



WELDING PROCEDURE SPECIFICATION (WPS)

Company Name Thainumpon Construction Company Limited
Welding Procedure Specification No. WPS - TNC - 002 Issued Date September 30, 2024
Supporting PQR No. PQR - TNC - 002 Revision No. 0 Date September 30, 2024
Welding Process(es) GTAW + SMAW Type(s) Manual
(Automatic, Manual, Machine, or Semi-Auto)

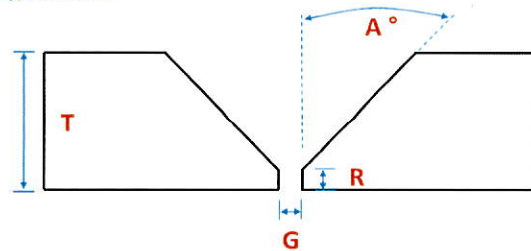
Joins

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. 1 Group-No. 1, 2 to P-No. 1 Group-No. 1, 2
OR Specification, Type and Grade or UNS Number ASTM A106 Grade B or equivalent
to Specification, Type and Grade or UNS Number ASTM A106 Grade B 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 $\leq \frac{1}{8}$ in. (13 mm.) (Yes) ✓ (No) x
Other: -

Filler Metal

Process	GTAW	SMAW
Spec. No. (SFA)	5.18	5.1
AWS No. (Class)	ER70S-6	E7016
F-No.	6	4
A-No.	1	1
Size of Filler Metals	2.4 mm	3.2, 4.0 mm
Filler metal product form	Solid wire	Flux cover electrode
Supplemental Filler Metal	None	None
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	FAMILIARC TG-S51T or equivalent	FAMILIARC LB-52 or equivalent

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



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(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) 220°C Max
Preheat Maintenance None

(Continuous or special heating where applicable should be recorded)

Gas

Shielding Gas :
Trailing Gas :
Backing Gas :
Other :

Percent Composition

Gas(es)	Mixture	Flow Rate (l/min)
Argon	99.99%	10-20
-	-	-
-	-	-
-	-	-

Electrical characteristics

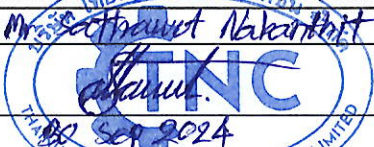
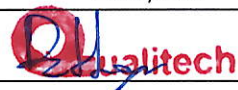
Weld Pass(es)	Process	Filler Metal		Current Type and Polarity	Amps.	Volts	Travel Speed (cm/min.)	Other (e.g., Remark, Comments, Hot Wire Addition, Technique Torch Angle, etc.)
		Class.	Dia.					
Root	GTAW	ER70S-6	2.4 mm	DCEN	80-130	9-14	5 - 10	-
Hot	GTAW	ER70S-6	2.4 mm	DCEN	90-150	9-14	5 - 12	-
Fill	SMAW	E7016	3.2 mm	DCEP	80-130	20-26	5 - 12	-
Cover	SMAW	E7016	3.2 mm	DCEP	80-130	20-26	5 - 12	-

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 :		Pattaya Ch.
SIGNATURE :		
DATE :	30 Sep 2024	September 30, 2024



PROCEDURE QUALIFICATION RECORD (PQR)

PQR No. PQR - TNC - 002

TENSILE TEST (QW-150)

TENSILE TEST REPORT NO. 837-67-2 TS001

Test No.	Thickness (mm)	Width (mm)	Area (mm ²)	Ultimate Total Load (kN)	Ultimate Unit Stress (MPa)	Type of Failure and Location
837-67-2 TS1	10.15	19.00	192.850	116.661	605	Out of weld metal
837-67-2 TS2	10.15	19.00	192.850	117.472	609	Out of weld metal

GUIDE BEND TESTS (QW-160)

GUIDE BEND TEST REPORT NO. 837-67-2 BD001

Type and Figure No.	Result
837-67-2 SB1 Side Bend	No Surface Discontinuity
837-67-2 SB2 Side Bend	No Surface Discontinuity
837-67-2 SB3 Side Bend	No Surface Discontinuity
837-67-2 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 : -

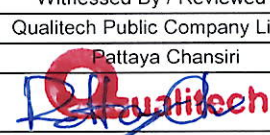
OTHER TESTS

Type of Test Visual Examination Acceptable
Radiographic Testing Report Acceptable
Macrostructure Test Report Report No. 837 - 67 - 2 / MA001
Vickers Hardness Test Report Report No. 837 - 67 - 2 / HV001
(Hardness HV10 , Max value at Weld Metal 199.1 HV, Max value at HAZ 183.2 HV, and Max value at Base Metal 169.9 HV)
Deposit Analysis N/A
Other N/A

