 Date: 14-12-61

Calibration Report

Certificate No.: 2102572-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Page 4 of 5

Date of Calibration: 26 April 2021
Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Standard Weight Class E2 1-500mg 15880 TCS M20111955 28 November 2021

Standard Weight Class E2 1-500g 15882 TCS M20111965 28 November 2021

Instrument **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Thermo-Hygro Meter POMPE 490 NFI.BTH 004/18 Quality Return QR21-0300 15 February 2022

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
10	0.0000
20	0.0000

2. Off-Center Error:

A mass of 5 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
5.0000	5.0002	5.0001	5.0001	5.0000	5.0000	0.0002

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 26 April 2021 **Page 5 of 5**

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Calibration with filter pan)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (±g)	Coverage Factor k
Unread	0.0000	0.0000	0.0000	0.000082	2.00
0.01	0.01000	0.01000	0.0000	0.000082	2.00
0.05	0.05000	0.05000	0.0000	0.000082	2.00
0.1	0.10000	0.10000	0.0000	0.000082	2.00
0.5	0.49999	0.50000	0.0000	0.000083	2.00
1	0.99999	1.00000	0.0000	0.000085	2.00
2	1.99999	2.00000	0.0000	0.000084	2.00
3	2.99998	3.00000	0.0000	0.000087	2.00
4	3.99999	4.00000	0.0000	0.000085	2.00
5	4.99998	5.00000	0.0000	0.000084	2.00
10	10.00003	10.00000	0.0000	0.00011	2.00
15	15.00001	15.00000	0.0000	0.00012	2.00
20	20.00004	20.00000	0.0000	0.00013	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 %.

----- End -----

FCS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 3344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM811
Page: 1 of 3

Certificate of Calibration

Equipment: BOD Incubator
Manufacturer: ARCO
Model: UR-1320
Serial No.: -
ID No.: UAE.WAO.018/2551
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangkok, Phrakhanong,
 Bangkok 10260
Location: Lab Floor 2
Received Order: 21 April 2021
Calibration Date: 21 April 2021
Ambient Temperature: (26 ± 10) °C
Relative Humidity: (50 ± 30) %
Calibrated by: Khit Ruttanaprapachai
Approved by:
 Approved Signatory
 () Pornthippa Tameyakul
 () Malee Buikrua
 () Suwit Injai

Issue Date: 5 May 2021

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.

เอกสารไม่ควบคุม

A 0027600



Equipment: BOD Incubator
Condition As-Received: Used Item
Reference: 2104-0024OC-3
Procedure Used :-
Cert. No.: 21TM811
Page: 2 of 3

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

- Reference standard instrument-
Instrument **Serial No.** **Cert. No.** **Traceable** **Due Date**
 1) Data Acquisition MY57013711 20LM7 NIST, NIMT 18 May 2021
- This certification is traceable to the SI unit.
- This certificate is valid only to the item calibrated on date and place of calibration.

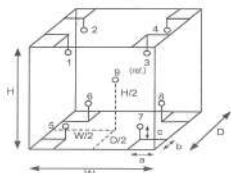
Remark: NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC*: Temperature Source

Fresh air setting: Not Available



Probe Installation Details: **Dimension of Chamber:**

a = 10 cm D = 0.62 m
 b = 10 cm W = 1.2 m
 c = 10 cm H = 1.2 m
 Capacity = 0.89 m³

Environment during calibration	
	Beginning
Temp. (°C)	27
REL.Humid. (%)	47
AC Supply (Volt)	221
	Finished
Temp. (°C)	28
REL.Humid. (%)	51
AC Supply (Volt)	222

Position	Ref. Std./ID No.:
1	18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	18RTD-2/6
7	18RTD-2/7
8	18RTD-2/8
9 (ref.)	18RTD-2/9



Equipment: BOD Incubator
Condition As-Received: Used Item
Reference: 2104-0024OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC*: Temperature Source
Cert. No.: 21TM811
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (±°C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (±°C)	Coverage Factor k
20.0	20.0	20.0	0.15	0.47	0.86	0.31	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.368	20.509	20.115	20.023	19.826	19.955	20.135	20.269	20.101

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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เอกสารไม่ควบคุม

a 1052720

เอกสารไม่ควบคุม

a 1052721



Cert. No.: 21TM812
Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UR-1320
Serial No. : -
ID No. : UAE.WAO.006/2553
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 21 April 2021
Calibration Date : 21 April 2021
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Khit Ruttanaprapachai
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 5 May 2021

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.

เอกสารไม่ควบคุม

A 0027601



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2104-0024OC-4
Procedure Used :-

Cert. No.: 21TM812
Page.: 2 of 3

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

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	20LM7	NIST, NIMT	18 May 2021

2. This certification is traceable to the SI unit.

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

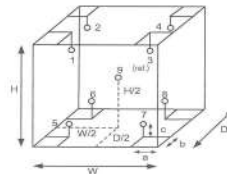
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Probe	Dimension	Value
a =	10 cm	D = 0.62 m
b =	10 cm	W = 1.2 m
c =	10 cm	H = 1.2 m
		Capacity = 0.89 m ³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	47	51
AC Supply (Volt)	221	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	18-18RTD-08
9 (ref.)	18-18RTD-09

เอกสารไม่ควบคุม

a 1052719



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2104-0024OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM812
Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	20.0	19.8	0.37	0.39	1.0	0.58	2
Measured Temperature (°C)							
Calibration Point (°C)	Position						
	1	2	3	4	5	6	7
20.0	20.059	20.108	19.849	19.766	20.117	20.291	19.725

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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เอกสารไม่ควบคุม

a 1052718



Cert. No.: 20TM1612
Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Arco
Model : UC4-1320
Serial No. : -
ID No. : UAE.LAB.002/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 18 August 2020
Calibration Date : 18 August 2020
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Preecha Hiahib
Approved by :
() Pornthippa Tameyakul
() Malee Butkruea
(✓) Suwit Imjai
Issue Date : 24 August 2020

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.

