



WELDING PROCEDURE SPECIFICATION (WPS)

Company Name Thainumpon Construction Company Limited		Issued Date September 30, 2024
Welding Procedure Specification No. WPS - TNC - 007	Revision No. 0	Date September 30, 2024
Supporting PQR No. PQR - TNC - 007	Type(s) Semi - Auto	(Automatic, Manual, Machine, or Semi-Auto)
Welding Process(es) FCAW		

Joins

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

Root Spacing **3 - 4 mm**

Backing (Yes) ☒ (No) ☒

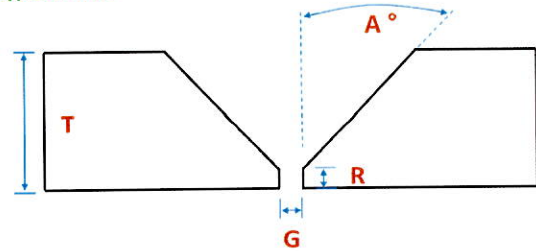
Backing Material (Type) **Weld Metal**
(Refer to both backing and retainers)

☒ 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 - 50.00 mm
Root Face (R)	~	0 - 4 mm
Root Gap (G)	~	2 - 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 A36 or equivalent	
	to Specification, Type and Grade or UNS Number	ASTM A36 or equivalent	
OR	Chem. Analysis and Mechanical Prop.	-	
	to Chem. Analysis and Mechanical Prop.	-	

Thickness Range

Base Metal	Groove	5.00 - 50.00 mm	Fillet	All
Maximum Pass Thickness $\leq \frac{1}{8}$ in. (13 mm.)	(Yes)	☒	(No)	☒

Other: -

Filler Metal

Process **FCAW**

Spec. No. (SFA) **5.20**

AWS No. (Class) **E71T-1C**

F-No. **6**

A-No. **1**

Size of Filler Metals **1.2 mm**

Filler metal product form **Flux Cored wire**

Supplemental Filler Metal **None**

Weld Metal

Deposited Thickness :

Groove **50.0 mm**

Fillet **All**

Electrode-flux Class **N/A**

Flux Type **N/A**

Flux Trade Name **N/A**

Consumable Insert **N/A**

Other : Trade Name **Hyundai SF-71 or equivalent**

FCAW	
5.20	
E71T-1C	
6	
1	
1.2 mm	
Flux Cored wire	
None	
50.0 mm	
All	
N/A	
N/A	
N/A	
N/A	
Hyundai SF-71 or equivalent	

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



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Supporting PQR No. PQR - TNC - 007 Revision No. 0 Date September 30, 2024
Welding Process(es) FCAW Type(s) Semi - Auto
(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
(*) thickness ≥ 25 mm required minimum preheat temperature 95°C

(Continuous or special heating where applicable should be recorded)

Gas

	Percent Composition		
	Gas(es)	Mixture	Flow Rate (l/min)
Shielding Gas :	CO ₂	99.95%	10-25
Trailing Gas :	-	-	-
Backing Gas :	-	-	-
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	FCAW	E71T-1C	1.2 mm	DCEP	100 - 250	20 - 30	8 - 30	-
Fill	FCAW	E71T-1C	1.2 mm	DCEP	100 - 250	20 - 30	10 - 30	-
Cover	FCAW	E71T-1C	1.2 mm	DCEP	100 - 250	20 - 30	10 - 30	-

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 N/A
(Pure Tungsten, 2% Thoriated, etc.)
Mode of Metal Transfer for GMAW (FCAW) Spray Arc / Globular Arc
(Spray Arc, Short Circuiting Arc, etc.)
Other -

Technique

String or Weave Bead Both
Orifice, Nozzle, or Gas Cup Size 3/8" - 7/8"
Initial or Interpass Cleaning (Brushing, Grinding etc.) Brushing and Grinding
Method of Back Gouging Grinding
Oscillation N/A
Contact Tube to Work Distance 20 - 30 mm
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 :	2024	September 30, 2024

