



## WELDING PROCEDURE SPECIFICATION (WPS)

Company Name Thainumpon Construction Company Limited  
Welding Procedure Specification No. WPS - TNC - 005 Issued Date September 30, 2024  
Supporting PQR No. PQR - TNC - 005 Revision No. 0 Date September 30, 2024  
Welding Process(es) GTAW Type(s) Manual  
( Automatic, Manual, Machine, or Semi Auto )

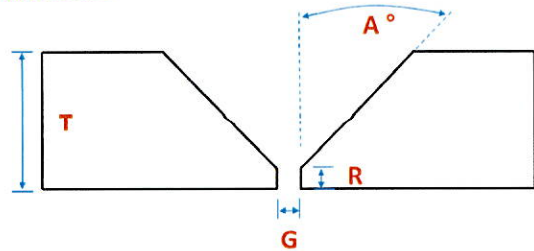
### Joins

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 - 11.04 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. 4 Group-No. 1 to P-No. 4 Group-No. 1  
OR Specification, Type and Grade or UNS Number ASTM A335 Grade P11 or equivalent  
to Specification, Type and Grade or UNS Number ASTM A335 Grade P11 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  $\leq \frac{1}{2}$  in. (13 mm.) (Yes) ✓ (No) x  
Other: -

### Filler Metal

Process  
Spec. No. (SFA)  
AWS No. (Class)  
F-No.  
A-No.  
Size of Filler Metals  
Filler metal product form  
Supplemental Filler Metal  
Weld Metal  
Deposited Thickness :  
Groove  
Fillet  
Electrode-flux Class  
Flux Type  
Flux Trade Name  
Consumable Insert  
Other : Trade Name

|                              |  |
|------------------------------|--|
| GTAW                         |  |
| 5.28                         |  |
| ER80S-B2                     |  |
| 6                            |  |
| 3                            |  |
| 2.4 mm                       |  |
| Solid wire                   |  |
| None                         |  |
|                              |  |
| 11.08 mm                     |  |
| All                          |  |
| N/A                          |  |
| N/A                          |  |
| N/A                          |  |
| N/A                          |  |
| UNION ER80S-B2 or equivalent |  |

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



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### Positions

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

### Postweld Heat Treatment

Temp. Range 690°C ± 15°C  
Time Range 1 hr/25 mm; 2 Hrs minimum  
Other Heating Rate 200°C ; load temp. 300°C  
Cooling Rate 200°C ; load temp. 300°C

### Preheat

Preheat Temp. (Min) 150°C Min  
Interpass Temp. (Max) 300°C Max  
Preheat Maintenance Yes and Post Heat after welding  
30 min. minimum

(Continuous or special heating where applicable should be recorded)

### Gas

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

### Electrical characteristics

| Weld Pass(es) | Process | Filler Metal |        | Current Type and Polarity | Amps.  | Volts | Travel Speed (cm/min.) | Other (e.g., Remark, Comments, Hot Wire Addition, Technique Torch Angle, etc.) |
|---------------|---------|--------------|--------|---------------------------|--------|-------|------------------------|--------------------------------------------------------------------------------|
|               |         | Class.       | Dia.   |                           |        |       |                        |                                                                                |
| Root          | GTAW    | ER80S-B2     | 2.4 mm | DCEN                      | 80-130 | 9-14  | 3 - 10                 | -                                                                              |
| Fill          | GTAW    | ER80S-B2     | 2.4 mm | DCEN                      | 90-150 | 9-14  | 5 - 10                 | -                                                                              |
| Cover         | GTAW    | ER80S-B2     | 2.4 mm | DCEN                      | 80-130 | 9-14  | 5 - 10                 | -                                                                              |
|               |         |              |        |                           |        |       |                        |                                                                                |

