WELDING PROCEDURE SPECIFICATION (WPS)

Company Name	Thainumpon Construction Company Limited				
Welding Procedure Specification No.	WPS - TNC - 008			Issued Date	September 30, 2024
Supporting PQR No.	PQR - TNC - 008	Revision No.	0	Date	September 30, 2024
Welding Process(es)	SMAW	Type(s)	Manual		
			(Automatic, Manual, Machine, or Semi-Auto)		

Joints

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)		

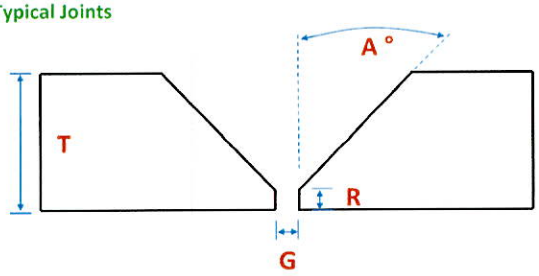
■ Metal ☐ Nonfusing Metal

☐ Non Metalic ☐ Other

Sketches, Production Drawing, Weld Symbols, or Written Description should show the genneral 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 proceduers, for multiple process procedures, etc.)

Typical Joints



Thickness (T)	~	5.00 - 24.00	mm
Root Face (R)	~	0 - 3	mm
Root Gap (G)	~	2 - 4	mm
Bevel Angle (A°)	~	30° - 35°	

or approval drawing joint

Base Metals

P-No.	Unassigned	Group-No.	-	to P-No.	Unassigned	Group-No. -
OR	Specification,Type and Grade or UNS Number				JIS G3101 SS400	
	to Specification,Type and Grade or UNS Number				JIS G3101 SS400	
OR	Chem.Analysis and Mechanical Prop.				-	
	to Chem.Analysis and Mechanical Prop.				-	

Thickness Range

Base Metal		Groove	5.00 - 24.00 mm	Fillet	All
Maximum Pass Thickness ≤ ½ in.(13 mm.)		(Yes)	✓	(No)	×
Other:	-				

Filler Metal

Process	SMAW	
Spec. No. (SFA)	5.1	
AWS No. (Class)	E7016	
F-No.	4	
A-No.	1	
Size of Filler Metals	3.2 , 4.0 mm	
Filler metal product form	Flux Cover Electrode	
Supplemental Filler Metal	None	
Weld Metal		
Deposited Thickness :		
Groove	24.0 mm	
Fillet	All	
Electrode-flux Class	N/A	
Flux Type	N/A	
Flux Trade Name	N/A	
Consumable Insert	N/A	
Other : Trade Name	FAMILIARC LB-52 or equivalent	

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

WELDING PROCEDURE SPECIFICATION (WPS)

Company Name	Thainumpon Construction Company Limited				
Welding Procedure Specification No.	WPS - TNC - 008			Issued Date	September 30, 2024
Supporting PQR No.	PQR - TNC - 008	Revision No.	0	Date	September 30, 2024
Welding Process(es)	SMAW	Type(s)	Manual		
			(Automatic, Manual, Machine, or Semi-Auto)		

Positions

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

Postweld Heat Treatment

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

Preheat

Preheat Temp. (Min)	10˚C Min
Interpass Temp. (Max)	300˚C Max
Preheat Maintenance	None

(Continuos or special heating where applicable should be recorded)

Gas

	Percent Composition		
	Gas(es)	Mixture	Flow Rate (l/min)
Shielding Gas :	-	-	-
Trailing Gas :	-	-	-
Backing Gas :	-	-	-
Other :	-	-	-

Electrical characteristics

Weld Pass(es)	Process	Filler Metal		Current Type and Polarity	Amps.	Volts	Traval Speed (cm/min.)	Other (e.g., Remark, Comments, Hot Wire Addition, Technique Torch Angle, etc.)
		Class.	Dia.					
Root	SMAW	E7016	3.2 mm	DCEP	70 - 130	20 - 26	5 - 12	-
Fill	SMAW	E7016	3.2 mm	DCEP	90 - 140	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: N/A

(Pure Tungsten,2% Thoriated, etc.)

Mode of Metal Transfer for GMAW (FCAW): N/A

(Spray Arc, Short Circuiting Arc, ect.)

Other: -

Technique

String or Weave Bead	Both
Orifice, Nozzle, or Gas Cup Size	N/A
Initial or Interpass Cleaning (Brushing, Grinding etc.)	Brushing and Grinding
Method of Back Gouging	Grinding
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	-

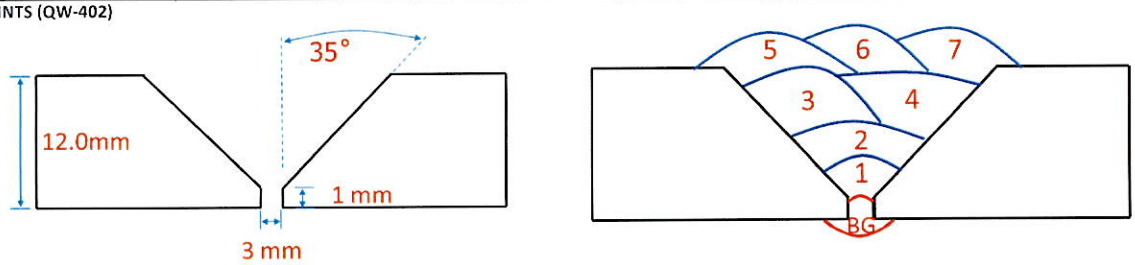
	Prepared By / Certified By	Witnessed / Reviewed By
COMPANY :	Thainumpon Construction Company Limited	Qualitech Public Company Limited
NAME :	Mr. Sathawut Nobantit	Pattaya Ch.
SIGNATURE :		
DATE :	2024	September 30, 2024