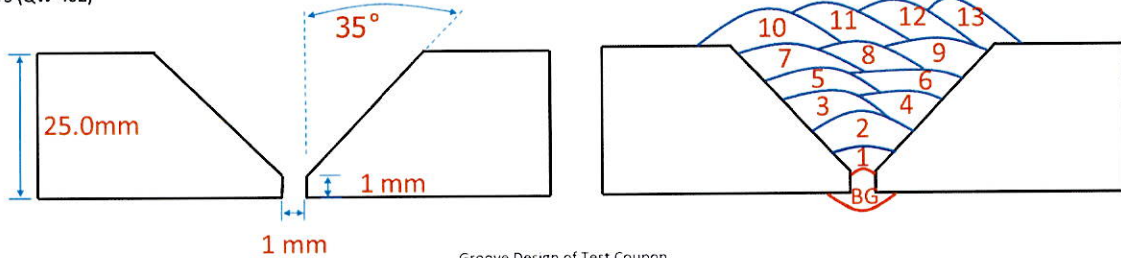


PROCEDURE QUALIFICATION RECORDS (PQR)

(Section IX, ASME Boiler & Pressure Vessel Code) Record Actual Variables Used to Weld Test Coupon

Organization Name: Thainumpon Construction Company Limited
 Procedure Qualification Record No.: PQR - TNC - 007
 WPS No.: WPS - TNC - 007
 Welding Process (es): FCAW
 Types (Manual, Automatic, Semi-Automatic): Semi-Automatic
 Date: 30-Sep-2024

JOINTS (QW-402)



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal and process used.)

BASE METALS (QW-403)

Material Spec. ASTM A36 to ASTM A36
 Type/Grade, or UNS Number -
 P - No. 1 Group No. 1 to P - No. 1 Group No. 1
 Thickness of Test coupon 25.00 mm
 Diameter of Test coupon Plate length 300 mm x 300 mm
 Maximum Pass Thickness 6.00 mm
 Other N/A

POSTWELD HEAT TREATMENT (QW-407)

Temperature None
 Time N/A
 Other N/A

GAS (QW-408)

	Gas (es)	Percent Composition (Mixture)	Flow Rate
Shielding	CO ₂	99.50%	20 L/min.
Trailing	-	-	-
Backing	-	-	-
Other	-	-	-

FILLER METALS (QW-404)

SFA Specification SFA 5.20
 AWS Classification E71T-1C
 Filler Metal F-No. F-No.6
 Weld Metal Analysis A-No. A-No.1
 Size of Filler Metal 1.2 mm
 Filler Metal Product Form Flux Cored Wire
 Supplemental Filler Metal None
 Electrode Flux Classification N/A
 Flux Type N/A
 Flux Trade Name N/A
 Weld Metal Thickness 25.00 mm
 Other N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current DC
 Polarity EP (+)
 Amps. 135.1 - 223.7
 Volts 22.2 - 29.8
 Waveform Control N/A
 Power or Energy N/A
 Arc Time N/A
 Weld Bead Length 10 mm max.
 Tungsten Electrode Size N/A

POSITION (QW-405)

Position (s) 3G
 Weld Progression (Uphill, Downhill) Uphill
 Other N/A

Mode of Metal Transfer for GMAW (FCAW) Spray
 Heat Input 31.52 kJ/cm max.
 Other N/A

PREHEAT (QW-406)

Preheat Temperature 32.5 °C minimum
 Interpass Temperature 201.7 °C maximum
 Other N/A

TECHNIQUE (QW-410)

Travel Speed (cm./min.) 9.78 - 25.00
 String or Weave Bead Both
 Oscillation N/A
 Multiple or Single Pass (Per Side) Multipass
 Single or Multiple Electrodes Single Electrode
 Other N/A