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

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

### Technique

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

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





|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------|------------|----------------|----------------------------|---|
| <h2>RADIOGRAPHIC TESTING REPORT</h2>                                                                                                                                                                          |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       | Report No. : RT-PQR-005      Page 1 of 1                                                                                    |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       | Our Ref. No : TNC-RT-R2409/0005                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       | Test Date : September 25, 2024                                                                                              |            |                             |            |                |                            |   |
| Client : Thainumpon Construction Company Limited                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                         |                               | Procedure No. / SST No. : -                                                                                                                                      |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Project : -                                                                                                                                                                                                   |                                                                                                                                                                              |                                                                                                                         |                               | Job No. : -                                                                                                                                                      |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Description : PQR PIPE                                                                                                                                                                                        |                                                                                                                                                                              |                                                                                                                         |                               | PQR No. : PQR-TNC-005                                                                                                                                            |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Welding Process : GTAW                                                                                                                                                                                        |                                                                                                                                                                              |                                                                                                                         |                               | WPS No. : -                                                                                                                                                      |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| <b>RADIOGRAPHIC TECHNIQUE</b>                                                                                                                                                                                 |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Technique : <input type="checkbox"/> SWSI <input type="checkbox"/> DWSI <input checked="" type="checkbox"/> DWDI <input type="checkbox"/> Superimposed                                                        |                                                                                                                                                                              |                                                                                                                         |                               | Degree : <input type="checkbox"/> Spot <input checked="" type="checkbox"/> Full                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Film/Type : <input type="checkbox"/> Agfa D7 <input checked="" type="checkbox"/> Agfa D4 <input type="checkbox"/> FUJI 50 <input type="checkbox"/> FUJI 100                                                   |                                                                                                                                                                              |                                                                                                                         |                               | Film Processing : <input checked="" type="checkbox"/> Manual <input type="checkbox"/> Automated                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Intensifying Lead Screen Thickness : <u>0.027</u> mm (Front/Back)                                                                                                                                             |                                                                                                                                                                              |                                                                                                                         |                               | Film in each cassette : <input checked="" type="checkbox"/> 1 Film <input type="checkbox"/> _____ Films                                                          |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Tested Material : <input type="checkbox"/> C/S <input type="checkbox"/> S/S <input checked="" type="checkbox"/> A335 Gr.P11                                                                                   |                                                                                                                                                                              |                                                                                                                         |                               | Number of exposure : <u>2</u>                                                                                                                                    |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| IQI Selection                                                                                                                                                                                                 | Type : <input checked="" type="checkbox"/> Wire-Type <input type="checkbox"/> Hole-Type                                                                                      |                                                                                                                         |                               | Radiation Source : <input checked="" type="checkbox"/> Ir-192 <input type="checkbox"/> Se-75 <input type="checkbox"/> X-Ray <input type="checkbox"/> Other _____ |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               | Material Group : <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> Other _____ |                                                                                                                         |                               | Strength : <u>15</u> <input checked="" type="checkbox"/> Curie <input type="checkbox"/> kV                                                                       |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               | Set : <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> Other _____            |                                                                                                                         |                               | Source Size (F) : <u>2.5 x 3</u> mm                                                                                                                              |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               | Placement : <input checked="" type="checkbox"/> Source Side <input type="checkbox"/> Film Side                                                                               |                                                                                                                         |                               | Film Density : <u>2.0</u> to <u>4.0</u>                                                                                                                          |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               | IQI Sensitivity : IQI Wire No. <u>6</u>                                                                                                                                      |                                                                                                                         |                               | Location Marker Placement : <input checked="" type="checkbox"/> Source Side <input type="checkbox"/> Film Side                                                   |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| <b>ACCEPTANCE STANDARD</b>                                                                                                                                                                                    |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| <input type="checkbox"/> ASME Section I<br>_____ Edt.                                                                                                                                                         |                                                                                                                                                                              | <input type="checkbox"/> ASME VIII Div.1<br>_____ Edt.<br><input type="checkbox"/> UW-51 <input type="checkbox"/> UW-52 |                               | <input type="checkbox"/> ASME B31.1<br>_____ Edt.                                                                                                                |                                       | <input type="checkbox"/> ASME B31.3<br>_____ Edt.<br><input type="checkbox"/> Normal <input type="checkbox"/> Severe Cyclic |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               | <input type="checkbox"/> AWS D1.1<br>_____ Edt.                                                                                                                  |                                       | <input checked="" type="checkbox"/> ASME IX<br>_____ Edt.<br><input type="checkbox"/> Other _____                           |            |                             |            |                |                            |   |
| Mark No.                                                                                                                                                                                                      | Position                                                                                                                                                                     | Section                                                                                                                 | Pipe/Plate<br>Dia.   Thk.(mm) | Welder<br>No.                                                                                                                                                    | D<br>(mm)                             | EWR<br>(mm)                                                                                                                 | WT<br>(mm) | d<br>(mm)                   | Ug<br>(mm) | Interpretation | Comply to code<br>Yes   No |   |
| Mr.Pairot K.                                                                                                                                                                                                  | 6G                                                                                                                                                                           | A                                                                                                                       | 2"   5.54                     | -                                                                                                                                                                | 558.8                                 | 1.5+1.5                                                                                                                     | 8.54       | 63.30                       | 0.44       | PR 1.6 mm      |                            | ✓ |
|                                                                                                                                                                                                               |                                                                                                                                                                              | B                                                                                                                       | 2"   5.54                     | -                                                                                                                                                                | 558.8                                 | 1.5+1.5                                                                                                                     | 8.54       | 63.30                       | 0.44       | NVD            | ✓                          |   |
| *****                                                                                                                                                                                                         |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
|                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                         |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Total Films : <input checked="" type="checkbox"/> 3.5" x 8.5" = <u>2</u> <input type="checkbox"/> 3.5" x 17" = _____ <input type="checkbox"/> 4.5" x 8.5" = _____ <input type="checkbox"/> 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. Samon K. (RT Level II)                                                                                              |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |
| Date                                                                                                                                                                                                          |                                                                                                                                                                              | September 25, 2024                                                                                                      |                               |                                                                                                                                                                  |                                       |                                                                                                                             |            |                             |            |                |                            |   |

