



WELDING PROCEDURE SPECIFICATION (WPS)

Company Name Thainumpon Construction Company Limited

Welding Procedure Specification No. WPS - TNC - 001 Issued Date September 30, 2024

Supporting PQR No. PQR - TNC - 001 Revision No. 0 Date September 30, 2024

Welding Process(es) GTAW 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)

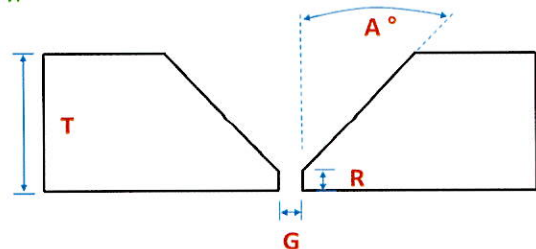
☐ Metal ☐ Nonfusing Metal

☐ 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) ~ 1.50 - 11.08 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 1.50 - 11.08 mm Fillet All

Maximum Pass Thickness $\leq \frac{1}{8}$ in. (13 mm.) (Yes) ✓ (No) x

Other: -

Filler Metal

Process	GTAW	
Spec. No. (SFA)	5.18	
AWS No. (Class)	ER70S-6	
F-No.	6	
A-No.	1	
Size of Filler Metals	2.4 mm	
Filler metal product form	Solid wire	
Supplemental Filler Metal	None	
Weld Metal		
Deposited Thickness :		
Groove	11.08 mm	
Fillet	All	
Electrode-flux Class	N/A	
Flux Type	N/A	
Flux Trade Name	N/A	
Consumable Insert	N/A	
Other : Trade Name	FAMILIARC TG-S51T or equivalent	

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



WELDING PROCEDURE SPECIFICATION (WPS)

Company Name Thainumpon Construction Company Limited
Welding Procedure Specification No. WPS - TNC - 001 Issued Date September 30, 2024
Supporting PQR No. PQR - TNC - 001 Revision No. - Date -
Welding Process(es) GTAW 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) 250°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 :	<u>Argon</u>	<u>99.99%</u>	<u>10-20</u>
Trailing Gas :	<u>-</u>	<u>-</u>	<u>-</u>
Backing Gas :	<u>-</u>	<u>-</u>	<u>-</u>
Other :	<u>-</u>	<u>-</u>	<u>-</u>

Electrical characteristics

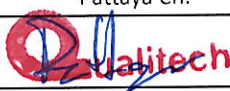
Weld Pass(es)	Process	Filler Metal		Current Type and Polarity	Amps.	Volts	Travel Speed (cm/min.)	Other (e.g., Remark, Comments, Hot Wire Addition, Technique Torch Angle, etc.)
		Class.	Dia.					
<u>Root</u>	<u>GTAW</u>	<u>ER70S-6</u>	<u>2.4 mm</u>	<u>DCEN</u>	<u>80-130</u>	<u>9-14</u>	<u>4 - 10</u>	<u>-</u>
<u>Fill</u>	<u>GTAW</u>	<u>ER70S-6</u>	<u>2.4 mm</u>	<u>DCEN</u>	<u>90-140</u>	<u>9-14</u>	<u>4 - 10</u>	<u>-</u>
<u>Cover</u>	<u>GTAW</u>	<u>ER70S-6</u>	<u>2.4 mm</u>	<u>DCEN</u>	<u>80-130</u>	<u>9-14</u>	<u>4 - 10</u>	<u>-</u>

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 :	<u>Mr. Sittawat Nantakrit</u>	<u>Pattaya Ch.</u>
SIGNATURE :		
DATE :	<u>30 Sep 2024</u>	<u>September 30, 2024</u>



PROCEDURE QUALIFICATION RECORD (PQR)

PQR No. PQR - TNC - 001

TENSILE TEST (QW-150)

TENSILE TEST REPORT NO. 837-67-1 TS001

Test No.	Thickness (mm)	Width (mm)	Area (mm ²)	Ultimate Total Load (kN)	Ultimate Unit Stress (MPa)	Type of Failure and Location
837-67-1 TS1	5.09	13.02	66.272	49.659	749	Out of weld metal
837-67-1 TS2	5.05	13.00	65.650	47.686	726	Out of weld metal

GUIDE BEND TESTS (QW-160)