Weld Pass(es)	Process	Deposited thickness (mm)	Filler Metal		Current Type & Polarity	Ampere Range (A)	Volt Range (V)	Travel Speed (cm/min)			Inter Pass Temp. °C	Heat Input (kJ/cm)
			Class	Dia. (mm)				Length	Min:Sec	TS		
1	FCAW	6.00	E71T-1C	1.2	DCEP	135.1	22.2	30.0	3.04	9.78	-	18.40
2	FCAW	4.00	E71T-1C	1.2	DCEP	223.7	28.3	30.0	1.29	20.22	58.7	18.78
3	FCAW	4.00	E71T-1C	1.2	DCEP	195.3	27.6	30.0	1.43	17.48	108.4	18.51
4	FCAW	4.00	E71T-1C	1.2	DCEP	193.8	28.5	30.0	1.29	20.22	201.7	16.39
5	FCAW	5.00	E71T-1C	1.2	DCEP	189.8	28.3	30.0	1.52	16.07	135.4	20.05
6	FCAW	5.00	E71T-1C	1.2	DCEP	189.0	29.3	30.0	1.53	15.93	116.2	20.86
7	FCAW	5.00	E71T-1C	1.2	DCEP	191.7	29.6	30.0	1.41	17.82	137.4	19.10
8	FCAW	5.00	E71T-1C	1.2	DCEP	191.2	29.8	30.0	2.21	12.77	149.0	26.78
9	FCAW	5.00	E71T-1C	1.2	DCEP	189.2	29.4	30.0	2.50	10.59	154.8	31.52
10	FCAW	1.00	E71T-1C	1.2	DCEP	192.1	29.2	30.0	2.14	13.43	87.6	25.05
11	FCAW	1.00	E71T-1C	1.2	DCEP	191.3	29.4	30.0	1.51	16.22	79.0	20.81
12	FCAW	1.00	E71T-1C	1.2	DCEP	193.5	29.5	30.0	2.13	13.53	93.8	25.31
13	FCAW	1.00	E71T-1C	1.2	DCEP	194.8	29.1	30.0	1.12	25.00	128.1	13.60
BG	FCAW	3.00	E71T-1C	1.2	DCEP	192.9	29.0	30.0	1.57	15.38	82.2	21.82



PROCEDURE QUALIFICATION RECORD (PQR)

PQR No. PQR - TNC - 007

TENSILE TEST (QW-150)

TENSILE TEST REPORT NO. 837-67-7 TS001

Test No.	Thickness (mm)	Width (mm)	Area (mm ²)	Ultimate Total Load (kN)	Ultimate Unit Stress (MPa)	Type of Failure and Location
837-67-7 TS1	24.85	19.00	472.150	248.270	526	Out of weld metal
837-67-7 TS2	24.87	19.08	474.520	248.848	524	Out of weld metal

GUIDE BEND TESTS (QW-160)

GUIDE BEND TEST REPORT NO. 837-67-7 BD001

Type and Figure No.	Result
837-67-7 SB1 Side Bend	No Surface Discontinuity
837-67-7 SB2 Side Bend	No Surface Discontinuity
837-67-7 SB3 Side Bend	No Surface Discontinuity
837-67-7 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

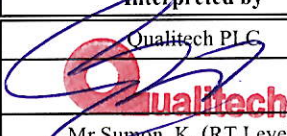
Type of Test Visual Examination Acceptable
Macrostructure Test Report Report No. 837 - 67 - 7 / MA001
Vickers Hardness Test Report Report No. 837 - 67 - 7 / HV001
(Hardness HV10 , Max value at Weld Metal 207.6 HV, Max value at HAZ 210.2 HV, and Max value at Base Metal 153.5 HV)
Deposit Analysis N/A
Other N/A

Welder's Name Mr. Kongsak J. Clock No. - Stamp No. -
Test Conducted by Qualitech Public Company Limited Laboratory Test No. 837 - 67 - 7

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 :	<u>Mr. Sathawat Nantachit</u>	<u>Pattaya Chansiri</u>
SIGNATURE :		
DATE :	<u>30 Sep 2024</u>	<u>September 30, 2024</u>