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 - 008	Date	30-Sep-2024
WPS No.	WPS - TNC - 008		
Welding Process (es)	SMAW		
Types (Manual , Automatic, Semi - Automatic):	Manual		

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.	JIS G3101	to	JIS G3101
Type/Grade, or UNS Number	SS400		SS400
P - No. Unassigned Group No.	-	to P - No. Unassigned Group No.	-
Thickness of Test coupon	12.00 mm		
Diameter of Test coupon	Plate length 300 mm x 300 mm		
Maximum Pass Thickness	4.00 mm		
Other	N/A		

FILLER METALS (QW-404)

SFA Specification	SFA 5.1
AWS Classification	E7016
Filler Metal F-No.	F-No.4
Weld Metal Analysis A-No.	A-No.1
Size of Filler Metal	3.2 mm
Filler Metal Product Form	Flux Cover electrode
Supplemental Filler Metal	None
Electrode Flux Classification	N/A
Flux Type	N/A
Flux Trade Name	N/A
Weld Metal Thickness	12.00 mm
Other	N/A

POSITION (QW-405)

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

PREHEAT (QW-406)

Preheat Temperature	33.3 °C minimum
Interpass Temperature	136.5 °C maximum
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	-	-	-
Trailing	-	-	-
Backing	-	-	-
Other	-	-	-

ELECTRICAL CHARACTERISTICS (QW-409)

Current	DC
Polarity	EP (+)
Amps.	70.7 - 96.6
Volts	23.6 - 25.4
Waveform Control	N/A
Power or Energy	N/A
Arc Time	N/A
Weld Bead Length	10 mm max.
Tunsgsten Electrode Size	N/A
Mode of Metal Transfer for GMAW (FCAW)	N/A
Heat Input	23.82 kJ/cm max.
Other	N/A

TECHNIQUE (QW-410)

Travel Speed (cm./min.)	5.11 - 11.39
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 Class	Filler Metal Dia. (mm)	Current Type & Polarity	Ampare Range (A)	Volt Range (V)	Travel Speed (cm/min) Length	Travel Speed (cm/min) Min:Sec	Travel Speed (cm/min) TS	Inter Pass Temp. C°	Heat Input (kJ/cm)
1	SMAW	4.00	E7016	3.2	DCEP	70.7	23.9	30.0	5.46	5.20	-	19.49
2	SMAW	3.00	E7016	3.2	DCEP	85.3	23.8	30.0	5.52	5.11	76.7	23.82
3	SMAW	3.00	E7016	3.2	DCEP	76.5	23.6	30.0	3.32	8.49	126.0	12.76
4	SMAW	2.00	E7016	3.2	DCEP	96.6	24.2	30.0	4.48	6.25	136.5	22.44
5	SMAW	2.00	E7016	3.2	DCEP	90.4	24.9	30.0	3.47	7.93	118.6	17.03
6	SMAW	2.00	E7016	3.2	DCEP	81.8	24.8	30.0	2.38	11.39	136.7	10.68
7	SMAW	2.00	E7016	3.2	DCEP	90.1	24.7	30.0	2.40	11.25	128.6	11.87
BG	SMAW	2.00	E7016	3.2	DCEP	90.0	25.4	30.0	3.09	9.52	58.9	14.40

PROCEDURE QUALIFICATION RECORD (PQR)

PQR No. PQR - TNC - 008

TENSILE TEST (QW-150)

TENSILE TEST REPORT NO. 837-67-8 TS001

Test No.	Thickness (mm)	Width (mm)	Area (mm^2)	Ultimate Total Load (kN)	Ultimate Unit Stress (MPa)	Type of Failure and Location
837-67-8 TS1	11.37	19.08	216.940	107.055	493	Out of weld metal
837-67-8 TS2	11.07	19.00	210.330	103.274	491	Out of weld metal

GUIDE BEND TESTS (QW-160)

GUIDE BEND TEST REPORT NO. 837-67-8 BD001

Type and Figure No.	Result
837-67-8 SB1 Side Bend	No Surface Discontinuity
837-67-8 SB2 Side Bend	Open Surface Discontinuity 0.50 mm
837-67-8 SB3 Side Bend	No Surface Discontinuity
837-67-8 SB4 Side Bend	No Surface Discontinuity

TOUGHNESS TEST (QW-170)

TOUGHNESS TEST REPORT NO. -

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

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 - 8 / MA001
	Vickers Hardness Test Report	Report No. 837 - 67 - 8 / HV001
	(Hardness HV10 , Max value at Weld Metal 197.0 HV, Max value at HAZ 155.8 HV, and Max value at Base Metal 144.9 HV)	
Deposit Analysis	N/A	
Other	N/A	