GUIDE BEND TEST REPORT NO. 837-67-1 BD001

Type and Figure No.	Result
837-67-1 FB1 Face Bend	No Surface Discontinuity
837-67-1 FB2 Face Bend	No Surface Discontinuity
837-67-1 RB1 Root Bend	No Surface Discontinuity
837-67-1 RB2 Root 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

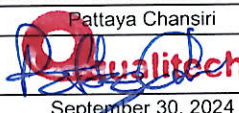
Type of Test Visual Examination Acceptable
Radiographic Testing Report Acceptable
Macrostructure Test Report Report No. 837 - 67 - 1 / MA001
Vickers Hardness Test Report Report No. 837 - 67 - 1 / HV001
(Hardness HV10 , Max value at Weld Metal 190.3 HV, Max value at HAZ 184.7 HV, and Max value at Base Metal 159.9 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 - 1

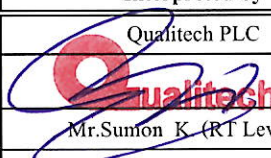
We certify that the statements in this record are correct and that the test weld were prepared, welded and tested in accordance with the -
requirements of Section IX of the ASME Boiler and Pressure Vessel Code

Manufacturer Thainumpon Construction Company Limited

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



RADIOGRAPHIC TESTING REPORT						Report No. : RT-PQR-001 Page 1 of 1							
						Our Ref. No : TNC-RT-R2409/0001							
						Test Date : September 25, 2024							
Client : Thainumpon Construction Company Limited				Procedure No. / SST No. : -									
Project : -				Job No. : -									
Description : PQR PIPE				PQR No. : PQR-TNC-001									
Welding Process : GTAW				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 : <u>0.027</u> mm (Front/Back)				Film in each cassette : ☒ 1 Film ☐ _____ Films									
Tested Material : ☐ C/S ☐ S/S ☒ A106 GR.B				Number of exposure : <u>2</u>									
IQI Selection	Type : ☒ Wire-Type ☐ Hole-Type			Radiation Source : ☒ Ir-192 ☐ Se-75 ☐ X-Ray ☐ Other _____									
	Material Group : ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Other _____			Strength : <u>15</u> ☒ Curie ☐ kV									
	Set : ☐ A ☒ B ☐ C ☐ D ☐ Other _____			Source Size (F) : <u>2.5 x 3</u> mm									
	Placement : ☒ Source Side ☐ Film Side			Film Density : <u>2.0</u> to <u>4.0</u>									
	IQI Sensitivity : IQI Wire No. <u>6</u>			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	2"	5.54	-	558.8	1.5+1.5	8.54	63.30	0.44	NVD	☒	☐
		B	2"	5.54	-	558.8	1.5+1.5	8.54	63.30	0.44	NVD	☒	☐

Total Films : ☒ 3.5" x 8.5" = <u>2</u> ☐ 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	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. : 837-67-1 / TS001 , 837-67-1 / BD001
: 837-67-1 / MA001 , 837-67-1 / 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-001

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. : 837-67-1 / 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						
					Welding Position : 6G						
					Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %						
Test Product : PQR-TNC-001					Dimension (mm) : Pipe 2" Thk. 5.54 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	837-67-1 TS1	5.09	13.02	66.272	N/A	N/A	N/A	N/A	49.659	749	OUT of Weld metal
2	837-67-1 TS2	5.05	13.00	65.650	N/A	N/A	N/A	N/A	47.686	726	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)
Completed by	Approved by	Client Representative			Reviewed by		Reviewed by		Owner Representative		
Company	Qualitech PCL										
Signature											
Name	Mr.Puriwat Sukonpatttra										
Date	30 September 2024										

