



WELDING PROCEDURE SPECIFICATION (WPS)

Company Name Thainumpon Construction Company Limited		Issued Date September 30, 2024
Welding Procedure Specification No. WPS - TNC - 004	Revision No. 0	Date September 30, 2024
Supporting PQR No. PQR - TNC - 004	Type(s) Manual	(Automatic, Manual, Machine, or Semi-Auto)
Welding Process(es) GTAW + SMAW		

Joins

Joint Design **Single V Groove - Butt Joint**

Root Spacing **3 - 4 mm**

Backing (Yes) **x** (No) **✓**

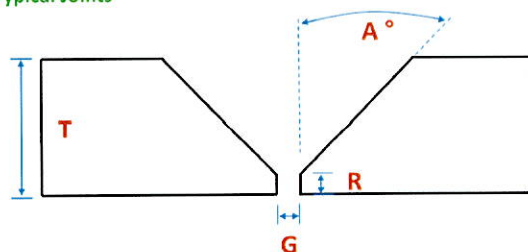
Backing Material (Type) **N/A**
(Refer to both backing and retainers)

☐ Metal ☐ Nonfusing Metal
☐ Non Metallic ☐ Other

Sketches, Production Drawing, Weld Symbols, or Written Description should show the general arrangement of the parts to be welded. Where applicable, the details of weld groove may be specified.

Sketches may be attached to illustrate joint design, welder layers, and bead sequence (e.g., for toughness procedures, for multiple process procedures, etc.)

Typical Joins



Thickness (T)	~	5.00 - 21.94 mm
Root Face (R)	~	0 - 1 mm
Root Gap (G)	~	3 - 4 mm
Bevel Angle (A°)	~	30° - 35°

or approval drawing joint

Base Metals

P-No. 8 Group-No. 1	to P-No. 8 Group-No. 1
OR Specification, Type and Grade or UNS Number	ASTM A312 Grade TP304 or equivalent
to Specification, Type and Grade or UNS Number	ASTM A312 Grade TP304 or equivalent
OR Chem. Analysis and Mechanical Prop.	-
to Chem. Analysis and Mechanical Prop.	-

Thickness Range

Base Metal	Groove	5.00 - 21.94 mm	Fillet	All
Maximum Pass Thickness $\leq \frac{1}{2}$ in. (13 mm.)	(Yes)	✓	(No)	x
Other:	-			

Filler Metal

	GTAW	SMAW
Process	5.9	5.4
Spec. No. (SFA)	ER308	E308L-16
AWS No. (Class)	6	5
F-No.	8	8
A-No.	2.4 mm	3.2, 4.0 mm
Size of Filler Metals	Solid wire	Flux cover electrode
Filler metal product form	None	None
Supplemental Filler Metal		
Weld Metal		
Deposited Thickness :		
Groove	5.94 mm	16.00 mm
Fillet	All	All
Electrode-flux Class	N/A	N/A
Flux Type	N/A	N/A
Flux Trade Name	N/A	N/A
Consumable Insert	N/A	N/A
Other : Trade Name	PREMIARC TG-S308 or equivalent	PREMIARC NC-38L

*Each base metal-filler metal combination should be recorded individually.



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Welding Procedure Specification No. **WPS - TNC - 004** Issued Date **September 30, 2024**
Supporting PQR No. **PQR - TNC - 004** Revision No. **0** Date **September 30, 2024**
Welding Process(es) **GTAW + SMAW** Type(s) **Manual**
(Automatic, Manual, Machine, or Semi-Auto)

Positions

Position (s) of Groove **All**
Welding Progression **Uphill**
Position (s) of Fillet **All**
Other **-**

Postweld Heat Treatment

Temp. Range **N/A**
Time Range **N/A**
Other **-**

Preheat

Preheat Temp. (Min) **10°C Min**
Interpass Temp. (Max) **175°C Max**
Preheat Maintenance **None**

(Continuous or special heating where applicable should be recorded)

Gas

	Percent Composition		
	Gas(es)	Mixture	Flow Rate (l/min)
Shielding Gas :	Argon	99.99%	10-20
Trailing Gas :	-	-	-
Backing Gas :	Argon	99.99%	10-25
Other :	-	-	-

Electrical characteristics

Weld Pass(es)	Process	Filler Metal		Current Type and Polarity	Amps.	Volts	Travel Speed (cm/min.)	Other (e.g., Remark, Comments, Hot Wire Addition, Technique Torch Angle, etc.)
		Class.	Dia.					
Root	GTAW	ER308	2.4 mm	DCEN	80-130	9-14	5 - 10	-
Hot	GTAW	ER308	2.4 mm	DCEN	90-150	9-14	5 - 10	-
Fill	SMAW	E308L-16	3.2 mm	DCEP	80-130	20-24	5 - 10	-
Cover	SMAW	E308L-16	3.2 mm	DCEP	75-130	20-24	5 - 10	-

Amps and volts, or power or energy range, should be recorded for each electrode size, position, and thickness, etc.

Pulsing Current **N/A** Heat Input (max.) **N/A (No impact test)**
Tungsten Electrode, Size in mm and Type **2.4 mm , 2% Thoriated (EWTh-2)**
(Pure Tungsten, 2% Thoriated, etc.)
Mode of Metal Transfer for GMAW (FCAW) **N/A**
(Spray Arc, Short Circuiting Arc, etc.)
Other **-**

Technique

String or Weave Bead **Both**
Orifice, Nozzle, or Gas Cup Size **ID 6-15 mm**
Initial or Interpass Cleaning (Brushing, Grinding etc.) **Brushing and Grinding**
Method of Back Gouging **N/A**
Oscillation **N/A**
Contact Tube to Work Distance **N/A**
Multiple or single pass (per side) **Multiple pass**
Multiple or Single Electrode **Single**
Electrode Spacing **N/A**
Peening **No**
Other **-**

	Prepared By / Certified By	Witnessed / Reviewed By
COMPANY :	Thainumpon Construction Company Limited	Qualitech Public Company Limited
NAME :	<i>Mr. Sathawat Nakornthit</i>	Pattaya Ch.
SIGNATURE :		
DATE :	September 30, 2024	September 30, 2024