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2008-0276OC-1

Cert. No.: 20TM1612
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

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY41021843	20LM1	NIMT, NIST	29 Dec 2020

2. This certification is traceable to the SI unit.

3. This result of calibration was found accurate as shown on date and place of calibration only.

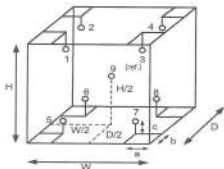
Remark : NIMT : National Institute of Metrology Thailand.

NIST : National Institute of Standards and Technology, The United State of America.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	31
REL.Humid. (%)	55	59
AC Supply (Volt)	220	220

Position :	Ref. Std./ID No.:
1	18-04RTD-01
2	18-04RTD-02
3	18-04RTD-03
4	18-04RTD-04
5	18-04RTD-05
6	18-04RTD-06
7	18-04RTD-07
8	18-04RTD-08
9 (ref.)	18-04RTD-09

Probe Installation Details :

Dimension of Chamber :

a = 10 cm
b = 10 cm
c = 10 cm
D = 0.53 m
W = 1.2 m
H = 1.2 m
Capacity = 0.76 m³

เอกไม่สำรควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2008-0276OC-1

Cert. No.: 20TM1612
Page.: 3 of 3

Result of Calibration :-

(*) Without Adjustment

Function of UUC* : Temperature Source

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	19.5	19.4	0.46	0.38	1.2	0.84	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.123	20.244	20.072	19.826	20.070	20.075	19.881	19.862	19.942

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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เอกไม่สำรควบคุม



**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CALIBRATION AND TESTING EQUIPMENT SERVICES**

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Cert. No.: 21TM364
Page.: 1 of 3

Certificate of Calibration

Equipment : Heating Block

Manufacturer : Hanna

Model : HI839800-02

Serial No. : H0185001

ID No. : UAE.WAS.004/2551

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Dry Laboratory

Received Order : 22 February 2021

Calibration Date : 22 February 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hiahib

Approved by :

() Ponthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

Issue Date : 3 March 2021

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 Calibration and Testing Equipment Services.

เอกสำรไม่ควบคุม



Equipment : Heating Block
Condition As-Received : Used Item
Reference : 2102-0755OC-1

Cert. No.: 21TM364
Page.: 2 of 3

Procedure Used :-

As agreed with customer the calibration was perform using in-house calibration method according to directed measurement method with Data Acquisition which connected with Thermocouple Type T.
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) Data Acquisition	MY49023932	20LM6	NIST, NIMT	20 Apr 2021

2. This certification is traceable to the SI unit.

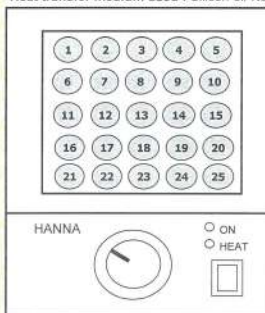
3. This result of calibration was found accurate as shown on date and place of calibration only.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Function of UUC* : Temperature Source

Heat transfer medium used : Silicon oil No. 50



Environment during calibration		
	Beginning	End
Temp.(°C)	30	32
REL.Humi.(%)	49	55
AC Supply (Volt)	220	220

Position :	1	2	3	4	5
Ref. Std./ID No.:	19-16TC-01	19-16TC-02	19-16TC-03	19-16TC-04	19-16TC-05
Position :	6	7	8	9	10
Ref. Std./ID No.:	19-16TC-06	19-16TC-07	19-16TC-08	19-16TC-09	19-16TC-10
Position :	11	12	13	14	15
Ref. Std./ID No.:	19-16TC-11	19-16TC-12	19-16TC-13	19-16TC-14	19-16TC-15
Position :	16	17	18	19	20
Ref. Std./ID No.:	19-16TC-16	19-16TC-17	19-16TC-18	19-16TC-19	19-16TC-20
Position :	21	22	23	24	25
Ref. Std./ID No.:	19-16TC-01	19-16TC-02	19-16TC-03	19-16TC-04	19-16TC-05

Top View

เอกสำรไม่ควบคุม



Equipment : Heating Block
Condition As-Received : Used Item
Reference : 2102-0755OC-1
Result of Calibration :- (*) Before Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM364
Page.: 3 of 3

Calibration Point 150 °C

UUC* Setting (°C)	UUC* Reading (°C)	Measured Temperature (°C)					Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
		Position							
150	-	1	2	3	4	5	0.37	0.94	2
		151.336	151.415	151.658	151.846	150.966			
		6	7	8	9	10			
		150.561	151.780	152.098	151.423	151.317			
		11	12	13	14	15			
		150.822	151.432	151.965	152.153	151.444			
		16	17	18	19	20			
		150.745	150.854	152.022	151.121	150.626			
		21	22	23	24	25			
		150.368	150.214	151.408	151.739	151.103			

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.

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 %.