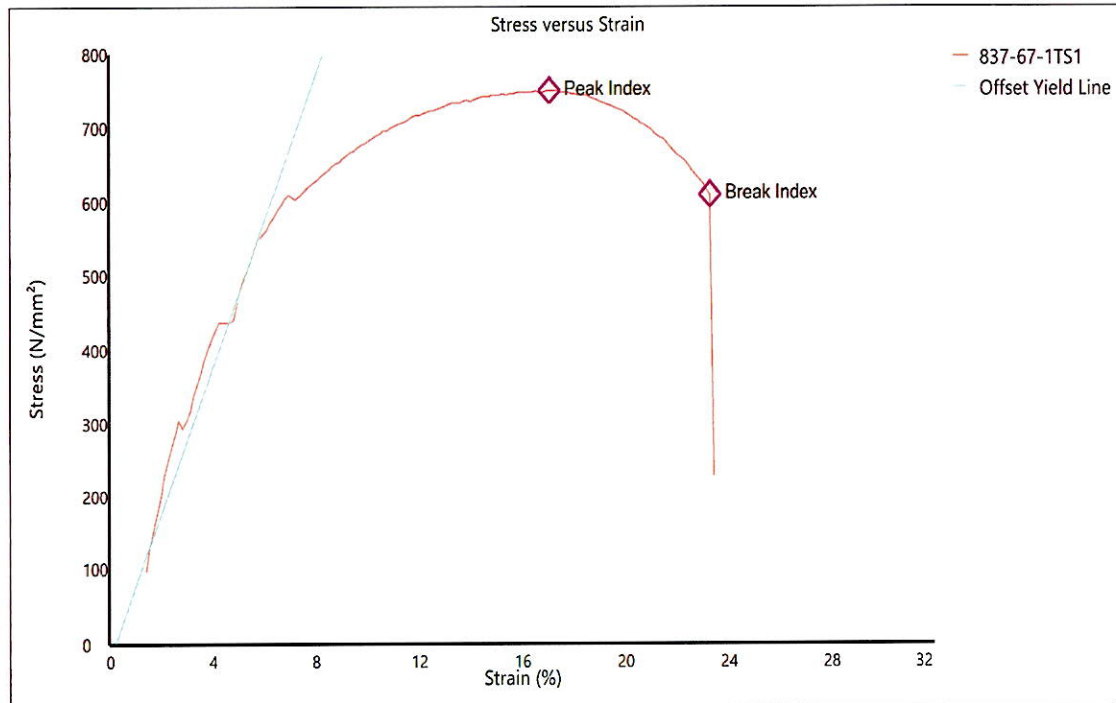
Note

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

Attachment 1 : Test Run Review Graph

TENSILE TEST REPORT

Report No. : 837-67-1 / TS001
Page : 2 / 3
Test Date : 30 September 2024



Display Name	Value	Unit
Thickness	5.09	mm
Width	13.02	mm
Test Run Name	837-67-1 TS1	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	66.272	mm ²
Maximum Force	49.659	kN
Maximum Stress	749	MPa