PROCEDURE QUALIFICATION RECORD (PQR)

PQR No. PQR - TNC - 004

TENSILE TEST (QW-150)

TENSILE TEST REPORT NO. 837-67-4 TS001

Test No.	Thickness (mm)	Width (mm)	Area (mm ²)	Ultimate Total Load (kN)	Ultimate Unit Stress (MPa)	Type of Failure and Location
837-67-4 TS1	8.87	19.01	168.619	118.713	704	In weld metal
837-67-4 TS2	9.75	19.02	185.445	126.495	682	In weld metal

GUIDE BEND TESTS (QW-160)

GUIDE BEND TEST REPORT NO. 837-67-4 BD001

Type and Figure No.	Result
837-67-4 SB1 Side Bend	No Surface Discontinuity
837-67-4 SB2 Side Bend	No Surface Discontinuity
837-67-4 SB3 Side Bend	No Surface Discontinuity
837-67-4 SB4 Side Bend	No Surface Discontinuity

TOUGHNESS TEST (QW-170)

TOUGHNESS TEST REPORT NO. -

Specimen No.	Notch Location	Specimen Size	Test Temp.	Impact Value			Lateral Expansion (mm)
				J	Average	% Shear	
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

FILLET TEST (QW-180)

Result - Satisfactory : Yes - No - Penetration into Parent Metal : Yes - No -

Macro - Results : -

OTHER TESTS

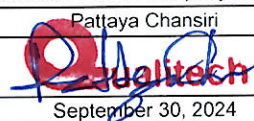
Type of Test Visual Examination Acceptable
Radiographic Testing Report Acceptable
Macrostructure Test Report Report No. 837 - 67 - 4 / MA001
Vickers Hardness Test Report Report No. 837 - 67 - 4 / HV001
(Hardness HV10 , Max value at Weld Metal 207.6 HV, Max value at HAZ 197.0 HV, and Max value at Base Metal 187.3 HV)
Deposit Analysis N/A
Other N/A

Welder's Name Mr. Yutthana P. Clock No. - Stamp No. -
Test Conducted by Qualitech Public Company Limited Laboratory Test No. 837 - 67 - 4

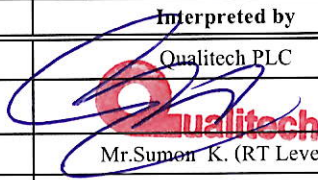
We certify that the statements in this record are correct and that the test weld were prepared, welded and tested in accordance with the -
requirements of Section IX of the ASME Boiler and Pressure Vessel Code

Manufacturer Thainumpon Construction Company Limited

	Prepared By / Certified By	Witnessed By / Reviewed By
COMPANY :	Thainumpon Construction Company Limited	Qualitech Public Company Limited
NAME :	Mr. Sathavut Nabanthit	Pattaya Chansiri
SIGNATURE :		
DATE :	30 Sep 2024	September 30, 2024



RADIOGRAPHIC TESTING REPORT						Report No. : RT-PQR-004 Page 1 of 1							
						Our Ref. No : TNC-RT-R2409/0004							
						Test Date : September 25, 2024							
Client : Thainumpon Construction Company Limited				Procedure No. / SST No. : -									
Project : -				Job No. : -									
Description : PQR PIPE				PQR No. : PQR-TNC-004									
Welding Process : GTAW+SMAW				WPS No. : -									
RADIOGRAPHIC TECHNIQUE													
Technique : ☐ SWSI ☒ DWSI ☐ DWDI ☐ Superimposed				Degree : ☐ Spot ☒ Full									
Film/Type : ☐ Agfa D7 ☒ Agfa D4 ☐ FUJI 50 ☐ FUJI 100				Film Processing : ☒ Manual ☐ Automated									
Intensifying Lead Screen Thickness : 0.027 mm (Front/Back)				Film in each cassette : ☒ 1 Film ☐ _____ Films									
Tested Material : ☐ C/S ☐ S/S ☒ A312 Gr.TP304				Number of exposure : 4									
IQI Selection	Type : ☒ Wire-Type ☐ Hole-Type			Radiation Source : ☒ Ir-192 ☐ Se-75 ☐ X-Ray ☐ Other _____									
	Material Group : ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Other _____			Strength : 15 ☒ Curie ☐ kV									
	Set : ☐ A ☒ B ☐ C ☐ D ☐ Other _____			Source Size (F) : 2.5 x 3 mm									
	Placement : ☒ Source Side ☐ Film Side			Film Density : 2.0 to 4.0									
	IQI Sensitivity : IQI Wire No. 8			Location Marker Placement : ☐ Source Side ☒ Film Side									
ACCEPTANCE STANDARD													
☐ ASME Section I _____ Edt.		☐ ASME VIII Div.1 _____ Edt. ☐ UW-51 ☐ UW-52		☐ ASME B31.1 _____ Edt.		☐ ASME B31.3 _____ Edt. ☐ Normal ☐ Severe Cyclic		☐ AWS D1.1 _____ Edt. ☐ Static ☐ Cyclic		☒ ASME IX _____ Edt. ☐ Other _____			
Mark No.	Position	Section	Pipe/Plate Dia. Thk.(mm)	Welder No.	D (mm)	EWR (mm)	WT (mm)	d (mm)	Ug (mm)	Interpretation	Comply to code Yes No		
Mr.Yutthana P.	6G	A-B	6" 10.97	-	157.33	3+3	16.97	16.97	0.42	NVD	✓		
		B-C	6" 10.97	-	157.33	3+3	16.97	16.97	0.42	NVD	✓		
		C-D	6" 10.97	-	157.33	3+3	16.97	16.97	0.42	NVD	✓		
		D-A	6" 10.97	-	157.33	3+3	16.97	16.97	0.42	NVD	✓		