Welder's Name Mr. Pairot K. Clock No - Stamp No -

Test Conducted by Qualitech Public Company Limited Laboratory Test No. 837 - 67 - 8

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 :	[illegible]	Pattaya Chansiri
SIGNATURE :		
DATE :	[illegible]	September 30, 2024

Qualitech Public Company Limited

RADIOGRAPHIC TESTING REPORT

Report No. : RT-PQR-008 Page 1 of 1
Our Ref. No : TNC-RT-R2409/0008
Test Date : September 25, 2024

Client : Thainumpon Construction Company Limited	Procedure No. / SST No. : -
Project : -	Job No. : -
Description : PQR PLATE	PQR No. : PQR-TNC-008
Welding Process : 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 ■ SS400+SS400	Number of exposure : 1
IQI Selection — Type : ■ Wire-Type ☐ Hole-Type	Radiation Source : ■ Ir-192 ☐ Se-75 ☐ X-Ray ☐ Other ____
IQI Selection — Material Group : ■ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Other ____	Strength : 15 ■ Curie ☐ kV
IQI Selection — Set : ☐ A ■ B ☐ C ☐ D ☐ Other ____	Source Size (F) : 2.5 x 3 mm
IQI Selection — Placement : ■ Source Side ☐ Film Side	Film Density : 2.0 to 4.0
IQI Sensitivity : IQI Wire No. 8	Location Maker Placement : ☐ Source Side ■ Film Side

ACCEPTANCE STANDARD

☐ ASME Section I ____ Edt.	☐ ASME VIII Div.1 ____ Edt. ☐ UW-51 ☐ UW-52	☐ ASME B31.1 ____ Edt.	☐ ASME B31.3 ____ Edt. ☐ Normal ☐ Severe Cyclic	☐ AWS D1.1 ____ Edt. ☐ Static ☐ Cyclic	■ ASME IX ____ Edt. ☐ Other ____

Mark No.	Position	Section	Pipe/Plate Dia.	Pipe/Plate Thk.(mm)	Welder No.	D (mm)	EWR (mm)	WT (mm)	d (mm)	Ug (mm)	Interpretation	Comply to code Yes	Comply to code No
Mr.Pairot K.	3G	A-B	-	12.00	-	558.8	2.5+2.5	17.00	17.00	0.12	PR 2 mm	✓	
	**********												

Total Films : ☐ 3.5" x 8.5" = ____ ■ 3.5" x 17" = 1 ☐ 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	Qualitech		
Name / Level	Mr.Sumon K. (RT Level II)		
Date	September 25, 2024		

FM-NDT-13

Qualitech Job No. : NDTA240000

Qualitech Public Company Limited

Qualitech public company limited, LAB Division
83/50 Moo 10, Tambol Nong Kham,
Amphur Sri Racha, Chonburi, 20230
Tel. 033-005-161 to 3

MECHANICAL AND METALLURGICAL TESTING LABORATORY

TEST REPORT

Report No. : 837-67-8 / TS001 , 837-67-8 / BD001
: 837-67-8 / MA001 , 837-67-8 / 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-008

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)

Qualitech Public Company Limited

Qualitech public company limited, LAB Division
83/50 Moo 10, Tambol Nong Kham,
Amphur Sri Racha, Chonburi, 20230
Tel. 033-005-161 to 3

NSC-TISI-TIS 17025
TESTING 0502

TENSILE TEST REPORT

Report No. : 837-67-8 / 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	:	SMAW
			Welding Position	:	3G
			Test Temperature	:	25 ± 3 °C Humidity : 50 ± 15 %
Test Product	:	PQR-TNC-008	Dimension (mm)	:	Plate Thk. 12 mm.
Material Specification	:	SS400+SS400	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	837-67-8 TS1	11.37	19.08	216.940	N/A	N/A	N/A	N/A	107.055	493	OUT of Weld metal
2	837-67-8 TS2	11.07	19.00	210.330	N/A	N/A	N/A	N/A	103.274	491	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 Sukonpahttra				
Date	30 September 2024				

Note
1. The above results are valid exclusively for tested samples as mentioned in this report.
2. Partial pubicity 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