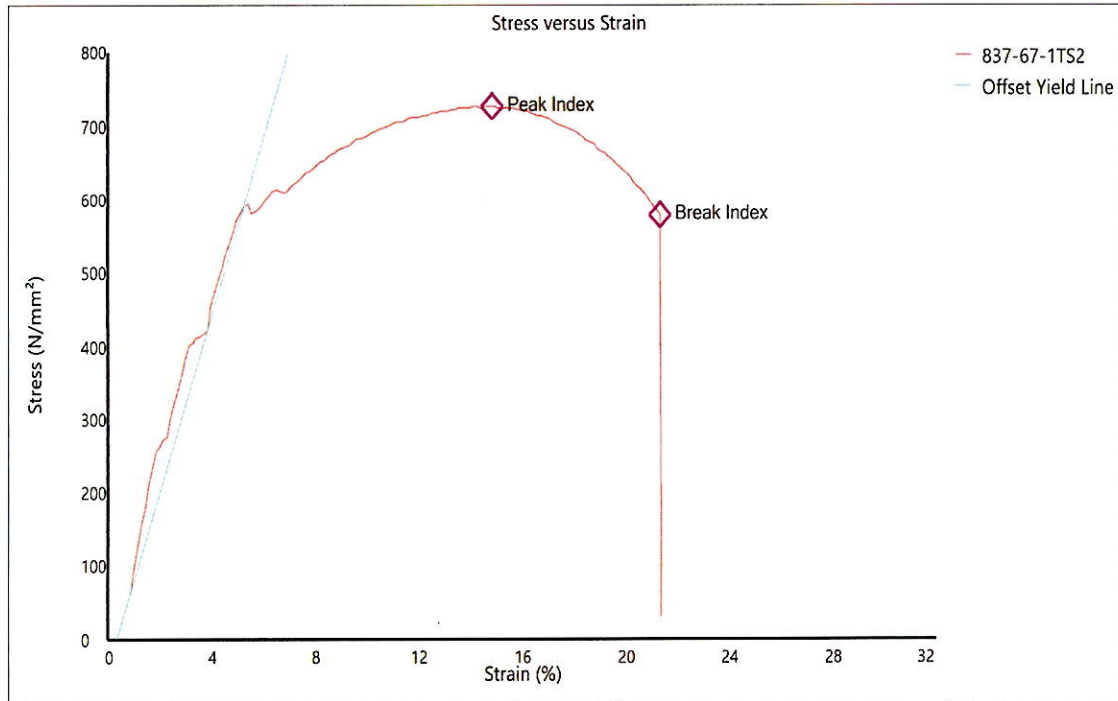
Attachment 2 : Test Run Review Graph

TENSILE TEST REPORT

Report No. : 837-67-1 / TS001

Page : 3 / 3

Test Date : 30 September 2024



Display Name	Value	Unit
Thickness	5.05	mm
Width	13.00	mm
Test Run Name	837-67-1 TS2	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	65.650	mm ²
Maximum Force	47.686	kN
Maximum Stress	726	MPa

GUIDED-BEND TEST REPORT

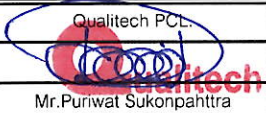
Report No. : 837-67-1 / BD001
Page : 1 / 1
Test Date : 30 September 2024

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
Test Product : PQR-TNC-001	Welding Process : GTAW
Material Specification : A106 Gr.B	Welding Position : 6G
Equipment : Guided Bend Machine, Model PU 30 L	Test Temperature : $25 \pm 3^{\circ}\text{C}$ Humidity : $50 \pm 15\%$
Serial No. : SC 001	Dimension (mm) : Pipe 2" Thk. 5.54 mm.
Preparation method : ASME IX : 2023	Received Date : 26 September 2024
Test method : ASME IX : 2023	Machine Capacity : 30 Tons
	Calibration Date : 23 December 2023
	Reference Code / Standard : ASME IX : 2023

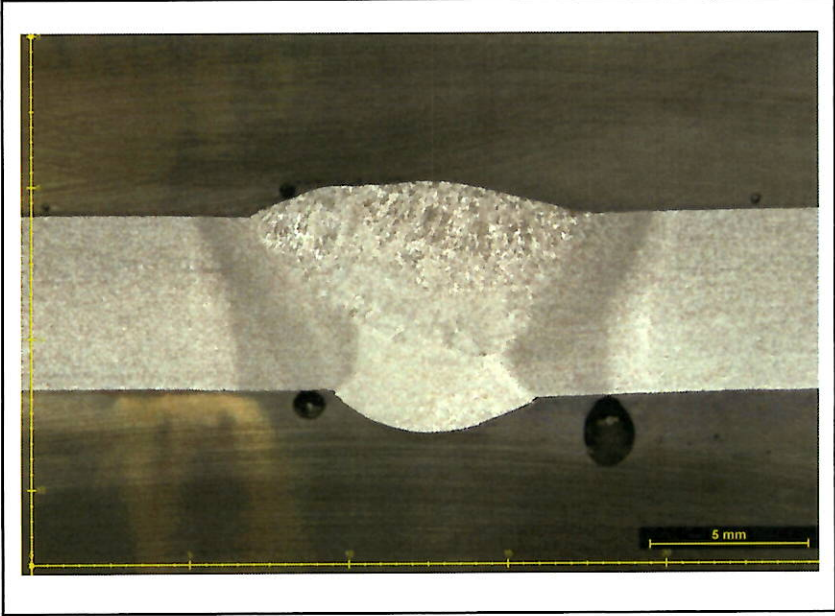
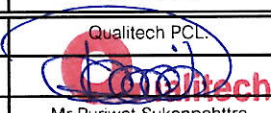
No.	Sample No.	Specimen Type	Specimen Dimension (mm)			Mandrel Diameter (mm)	Bend Angle (Degree)	Visually examined result for Surface discontinuities	Remark
			Thickness	Width	Length				
1	837-67-1 FB1	Face bend	5.35	19.25	160.00	20	180°	NSD	N/A
2	837-67-1 FB2	Face bend	5.35	19.26	160.00	20	180°	NSD	N/A
3	837-67-1 RB1	Root bend	5.35	19.25	160.00	20	180°	NSD	N/A
4	837-67-1 RB2	Root bend	5.35	19.25	160.00	20	180°	NSD	N/A

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

Addition details : Welder Name : Mr. Pairoi K.