-000-

เอกสารไม่ควบคุม

a 1044086

กำหนดจุดห้ามใช้งาน

References Certificate Number. : 21TM364

Equipment : Heating Block

Model : HI839800-02

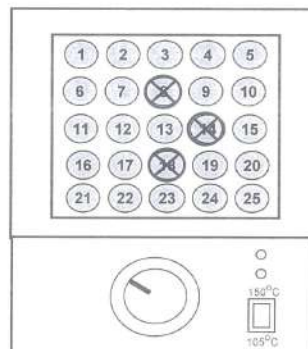
Serial No. : H0185001

ID No. : UAE.WAS.004/2551

Manufacturer : Hanna

Calibration Point : 150 °C

Unit Under Calibration Setting : 150 °C



รูปภาพเครื่องมือ แสดงจุดที่ได้รับการสอบเทียบ และสัญลักษณ์ X แสดงจุดห้ามใช้งาน

กำหนดจุดห้ามใช้งานตำแหน่งที่....8, 14, 18.....

หมายเลข เก็บใบแฟ้ม.....

\\uae.net\app\vetapp_LAB\Lab-BK\INSTRUMENT\01-2106-04\Certificate\กำหนดจุดห้ามใช้งานเครื่องมือ\กำหนดจุดห้ามใช้งานเครื่องมือ 2551\กำหนดจุดห้ามใช้งานเครื่องมือ 2551\UAE\LAB004_2551\21TM364.doc

เอกสารไม่ควบคุม



Hanna Instruments (Thailand) Ltd.

410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samsen-nok,
Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198

Certificate No. : HIT-2121-0516

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater
Meter Model : HI839800-02 Serial No. : 4500052101
Manufacturer : Hanna Instruments
Made in : Romania
Condition As-Received : Used Product
Reference : RE210675
Customer name : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Rd., Bangehak
Phrakhanong, Bangkok 10260
Received date : 13 May 2021
Calibrate date : 17 May 2021
Issue date : 17 May 2021
Ambient Temperature : (25 ± 2) °C
Relative Humidity : (50 ± 15) % RH
Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibrated by :

Mr. Pichit Petthong
Calibration Engineer

Approved by :

Mr. Anan Suwanchaisakul



This certificate was certified only for the instrument we calibrated.

This result of calibration was found accurate on date and place of calibration only.

** This certificate may not be reproduced other than in full, except with the prior written **

approval of the head of Hanna Instrument (Thailand)

เอกสารไม่ควบคุม



Certificate No. : HIT-2121-0516

Page : 2 of 3

Condition of this result of calibration

Reference Standard Instruments :

Instruments	Model	Serial No.	Certificate No.	Traceable
Thermometer With Sensor	HI935005	03250060101	21T167	Technology Promotion Association (Thailand-Japan)

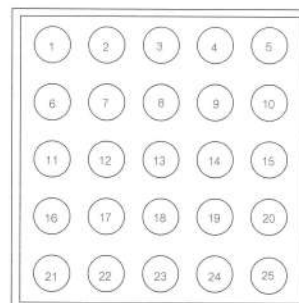
Reference / Procedure :

This equipment was calibration by comparison to the reference standard (Standard platinum resistance thermometer) whose accuracy is traceable to the national standard. The calibration was performed by generating the specified working point of temperature then recorded the temperature reading values against the reference standard according to Hanna Calibration Laboratory work Instruction No. 141,

This temperature scale used was based on ITS-90

All data shown below were as-received values without adjustment.

SITE CALIBRATION



เอกสารไม่ควบคุม

Result of Calibration :

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 (°C)	150.6 (°C)	150.3 (°C)	2.0 (°C)	± 0.62 (°C)

Calibration Point (°C)	Average Standard Reading (°C)				
	Position				
150.0	1	2	3	4	5
	149.4	150.6	150.8	150.6	150.0
	6	7	8	9	10
	149.5	150.8	151.0	151.0	150.2
	11	12	13	14	15
	149.7	150.7	151.0	151.0	150.2
	16	17	18	19	20
	149.4	150.7	150.9	150.8	150.0
	21	22	23	24	25
	149.0	149.8	150.2	150.3	149.1

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

** End of certificate **

เอกสารไม่ควบคุม

Verification Certificate

Substitute for Certificate No.: 2103014-001-01
Certificate No.: 2103014-001-02
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PRAKHANONG, BANGKOK, 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION
Manufacturer: VELP SCIENTIFICA
Model: DK120
Serial No.: 213517
ID No.: UAE.WAS.005/2555
Order No.: 2103014
Operation No.: 2103014-001
Date of Receipt: 30 May 2021
Date of Calibration: 2,7 June 2021

Calibrated by Mr.Nuttapol Niyomchat Expert Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Date of Issue: 25 June 2021 Responsible for the Technical Management Team

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2103014-001-02
Equipment: HEATING BLOCK DIGESTION
Model: DK120 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA
Date of Calibration: 2,7 June 2021

Page 2 of 4

Location: Calibration Laboratory, NATIONAL FOOD INSTITUTE
Environment Condition: Ambient Temperature (25 ± 3) °C
Relative Humidity (55 ± 15) %
Line Voltage (220 ± 10) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.
- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.
- Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A/34901A Type R	MY40405576/MY41194453 TCR101-103 / CH101-103	TC21/0041	24-Apr-2022	N.M. Technical Center Laboratory

- This certificate is traceable to international system of units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC* Description
Time of Record : Hour 30 Minute : At 380 °C

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2103014-001-02
Equipment: HEATING BLOCK DIGESTION
Model: DK120 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA
Date of Calibration: 2,7 June 2021