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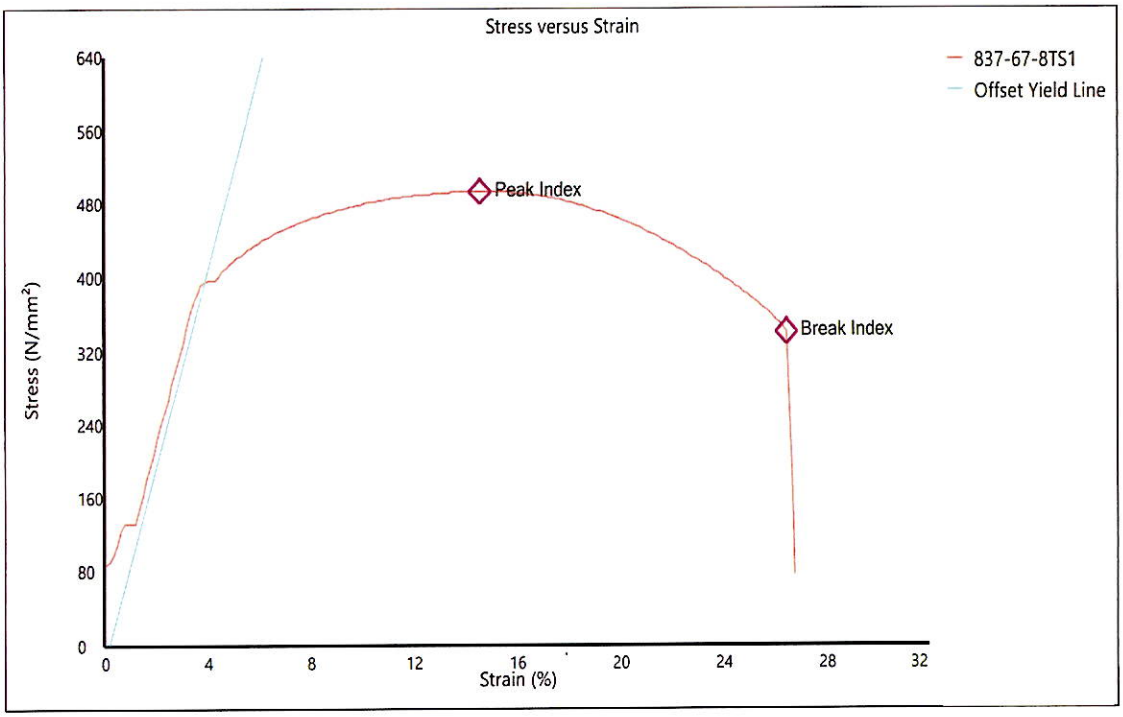
Qualitech public company limited, LAB Division
83/50 Moo 10, Tambol Nong Kham,
Amphur Sri Racha, Chonburi, 20230
Tel. 033-005-161 to 3

NSC-TISI-TIS 17025
TESTING 0502

Attachment 1 : Test Run Review Graph

TENSILE TEST REPORT

Report No.	:	837-67-8 / TS001
Page	:	2 / 3
Test Date	:	30 September 2024



Display Name	Value	Unit
Thickness	11.37	mm
Width	19.08	mm
Test Run Name	837-67-8 TS1	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	216.940	mm²
Maximum Force	107.055	kN
Maximum Stress	493	MPa

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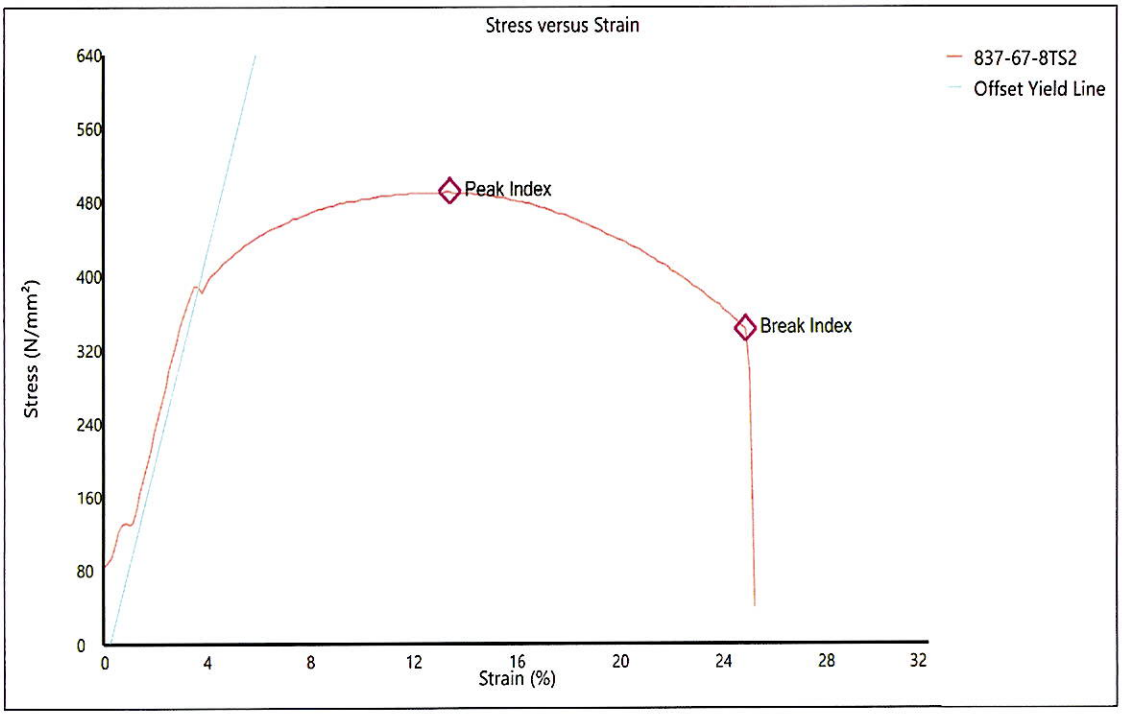
NSC-TISI-TIS 17025
TESTING 0502