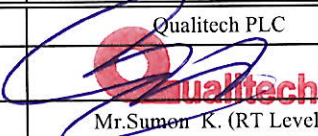
Welder's Name Mr. Parot K Clock No. - Stamp No. -
Test Conducted by Qualitech Public Company Limited Laboratory Test No 837 - 67 - 2

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. Parot K	Pattaya Chansiri
SIGNATURE :		
DATE :	30 Sep 2024	September 30, 2024

RADIOGRAPHIC TESTING REPORT						Report No. : RT-PQR-002 Page 1 of 1							
						Our Ref. No : TNC-RT-R2409/0002							
						Test Date : September 25, 2024							
Client : Thainumpon Construction Company Limited				Procedure No. / SST No. : -									
Project : -				Job No. : -									
Description : PQR PIPE				PQR No. : PQR-TNC-002									
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 ☒ A106 GR.B				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		Welder No.	D (mm)	EWR (mm)	WT (mm)	d (mm)	Ug (mm)	Interpretation	Comply to code	
			Dia.	Thk.(mm)								Yes	No
Mr.Pairot K.	6G	A-B	6"	10.97	-	157.33	3+3	16.97	16.97	0.42	PR 1.6 mm	☒	☐
		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	PR 1.6 mm	☒	☐
		D-A	6"	10.97	-	157.33	3+3	16.97	16.97	0.42	PR 1 mm	☒	☐

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								
IF	LACK OF FUSION	SLSL	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. : 837-67-2 / TS001 , 837-67-2 / BD001
: 837-67-2 / MA001 , 837-67-2 / 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-002

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. : 837-67-2 / TS001	
										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-002					Dimension (mm) : Pipe 6" Thk. 10.97 mm.						
Material Specification : A106 Gr.B					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	837-67-2 TS1	10.15	19.00	192.850	N/A	N/A	N/A	N/A	116.661	605	OUT of Weld metal
2	837-67-2 TS2	10.15	19.00	192.850	N/A	N/A	N/A	N/A	117.472	609	OUT of Weld metal

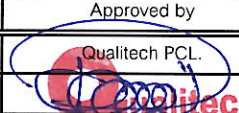
Remark : 1. Machine was calibrated by Thailand Institute of Scientific and Technological Research (TISTR)

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. Pairot K.

Total	2	Unit(s)	Attachment	2	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				