Page 3 of 4

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	379 - 380	0.53	383.17	1.8
2	380	379 - 380	0.32	383.16	1.8
3	380	379 - 380	0.39	382.96	1.8
4	380	379 - 380	0.18	381.23	1.8
5	380	379 - 380	0.49	382.97	1.8
6	380	379 - 380	0.49	382.85	1.8
7	380	379 - 380	0.54	382.97	1.8
8	380	379 - 380	0.24	382.95	1.8
9	380	379 - 380	0.61	383.17	1.8
10	380	379 - 380	0.73	381.14	1.9
11	380	379 - 380	0.73	382.53	1.9
12	380	379 - 380	0.76	381.56	1.9
13	380	379 - 380	0.38	382.25	1.7
14	380	379 - 380	0.43	383.00	1.7
15	380	379 - 380	0.31	383.08	1.7
16	380	379 - 380	0.22	381.78	1.7
17	380	379 - 380	0.31	382.99	1.7
18	380	379 - 380	0.37	383.24	1.7
19	380	379 - 380	0.32	380.98	1.7
20	380	379 - 380	0.31	382.63	1.7

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

เอกสารไม่ควบคุม

Preventive Maintenance Protocol

Verification Report

Certificate No.:	2103014-001-02
Equipment:	HEATING BLOCK DIGESTION
	Model: DKL20 Serial No.: 213517
	Resolution: 1 °C ID No.: UAE.WAS.005/2555
	Manufacturer: VELP SCIENTIFICA
Date of Calibration:	2,7 June 2021
Calibration point:	380 °C
Calibration result:	Continued

Page 4 of 4

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



Sensor Installation Location

Remark: Edited ID.No. from UAE.WAB.005/2555 to UAE.WAS.005/2555.

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

----- End -----

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Instrument: Digestor unit	Model 2530auto	S/N: 91794469
Customer บริษัท สุวิทย์ แอโรแมคเคิล แอนด์ อีควิปเม้นท์ จำกัด	Job No. MS63FO700848	

Introduction

A maintenance protocol provides a systematic and functional means of maintaining a specific instrument type. The certified performed PM interval depends on the operational conditions, and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be taken into account. Demanding environments, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

The content of this protocol is subject to change over time. In order to ensure you the correct parts, please make sure to indicate serial number and date of installation when contacting you FOSS representative.

Maintenance Procedure

Check and Cleaning

Step	Action	OK
1	Check cables, electrical connections and power supply AC 220 volts	<input checked="" type="checkbox"/>
2	Check the function of power switch	<input checked="" type="checkbox"/>
3	Check the function of temperature controller	<input checked="" type="checkbox"/>
4	Check the display and keypad function	<input checked="" type="checkbox"/>
5	General cleaning	<input checked="" type="checkbox"/>
6	Check the time of heating up to 420°C (D6 6 and 8 ~ 30 mins, D520 and 40 ~ 40 mins)	<input checked="" type="checkbox"/>
7	Check the digestion time with external watch	<input checked="" type="checkbox"/>
8	Check the temperature in seasand of test tube	<input checked="" type="checkbox"/>

Temp. setting	T1	T2	T3	T4	T5	Mean value
420°C 89.0°C	89.0	89.7	89.9	89.6	89.1	89.304

Remark

Signature

Customer's Signature

Signature

Engineer's Signature

Date 25/02/2021

451-451/1 ศูนย์บริการ และซ่อมบำรุงภาค เขตบางพลี กรุงเทพฯ 10700 โทร. 0-2433-8331, 0-24358800, 0-2434-9191 แฟกซ์ 0-2433-1679, 0-2434-9510

451-451/1 Srinthorn Road, Bangbunru, bangplud, bangkok 10700, Thailand Tel.(662) 433-8331, 435-8800

EMAIL: center@sithiphorn.com www.sithiphorn.com เอกสารไม่ควบคุม

SITHIPHORN

1

Preventive Maintenance Protocol

Instrument: Kjeltec™ 2100	Model 2100 S/N: 524 424
Customer บริษัท สุวิทย์ แอโรแมคเคิล แอนด์ อีควิปเม้นท์ จำกัด	Job No. MS63FO700848
Certified performed PM interval (whichever occurs first between interval and no. of samples analysed)	12 Months No. of samples analysed (if applicable):

Introduction

A maintenance protocol provides a systematic and functional means of maintaining a specific instrument type. The certified performed PM interval depends on the operational conditions, and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be taken into account. Demanding environments, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

The content of this protocol is subject to change over time. In order to ensure you the correct parts, please make sure to indicate serial number and date of installation when contacting you FOSS representative.

Maintenance Procedure

Parts to be Exchanged

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	10000056	<input type="checkbox"/>
2	Replace	Non return valve	10003538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	15750093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	15820006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	15820011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/12 mm	15820004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

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associates

3

Check and Adjustment

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump	10.1 ml	At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume		10.9 ml	100 - 150 ml/4min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cable, electrical connection and main power supply AC 220 Volts				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

Remark

Signature

Customer's Signature

Signature

Engineer's Signature

Date 25/02/2021

Preventive Maintenance Protocol

Instrument: Kjeltec™ 2100	Model: K7001 S/N: 91798524
Customer: บริษัท สุวิทย์ เทคโนโลยี จำกัด (มหาชน) 53/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110	Job No. MS-2100-0048
Certified performed PM interval (whichever occurs first between interval and no. of samples analysed)	12 Months No. of samples analysed (if applicable):

Introduction

A maintenance protocol provides a systematic and functional means of maintaining a specific instrument type, the certified performed PM interval depends on the operational conditions, and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be taken into account. Demanding environments, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

The content of this protocol is subject to change over time. In order to ensure you the correct parts, please make sure to indicate serial number and date of installation when contacting your FOSS representative.