Attachment 2 : Test Run Review Graph

TENSILE TEST REPORT

Report No.	:	837-67-8 / TS001
Page	:	3 / 3
Test Date	:	30 September 2024



Display Name	Value	Unit
Thickness	11.07	mm
Width	19.00	mm
Test Run Name	837-67-8 TS2	
Test Rate	0.21	mm/s
Temperature	25 ± 3	°C
Area	210.330	mm²
Maximum Force	103.274	kN
Maximum Stress	491	MPa

Qualitech Public Company Limited

Qualitech public company limited, LAB Division
83/50 Moo 10, Tambol Nong Kham,
Amphur Sri Racha, Chonburi, 20230
Tel. 033-005-161 to 3

NSC-TISI-TIS 17025
TESTING 0502

GUIDED-BEND TEST REPORT

Report No. : 837-67-8 / 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	: SMAW
		Welding Position	: 3G
		Test Temperature	: 25 ± 3 °C Humidity : 50 ± 15 %
Test Product	: PQR-TNC-008	Dimension (mm)	: Plate Thk. 12 mm.
Material Specification	: SS400+SS400	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) Thickness	Width	Length	Mandrel Diameter (mm)	Bend Angle (Degree)	Visually examined result for Surface discontinuities	Remark
1	837-67-8 SB1	Side bend	11.75	10.29	200.00	40	180°	NSD	N/A
2	837-67-8 SB2	Side bend	11.75	10.26	200.00	40	180°	OSD 0.50 mm.	N/A
3	837-67-8 SB3	Side bend	11.79	10.25	200.00	40	180°	NSD	N/A
4	837-67-8 SB4	Side bend	11.74	10.24	200.00	40	180°	NSD	N/A

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

Addition details : Welder Name : Mr. Pairot 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 Sukonpahttra				
Date	30 September 2024				

Note
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Qualitech Public Company Limited

Qualitech public company limited, LAB Division
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Amphur Sri Racha, Chonburi, 20230
Tel. 033-005-161 to 3

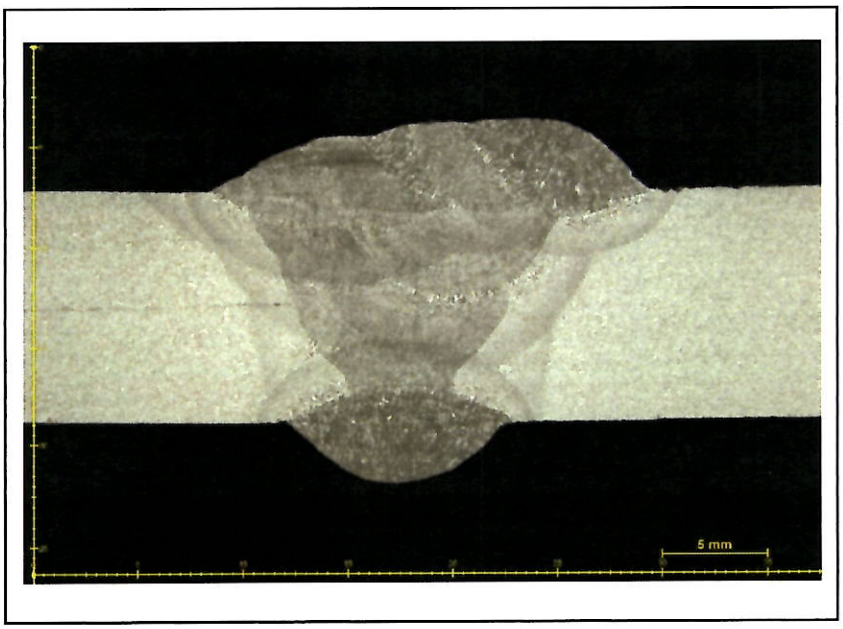
NSC-TISI-TIS 17025
TESTING 0502

MACROSTRUCTURE TEST REPORT

Report No.	:	837-67-8 / 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	:	SMAW
			Welding Position	:	3G
			Test Temperature	:	25 ± 3 °C Humidity : 50 ± 15 %
Test Product	:	PQR-TNC-008	Dimension (mm)	:	Plate Thk. 12 mm.
Material Specification	:	SS400+SS400	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
837-67-8 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
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Qualitech Public Company Limited

Qualitech public company limited, LAB Division
83/50 Moo 10, Tambol Nong Kham,
Amphur Sri Racha, Chonburi, 20230
Tel. 033-005-161 to 3

NSC-TISI-TIS 17025
TESTING 0502

VICKERS HARDNESS TEST REPORT

Report No.	:	837-67-8 / 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	:	SMAW	
				Welding Position	:	3G	
				Test Temperature	:	25 ± 3 °C	Humidity : 50 ± 15 %
Test Product	:	PQR-TNC-008		Dimension (mm)	:	Plate Thk. 12 mm.	
Material Specification	:	SS400+SS400		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. 837-67-8 HV Test Location	Hardness Value					
	Point No.	Line 1	Point No.	Line 2	Point No.	Line 3
Base Metal of Left Side	1	139.0	16	138.0	-	-
	2	137.5	17	139.5	-	-
	3	137.3	18	138.5	-	-
Heat Affected Zone (HAZ) of Left Side	4	141.7	19	133.8	-	-
	5	146.7	20	134.3	-	-
	6	150.2	21	137.5	-	-
Weld Metal	7	174.4	22	196.6	-	-
	8	177.1	23	197.0	-	-
	9	176.4	24	191.4	-	-
Heat Affected Zone (HAZ) of Right Side	10	155.8	25	144.2	-	-
	11	154.9	26	140.4	-	-
	12	155.8	27	141.9	-	-
Base Metal of Right Side	13	144.9	28	141.4	-	-
	14	140.7	29	139.9	-	-
	15	141.6	30	142.2	-	-