Total Films : ☒ 3.5" x 8.5" = 4 ☐ 3.5" x 17" = _____ ☐ 4.5" x 8.5" = _____ ☐ 4.5" x 17" = _____													
BC	BASE METAL CRACK	LP	LACK OF PENETRATION	TC	TRANSVERSE CRACK								
BT	BURN THROUGH	CP	CLUSTER POROSITY	TI	TUNGSTEN INCLUSION								
CC	CRATER CRACK	NVD	NO VISIBLE DEFECT	UC	UNDERCUT (Cover Pass)								
WT	WELD THICKNESS	OR	OXIDIZE ROOT	RUC	UNDERCUT (Root Pass)								
HB	HOLLOW BEAD	PD	PROCESSING DEFECT	WH	WORM HOLE								
IN	INCLUSION	PR	POROSITY	D	SOURCE TO OBJECT DISTANCE								
LC	LONGITUDINAL CRACK	RC, EP	ROOT CONCAVITY, EXCESSIVE PENETRATION	d	OBJECT TO FILM DISTANCE								
LF	LACK OF FUSION	SL, SL	SLAG INCLUSION, SLAG LINE	EWR	ESTIMATE WELD REINFORCEMENT								
Completed by		Interpreted by		Reviewed and Accepted by		Owner Representative / AI							
Company		Qualitech PLC											
Signature													
Name / Level		Mr. Sumon K. (RT Level II)											
Date		September 25, 2024											

MECHANICAL AND METALLURGICAL TESTING LABORATORY

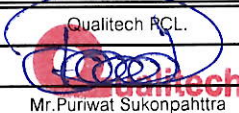
TEST REPORT

Report No. : 837-67-4 / TS001 , 837-67-4 / BD001
: 837-67-4 / MA001 , 837-67-4 / HV001
Page : 9
Test Date : 30 September 2024

Test No. : 837-67
Received Date : 26 September 2024
Customer : Thainumpon Construction Company Limited
Address : 35/5 Nong Wa Rd., Huai Pong, Mueang Rayong District, Rayong 21150
Test Product : PQR-TNC-004
Project Name : N/A
Project No : N/A


Mr. Apichit Sukprasert
LAB Division Manager

Laboratory of Qualitech plc wasn't accredited in testing scope that show *(an asterisk)

TENSILE TEST REPORT										Report No. : 837-67-4 / TS001	
										Page : 1 / 3	
										Test Date : 30 September 2024	
Customer : Thainumpon Construction Company Limited					Project Name : N/A						
Address : 35/5 Nong Wa Rd., Huai Pong, Mueang Rayong District, Rayong 21150					Project No : N/A						
					Welding Process : GTAW+SMAW						
					Welding Position : 6G						
					Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %						
Test Product : PQR-TNC-004					Dimension (mm) : Pipe 6" Thk. 10.97 mm.						
Material Specification : A312 Gr.TP304					Received Date : 26 September 2024						
Equipment : MTS-SANS, Universal Testing Machine, Model E64.206					Machine Capacity : 2,000kN, Class 0.5						
Serial No. : 51607002					Calibration Date : 24 January 2024						
Preparation method : ASTM A370-21			Test method : ASTM A370-21		Reference Code / Standard : ASME IX : 2023						
No.	Sample No.	Specimen Dimension			Gauge Length		Yield (0.2%Offset)		Ultimate Tensile		Location of fracture
		Thickness (mm)	Width (mm)	Area (mm ²)	Before (mm)	After (mm)	Load (kN)	Strength (MPa)	Load (kN)	Strength (MPa)	
1	837-67-4 TS1	8.87	19.01	168.619	N/A	N/A	N/A	N/A	118.713	704	IN Weld metal
2	837-67-4 TS2	9.75	19.02	185.445	N/A	N/A	N/A	N/A	126.495	682	IN Weld metal
Remark : 1. Machine was calibrated by Thailand Institute of Scientific and Technological Research (TISTR) 2. Stress-Strain curve were attached at the end of this report Addition details : Type of test specimen : Transverse Tensile Test (Weld) Welder Name : Mr. Yuthana P.											
Total		2			Unit(s)		Attachment		2		Page(s)
Completed by	Approved by		Client Representative		Reviewed by		Reviewed by		Owner Representative		
Company	Qualitech PCL.										
Signature											
Name	Mr. Puriwat Sukonpahttra										
Date	30 September 2024										

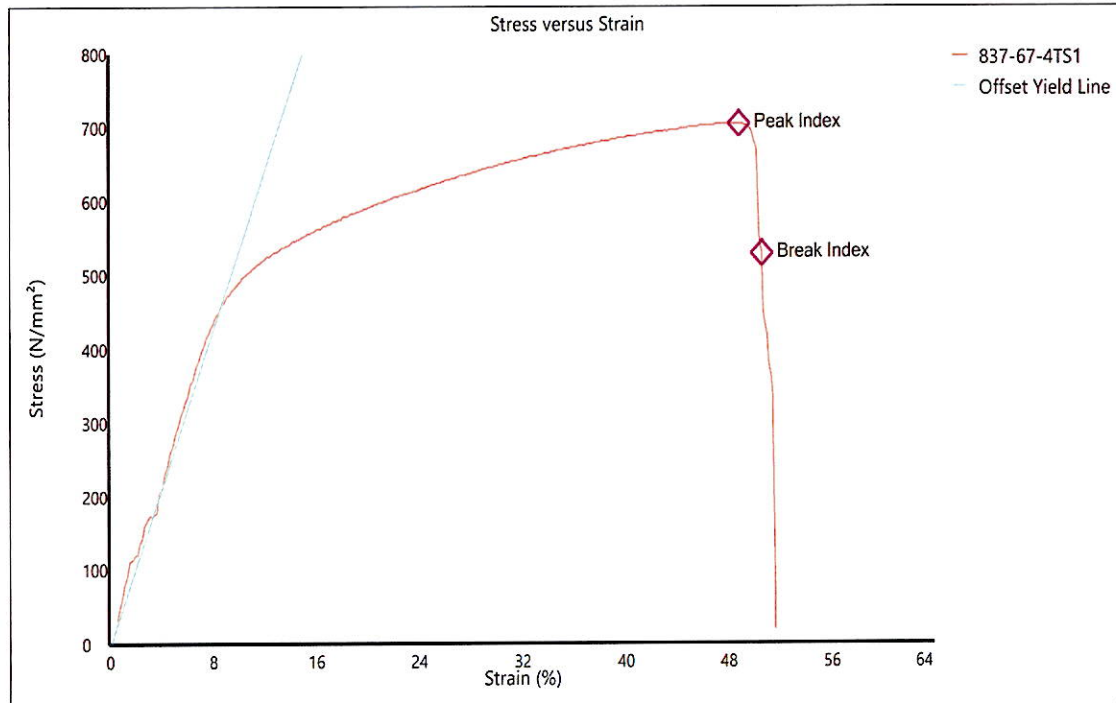
Note

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Attachment 1 : Test Run Review Graph