Maintenance Procedure

Parts to be Exchanged

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	10000056	<input type="checkbox"/>
2	Replace	Non return valve	10003538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	15750093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	15820006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	15820011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	15820004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

Check and Adjustment

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump	10 ml	At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume		110 ml	100 - 150 ml/4min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cable, electrical connection and main power supply AC 220 Volts				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

Remark:

[Signature]
Customer's Signature

[Signature]
Engineer's Signature

Date: 25/05/2021

451-451/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10700 โทร. 0-2433-8331, 0-24358800, 0-2434-9191 แฟกซ์ 0-2433-1679, 0-2434-8510
451-451/1 Srinthorn Road, Bangumru, Bangkok 10700, Thailand Tel.(662) 433-8331, 435-8800 Fax(662) 433-1679, 434-8510
EMAIL: center@sithiphorn.com www.sithiphorn.com เอกสารไม่ควบคุม

451-451/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10700 โทร. 0-2433-8331, 0-24358800, 0-2434-9191 แฟกซ์ 0-2433-1679, 0-2434-8510
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EMAIL: center@sithiphorn.com www.sithiphorn.com เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3880-27 FAX: 0-2719-9484



Certificate of Calibration

Cert. No.: 20TM841
Page.: 1 of 3

Equipment : Incubator
Manufacturer : Memmert
Model : IPP 260
Serial No. : V613.0095
ID No. : UAE.LAB.009/2558
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 27 April 2020
Calibration Date : 27 April 2020
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Preecha Hiahb
Approved by : *[Signature]*
Approved Signatory
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 7 May 2020

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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2004-03790C-3

Cert. No.: 20TM841
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

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44031769	19LM5	NIST	02 Aug 2020

2. This certification is traceable to the SI unit.

3. This result of calibration was found accurate as shown on date and place of calibration only.

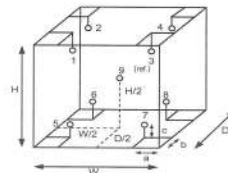
Remark : NIST : National Institute of Standards and Technology, The United State of America.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	21	20
REL.Humid. (%)	60	62
AC Supply (Volt)	220	222



Probe Installation Details :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³

Position :	Ref. Std./ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

เอกสารไม่ควบคุม



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2004-0379OC-3
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 20TM841
 Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
35.0	35.0	35.0	0.039	0.68	0.91	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.287	35.460	35.091	35.234	34.838	34.732	34.595	34.732	35.247

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 .

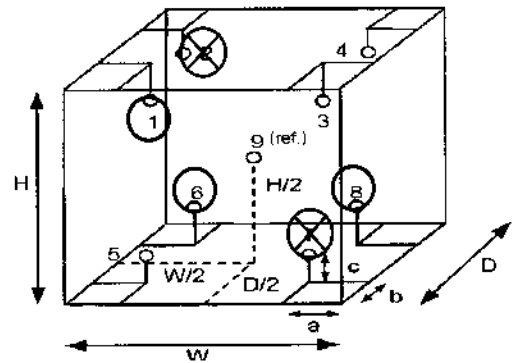
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.

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เอกสารไม่ควบคุม

กำหนดจุดห้ามใช้งาน

Equipment : Incubator
 Model : IPP260
 Serial No. : V613.0095
 ID No. : UAE.LAB.009/2558
 Manufacturer : Memmert
 Calibration Point : 35.0 °C
 Unit Under Calibration Setting : 35.0 °C



กำหนดจุดเพื่อระวางตำแหน่งที่ 1,6,8
 กำหนดจุดห้ามใช้งานตำแหน่งที่ 2,7

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL: 0-2717-3000-27 FAX: 0-2719-9484



Cert. No.: 21TM832
 Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
 Manufacturer : Memmert
 Model : IF 75
 Serial No. : D317.0305
 ID No. : UAE.MIC.022/2561
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchak, Phrakhanong,
 Bangkok 10260
 Location : Microbiology Laboratory
 Received Order : 7 May 2021
 Calibration Date : 7 May 2021
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 Calibrated by : Khit Rutanaprapachai

Approved by :
 Approved Signatory

() Pormthippa Tamayakul
 () Malee Butkruea
 () Suwit Imjai

Issue Date : 18 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2105-0012OC-2

Cert. No.: 21TM832
 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

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	20LM7	18 May 2021

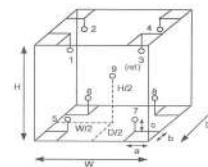
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 :
 a = 5.0 cm
 b = 5.0 cm
 c = 5.0 cm

Dimension of Chamber :
 D = 0.32 m
 W = 0.42 m
 H = 0.56 m
 Capacity = 0.075 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	59	62
AC Supply (Volt)	220	221

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	18-18RTD-08
9 (ref.)	18-18RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2105-0012OC-2
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 21TM832
 Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
44.0	44.0	44.0	0.041	0.31	0.37	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
44.0	43.921	44.045	44.053	43.982	43.968	43.856	43.798	43.993	44.093

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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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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 534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 20TM8
 Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
 Manufacturer : Memmert
 Model : IF 75
 Serial No. : D317.0305
 ID No. : UAE.LAB.022/2561
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangkok, Phrakhanong,
 Bangkok 10260
 Location : Microbiology Laboratory
 Received Order : 8 May 2020
 Calibration Date : 8 May 2020
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %

Calibrated by : Suwit Imjai

Approved by :
 Approved Signatory

() Ponthipha Tameyakul
 (/) Malee Butkruea

Issue Date : 12 May 2020

The Uncertainties are for a confidence probability of approximately 95 %

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เอกสารไม่ควบคุม



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2005-0107OC-2
 Procedure Used :-

Cert. No.: 20TM8
 Page.: 2 of 3

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

- Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44031769	19LM5	NIST	02 Aug 2020
- This certification is traceable to the SI unit.
- This result of calibration was found accurate as shown on date and place of calibration only.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