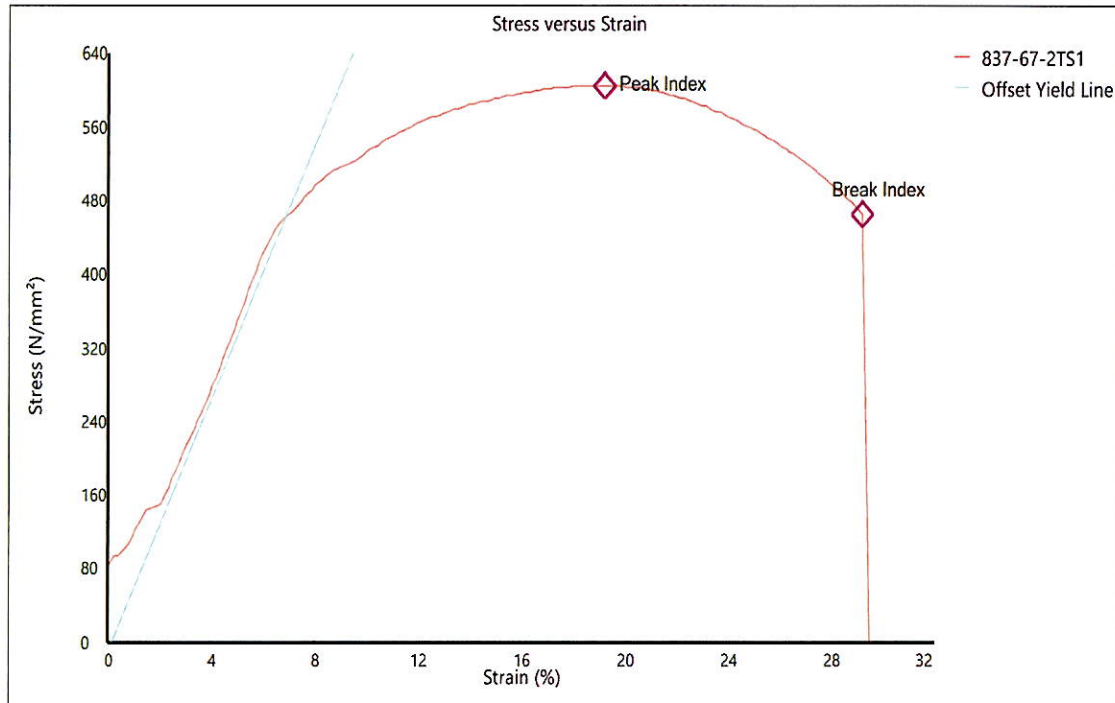
Note

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Attachment 1 : Test Run Review Graph

TENSILE TEST REPORT

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

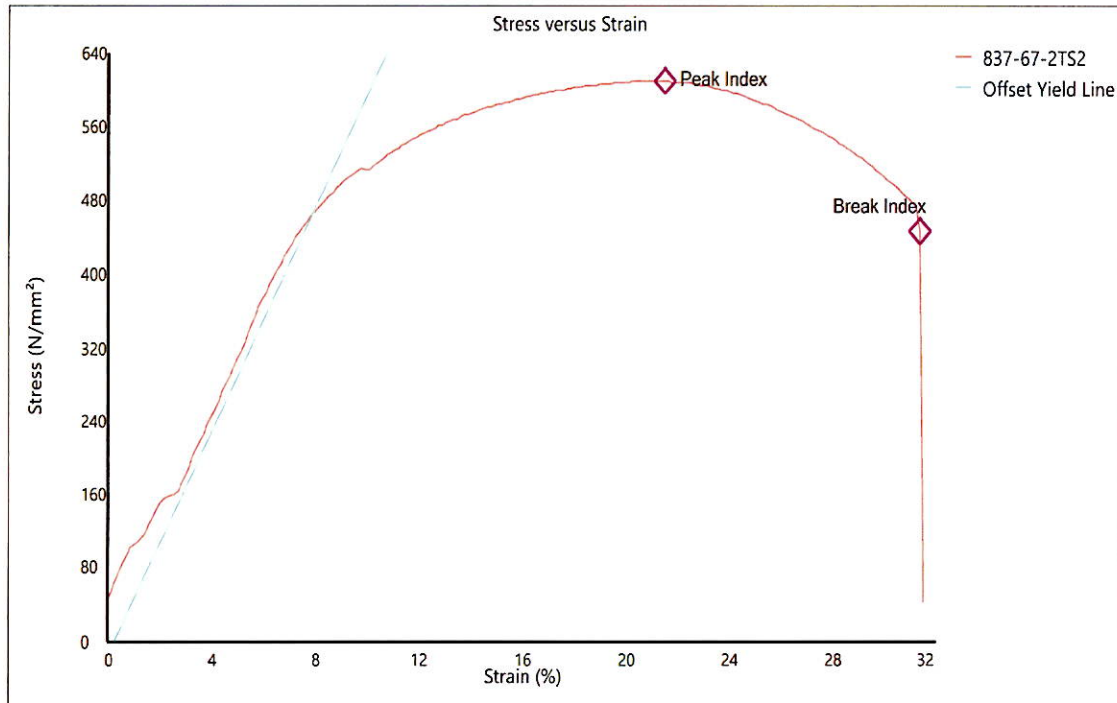


Display Name	Value	Unit
Thickness	10.15	mm
Width	19.00	mm
Test Run Name	837-67-2 TS1	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	192.850	mm ²
Maximum Force	116.661	kN
Maximum Stress	605	MPa

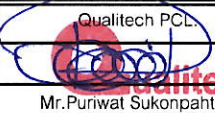
Attachment 2 : Test Run Review Graph

TENSILE TEST REPORT

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



Display Name	Value	Unit
Thickness	10.15	mm
Width	19.00	mm
Test Run Name	837-67-2 TS2	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	192.850	mm ²
Maximum Force	117.472	kN
Maximum Stress	609	MPa

MACROSTRUCTURE TEST REPORT				Report No. : 837-67-2 / 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-002			Dimension (mm) : Pipe 6" Thk. 10.97 mm.		
Material Specification : A106 Gr.B			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
837-67-2 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. Pairot K.					
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