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
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83/50 Moo 10, Tambol Nong Kham,
Amphur Sri Racha, Chonburi, 20230
Tel. 033-005-161 to 3

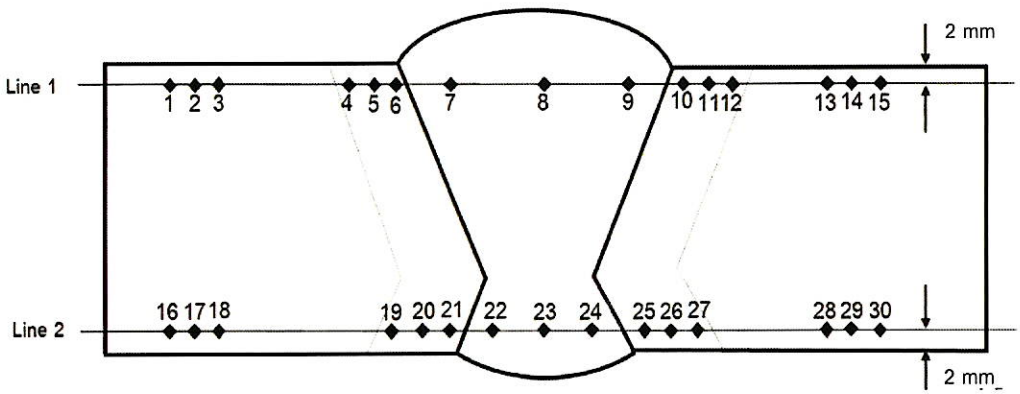
ilac-MRA
NSC-TISI-TIS 17025
TESTING 0502

VICKERS HARDNESS TEST REPORT

Report No.	:	837-67-8 / 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	:	SMAW	
				Welding Position	:	3G	
				Test Temperature	:	25 ± 3 °C	Humidity : 50 ± 15 %
Test Product	:	PQR-TNC-008		Dimension (mm)	:	Plate Thk. 12 mm.	
Material Specification	:	SS400+SS400		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	Qualitech				
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 pubicity of the result on testing is prohibited without the written permission from Qualitech plc
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Qualitech Public Company Limited

Qualitech public company limited, LAB Division

83/50 Moo 10, Tambol Nong Kham,

Amphur Sri Racha, Chonburi, 20230

Tel. 033-005-161 to 3

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 : 837-67-8HV
Standard : ASME IX : 2023
Test Method : ASTM E384-17
PQR-TNC-008
Plate Tiz / 99400

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	368.99	361.59	139.0	HV	16	10	10X	368.35	364.73	138.0	HV
2	10	10X	374.71	359.70	137.5	HV	17	10	10X	367.08	362.22	139.5	HV
3	10	10X	372.81	362.22	137.3	HV	18	10	10X	370.26	361.59	138.5	HV
4	10	10X	365.17	358.44	141.7	HV	19	10	10X	377.26	367.25	133.8	HV
5	10	10X	358.17	352.78	146.7	HV	20	10	10X	375.99	367.25	134.3	HV
6	10	10X	354.99	347.75	150.2	HV	21	10	10X	368.99	365.36	137.5	HV
7	10	10X	330.18	321.97	174.4	HV	22	10	10X	319.37	294.93	196.6	HV
8	10	10X	327.64	319.45	177.1	HV	23	10	10X	314.28	299.33	197.0	HV
9	10	10X	328.91	319.45	176.4	HV	24	10	10X	317.46	304.99	191.4	HV
10	10	10X	346.09	343.98	155.8	HV	25	10	10X	365.17	352.15	144.2	HV
11	10	10X	351.18	340.83	154.9	HV	26	10	10X	369.62	357.18	140.4	HV
12	10	10X	349.27	340.83	155.8	HV	27	10	10X	365.81	357.18	141.9	HV
13	10	10X	365.17	350.27	144.9	HV	28	10	10X	367.08	357.18	141.4	HV
14	10	10X	370.90	355.30	140.7	HV	29	10	10X	367.08	360.96	139.9	HV
15	10	10X	368.35	355.30	141.6	HV	30	10	10X	361.35	360.96	142.2	HV

Tested By : .....
Position : Engineer
Date : 30 Sep 2024

Project Engineer
1/10/24

Reviewed By: .....
Position : .....
Date : 30/9/2024

Qualitech
บริษัท ควอลลีเทค 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 : 64 %