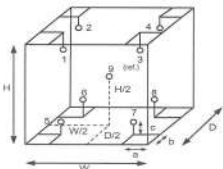
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Fan setting : 60%

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	24
REL.Humid. (%)	62	64
AC Supply (Volt)	231	233



Probe Installation Details :
 a = 5.0 cm
 b = 5.0 cm
 c = 5.0 cm
 Dimension of Chamber :
 D = 0.32 m
 W = 0.42 m
 H = 0.56 m
 Capacity = 0.075 m³

Position :	Ref. Std./ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/10
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2005-0107OC-2
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 20TM8
 Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
44.0	43.9	43.9	0.059	0.33	0.41	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
44.0	44.084	44.045	44.187	44.158	44.167	44.095	43.877	43.927	44.186

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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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Cert. No.: 21TM833
Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : IN 75
Serial No. : D317.0307
ID No. : UAE.MIC.023/2561
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 7 May 2021
Calibration Date : 7 May 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Khit Ruttanaprapachai
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 18 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2105-0012OC-3
Procedure Used :-

Cert. No.: 21TM833
Page.: 2 of 3

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

1. Reference standard instrument-

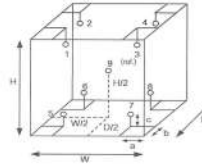
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	20LM7	18 May 2021

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 :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.32 m
W = 0.42 m
H = 0.56 m
Capacity = 0.075 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	59	62
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	18RTD-2/6
7	18RTD-2/7
8	18RTD-2/8
9 (ref.)	18RTD-2/9

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2105-0012OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM833
Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
36.0	36.0	36.0	0.068	0.33	0.60	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
36.0	1	2	3	4	5	6	7	8	9 (ref.)
	36.281	36.162	36.312	36.247	35.764	35.780	35.851	35.861	36.007

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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เอกสารไม่ควบคุม



Cert. No.: 21TM422
Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0606
ID No. : UAE.MIC.002/2560
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 22 February 2021
Calibration Date : 22 February 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 3 March 2021

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2102-0751OC-3
Procedure Used :-

Cert. No.: 21TM422
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

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) Data Acquisition	MY44036292	20LM5	NIST, NIMT	10 Apr 2021

2. This certification is traceable to the SI unit.

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

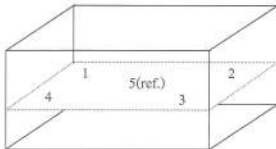
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	54	219
Finished of Calibration	24	58	221



Front

Position :	Ref. Std. ID No.
1	70RC148
2	70RC149
3	70RC150
4	70RC151
5(ref.)	70RC152

เอกสารไม่ควบคุม

1047071



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2102-0751OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM422
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.462	44.465	44.510	44.496	44.460

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.097	0.046	0.15	2

Average* : The average of 30 values in each position.

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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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เอกสารไม่ควบคุม

1047070



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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM423
Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0612
ID No. : UAE.MIC.003/2560
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 22 February 2021
Calibration Date : 23 February 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon

Approved by :
Approved Signatory

() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 3 March 2021

The Uncertainties are for a confidence probability of approximately 95%

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1045318



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2102-0751OC-4
Procedure Used :-

Cert. No.: 21TM423
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

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) Data Acquisition	MY44036292	20LM5	NIST, NIMT	10 Apr 2021

2. This certification is traceable to the SI unit.

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

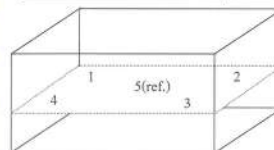
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	56	220
Finished of Calibration	24	59	221



Front

Position :	Ref. Std. ID No.
1	70RC148
2	70RC149
3	70RC150
4	70RC151
5(ref.)	70RC152

เอกสารไม่ควบคุม

1045329



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2102-0751OC-4
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 21TM423
 Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.531	44.474	44.492	44.514	44.537

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.12	0.044	0.15	2

Average* : The average of 30 values in each position.

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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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Melu.

เอกสารไม่ควบคุม

1043928



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-4484



Certificate of Calibration

Cert. No.: 20TM843
 Page.: 1 of 3

Equipment : Water Bath
 Manufacturer : Memmert
 Model : WNE 14
 Serial No. : L414.1407
 ID No. : UAE.LAB.006/2558
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangkok, Phrakhanong,
 Bangkok 10260
 Location : Microbiology Laboratory
 Received Order : 27 April 2020
 Calibration Date : 27 April 2020
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :
 Approved Signatory

() Pornthippa Tameyakul
 (/) Malee Butkruea
 () Suwit Imjai

Issue Date : 7 May 2020
 The Uncertainties are for a confidence probability of approximately 95 %

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เอกสารไม่ควบคุม



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2004-0379OC-6
 Procedure Used :-

Cert. No.: 20TM843
 Page.: 2 of 3

Calibration were conducted using In-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPR T).

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) Data Acquisition	MY44031769	19LM5	NIST	02 Aug 2020

2. This certification is traceable to the SI unit.

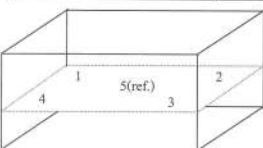
3. This result of calibration was found accurate as shown on date and place of calibration only.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	20	62	222
Finished of Calibration	20	63	222



Front

Position :	Ref. Std. ID No.
1	N37P301419
2	N37P300732
3	N37P301420
4	N37P301421
5 (ref.)	N37P301425



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2004-0379OC-6
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 20TM843
 Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.4	44.4	44.519	44.519	44.513	44.479	44.484

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.094	0.074	0.15	2

Average* : The average of 30 values in each position.