RADIOGRAPHIC TESTING REPORT						Report No. : RT-PQR-007 Page 1 of 1						
						Our Ref. No : TNC-RT-R2409/0007						
						Test Date : September 25, 2024						
Client : Thainumpon Construction Company Limited				Procedure No. / SST No. : -								
Project : -				Job No. : -								
Description : PQR PLATE				PQR No. : PQR-TNC-007								
Welding Process : FCAW				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 ☒ A36+A36				Number of exposure : <u>1</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>10</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.		☒ 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.Kaingsak J.	3G	A-B	- 25.00	-	558.8	2.5+2.5	30.00	30.00	0.21	NVD	☒	☐

Total Films : ☐ 3.5" x 8.5" = _____ ☒ 3.5" x 17" = <u>1</u> ☐ 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. : 837-67-7 / TS001 , 837-67-7 / BD001
: 837-67-7 / MA001 , 837-67-7 / 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-007

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. : 837-67-7 / 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 : FCAW							
					Welding Position : 3G							
					Test Temperature : 25 ± 3 °C					Humidity : 50 ± 15 %		
Test Product : PQR-TNC-007					Dimension (mm) : Plate Thk. 25 mm.							
Material Specification : A36+A36					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	837-67-7 TS1	24.85	19.00	472.150	N/A	N/A	N/A	N/A	248.270	526	OUT of Weld metal	
2	837-67-7 TS2	24.87	19.08	472.530	N/A	N/A	N/A	N/A	248.848	527	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. Kaingsak J.												
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 Sukonpanthra											
Date	30 September 2024											

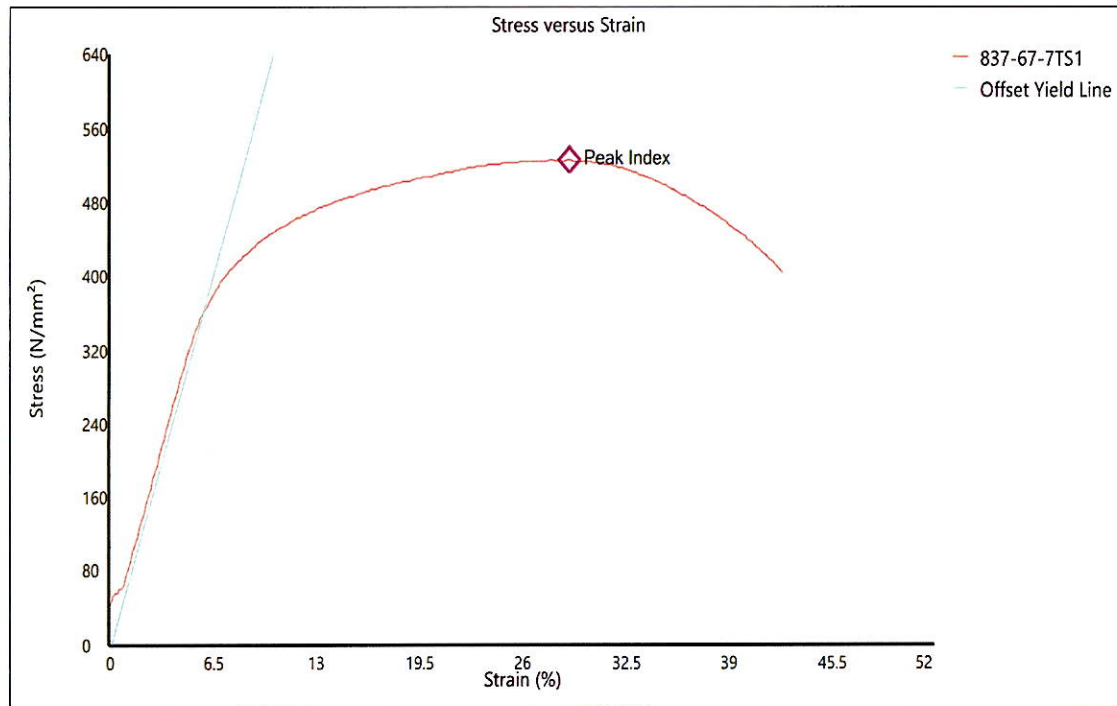
Note

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2. Partial publicity of the result on testing is prohibited without the written permission from Qualitech plc
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Attachment 1 : Test Run Review Graph