Reference Standard : ASME Section IX: 2023

Test Standard : ASTM A370-21

Measurement tools (1) : เวอร์เนีย

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	5.03
		2	5.09	5.05	10.15	10.15	5.07	5.03
		3	5.09	5.05	10.15	10.15	5.07	5.03
		Avg.	5.09	5.05	10.15	10.15	5.07	5.03
	Width (W) / Diameter(D) (mm)	1	13.02	13.00	19.00	19.00	13.00	13.00
		2	13.02	13.00	19.00	19.00	13.00	13.00
		3	13.02	13.00	19.00	19.00	13.00	13.00
		Avg.	13.02	13.00	19.00	19.00	13.00	13.00
After	Thickness (T) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
	Width (W) / Diameter(D) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
Area (mm^2)		Before	66.2719	65.6500	192.8500	192.8500	65.9100	65.3900
		After	-	-	-	-	-	-
Reduction of Area (%)			-	-	-	-	-	-
Gauge length (mm)		Before	-	-	-	-	-	-
		After	-	-	-	-	-	-
Elongation (%)			-	-	-	-	-	-
Yield ☐ Upper ☐ Offset		Load (kN)	-	-	-	-	-	-
		Strength (Mpa)	-	-	-	-	-	-
Tensile		Load (kN)	49.659	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	TPC		
Name	Thiwaphong Champhichip	PURIWAT / SUPERVISOR	Mr. Sattawut Nabarthit
Position	Technician		Project Engineer
Date	30/9/2024	30/9/2024	1-10-24

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บริษัท ควอลลีเทค 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	4.61	10.03	10.07
		2	8.67	9.75	4.65	4.61	10.03	10.07
		3	8.67	9.75	4.66	4.61	10.03	10.07
		Avg.	8.67	9.75	4.65	4.62	10.03	10.07
	Width (W) / Diameter(D) (mm)	1	19.01	19.01	19.01	19.00	19.01	19.03
		2	19.01	19.01	19.01	19.00	19.01	19.03
		3	19.01	19.01	19.01	19.00	19.01	19.03
		Avg.	19.01	19.01	19.01	19.00	19.01	19.03
After	Thickness (T) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
	Width (W) / Diameter(D) (mm)	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	-	-	-	-	-	-
		Avg.	-	-	-	-	-	-
Area (mm^2)		Before	169.6187	185.4450	60.1470	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	126.495	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	TPC		
Name	Tiraphong Champhithip	PURIWAT / SUPERVISOR	Mr. Sattawat Nabanthit
Position	Technical		Project Engineer
Date	30/9/2024	30/9/2024	1-10-24

Qualitech บริษัท ควอลลีเทค 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 area : ☑ Rectangular ☐ Round ☐ Pipe ☐ Camber ☐ Other : Tensile Transverse Weld — Test Temp. : 25.0 °C — Humidity : 46 %

Reference Standard : ASME Section IX: 2023 — Test Standard : ASTM A370-21

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

			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	11.37	11.07	23.94	24.04
		2	24.85	24.87	11.37	11.07	23.94	24.04
		3	24.85	24.87	11.37	11.07	23.94	24.04
		Avg.	24.85	24.87	11.37	11.07	23.94	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	216.9396	210.3300	454.8600	458.6832
		After	-	-	-	-	-	-
Reduction of Area (%)			-	-	-	-	-	-
Gauge length (mm)		Before	-	-	-	-	-	-
		After	-	-	-	-	-	-
Elongation (%)			-	-	-	-	-	-
Yield	☐ Upper	Load (kN)	-	-	-	-	-	-
	☐ ___ Offset	Strength (Mpa)	-	-	-	-	-	-
Tensile		Load (kN)	248.270	248.848	107.055	103.244	234.734	233.643
		Strength (Mpa)	526	527	493	491	516	509
Fracture (IN/OUT)	☐ Gauge length ☑ Weldment		Out weld	Out weld.	Out weld.	Out weld.	Out weld.	Out weld

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

	Tested by	Reviewed by	Witness by
Signature	(signature)	(signature)	(signature)
Name	Thivaphong Chomphetthip		Mr. Sutthawat Nakanthit
Position	Technical	PURIWAT / SUPERVISOR	Project Engineer
Date	30/9/2024	30/9/2024	1 - 10 - 24