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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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เอกสารไม่ควบคุม

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เอกสารไม่ควบคุม



Cert. No.: 21TM707
Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L414.1410
ID No. : UAE.MIC.007/2558
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udumsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 21 April 2021
Calibration Date : 21 April 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Kritsada Chairong
Approved by :
() Pornthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 5 May 2021

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.

เอกสารไม่ควบคุม

A 0027613



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2104-0019OC-5
Procedure Used :-

Cert. No.: 21TM707
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

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) Data Acquisition	MY44080450	21LM4	NIMT	06 Mar 2022

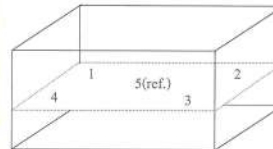
2. This certification is traceable to the SI unit.
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	
Beginning of Calibration	24	60	223
Finished of Calibration	23	64	224



Front

Position :	Ref. Std. S/N.:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

เอกสารไม่ควบคุม

A 1052698



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2104-0019OC-5
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM707
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.467	44.482	44.469	44.499	44.484

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.063	0.036	0.16	2

Average* : The average of 30 values in each position.

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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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เอกสารไม่ควบคุม

A 1052697



Cert. No.: 21TM424
Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0614
ID No. : UAE.MIC.020/2561
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udumsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 22 February 2021
Calibration Date : 22 February 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Pornthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 3 March 2021

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.

เอกสารไม่ควบคุม



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2102-07510C-5
 Procedure Used :-

Cert. No.: 21TM424
 Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

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) Data Acquisition MY44036292 20LM5 NIST, NIMT 10 Apr 2021

2. This certification is traceable to the SI unit.

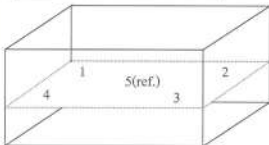
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIST : National Institute of Standards and Technology, The United State of America.
 NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	58	221
Finished of Calibration	24	59	223



Front

Position :	Ref. Std. ID No.
1	70RC148
2	70RC149
3	70RC150
4	70RC151
5(ref.)	70RC152

เอกสารไม่ควบคุม



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2102-07510C-5
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 21TM424
 Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.548	44.518	44.505	44.527	44.529
50.0	50.0	50.0	50.067	49.999	50.041	50.050	50.053

Calibration point (°C)	Uniformity (°C)	Stability (°C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.078	0.045	0.15	2
50.0	0.12	0.054	0.15	2

Average* : The average of 30 values in each position.

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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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เอกสารไม่ควบคุม



National Food Institute, Ministry of Industry, Thailand

10009 Sai Anu Amnath 35, Anu Amnath Rd., Bangkhenkhan, Bangkok 10250 Thailand
 Tel : +66 (0) 2428 8888 Fax : +66 (0) 2428 8888 Website : www.nfi.go.th E-mail : cal@nfi.go.th



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10009 Sai Anu Amnath 35, Anu Amnath Rd., Bangkhenkhan, Bangkok 10250 Thailand
 Tel : +66 (0) 2428 8888 Fax : +66 (0) 2428 8888 Website : www.nfi.go.th E-mail : cal@nfi.go.th



Calibration Certificate

Certificate No.: 2000970-001-01
 Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
 Address: 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance
 Manufacturer: METTLER TOLEDO
 Model: MS603S/01
 Serial No.: B007010311
 ID No.: UAE.LAB.008/2553
 Order No.: 2000970
 Operation No.: 2000970-001
 Date of Receipt: 25 December 2019
 Date of Calibration: 25 December 2019

Calibrated by Mr.Manas Somsak Senior Analyst
 Approved by (Mr.Pheraphat Tuanjit) Manager, Division of Calibration Laboratory
 Responsible for the Technical Management Team
 Date of Issue: 27 December 2019

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2000970-001-01
 Equipment: Electronic Balance
 Model: MS603S/01
 Serial No.: B007010311
 Capacity: 620 g
 Manufacturer: METTLER TOLEDO
 Resolution: 0.001 g
 ID No.: UAE.LAB.008/2553

Page 2 of 3

Environment Condition: Ambient Temperature 23.6 ± 0.2 °C Relative Humidity: 50 ± 2.5 %

Place of Calibration: 306 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard Model Serial No. Calibrated By Certificate No. Due Date
 Standard Weight Class E2 1mg to 200g 8505567572 TCS M19040595 6 April 2020

Instrument Model Serial No. Calibrated By Certificate No. Due Date
 Thermo-Hygro Meter 11A1 8888888888888888 Quality Reborn QR19-1436 19 August 2020

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
300	0.00032
600	0.00032

2. Off-Center Error:

A mass of 200 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
200.000	199.999	200.000	200.001	200.001	200.000	0.001

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2009970-001-01
Equipment: Electronic Balance
Model: HS6035/01
Serial No.: 8607010311
Capacity: 620 g
Manufacturer: METTLER TOLEDO
Resolution: 0.001 g
ID No.: UAE/LAB/008/2553

Date of Calibration: 25 December 2019 **Page 3 of 3**

Calibration Results: (Continued)

Calibration Range: 0 - 600 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unloaded	0.0000	0.000	0.000	0.00085	2.00
0.1	0.1000	0.100	0.000	0.00085	2.00
0.5	0.5000	0.500	0.000	0.00085	2.00
1	1.0000	1.000	0.000	0.00085	2.00
5	5.0000	5.000	0.000	0.00085	2.00
10	10.0000	10.000	0.000	0.00085	2.00
20	20.0000	20.000	0.000	0.00085	2.00
50	50.0000	50.000	0.000	0.00085	2.00
70	70.0000	70.000	0.000	0.00085	2.00
100	100.0000	100.000	0.000	0.00086	2.00
150	150.0000	150.000	0.000	0.00087	2.00
200	200.0000	200.000	0.000	0.00088	2.00
300	300.0000	300.000	0.000	0.00092	2.00
400	400.0000	400.000	0.000	0.00098	2.00
500	500.0000	500.000	0.000	0.0011	2.00
600	600.0005	600.000	0.000	0.0012	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 %.