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VICKERS HARDNESS TEST REPORT				Report No. : 837-67-2 / 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-002			Dimension (mm) : Pipe 6" Thk. 10.97 mm.		
Material Specification : A106 Gr.B			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. 837-67-2 HV Test Location	Hardness Value					
	Point No.	Line 1	Point No.	Line 2	Point No.	Line 3
Base Metal of Left Side	1	161.1	16	169.9	-	-
	2	157.5	17	163.5	-	-
	3	152.7	18	164.4	-	-
Heat Affected Zone (HAZ) of Left Side	4	165.6	19	170.7	-	-
	5	165.9	20	171.1	-	-
	6	181.7	21	178.9	-	-
Weld Metal	7	174.4	22	191.1	-	-
	8	185.7	23	194.3	-	-
	9	199.1	24	181.8	-	-
Heat Affected Zone (HAZ) of Right Side	10	183.2	25	166.9	-	-
	11	181.8	26	166.3	-	-
	12	175.8	27	170.1	-	-
Base Metal of Right Side	13	153.2	28	164.7	-	-
	14	160.1	29	163.5	-	-
	15	156.1	30	160.5	-	-

Addition details : Welder Name : Mr. Pairot K.

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. : 837-67-2 / HV001	
				Page : 3 / 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-002			Dimension (mm) : Pipe 6" Thk. 10.97 mm.		
Material Specification : A106 Gr.B			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	
Layout of Test Location					
Addition details : Welder Name : Mr. Pairot K.					
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 Sukonpachtra				
Date	30 September 2024				

Note

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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 : 837-67-2HV
Standard : ASME IX : 2023
Test Method : ASTM E384-17

PQR-TNC-002
P6" / A106Gr.B

Vickers Hardness Test Result

No.	Force	Detection Lens d1 [μm]	d2 [μm]	Hardness Scale	No.	Force	Detection Lens d1 [μm]	d2 [μm]	Hardness Scale
1	10	10X	337.82 340.83	161.1 HV	16	10	10X	318.09 342.72	169.9 HV
2	10	10X	345.45 340.83	157.5 HV	17	10	10X	334.63 338.95	163.5 HV
3	10	10X	348.63 348.38	152.7 HV	18	10	10X	332.73 338.95	164.4 HV
4	10	10X	337.18 332.03	165.6 HV	19	10	10X	332.73 326.37	170.7 HV
5	10	10X	336.54 332.03	165.9 HV	20	10	10X	330.18 328.26	171.1 HV
6	10	10X	324.46 314.42	181.7 HV	21	10	10X	318.09 325.74	178.9 HV
7	10	10X	325.09 327.00	174.4 HV	22	10	10X	309.19 313.79	191.1 HV
8	10	10X	323.82 308.13	185.7 HV	23	10	10X	307.28 310.65	194.3 HV
9	10	10X	309.19 301.22	199.1 HV	24	10	10X	317.46 321.34	181.8 HV
10	10	10X	320.64 315.68	183.2 HV	25	10	10X	332.09 334.55	166.9 HV
11	10	10X	320.64 318.20	181.8 HV	26	10	10X	330.82 337.06	166.3 HV
12	10	10X	325.09 324.48	175.8 HV	27	10	10X	330.82 329.52	170.1 HV
13	10	10X	353.72 342.09	153.2 HV	28	10	10X	328.27 342.72	164.7 HV
14	10	10X	340.36 340.21	160.1 HV	29	10	10X	331.45 342.09	163.5 HV
15	10	10X	346.09 343.35	156.1 HV	30	10	10X	333.36 346.49	160.5 HV

Tested By : *M. S. S.*
Position : Engineer
Date : 30 Sep 2024

Stant.
Project Engineer
1 / 10 / 24

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



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 :	84 %
Reference Standard :	ASME Section IX: 2023	Test Standard :	ASTM A370-21
Measurement tools (1) :	1207212	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	5.07
		2	5.09	5.05	10.15	10.15	5.07	5.07
		3	5.09	5.05	10.15	10.15	5.07	5.07
		Avg.	5.09	5.05	10.15	10.15	5.07	5.07
	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	47.696	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			
Name	Thiraphong Chompetchit	PURIWAT / SUPERVISOR	Mr. Sathawat Noharathit
Position	Technician		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	8.87	9.75	4.65	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	68.1470	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	126.445	41.727	40.999	109.399	110.437	
	Strength (Mpa)	704	682	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		TPD						
Name		Thiraphong Chomphitirap		PURIWAT / SUPERVISOR		Mr. Sattawat Nabanthit		
Position		Technician				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- 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	24.94	24.04
		2	24.85	24.87	11.97	11.07	24.94	24.04
		3	24.85	24.87	11.97	11.07	24.94	24.04
		Avg.	24.85	24.87	11.97	11.07	24.94	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)	248.220	248.848	107.055	103.244	234.732	233.643	
	Strength (Mpa)	526	527	493	491	516	509	
Fracture (IN/OUT)	☐ Gauge length	cut web	cut weld.	cut weld.	cut weld.	cut web.	cut weld.	
	☒ Weldment							
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	[Signature]			[Signature]			[Signature]	
Name	thiraphong Chemphattinip			PURIWAT / SUPERVISOR			Mr. Suttanant Nabanthit	
Position	Technician						Project Engineer	
Date	30/9/2024			30/9/2024			1 - 10 - 24	