## MECHANICAL AND METALLURGICAL TESTING LABORATORY

### TEST REPORT

Report No. : 837-67-5 / TS001 , 837-67-5 / BD001  
: 837-67-5 / MA001 , 837-67-5 / HV001  
Page : 9  
Test Date : 30 September 2024

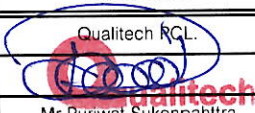
Test No. : 837-67  
  
Received Date : 26 September 2024  
  
Customer : Thainumpon Construction Company Limited  
  
Address : 35/5 Nong Wa Rd., Huai Pong, Mueang Rayong District, Rayong 21150  
\*  
Test Product : PQR-TNC-005  
  
Project Name : N/A  
  
Project No : N/A

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Mr. Apichit Sukprasert  
LAB Division Manager

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

| <b>TENSILE TEST REPORT</b>                                                                                                                                                                                                                                                              |                                                                                     |                            |                       |                            |                |                                                   |                    | Report No. : 837-67-5 / 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,<br>Rayong 21150                                                                                                                                                                                                          |                                                                                     |                            |                       |                            |                | Project No : N/A                                  |                    |                               |                      |                   |                      |
|                                                                                                                                                                                                                                                                                         |                                                                                     |                            |                       |                            |                | Welding Process : GTAW                            |                    |                               |                      |                   |                      |
|                                                                                                                                                                                                                                                                                         |                                                                                     |                            |                       |                            |                | Welding Position : 6G                             |                    |                               |                      |                   |                      |
|                                                                                                                                                                                                                                                                                         |                                                                                     |                            |                       |                            |                | Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 % |                    |                               |                      |                   |                      |
| Test Product : PQR-TNC-005                                                                                                                                                                                                                                                              |                                                                                     |                            |                       |                            |                | Dimension (mm) : Pipe 2" Thk. 5.54 mm.            |                    |                               |                      |                   |                      |
| Material Specification : A335 Gr.P11                                                                                                                                                                                                                                                    |                                                                                     |                            |                       |                            |                | 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<br>(mm)          | Width<br>(mm)         | Area<br>(mm <sup>2</sup> ) | Before<br>(mm) | After<br>(mm)                                     | Load<br>(kN)       | Strength<br>(MPa)             | Load<br>(kN)         | Strength<br>(MPa) |                      |
| 1                                                                                                                                                                                                                                                                                       | 837-67-5 TS1                                                                        | 4.85                       | 13.02                 | 63.147                     | N/A            | N/A                                               | N/A                | N/A                           | 41.727               | 661               | OUT of Weld metal    |
| 2                                                                                                                                                                                                                                                                                       | 837-67-5 TS2                                                                        | 4.62                       | 13.00                 | 60.060                     | N/A            | N/A                                               | N/A                | N/A                           | 40.999               | 683               | OUT of Weld metal    |
| Remark : 1. Machine was calibrated by Thailand Institute of Scientific and Technological Research (TISTR)<br>2. Stress-Strain curve were attached at the end of this report<br>Addition details : Type of test specimen : Transverse Tensile Test (Weld)<br>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 Sukonpachitra                                                           |                            |                       |                            |                |                                                   |                    |                               |                      |                   |                      |
| Date                                                                                                                                                                                                                                                                                    | 30 September 2024                                                                   |                            |                       |                            |                |                                                   |                    |                               |                      |                   |                      |