***** End *****

FCS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534-4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3080-27 FAX: 0-2719-9484



Cert. No.: 21TM831
Page: 1 of 3

Certificate of Calibration

Equipment: Autoclave
Manufacturer: ALP
Model: CL-40L
Serial No.: 807298
ID No.: UAE.MIC.019/2560
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
301 Room
Location:
Received Order: 7 May 2021
Calibration Date: 7 May 2021
Ambient Temperature: (26 ± 10) °C
Relative Humidity: (50 ± 30) %
Calibrated by: Khit Ruttanaprapachai
Approved by:
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date: 18 May 2021

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.

เอกสารไม่ควบคุม



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2105-0012OC-1
Result of Calibration: (°) Without Adjustment
Cert. No.: 21TM831
Page: 3 of 3

Operating parameter Set: Temperature = 116 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
116	116	1	116.744	0.12	0.08	0.90	2
		2	116.549				
		3	116.515				

Operating parameter Set: Temperature = 122 °C
Sterilization period = 30 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
122	122	1	122.672	0.076	0.12	1.1	2
		2	122.469				
		3	122.414				

Average*: The average of 30 values in each position.

Stability: One-half of the greatest maximum difference of measured temperature at any one probe.

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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เอกสารไม่ควบคุม



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2105-0012OC-1
Cert. No.: 21TM831
Page: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	20LM7	18 May 2021

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.

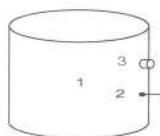
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Result of Calibration :- (°) Without Adjustment

Function of UUC*: Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	62	222
Finished of Calibration	25	63	221

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	18-18TC-04
2 =	Temperature sensor	18-18TC-05
3 =	Exhaust port	18-18TC-06

เอกสารไม่ควบคุม



Cert. No.: 21TM425
Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave
Manufacturer : ALP
Model : CL-40L
Serial No. : 802664
ID No. : UAE.MIC.014/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Air Analysis Unit
Received Order : 22 February 2021
Calibration Date : 23 February 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon

Approved by :
Approved Signatory

() Ponthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 3 March 2021

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.

เอกสารไม่ควบคุม

A 0025135



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2102-0751QC-1
Procedure Used :-

Cert. No.: 21TM425
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

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) Data Acquisition	MY49023932	20LM6	NIST, NIMT	20 Apr 2021

2. This certification is traceable to the SI unit.

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

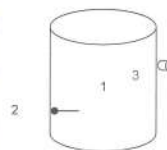
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	61	222
Finished of Calibration	26	63	223

Position	Description	Ref. Std. Thermocouple
1 =	Center of chamber	19-16TC-08
2 =	Temperature sensor	19-16TC-09
3 =	Exhaust port	19-16TC-10

เอกสารไม่ควบคุม

a 1043935



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2102-0751QC-1
Result of Calibration :- (*) Without Adjustment

Cert. No.: 21TM425
Page.: 3 of 3

Operating parameter Set : Temperature = 116 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
116	116	1	117.021	0.23	0.08	0.92	2
		2	117.111				
		3	117.212				

Operating parameter Set : Temperature = 122 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
122	122	1	122.817	0.15	0.12	1.10	2
		2	122.914				
		3	122.978				

Average* : The average of 30 values in each position.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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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เอกสารไม่ควบคุม

a 1043934



Cert. No.: 21TM710
Page.: 1 of 3

Certificate of Calibration

Equipment : Refrigerator
Manufacturer : Sanyo
Model : SBC-337KD (GYN)
Serial No. : 71100607
ID No. : UAE.MIC.003/2551
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 21 April 2021
Calibration Date : 22 April 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Kritsada Chaitrong

Approved by :
Approved Signatory

() Ponthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 5 May 2021

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.

เอกสารไม่ควบคุม

A 0027610



Equipment : Refrigerator
Condition As-Received : Used Item
Reference : 2104-0019OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM710
Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
4	4	-	3.5	1.2	7.2	4.1	2

Calibration Point (°C)	Measured Temperature (°C)								
4	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
4	4.757	4.324	4.386	3.981	4.077	4.404	3.766	3.957	4.147

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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เอกสารไม่ควบคุม
a 1052705



Equipment : Refrigerator
Condition As-Received : Used Item
Reference : 2104-0019OC-2
Procedure Used :-

Cert. No.: 21TM710
Page.: 2 of 3

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

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44060450	21LM4	NIMT	06 Mar 2022

2. This certification is traceable to the SI unit.

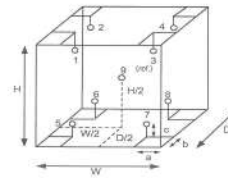
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	26
REL Humid. (%)	59	63
AC Supply (Volt)	225	224

Position :	Ref. Std. ID No.:
1	19-14RTD-01
2	19-14RTD-02
3	19-14RTD-03
4	19-14RTD-04
5	19-14RTD-05
6	19-14RTD-06
7	21-14RTD-07
8	19-14RTD-08
9 (ref.)	19-14RTD-09

Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.45 m
W = 0.45 m
H = 1.0 m
Capacity = 0.20 m³

เอกสารไม่ควบคุม
a 1052706