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บริษัท ควอลลีเทค 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 No. : 837-67
Test Standard : ASME IX : 2023
Measurement Tools : [illegible]
Testing room temperature : 24.5 °C
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	Face bend	5.50	19.19	200.00	20	180°	NSD	N/A	PQR No : PQR-TNC-005
"	FB2	"	5.49	19.20	200.00	20	180°	NSD	N/A	GTAW / 6G / 5.54 mm.
"	RB1	Root bend	5.56	19.18	200.00	20	180°	OSD	0.50 mm	Pipe 2 " / A335GR.P11
"	RB2	"	5.52	19.19	200.00	20	180°	NSD	N/A	"
837-67-6	SB1	Side bend	11.33	10.25	200.00	40	180°	NSD	N/A	PQR No : PQR-TNC-006
"	SB2	"	11.35	10.26	200.00	40	180°	OSD	0.50 mm	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	"	11.34	10.24	200.00	40	180°	NSD	N/A	Pipe 6 " / A335GR.P11
"	SB4	"	11.33	10.25	200.00	40	180°	NSD	N/A	"
837-67-7	SB1	Side bend	25.49	10.21	200.00	40	180°	NSD	N/A	PQR No : PQR-TNC-007
"	SB2	"	25.49	10.24	200.00	40	180°	NSD	N/A	FCAW / Plate Thk.25.0 mm.
"	SB3	"	25.49	10.25	200.00	40	180°	NSD	N/A	A36 + A36
"	SB4	"	25.49	10.26	200.00	40	180°	NSD	N/A	"
837-67-8	SB1	Side bend	11.75	10.29	200.00	40	180°	NSD	N/A	PQR No : PQR-TNC-008
"	SB2	"	11.75	10.26	200.00	40	180°	OSD	0.50 mm	SMAW / Plate Thk.12.0 mm.
"	SB3	"	11.79	10.25	200.00	40	180°	NSD	N/A	SS400 + SS400
"	SB4	"	11.75	10.24	200.00	40	180°	NSD	N/A	"

Additional Detail :

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

	Tested by	Reviewed By	Witnessed by
Signature	SDT	(signature)	(signature)
Name / Position	Sutthi Juthimiwa	PURIWAT / SUPERVISOR	Mr. Sattrawut / Project Engineer
Date	30/9/2024	30/9/2024	1 - 10 - 24

Qualitech
บริษัท ควอลดีเทค 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 : 1207212 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	Face bend	5.75	19.25	160.00	20	180°	NSD	N/A	PQR No : PQR-TNC-001
"	FB2	"	5.35	19.26	160.00	20	180°	NSD	N/A	GTAW / 6G / 5.54 mm.
"	RB1	Root bend	5.35	19.25	160.00	20	180°	NSD	N/A	Pipe 2 " / A106 GR.B
"	RB2	"	5.35	19.26	160.00	20	180°	NSD	N/A	"
837-67-2	SB1	Side bend	11.99	10.25	200.00	40	180°	NSD	N/A	PQR No : PQR-TNC-002
"	SB2	"	11.89	10.23	200.00	40	180°	NSD	N/A	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	"	11.40	10.25	200.00	40	180°	NSD	N/A	Pipe 6 " / A106GR.B
"	SB4	"	11.37	10.26	200.00	40	180°	NSD	N/A	"
837-67-3	FB1	Face bend	5.49	19.22	160.00	20	180°	NSD	N/A	PQR No : PQR-TNC-003
"	FB2	"	5.49	19.25	160.00	20	180°	NSD	N/A	GTAW / 6G / 5.54 mm.
"	RB1	Root bend	5.48	19.26	160.00	20	180°	NSD	N/A	Pipe 2 " / A312GR.TP304
"	RB2	"	5.50	19.22	160.00	20	180°	NSD	N/A	"
837-67-4	SB1	Side bend	11.07	10.25	200.00	40	180°	NSD	N/A	PQR No : PQR-TNC-004
"	SB2	"	11.07	10.24	200.00	40	180°	NSD	N/A	GTAW + SMAW / 6G / 10.97 mm.
"	SB3	"	11.00	10.26	200.00	40	180°	NSD	N/A	Pipe 6 " / A312GR.TP304
"	SB4	"	11.05	10.25	200.00	40	180°	NSD	N/A	"

Additional Detail :

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

	Tested by	Reviewed By	Witnessed by
Signature	SDT		
Name / Position	Suthi / Technician	PURIWAT / SUPERVISOR	Mr. Sathawut / Project Engineer
Date	30/9/2024	30/9/2024	1-10-24

Qualitech
บริษัท ควอลลีเทค จำกัด (มหาชน)
Qualitech Public Company Limited

บันทึกผลชิ้นงานทดสอบการดัดโค้ง

Guided-Bend Test Record

รหัสเอกสาร	: FM-BD-01
หน้าที่	: 1 / 1
แก้ไขครั้งที่	: 04
วันที่บังคับใช้	: 28 พฤศจิกายน 2560

Reference code/Standard : ASME Section IX: 2023 Test Standard : ASME IX : 2023 Testing room temperature : 24.5 °C

Test No. : 837-67 Measurement Tools : 12-7212 Humidity : 47 %

Sample No.		Location	Sample Dimension (mm.)			Mandrel Dia. (mm.)	Angle	Visually examined for surface discontinuities		Remark
			Thickness	Width	Length			Visual result	Discontinuity Dimensions (mm.)	
837-67-9	SB1	Side bend	24.86	10.27	200.00	40	180°	NSD	N/A	PQR No : PQR-TNC-009
"	SB2	"	24.86	10.25	200.00	40	180°	NSD	N/A	FCAW / Plate Thk.25.0 mm.
"	SB3	"	24.86	10.25	200.00	40	180°	NSD	N/A	SS400 + SS400
"	SB4	"	24.86	10.26	200.00	40	180°	NSD	N/A	"

Additional Detail :

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

	Tested by	Reviewed By	Witnessed by
Signature	SDT		
Name / Position	Suttha / Technician	PURIWAT / SUPERVISOR	Mr. Sattrawut / Project Engineer
Date	30/9/2024	30/9/2024	1-10-24