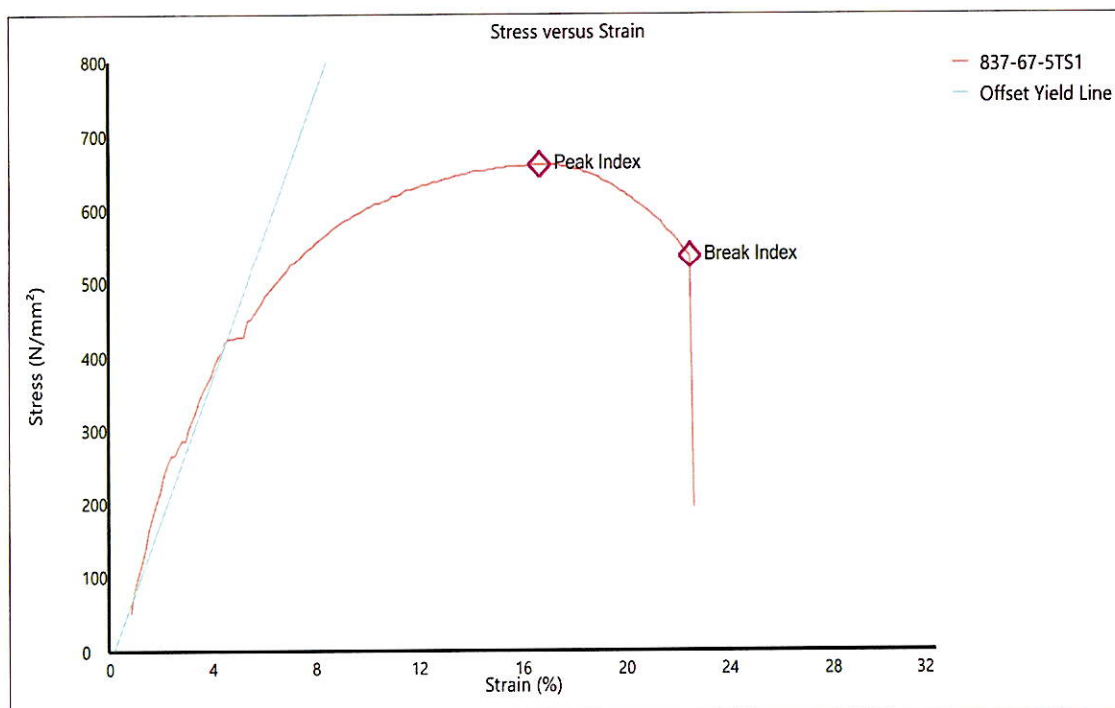
Note

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Attachment 1 : Test Run Review Graph