TENSILE TEST REPORT

Report No. : 837-67-4 / TS001
Page : 2 / 3
Test Date : 30 September 2024

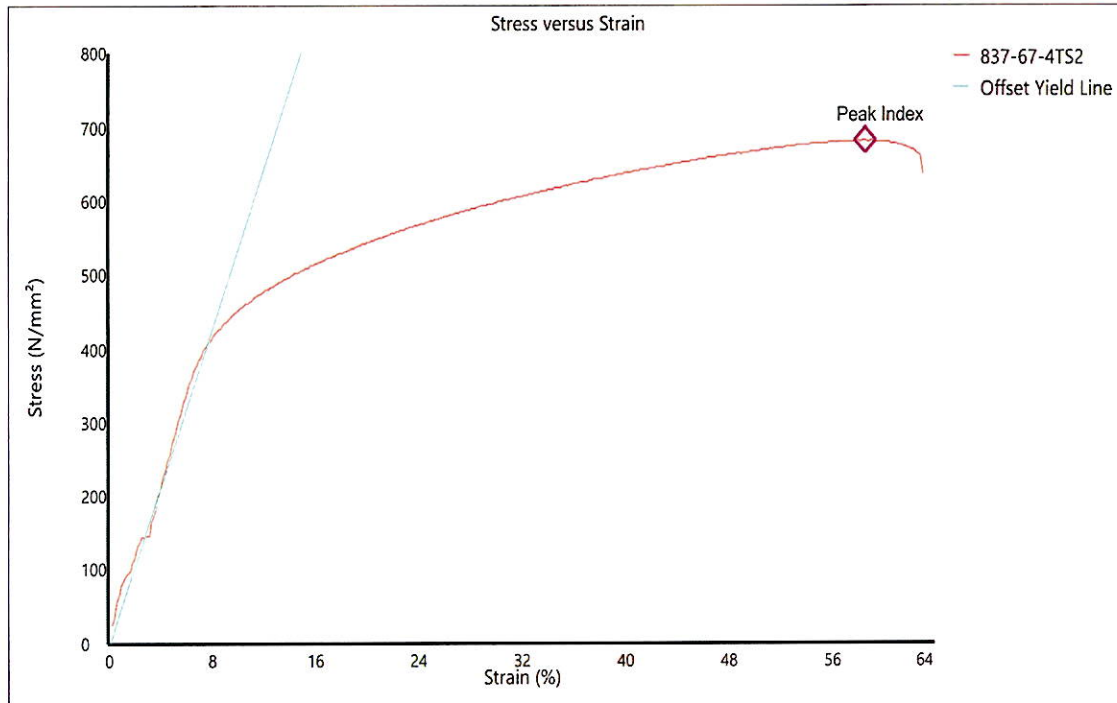


Display Name	Value	Unit
Thickness	8.87	mm
Width	19.01	mm
Test Run Name	837-67-4 TS1	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	168.619	mm ²
Maximum Force	118.713	kN
Maximum Stress	704	MPa

Attachment 2 : Test Run Review Graph

TENSILE TEST REPORT

Report No. : 837-67-4 / TS001
Page : 3 / 3
Test Date : 30 September 2024



Display Name	Value	Unit
Thickness	9.75	mm
Width	19.02	mm
Test Run Name	837-67-4 TS2	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	185.445	mm ²
Maximum Force	126.495	kN
Maximum Stress	682	MPa

GUIDED-BEND TEST REPORT

Report No. : 837-67-4 / BD001

Page : 1 / 1

Test Date : 30 September 2024

Customer : Thainumpon Construction Company Limited	Project Name : N/A
	Project No : N/A
Address : 35/5 Nong Wa Rd., Huai Pong, Mueang Rayong District, Rayong 21150	Welding Process : GTAW+SMAW
	Welding Position : 6G
	Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %
Test Product : PQR-TNC-004	Dimension (mm) : Pipe 6" Thk. 10.97 mm.
Material Specification : A312 Gr.TP304	Received Date : 26 September 2024
Equipment : Guided Bend Machine, Model PU 30 L	Machine Capacity : 30 Tons
Serial No. : SC 001	Calibration Date : 23 December 2023
Preparation method : ASME IX : 2023	Test method : ASME IX : 2023
	Reference Code / Standard : ASME IX : 2023

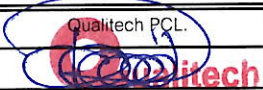
No.	Sample No.	Specimen Type	Specimen Dimension (mm)			Mandrel Diameter (mm)	Bend Angle (Degree)	Visually examined result for Surface discontinuities	Remark
			Thickness	Width	Length				
1	837-67-4 SB1	Side bend	11.07	10.25	200.00	40	180°	NSD	N/A
2	837-67-4 SB2	Side bend	11.07	10.24	200.00	40	180°	NSD	N/A
3	837-67-4 SB3	Side bend	11.00	10.26	200.00	40	180°	NSD	N/A
4	837-67-4 SB4	Side bend	11.05	10.25	200.00	40	180°	NSD	N/A

Remark : (NSD) = No Surface Discontinuity (OSD) = Open Surface Discontinuity (CD) = Corner Discontinuity

Addition details : Welder Name : Mr. Yutthana P.