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 No. : 837-67
Test Standard : ASME IX : 2023
Testing room temperature : 24.5 °C
Measurement Tools : 110711
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	5.49	14.20	200.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.
"	RB1	5.56	14.16	200.00	20	180°	0.50 mm	0.50 mm	Pipe 2 " / A335GR.P11
"	RB2	5.52	14.14	200.00	20	180°	N/A	N/A	"
837-67-6	SB1	11.96	10.25	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-006
"	SB2	11.95	10.26	200.00	40	180°	0.50 mm	0.50 mm	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	11.96	10.24	200.00	40	180°	N/A	N/A	Pipe 6 " / A335GR.P11
"	SB4	11.97	10.25	200.00	40	180°	N/A	N/A	"
837-67-7	SB1	25.49	10.21	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-007
"	SB2	25.49	10.24	200.00	40	180°	N/A	N/A	FCAW / Plate Thk.25.0 mm.
"	SB3	25.44	10.25	200.00	40	180°	N/A	N/A	A36 + A36
"	SB4	25.47	10.26	200.00	40	180°	N/A	N/A	"
837-67-8	SB1	11.95	10.29	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-008
"	SB2	11.95	10.26	200.00	40	180°	0.50 mm	0.50 mm	SMAW / Plate Thk.12.0 mm.
"	SB3	11.99	10.25	200.00	40	180°	N/A	N/A	SS400 + SS400
"	SB4	11.97	10.24	200.00	40	180°	N/A	N/A	"

Additional Detail :

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

Signature	Tested by	Reviewed by	Witnessed by
Name / Position			
Date			

Signature: Sutthi Sukmanee
Name / Position: PURWAT / SUPERVISOR
Date: 30/9/2024
Reviewed by: [Signature]
Witnessed by: [Signature]
Project Engineer: Mr. Sutthawut / Project Engineer
1 - 10 - 24

Qualitech 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 : 24.6 °C									
Test No. : 837-67		Measurement Tools : 12.0711		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	5.05	11.25	160.00	20	180°	N/A	N/A	PQR No : PQR-TNC-001				
"	FB2	5.25	11.26	160.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.				
"	RB1	5.35	11.25	160.00	20	180°	N/A	N/A	Pipe 2 " / A106 GR.B				
"	RB2	5.35	11.25	160.00	20	180°	N/A	N/A	"				
837-67-2	SB1	11.99	10.25	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-002				
"	SB2	11.89	10.25	200.00	40	180°	N/A	N/A	GTAW + SMAW / 6G / 10.97 mm.				
"	SB3	11.40	10.25	200.00	40	180°	N/A	N/A	Pipe 6 " / A106GR.B				
"	SB4	11.37	10.26	200.00	40	180°	N/A	N/A	"				
837-67-3	FB1	5.49	11.22	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	5.45	11.26	160.00	20	180°	N/A	N/A	Pipe 2 " / A312GR.TP304				
"	RB2	5.30	11.22	160.00	20	180°	N/A	N/A	"				
837-67-4	SB1	11.07	10.25	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-004				
"	SB2	11.07	10.24	200.00	40	180°	N/A	N/A	GTAW + SMAW / 6G / 10.97 mm.				
"	SB3	11.00	10.26	200.00	40	180°	N/A	N/A	Pipe 6 " / A312GR.TP304				
"	SB4	11.05	10.25	200.00	40	180°	N/A	N/A	"				
Additional Detail :													
Result : (NSD) = No Surface Discontinuity													
(OSD) = Open Surface Discontinuity													
(CC) = Corner Crack													
Signature		Tested by		Reviewed By		Witnessed by							
Sudhiti Aulinda		SPT		SPT		Sudhiti Aulinda							
Name / Position		PURIWAT / SUPERVISOR		PURIWAT / SUPERVISOR		Mr. Sudhiti Aulinda / Project Engineer							
Date		30/9/2024		30/9/2024		1-10-24							