**TENSILE TEST REPORT**

Report No. : 837-67-5 / TS001  
Page : 2 / 3  
Test Date : 30 September 2024

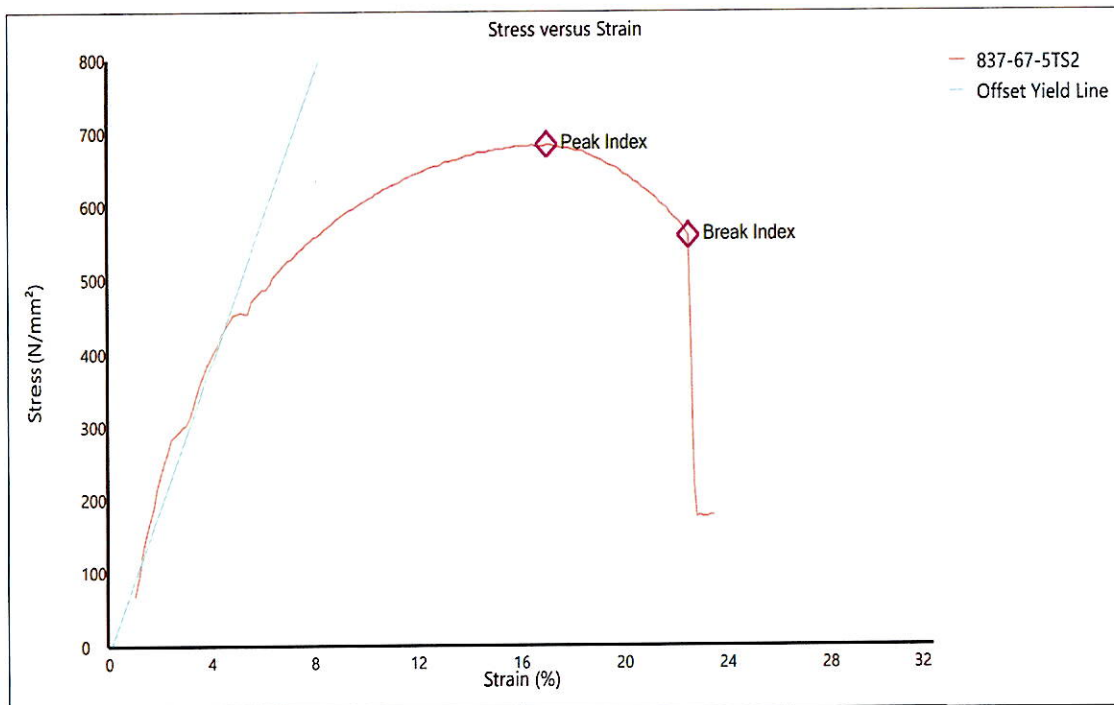


| Display Name   | Value        | Unit            |
|----------------|--------------|-----------------|
| Thickness      | 4.85         | mm              |
| Width          | 13.02        | mm              |
| Test Run Name  | 837-67-5 TS1 |                 |
| Test Rate      | 0.21         | mm/s            |
| Temperature    | 25 ± 3       | °C              |
| Area           | 63.147       | mm <sup>2</sup> |
| Maximum Force  | 41.727       | kN              |
| Maximum Stress | 661          | MPa             |

Attachment 2 : Test Run Review Graph

**TENSILE TEST REPORT**

Report No. : 837-67-5 / TS001  
Page : 3 / 3  
Test Date : 30 September 2024



| Display Name   | Value        | Unit            |
|----------------|--------------|-----------------|
| Thickness      | 4.62         | mm              |
| Width          | 13.00        | mm              |
| Test Run Name  | 837-67-5 TS2 |                 |
| Test Rate      | 0.21         | mm/s            |
| Temperature    | 25 ± 3       | °C              |
| Area           | 60.060       | mm <sup>2</sup> |
| Maximum Force  | 40.999       | kN              |
| Maximum Stress | 683          | MPa             |

| GUIDED-BEND TEST REPORT                                                                                                                                    |                                                                                     |               |                              |       |        |                                                   |                     | Report No. : 837-67-5 / 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,<br>Rayong 21150                                                                             |                                                                                     |               |                              |       |        | Welding Process : GTAW                            |                     |                                                      |        |
|                                                                                                                                                            |                                                                                     |               |                              |       |        | Welding Position : 6G                             |                     |                                                      |        |
|                                                                                                                                                            |                                                                                     |               |                              |       |        | Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 % |                     |                                                      |        |
| Test Product : PQR-TNC-005                                                                                                                                 |                                                                                     |               |                              |       |        | Dimension (mm) : Pipe 2" Thk. 5.54 mm.            |                     |                                                      |        |
| Material Specification : A335 Gr.P11                                                                                                                       |                                                                                     |               |                              |       |        | 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                                                                                                                                                          | 837-67-5 FB1                                                                        | Face bend     | 5.50                         | 19.13 | 200.00 | 20                                                | 180°                | NSD                                                  | N/A    |
| 2                                                                                                                                                          | 837-67-5 FB2                                                                        | Face bend     | 5.49                         | 19.20 | 200.00 | 20                                                | 180°                | NSD                                                  | N/A    |
| 3                                                                                                                                                          | 837-67-5 RB1                                                                        | Root bend     | 5.56                         | 19.18 | 200.00 | 20                                                | 180°                | OSD 0.50 mm.                                         | N/A    |
| 4                                                                                                                                                          | 837-67-5 RB2                                                                        | Root bend     | 5.52                         | 19.19 | 200.00 | 20                                                | 180°                | NSD                                                  | N/A    |
| Remark : (NSD) = No Surface Discontinuity (OSD) = Open Surface Discontinuity (CD) = Corner Discontinuity<br>Addition details : Welder Name : Mr. Pairot K. |                                                                                     |               |                              |       |        |                                                   |                     |                                                      |        |
|                                                                                                                                                            |                                                                                     |               |                              |       |        |                                                   |                     |                                                      |        |
| Total                                                                                                                                                      |                                                                                     |               | 4                            |       |        | Unit(s)                                           |                     | Attachment                                           |        |
|                                                                                                                                                            |                                                                                     |               |                              |       |        |                                                   |                     | Page(s)                                              |        |
| Completed by                                                                                                                                               | Approved by                                                                         |               | Client Representative        |       |        | Reviewed by                                       |                     | Reviewed by                                          |        |
| Company                                                                                                                                                    | Qualitech PCL.                                                                      |               |                              |       |        |                                                   |                     |                                                      |        |
| Signature                                                                                                                                                  |  |               |                              |       |        |                                                   |                     |                                                      |        |
| Name                                                                                                                                                       | Mr.Puriwat Sukonpatttra                                                             |               |                              |       |        |                                                   |                     |                                                      |        |
| Date                                                                                                                                                       | 30 September 2024                                                                   |               |                              |       |        |                                                   |                     |                                                      |        |