Total	4	Unit(s)	Attachment	-	Page(s)
Completed by	Approved by	Client Representative	Reviewed by	Reviewed by	Owner Representative
Company	Qualitech PCL.				
Signature					
Name	Mr. Puriwat Sukonpahttra				
Date	30 September 2024				

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MACROSTRUCTURE TEST REPORT				Report No. : 837-67-4 / MA001	
				Page : 1 / 1	
				Test Date : 30 September 2024	
Customer : Thainumpon Construction Company Limited			Project Name : N/A		
			Project No : N/A		
Address : 35/5 Nong Wa Rd., Huai Pong, Mueang Rayong District, Rayong 21150			Welding Process : GTAW+SMAW		
			Welding Position : 6G		
			Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %		
Test Product : PQR-TNC-004			Dimension (mm) : Pipe 6" Thk. 10.97 mm.		
Material Specification : A312 Gr.TP304			Received Date : 26 September 2024		
Equipment : Microscope, SMZ745T			Etchants Reagent : 10% Nital , Nitric Acid (65%) + Ethyl alcohol		
Serial No. : 2003739		Calibration Date : 26 October 2023		Etching Temperature: N/A °C	
				Etching Time : N/A sec.	
Preparation method : ASTM E340-15		Test method : ASTM E340-15		Reference Code / Standard : ASME IX : 2023	
Sample No.		Macrostructure Description			Remark
837-67-4 MA		The macrostructure show completed fusion of the weldment. Weld metal and Heat affected zone are free from cracks.			N/A
					
Addition details : Welder Name : Mr. Yutthana P.					
Total		1		Unit(s) Attachment - Page(s)	
Completed by	Approved by	Client Representative	Reviewed by	Reviewed by	Owner Representative
Company	Qualitech PCL.				
Signature					
Name	Mr.Puriwat Sukonpatttra				
Date	30 September 2024				

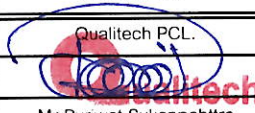
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VICKERS HARDNESS TEST REPORT				Report No. : 837-67-4 / HV001	
				Page : 1 / 3	
				Test Date : 30 September 2024	
Customer : Thainumpon Construction Company Limited			Project Name : N/A		
			Project No : N/A		
Address : 35/5 Nong Wa Rd., Huai Pong, Mueang Rayong District, Rayong 21150			Welding Process : GTAW+SMAW		
			Welding Position : 6G		
			Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %		
Test Product : PQR-TNC-004			Dimension (mm) : Pipe 6" Thk. 10.97 mm.		
Material Specification : A312 Gr.TP304			Received Date : 26 September 2024		
Equipment : Vickers Hardness Testing Machine, Model HV-100			Indenter : Diamond		
Serial No. : 000031410		Calibration Date : 28 September 2023		Test Force : 10 Kgf. Test Scale : HV10	
Preparation method : ASTM E384-17		Test method : ASTM E384-17		Reference Code / Standard : ASME IX : 2023	

Sample No. 837-67-4 HV Test Location	Hardness Value					
	Point No.	Line 1	Point No.	Line 2	Point No.	Line 3
Base Metal of Left Side	1	154.3	16	168.2	-	-
	2	156.6	17	173.1	-	-
	3	157.2	18	175.1	-	-
Heat Affected Zone (HAZ) of Left Side	4	179.6	19	197.0	-	-
	5	181.4	20	191.1	-	-
	6	185.0	21	188.0	-	-
Weld Metal	7	176.1	22	188.4	-	-
	8	166.2	23	207.6	-	-
	9	149.1	24	192.6	-	-
Heat Affected Zone (HAZ) of Right Side	10	168.8	25	183.5	-	-
	11	189.1	26	192.3	-	-
	12	194.6	27	183.9	-	-
Base Metal of Right Side	13	163.2	28	187.3	-	-
	14	158.7	29	178.9	-	-
	15	158.9	30	184.7	-	-

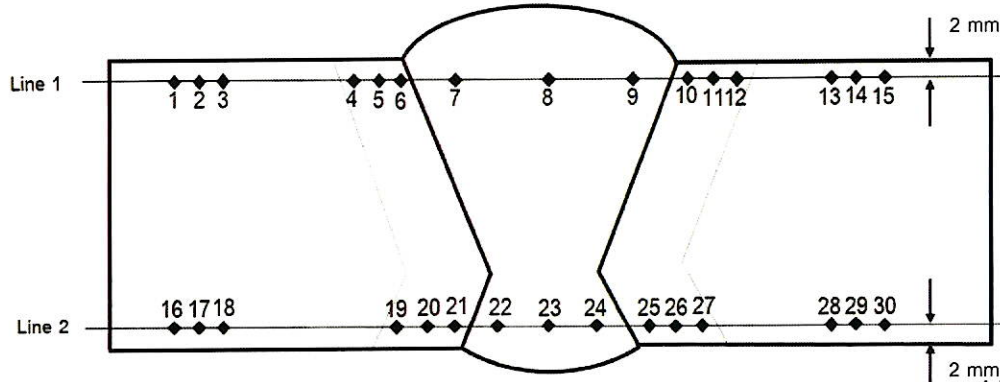
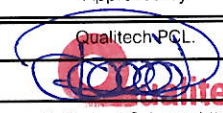
Addition details : Welder Name : Mr. Yutthana P.