TENSILE TEST REPORT

Report No. : 837-67-7 / TS001
Page : 2 / 3
Test Date : 30 September 2024

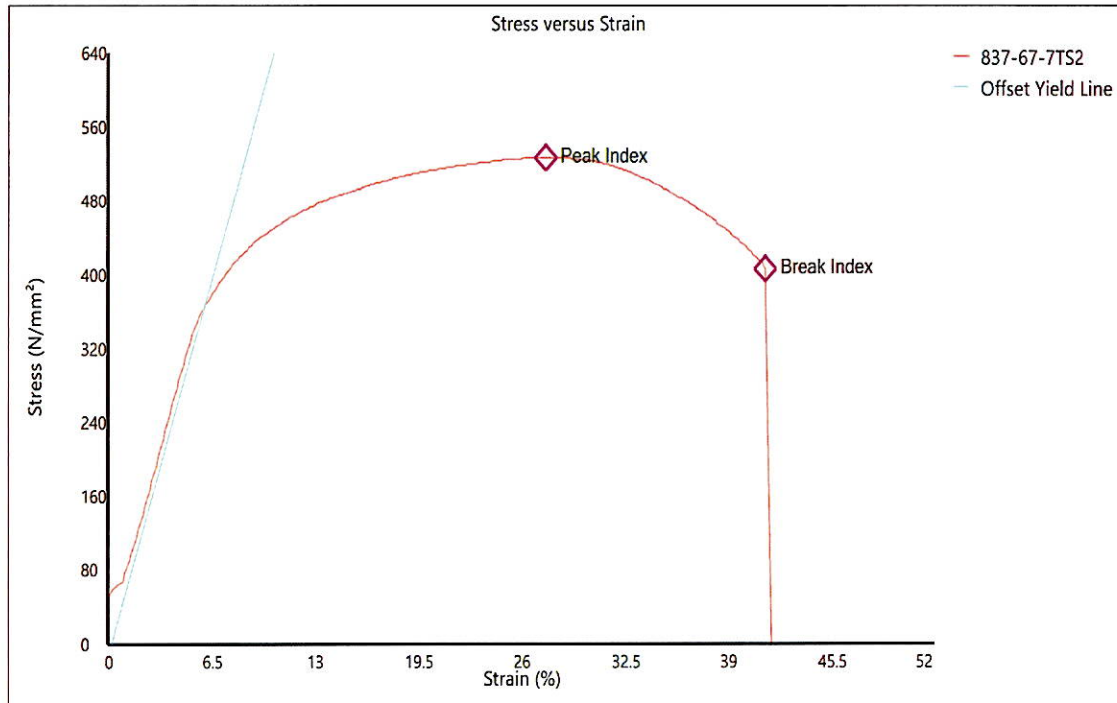


Display Name	Value	Unit
Thickness	24.85	mm
Width	19.00	mm
Test Run Name	837-67-7 TS1	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	472.150	mm ²
Maximum Force	248.270	kN
Maximum Stress	526	MPa

Attachment 2 : Test Run Review Graph

TENSILE TEST REPORT

Report No. : 837-67-7 / TS001
Page : 3 / 3
Test Date : 30 September 2024



Display Name	Value	Unit
Thickness	24.87	mm
Width	19.08	mm
Test Run Name	837-67-7 TS2	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	472.530	mm ²
Maximum Force	248.848	kN
Maximum Stress	527	MPa

GUIDED-BEND TEST REPORT

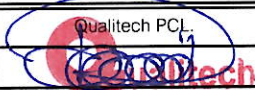
Report No. : 837-67-7 / BD001
Page : 1 / 1
Test Date : 30 September 2024