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 Sukonphattra				
Date	30 September 2024				

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

MACROSTRUCTURE TEST REPORT				Report No. : 837-67-1 / 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		
			Welding Position : 6G		
			Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %		
Test Product : PQR-TNC-001			Dimension (mm) : Pipe 2" Thk. 5.54 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
837-67-1 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 Sukonpahttra				
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

VICKERS HARDNESS TEST REPORT				Report No. : 837-67-1 / 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		
			Welding Position : 6G		
			Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %		
Test Product : PQR-TNC-001			Dimension (mm) : Pipe 2" Thk. 5.54 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. 837-67-1 HV Test Location	Hardness Value					
	Point No.	Line 1	Point No.	Line 2	Point No.	Line 3
Base Metal of Left Side	1	151.9	16	158.7	-	-
	2	157.5	17	159.9	-	-
	3	156.6	18	158.1	-	-
Heat Affected Zone (HAZ) of Left Side	4	162.2	19	173.1	-	-
	5	171.4	20	175.1	-	-
	6	176.1	21	177.5	-	-
Weld Metal	7	179.3	22	162.2	-	-
	8	183.6	23	170.1	-	-
	9	190.3	24	163.8	-	-
Heat Affected Zone (HAZ) of Right Side	10	184.7	25	174.1	-	-
	11	177.2	26	172.7	-	-
	12	174.8	27	166.6	-	-
Base Metal of Right Side	13	153.2	28	153.5	-	-
	14	152.1	29	153.0	-	-
	15	159.0	30	155.5	-	-

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 Sukonpahttra				
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

VICKERS HARDNESS TEST REPORT				Report No. : 837-67-1 / 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		
			Welding Position : 6G		
			Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %		
Test Product : PQR-TNC-001			Dimension (mm) : Pipe 2" Thk. 5.54 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 Kg. 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 Sukonpahttra				
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 : 837-67-1HV
Standard : ASME IX : 2023
Test Method : ASTM E384-17

PQR-TNC-001
P2" / A106 Gr.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	349.27	349.64	151.9	HV	16	10	10X	335.91	347.75	158.7	HV
2	10	10X	337.82	348.38	157.5	HV	17	10	10X	337.82	343.35	159.9	HV
3	10	10X	342.27	345.87	156.6	HV	18	10	10X	341.63	343.35	158.1	HV
4	10	10X	339.72	336.43	162.2	HV	19	10	10X	328.91	325.74	173.1	HV
5	10	10X	331.45	326.37	171.4	HV	20	10	10X	325.09	325.74	175.1	HV
6	10	10X	322.55	326.37	176.1	HV	21	10	10X	325.09	321.34	177.5	HV
7	10	10X	322.55	320.71	179.3	HV	22	10	10X	341.63	334.55	162.2	HV
8	10	10X	314.91	320.71	183.6	HV	23	10	10X	332.73	327.63	170.1	HV
9	10	10X	313.64	310.65	190.3	HV	24	10	10X	339.09	333.92	163.8	HV
10	10	10X	319.37	314.42	184.7	HV	25	10	10X	331.45	321.34	174.1	HV
11	10	10X	324.46	322.60	177.2	HV	26	10	10X	331.45	323.86	172.7	HV
12	10	10X	326.36	325.11	174.8	HV	27	10	10X	336.54	330.77	166.6	HV
13	10	10X	352.45	343.35	153.2	HV	28	10	10X	342.90	352.15	152.5	HV
14	10	10X	351.18	347.12	152.1	HV	29	10	10X	346.72	349.64	153.0	HV
15	10	10X	336.54	346.49	159.0	HV	30	10	10X	341.00	349.64	155.5	HV

Tested By : 
Position : Engineer
Date : 30 Sep 2024


Project Engineer
2 / 10 / 24

Reviewed By : 
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
Shape of Crossection : ☒ Rectangular ☐ Round ☐ Pipe ☐ Camber
area ☐ Other : Tensile Transverse Weld
Reference Standard : ASME Section IX: 2023
Measurement tools (1) : 110712 Measurement tools (2) :