Total	1	Unit(s)	Attachment	-	Page(s)
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Completed by	Approved by	Client Representative	Reviewed by	Reviewed by	Owner Representative
Company	Qualitech PCL.				
Signature					
Name	Mr. Puriwat Sukonpatttra				
Date	30 September 2024				

Note

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VICKERS HARDNESS TEST REPORT				Report No. : 837-67-4 / HV001	
				Page : 3 / 3	
				Test Date : 30 September 2024	
Customer : Thainumpon Construction Company Limited			Project Name : N/A		
Address : 35/5 Nong Wa Rd., Huai Pong, Mueang Rayong District, Rayong 21150			Project No : N/A		
			Welding Process : GTAW+SMAW		
			Welding Position : 6G		
			Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %		
Test Product : PQR-TNC-004			Dimension (mm) : Pipe 6" Thk. 10.97 mm.		
Material Specification : A312 Gr.TP304			Received Date : 26 September 2024		
Equipment : Vickers Hardness Testing Machine, Model HV-100			Indenter : Diamond		
Serial No. : 000031410		Calibration Date : 28 September 2023		Test Force : 10 Kgf. Test Scale : HV10	
Preparation method : ASTM E384-17		Test method : ASTM E384-17		Reference Code / Standard : ASME IX : 2023	
<u>Layout of Test Location</u> 					
Addition details : Welder Name : Mr. Yutthana P.					
Total : 1		Unit(s) : Attachment : -		Page(s) :	
Completed by	Approved by	Client Representative	Reviewed by	Reviewed by	Owner Representative
Company	Qualitech PCL.				
Signature					
Name	Mr. Puriwat Sukonpatttra				
Date	30 September 2024				

Note

1. The above results are valid exclusively for tested samples as mentioned in this report.
2. Partial publicity of the result on testing is prohibited without the written permission from Qualitech plc
3. This report shall not be reproduced in whole or part without the written approval from Qualitech plc

Appendix #1

Pictures of Specimen Test

Before Testing



After Testing



Test No. : 837-67
Test date : 30/9/2024
Temperature : 25.8° C
Humidity : 46% RH

Sample No : 837-67-4HV
Standard : ASME IX : 2023
Test Method : ASTM E384-17

PQR-TNC-004

P6th / A312 Gr. TP304

Vickers Hardness Test Result

No	Force	Detector	Lens d1 [μm]	d2 [μm]	Hardness	Scale	No	Force	Detector	Lens d1 [μm]	d2 [μm]	Hardness	Scale
1	10		10X	349.90	343.35	154.3 HV	16	10		10X	332.73	331.40	168.2 HV
2	10		10X	346.72	341.46	156.6 HV	17	10		10X	332.73	321.97	173.1 HV
3	10		10X	347.99	338.95	157.2 HV	18	10		10X	330.18	320.71	175.1 HV
4	10		10X	328.27	314.42	179.6 HV	19	10		10X	311.73	301.85	197.0 HV
5	10		10X	321.27	318.20	181.4 HV	20	10		10X	317.46	305.62	191.1 HV
6	10		10X	317.46	315.68	185.0 HV	21	10		10X	317.46	310.65	188.0 HV
7	10		10X	325.73	323.23	176.1 HV	22	10		10X	317.46	310.02	188.4 HV
8	10		10X	337.82	330.14	166.2 HV	23	10		10X	297.10	300.59	207.6 HV
9	10		10X	350.54	354.67	149.1 HV	24	10		10X	314.28	306.25	192.6 HV
10	10		10X	331.45	331.40	168.8 HV	25	10		10X	323.18	312.54	183.5 HV
11	10		10X	320.00	306.25	189.1 HV	26	10		10X	313.64	307.51	192.3 HV
12	10		10X	312.37	304.99	194.6 HV	27	10		10X	323.18	311.91	183.9 HV
13	10		10X	339.09	335.18	163.2 HV	28	10		10X	317.46	311.91	187.3 HV
14	10		10X	341.00	342.72	158.7 HV	29	10		10X	321.27	322.60	178.9 HV
15	10		10X	348.63	334.55	158.9 HV	30	10		10X	319.37	314.42	184.7 HV

Tested By : *Muhammad Sufi*
Position : Engineer
Date : 30 Sep. 2024

Alhamd
Project Engineer
1 / 10 / 24

Reviewed By : *[Signature]*
Position : Supervisor
Date : 30/9/2024

Test No. :	837-67	Test Date :	30/9/2024
Shape of Crossection :	☒ Rectangular ☐ Round ☐ Pipe ☐ Camber	Test Temp. :	25.0 °C
area ☐ Other :	Tensile Transverse Weld	Humidity :	44 %
Reference Standard :	ASME Section IX: 2023	Test Standard :	ASTM A370-21
Measurement tools (1) :	1107212	Measurement tools (2) :	

Sample No.		837-67-1 TS 1	837-67-1 TS 2	837-67-2 TS 1	837-67-2 TS 2	837-67-3 TS 4	837-67-3 TS 2	
Before	Thickness (T) (mm)	1	5.09	5.05	10.15	10.15	5.07	5.03
		2	5.09	5.05	10.15	10.15	5.07	5.03
		3	5.09	5.05	10.15	10.15	5.07	5.03
		Avg.	5.09	5.05	10.15	10.15	5.07	5.03
	Width (W) / Diameter(D) (mm)	1	13.02	13.00	19.00	19.00	13.00	13.00
		2	13.02	13.00	19.00	19.00	13.00	13.00
		3	13.02	13.00	19.00	19.00	13.00	13.00
		Avg.	13.02	13.00	19.00	19.00	13.00	13.00
After	Thickness (T) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
	Width (W) / Diameter(D) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
Area (mm^2)	Before	66.2719	65.6500	192.8500	192.8500	65.9100	65.3900	
	After	-	-	-	-	-	-	
Reduction of Area (%)		-	-	-	-	-	-	
Gauge length (mm)	Before	-	-	-	-	-	-	
	After	-	-	-	-	-	-	
Elongation (%)		-	-	-	-	-	-	
Yield ☐ Upper ☐ Offset	Load (kN)	-	-	-	-	-	-	
	Strength (Mpa)	-	-	-	-	-	-	
Tensile	Load (kN)	49.659	44.696	116.661	117.472	52.316	48.958	
	Strength (Mpa)	749	726	605	609	794	749	
Fracture (IN/OUT) ☐ Gauge length ☐ Weldment		OUT weld	OUT weld	OUT weld	OUT weld	IN weld	IN weld	
Remark :	PQR NO :	PQR-TNC-001		PQR-TNC-002		PQR-TNC-003		
	Material :	A106 GR.B + A106 GR.B		A106 GR.B + A106 GR.B		A312 GR.TP304 + A312 GR.TP304		
	Tested by		Reviewed by			Witness by		
Signature	TTC							
Name	Thiraphong Champichit		PURIWAT / SUPERVISOR			Mr. Sathawat Nabanthit		
Position	Chief Engineer					Project Engineer		
Date	30/9/2024		30/9/2024			1-10-24		