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 : FCAW
	Welding Position : 3G
	Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %
Test Product : PQR-TNC-007	Dimension (mm) : Plate Thk. 25 mm.
Material Specification : A36+A36	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

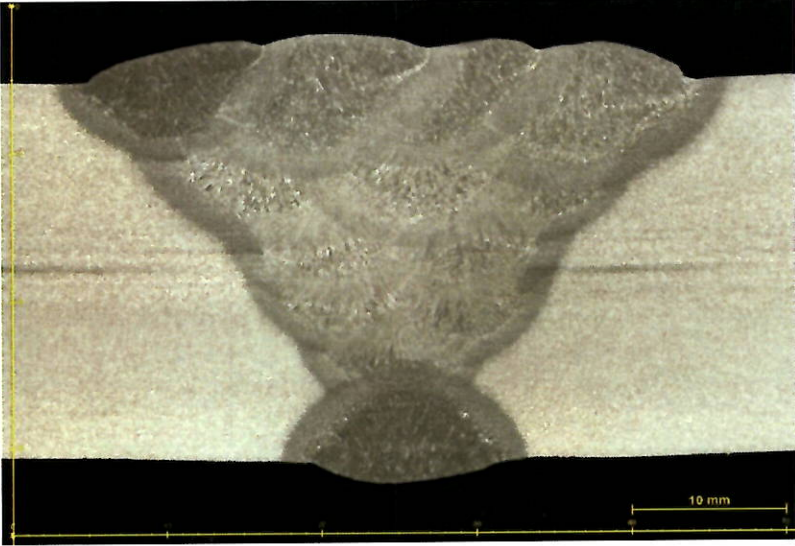
No.	Sample No.	Specimen Type	Specimen Dimension (mm)			Mandrel Diameter (mm)	Bend Angle (Degree)	Visually examined result for Surface discontinuities	Remark
			Thickness	Width	Length				
1	837-67-7 SB1	Side bend	25.49	10.22	200.00	40	180°	NSD	N/A
2	837-67-7 SB2	Side bend	25.49	10.24	200.00	40	180°	NSD	N/A
3	837-67-7 SB3	Side bend	25.49	10.25	200.00	40	180°	NSD	N/A
4	837-67-7 SB4	Side bend	25.47	10.26	200.00	40	180°	NSD	N/A

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

Addition details : Welder Name : Mr. Kaingsak J.

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 Sukonpatttra				
Date	30 September 2024				

- Note
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MACROSTRUCTURE TEST REPORT				Report No. : 837-67-7 / 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 : FCAW		
			Welding Position : 3G		
			Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %		
Test Product : PQR-TNC-007			Dimension (mm) : Plate Thk. 25 mm.		
Material Specification : A36+A36			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
837-67-7 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. Kaingsak J.					
Total		1		Unit(s) Attachment - Page(s)	
Completed by		Approved by		Client Representative	
Company		Qualitech PCL.		Reviewed by	
Signature		[Signature]		Reviewed by	
Name		Mr. Puriwat Sukonpahttra		Owner Representative	
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
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VICKERS HARDNESS TEST REPORT

Report No. : 837-67-7 / 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 : FCAW
	Welding Position : 3G
	Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %
Test Product : PQR-TNC-007	Dimension (mm) : Plate Thk. 25 mm.
Material Specification : A36+A36	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. 837-67-7 HV Test Location	Hardness Value					
	Point No.	Line 1	Point No.	Line 2	Point No.	Line 3
Base Metal of Left Side	1	149.1	16	148.9	-	-
	2	152.4	17	149.2	-	-
	3	146.8	18	148.1	-	-
Heat Affected Zone (HAZ) of Left Side	4	171.0	19	162.2	-	-
	5	184.3	20	163.1	-	-
	6	210.2	21	184.3	-	-
Weld Metal	7	186.5	22	207.1	-	-
	8	194.6	23	201.2	-	-
	9	177.5	24	207.6	-	-
Heat Affected Zone (HAZ) of Right Side	10	197.0	25	176.8	-	-
	11	184.3	26	167.2	-	-
	12	175.1	27	164.1	-	-
Base Metal of Right Side	13	153.0	28	152.0	-	-
	14	148.1	29	150.8	-	-
	15	144.4	30	153.5	-	-

Addition details : Welder Name : Mr. Kaingsak J.