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## MACROSTRUCTURE TEST REPORT

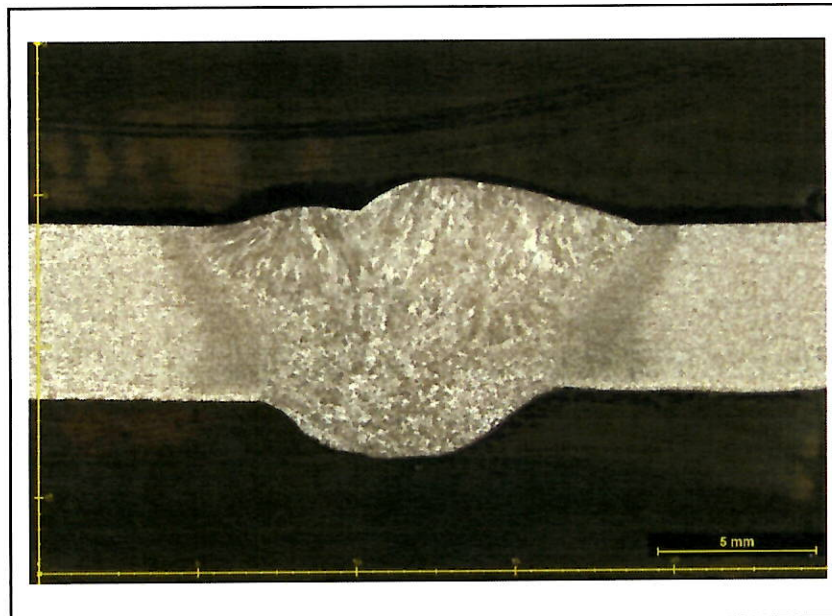
Report No. : 837-67-5 / MA001

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,<br>Rayong 21150 | Project No : N/A                                                 |
| Test Product : PQR-TNC-005                                                     | Welding Process : GTAW                                           |
| Material Specification : A335 Gr.P11                                           | Welding Position : 6G                                            |
| Equipment : Microscope, SMZ745T                                                | Test Temperature : $25 \pm 3$ °C Humidity : $50 \pm 15$ %        |
| Serial No. : 2003739                                                           | Dimension (mm) : Pipe 2" Thk. 5.54 mm.                           |
| Calibration Date : 26 October 2023                                             | Received Date : 26 September 2024                                |
| Preparation method : ASTM E340-15                                              | Etchants Reagent : 10% Nital , Nitric Acid (65%) + Ethyl alcohol |
| Test method : ASTM E340-15                                                     | Etching Temperature: N/A °C Etching Time : N/A sec.              |
|                                                                                | Reference Code / Standard : ASME IX : 2023                       |

| Sample No.  | Macrostructure Description                                                                                        | Remark |
|-------------|-------------------------------------------------------------------------------------------------------------------|--------|
| 837-67-5 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        |                       |             |             |                      |