Test Date : 30/9/2024
Test Temp. : 25.0 °C
Humidity : 84 %
Test Standard : ASTM A370-21

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 1	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	Load (kN)	-	-	-	-	-	-
	☐ Offset	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	OUT weld	OUT weld.	OUT weld.	OUT weld	IN weld	IN weld.	
	☒ Weldment							
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		[Signature]			[Signature]			
Name		Thirupong Sampathinathan			Mr. Sathyanath Natarathin			
Position		PURIWAT / SUPERVISOR			Project Engineer			
Date		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 4	837-67-6 TS 2
Before	Thickness (T) (mm)	1	6.67	9.75	4.65	4.62	10.09	10.09
		2	6.67	9.75	4.65	4.62	10.09	10.09
		3	6.67	9.75	4.65	4.62	10.09	10.09
		Avg.	6.67	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	126.415	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	ext weld.	out weld.	ext 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. 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	11.47	11.07	24.94	24.04
		2	24.85	24.87	11.47	11.07	24.94	24.04
		3	24.85	24.87	11.47	11.07	24.94	24.04
		Avg.	24.85	24.87	11.47	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	216.7396	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)		248.270	248.848	107.055	103.244	234.732	233.643
	Strength (Mpa)		526	527	493	491	516	509
Fracture (IN/OUT)	☐ Gauge length		out weld.	out weld.	out weld.	out weld.	out weld.	out 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			
Name	Winaphong Chomphetrip	PURIWAT / SUPERVISOR	Mr. Suttawat Nibantat
Position	Technician		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	11.90	10.20	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-006
"	SB2	11.90	10.20	200.00	40	180°	0.50 mm	0.50 mm	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	11.90	10.20	200.00	40	180°	N/A	N/A	Pipe 6 " / A335GR.P11
"	SB4	11.90	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	11.90	10.20	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-008
"	SB2	11.90	10.20	200.00	40	180°	0.50 mm	0.50 mm	SMAW / Plate Thk.12.0 mm.
"	SB3	11.90	10.20	200.00	40	180°	N/A	N/A	SS400 + SS400
"	SB4	11.90	10.20	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	Sudthi Sukhthong	PURIWAT / SUPERVISOR	Mr. Satharut / 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 Standard : ASME IX: 2023

Testing room temperature : 24.6 °C

Test No. : 837-67

Measurement Tools : 12.07.11

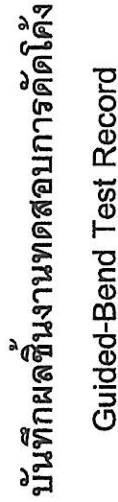
Humidity : 42 %

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	5.25	11.25	160.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.
"	RB1	5.55	11.25	160.00	20	180°	N/A	N/A	Pipe 2 " / A106 GR.B
"	RB2	5.55	11.25	160.00	20	180°	N/A	N/A	"
837-67-2	SB1	11.44	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	11.57	10.25	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	5.44	11.25	160.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.
"	RB1	5.46	11.26	160.00	20	180°	N/A	N/A	Pipe 2 " / A312GR.TP304
"	RB2	5.50	11.22	160.00	20	180°	N/A	N/A	"
837-67-4	SB1	11.67	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
	SPT	SPT	
Name / Position	Sudhiti Aukhade	PURIWAT / SUPERVISOR	Mr. Sathawat / Project Engineer
Date	30/9/2024	30/9/2024	1-10-24



รหัสเอกสาร : FM-BD-01

หน้า 1 / 1

แก้ไขครั้งที่ : 04

วันที่บังคับใช้: 28 พฤศจิกายน 2560

Reference code/Standard : ASME Section IX: 2023

ASME Section IX: 2023

Test Standard : ASME IX : 2023

: ASME IX : 2023

Testing room temperature

Testing room temperature : 24.5 °C

Test No. : 837-67

837-67

Measurement Tools

s/c

9907219

9907219

Humidity

Humidity

[illegible]

Additional Detail :

Result : (NSD) = No Surface Discontinuity

(OSD) = Open Surface Discontinuity

(CC) = Coner Crack

Tested by

100

1

Reviewed, By:

2

WAT / SUPERV

Witnessed by

[Signature]

1. Primer

10-24