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				

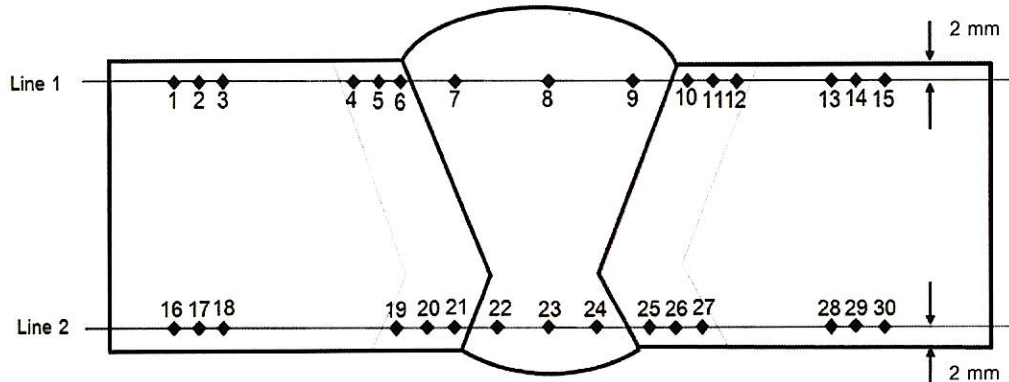
- Note
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VICKERS HARDNESS TEST REPORT

Report No. : 837-67-7 / 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
Test Product : PQR-TNC-007	Welding Process : FCAW
Material Specification : A36+A36	Welding Position : 3G
Equipment : Vickers Hardness Testing Machine, Model HV-100	Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 %
Serial No. : 000031410	Dimension (mm) : Plate Thk. 25 mm.
Calibration Date : 28 September 2023	Received Date : 26 September 2024
Preparation method : ASTM E384-17	Indenter : Diamond
Test method : ASTM E384-17	Test Force : 10 Kgf. Test Scale : HV10
	Reference Code / Standard : ASME IX : 2023

Layout of Test Location



Addition details : Welder Name : Mr. Kaingsak J.

Total	1	Unit(s)	Attachment	-	Page(s)
Completed by	Approved by	Client Representative	Reviewed by	Reviewed by	Owner Representative
Company	QualitechIRCL				
Signature					
Name	Mr. Puriwat Sukonpahrttra				
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
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Appendix #1

Pictures of Specimen Test

Before Testing



After Testing



Test No. : 837-67
Test date : 20/9/2024
Temperature : 25.8° C
Humidity : 46% RH

Sample No : 837-67-7HV
Standard : ASME IX : 2023
Test Method : ASTM E384-17
PQR-TNC-007
Plate T25 / A36

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	355.63	349.64	149.1	HV	16	10	10X	342.27	363.47	148.9	HV
2	10	10X	346.72	350.90	152.4	HV	17	10	10X	347.36	357.81	149.2	HV
3	10	10X	356.26	354.67	146.8	HV	18	10	10X	349.90	357.81	148.1	HV
4	10	10X	337.18	321.34	171.0	HV	19	10	10X	342.27	333.92	162.2	HV
5	10	10X	316.82	317.57	184.3	HV	20	10	10X	340.36	333.92	163.1	HV
6	10	10X	301.55	292.41	210.2	HV	21	10	10X	318.09	316.31	184.3	HV
7	10	10X	319.37	311.28	186.5	HV	22	10	10X	304.73	293.67	207.1	HV
8	10	10X	313.00	304.36	194.6	HV	23	10	10X	306.64	300.59	201.2	HV
9	10	10X	328.27	318.20	177.5	HV	24	10	10X	303.46	294.30	207.6	HV
10	10	10X	313.64	299.96	197.0	HV	25	10	10X	328.91	318.83	176.8	HV
11	10	10X	320.00	314.42	184.3	HV	26	10	10X	335.27	330.77	167.2	HV
12	10	10X	328.91	321.97	175.1	HV	27	10	10X	341.63	330.77	164.1	HV
13	10	10X	347.36	349.01	153.0	HV	28	10	10X	346.72	351.53	152.1	HV
14	10	10X	348.63	359.07	148.1	HV	29	10	10X	346.72	354.67	150.8	HV
15	10	10X	357.54	359.07	144.4	HV	30	10	10X	346.72	348.38	153.5	HV