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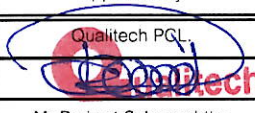
| VICKERS HARDNESS TEST REPORT                                                   |  |                                      |                                                   | Report No. : 837-67-5 / HV001              |  |
|--------------------------------------------------------------------------------|--|--------------------------------------|---------------------------------------------------|--------------------------------------------|--|
|                                                                                |  |                                      |                                                   | 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,<br>Rayong 21150 |  |                                      | Welding Process : GTAW                            |                                            |  |
|                                                                                |  |                                      | Welding Position : 6G                             |                                            |  |
|                                                                                |  |                                      | Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 % |                                            |  |
| Test Product : PQR-TNC-005                                                     |  |                                      | Dimension (mm) : Pipe 2" Thk. 5.54 mm.            |                                            |  |
| Material Specification : A335 Gr.P11                                           |  |                                      | 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. 837-67-5 HV<br>Test Location | Hardness Value |        |           |        |           |        |
|-----------------------------------------|----------------|--------|-----------|--------|-----------|--------|
|                                         | Point No.      | Line 1 | Point No. | Line 2 | Point No. | Line 3 |
| Base Metal of Left Side                 | 1              | 135.0  | 16        | 159.9  | -         | -      |
|                                         | 2              | 133.6  | 17        | 157.2  | -         | -      |
|                                         | 3              | 137.8  | 18        | 152.1  | -         | -      |
| Heat Affected Zone (HAZ) of Left Side   | 4              | 135.2  | 19        | 156.6  | -         | -      |
|                                         | 5              | 152.1  | 20        | 173.7  | -         | -      |
|                                         | 6              | 169.7  | 21        | 174.8  | -         | -      |
| Weld Metal                              | 7              | 179.3  | 22        | 168.5  | -         | -      |
|                                         | 8              | 198.7  | 23        | 156.6  | -         | -      |
|                                         | 9              | 201.6  | 24        | 145.4  | -         | -      |
| Heat Affected Zone (HAZ) of Right Side  | 10             | 186.1  | 25        | 170.7  | -         | -      |
|                                         | 11             | 162.9  | 26        | 169.8  | -         | -      |
|                                         | 12             | 143.9  | 27        | 165.3  | -         | -      |
| Base Metal of Right Side                | 13             | 132.9  | 28        | 138.0  | -         | -      |
|                                         | 14             | 135.0  | 29        | 139.0  | -         | -      |
|                                         | 15             | 132.2  | 30        | 140.7  | -         | -      |

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 PQL                                                                       |                       |              |             |                      |
| Signature    |  |                       |              |             |                      |
| Name         | Mr.Puriwat Sukonpanttra                                                             |                       |              |             |                      |
| Date         | 30 September 2024                                                                   |                       |              |             |                      |

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| <b>VICKERS HARDNESS TEST REPORT</b>                                            |                          |                                      |                                                   | Report No. : 837-67-5 / 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,<br>Rayong 21150 |                          |                                      | Welding Process : GTAW                            |                               |                      |
|                                                                                |                          |                                      | Welding Position : 6G                             |                               |                      |
|                                                                                |                          |                                      | Test Temperature : 25 ± 3 °C Humidity : 50 ± 15 % |                               |                      |
| Test Product : PQR-TNC-005                                                     |                          |                                      | Dimension (mm) : Pipe 2" Thk. 5.54 mm.            |                               |                      |
| Material Specification : A335 Gr.P11                                           |                          |                                      | 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        |                               |                      |
| <p>Layout of Test Location</p>                                                 |                          |                                      |                                                   |                               |                      |
| <p>Addition details : Welder Name : Mr. Pairot K.</p>                          |                          |                                      |                                                   |                               |                      |
| Total : 1                                                                      |                          | Unit(s) : Attachment                 |                                                   | Page(s) : -                   |                      |
| Completed by                                                                   | Approved by              | Client Representative                | Reviewed by                                       | Reviewed by                   | Owner Representative |
| Company                                                                        | Qualitech PCL            |                                      |                                                   |                               |                      |
| Signature                                                                      |                          |                                      |                                                   |                               |                      |
| Name                                                                           | Mr. Puriwat Sukonpahttra |                                      |                                                   |                               |                      |
| Date                                                                           | 30 September 2024        |                                      |                                                   |                               |                      |