บริษัท ควอลิเทค จำกัด (มหาชน)
Qualitech Public Company Limited

บันทึกผลการทดสอบความต้านแรงดึง

Tensile Test Record

รหัสเอกสาร : FM-TS-01

หน้าที่ : 1 / 1

แก้ไขครั้งที่ : 04

วันที่บังคับใช้ : 28 พฤศจิกายน 2560

Test No. : 837-67

Test Date : 30/9/2024

Shape of Crossection : ☒ Rectangular ☐ Round ☐ Pipe ☐ Camber

Test Temp. : 25.0 °C

area ☐ Other : Tensile Transverse Weld

Humidity : 44 %

Reference Standard : ASME Section IX: 2023

Test Standard : ASTM A370-21

Measurement tools (1) : Measurement tools (2) :

Sample No.			837-67-4 TS 1	837-67-4 TS 2	837-67-5 TS 1	837-67-5 TS 2	837-67-6 TS 1	837-67-6 TS 2
Before	Thickness (T) (mm)	1	8.67	9.75	4.65	4.62	10.09	10.09
		2	8.67	9.75	4.65	4.62	10.09	10.09
		3	8.89	9.75	4.66	4.62	10.09	10.09
		Avg.	8.67	9.75	4.65	4.62	10.09	10.09
	Width (W) / Diameter(D) (mm)	1	19.01	19.02	19.02	19.00	19.01	19.09
		2	19.01	19.02	19.02	19.00	19.01	19.09
		3	19.01	19.02	19.02	19.00	19.01	19.09
		Avg.	19.01	19.02	19.02	19.00	19.01	19.09
After	Thickness (T) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
	Width (W) / Diameter(D) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
Area (mm^2)		Before	168.6187	185.4450	68.1430	60.0600	190.6703	191.63210
		After	-	-	-	-	-	-
Reduction of Area (%)			-	-	-	-	-	-
Gauge length (mm)		Before	-	-	-	-	-	-
		After	-	-	-	-	-	-
Elongation (%)			-	-	-	-	-	-
Yield ☐ Upper ☐ Offset	Load (kN)		-	-	-	-	-	-
	Strength (Mpa)		-	-	-	-	-	-
Tensile		Load (kN)	118.713	126.145	41.727	40.999	109.399	110.437
		Strength (Mpa)	704	692	661	683	574	576
Fracture (IN/OUT)	☐ Gauge length ☒ Weldment		IN weld	IN weld	out weld	out weld	out weld	Out of Weld

Remark :	PQR NO :	PQR-TNC-004	PQR-TNC-005	PQR-TNC-006
	Material :	A312 GR.TP304 + A312GR.TP304	A335GR.P11 + A335GR.P11	A335GR.P11+A335GR.P11

	Tested by	Reviewed by	Witness by
Signature	TP6		
Name	Thiraphong Chomphitip	PURIWAT / SUPERVISOR	Mr. Sathawat Nabanthit
Position	Technician		Project Engineer
Date	30/9/2024	30/9/2024	1-10-24

 Qualitech บริษัท ควอลิเทค จำกัด (มหาชน) Qualitech Public Company Limited		บันทึกผลการทดสอบความต้านแรงดึง Tensile Test Record				รหัสเอกสาร : FM-TS-01	
				หน้าที่ : 1 / 1			
				แก้ไขครั้งที่ : 04			
				วันที่บังคับใช้ : 28 พฤศจิกายน 2560			

Test No. : 837-67	Test Date : 30/9/2024
Shape of Crossection : ☒ Rectangular ☐ Round ☐ Pipe ☐ Camber	Test Temp. : 25.0 °C
area : ☐ Other : Tensile Transverse Weld	Humidity : 44 %
Reference Standard : ASME Section IX: 2023	Test Standard : ASTM A370-21
Measurement tools (1) : _____	Measurement tools (2) : _____

Sample No.		837-67- 7 TS 1	837-67- 7 TS 2	837-67- 8 TS 1	837-67- 8 TS 2	837-67- 9 TS 2	837-67- 9 TS 2	
Before	Thickness (T) (mm)	1	24.85	24.87	11.97	11.07	29.94	24.04
		2	24.85	24.87	11.97	11.07	29.94	24.04
		3	24.85	24.87	11.97	11.07	29.94	24.04
		Avg.	24.85	24.87	11.97	11.07	29.94	24.04
	Width (W) / Diameter(D) (mm)	1	19.00	19.08	19.03	19.00	19.00	19.03
		2	19.00	19.08	19.03	19.00	19.00	19.03
		3	19.00	19.08	19.03	19.00	19.00	19.03
		Avg.	19.00	19.08	19.03	19.00	19.00	19.03
After	Thickness (T) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
	Width (W) / Diameter(D) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
Area (mm^2)	Before	472.1500	472.5300	216.9896	210.3300	454.8600	458.6832	
	After	-	-	-	-	-	-	
Reduction of Area (%)		-	-	-	-	-	-	
Gauge length (mm)	Before	-	-	-	-	-	-	
	After	-	-	-	-	-	-	
Elongation (%)		-	-	-	-	-	-	
Yield ☐ Upper ☐ Offset	Load (kN)	-	-	-	-	-	-	
	Strength (Mpa)	-	-	-	-	-	-	
Tensile	Load (kN)	249.270	249.848	107.055	103.244	234.732	233.643	
	Strength (Mpa)	526	527	493	491	516	509	
Fracture (IN/OUT)	☐ Gauge length ☒ Weldment	out weld	out weld	out weld	out weld	out weld	out weld	

Remark :	PQR NO : PQR-TNC-007	PQR-TNC-008	PQR-TNC-009
	Material : A36 + A36	SS400 + SS400	SS400 + SS400