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

Estimate.
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 :	84 %
Reference Standard :	ASME Section IX: 2023	Test Standard :	ASTM A370-21
Measurement tools (1) :	120722	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 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	44.696	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		TNC		[Signature]		[Signature]		
Name		Thiraphong Chompichit		PURIWAT / SUPERVISOR		Mr. Suttawat Noharathit		
Position		[Signature]				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	
		2	8.67	9.75	4.65	4.62	10.09	10.07
		3	8.67	9.75	4.65	4.62	10.09	10.07
		Avg.	8.67	9.75	4.65	4.62	10.09	10.07
	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	168.6197	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	126.145	41.727	40.999	109.399	110.437	
	Strength (Mpa)	704	682	661	683	574	576	
Fracture (IN/OUT)	☐ Gauge length	IN weld	IN weld	ext weld.	out weld.	ext weld.	Out of Weld	
	☒ Weldment							
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		Signature			Signature			
Name		Name			Name			
Position		Position			Position			
Date		Date			Date			



บริษัท ควอลิเทค จำกัด (มหาชน)
Qualitech Public Company Limited

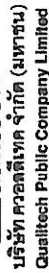
บันทึกผลการทดสอบความต้านแรงดึง

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	472.1600	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	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		PURIWAT / SUPERVISOR		Project Engineer				
Position		30/9/2024		1 - 10 - 24				
Date		30/9/2024		30/9/2024				



Guided-Bend Test Record

แก้ไขครั้งที่ : 04

วันที่บังคับใช้: 28 พฤศจิกายน 2560

Testing room temperature : 24.5 °C

1957219

Humidity : 49 %

Additional Detail:

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

Witnessed by

Reviewed By _____

Tested by _____

1

Result : (NSD) = No Surface Discontinuity

(NSD) = No Surface D

Result :

Result :



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 :	1207211	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	11.44	10.25	200.00	40	180°	N/A	N/A	PQR No : PQR-TNC-002
"	SB2	11.44	10.25	200.00	40	180°	N/A	N/A	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	11.44	10.25	200.00	40	180°	N/A	N/A	Pipe 6 " / A106GR.B
"	SB4	11.44	10.25	200.00	40	180°	N/A	N/A	"
837-67-3	FB1	5.44	11.22	160.00	20	180°	N/A	N/A	PQR No : PQR-TNC-003
"	FB2	5.44	11.22	160.00	20	180°	N/A	N/A	GTAW / 6G / 5.54 mm.
"	RB1	5.44	11.22	160.00	20	180°	N/A	N/A	Pipe 2 " / A312GR.TP304
"	RB2	5.44	11.22	160.00	20	180°	N/A	N/A	"
837-67-4	SB1	11.07	10.24	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	11.07	10.24	200.00	40	180°	N/A	N/A	Pipe 6 " / A312GR.TP304
"	SB4	11.07	10.24	200.00	40	180°	N/A	N/A	"

Additional Detail :		Tested by		Reviewed By	Witnessed by
Result : (NSD) = No Surface Discontinuity		SPT		SPT	
(OSD) = Open Surface Discontinuity		Signature		Signature	
(CC) = Corner Crack		Name / Position		Name / Position	
		Subhikha Auluck		Mr. Subhikha Auluck / Project Engineer	
		Date		Date	
		30/9/2024		30/9/2024	
				1-10-24	