Tested by	Reviewed by	Witness by
Signature: <i>twipong</i>	<i>[Signature]</i>	<i>[Signature]</i>
Name: twipong Chomphetnir	PURIWAT / SUPERVISOR	Mr. Suttanant Nibantnit
Position: technical		Project Engineer
Date: 30/9/2024	30/9/2024	1 - 10 - 24



บริษัท ควอลิเทค จำกัด (มหาชน)
Qualitech Public Company Limited

บันทึกผลชิ้นงานทดสอบการดัดโค้ง Guided-Bend Test Record

รหัสเอกสาร : FM-BD-01

หน้าที่ : 1 / 1

แก้ไขครั้งที่ : 04

วันที่บังคับใช้ : 28 พฤศจิกายน 2560

Reference code/Standard : ASME Section IX: 2023

Test Standard : ASME IX : 2023

Testing room temperature : 24.5 °C

Test No. : 837-67

Measurement Tools : 100 mm

Humidity : 42 %

Sample No.	Location	Sample Dimension (mm.)			Mandrel Dia. (mm.)	Angle	Visually examined for surface discontinuities		Remark
		Thickness	Width	Length			Visual result	Discontinuity Dimensions (mm.)	
837-67-5	FB1	5.50	14.10	200.00	20	180°	N/A	N/A	PQR No : PQR-TNC-005
"	FB2	5.40	14.20	200.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.
"	RB1	5.50	14.10	200.00	20	180°	0.50 mm	0.50 mm	Pipe 2" / A335GR.P11
"	RB2	5.50	14.10	200.00	20	180°	N/A	N/A	"
837-67-6	SB1	11.50	10.25	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-006
"	SB2	11.50	10.20	200.00	40	180°	0.50 mm	0.50 mm	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	11.50	10.20	200.00	40	180°	N/A	N/A	Pipe 6" / A335GR.P11
"	SB4	11.50	10.20	200.00	40	180°	N/A	N/A	"
837-67-7	SB1	25.40	10.20	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-007
"	SB2	25.40	10.20	200.00	40	180°	N/A	N/A	FCAW / Plate Thk.25.0 mm.
"	SB3	25.40	10.20	200.00	40	180°	N/A	N/A	A36 + A36
"	SB4	25.40	10.20	200.00	40	180°	N/A	N/A	"
837-67-8	SB1	11.50	10.20	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-008
"	SB2	11.50	10.20	200.00	40	180°	0.50 mm	0.50 mm	SMAW / Plate Thk.12.0 mm.
"	SB3	11.50	10.20	200.00	40	180°	N/A	N/A	SS400 + SS400
"	SB4	11.50	10.20	200.00	40	180°	N/A	N/A	"

Additional Detail :

Result : (NSD) = No Surface Discontinuity
(OSD) = Open Surface Discontinuity
(CC) = Corner Crack

Witnessed by

Reviewed By

Tested by

Signature

Name / Position

Date

PURIWAT / SUPERVISOR

30/9/2024

Mr. Sathawat / Project Engineer

1 - 10 - 24



บริษัท ควอลิเทค จำกัด (มหาชน)
Qualitech Public Company Limited

บันทึกผลชิ้นงานทดสอบการดัดโค้ง
Guided-Bend Test Record

รหัสเอกสาร : FM-BD-01

หน้าที่ : 1 / 1

แก้ไขครั้งที่ : 04

วันที่บังคับใช้ : 28 พฤศจิกายน 2560

Reference code/Standard :

ASME Section IX: 2023

Test Standard :

ASME IX : 2023

Testing room temperature : 24.5 °C

Test No.

837-67

Measurement Tools :

12.07.11

Humidity :

42 %

Sample No.	Location	Sample Dimension (mm.)			Mandrel Dia. (mm.)	Angle	Visually examined for surface discontinuities		Remark
		Thickness	Width	Length			Visual result	Discontinuity Dimensions (mm.)	
837-67-1	FB1	5.75	11.25	160.00	20	180°	N/A	N/A	PQR No : PQR-TNC-001
"	FB2	5.75	11.25	160.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.
"	RB1	5.75	11.25	160.00	20	180°	N/A	N/A	Pipe 2 " / A106 GR.B
"	RB2	5.75	11.25	160.00	20	180°	N/A	N/A	"
837-67-2	SB1	11.49	10.25	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-002
"	SB2	11.49	10.25	200.00	40	180°	N/A	N/A	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	11.49	10.25	200.00	40	180°	N/A	N/A	Pipe 6 " / A106GR.B
"	SB4	11.49	10.25	200.00	40	180°	N/A	N/A	"
837-67-3	FB1	5.49	11.25	160.00	20	180°	N/A	N/A	PQR No : PQR-TNC-003
"	FB2	5.49	11.25	160.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.
"	RB1	5.49	11.25	160.00	20	180°	N/A	N/A	Pipe 2 " / A312GR.TP304
"	RB2	5.49	11.25	160.00	20	180°	N/A	N/A	"
837-67-4	SB1	11.01	10.25	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-004
"	SB2	11.01	10.25	200.00	40	180°	N/A	N/A	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	11.01	10.25	200.00	40	180°	N/A	N/A	Pipe 6 " / A312GR.TP304
"	SB4	11.01	10.25	200.00	40	180°	N/A	N/A	"

Additional Detail :

Result : (NSD) = No Surface Discontinuity

(OSD) = Open Surface Discontinuity

(CC) = Corner Crack

Witnessed by

Reviewed By

Tested by

Signature

Name / Position

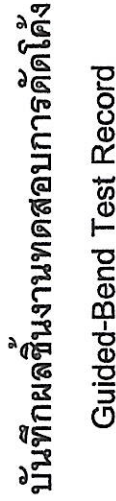
Date

PURIWAT / SUPERVISOR

30/9/2024

Mr. Sathawat / Project Engineer

1-10-24



วันที่บังคับใช้: 28 พฤศจิกายน 2560

Humidity : 47 %

Additional Detail :

1-10-24