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Appendix #1

Pictures of Specimen Test

Before Testing



After Testing



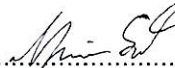
Test No. : 837-67  
Test date : 20/9/2024  
Temperature : 25.8° C  
Humidity : 46% RH

Sample No : 837-67-5HV  
Standard : ASME IX : 2023  
Test Method : ASTM E384-17

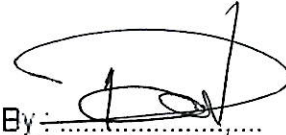
PQR-TNC-005  
P2<sup>n</sup> / A335 Gr. P17

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            | 374.08  | 367.25  | 135.0    | HV    | 16  | 10    | 10X            | 337.18  | 343.98  | 159.9    | HV    |
| 2   | 10    | 10X            | 374.08  | 371.02  | 133.6    | HV    | 17  | 10    | 10X            | 337.18  | 349.64  | 157.2    | HV    |
| 3   | 10    | 10X            | 370.90  | 362.84  | 137.8    | HV    | 18  | 10    | 10X            | 349.90  | 348.38  | 152.1    | HV    |
| 4   | 10    | 10X            | 375.99  | 364.73  | 135.2    | HV    | 19  | 10    | 10X            | 348.63  | 339.58  | 156.6    | HV    |
| 5   | 10    | 10X            | 351.18  | 347.12  | 152.1    | HV    | 20  | 10    | 10X            | 330.18  | 323.23  | 173.7    | HV    |
| 6   | 10    | 10X            | 337.82  | 323.23  | 169.7    | HV    | 21  | 10    | 10X            | 328.27  | 323.23  | 174.8    | HV    |
| 7   | 10    | 10X            | 323.82  | 319.45  | 179.3    | HV    | 22  | 10    | 10X            | 334.00  | 329.52  | 168.5    | HV    |
| 8   | 10    | 10X            | 311.10  | 299.96  | 198.7    | HV    | 23  | 10    | 10X            | 346.09  | 342.09  | 156.6    | HV    |
| 9   | 10    | 10X            | 308.55  | 298.07  | 201.6    | HV    | 24  | 10    | 10X            | 361.99  | 352.15  | 145.4    | HV    |
| 10  | 10    | 10X            | 318.09  | 313.17  | 186.1    | HV    | 25  | 10    | 10X            | 336.54  | 322.60  | 170.7    | HV    |
| 11  | 10    | 10X            | 337.18  | 337.69  | 162.9    | HV    | 26  | 10    | 10X            | 336.54  | 324.48  | 169.8    | HV    |
| 12  | 10    | 10X            | 356.26  | 361.59  | 143.9    | HV    | 27  | 10    | 10X            | 336.54  | 333.29  | 165.3    | HV    |
| 13  | 10    | 10X            | 375.99  | 371.02  | 132.9    | HV    | 28  | 10    | 10X            | 370.90  | 362.22  | 138.0    | HV    |
| 14  | 10    | 10X            | 370.26  | 371.02  | 135.0    | HV    | 29  | 10    | 10X            | 362.63  | 367.88  | 139.0    | HV    |
| 15  | 10    | 10X            | 381.71  | 367.25  | 132.2    | HV    | 30  | 10    | 10X            | 365.81  | 360.33  | 140.7    | HV    |

Tested By :   
Position : Engineer  
Date : 20 Sep. 2024

  
Project Engineer  
1 / 10 / 24

Reviewed By :   
Position : S. M. N. R.  
Date : 20/9/2024



บริษัท ควอลิเทค จำกัด (มหาชน)  
Qualitech Public Company Limited

# บันทึกผลการทดสอบความต้านแรงดึง

## Tensile Test Record

รหัสเอกสาร : FM-TS-01

หน้าที่ : 1 / 1

แก้ไขครั้งที่ : 04

วันที่บังคับใช้ : 28 พฤศจิกายน 2560

|                                       |                                                                                                                                              |                         |              |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------|
| Test No. :                            | 837-67                                                                                                                                       | Test Date :             | 30/9/2024    |
| Shape of Crossection :                | <input checked="" type="checkbox"/> Rectangular <input type="checkbox"/> Round <input type="checkbox"/> Pipe <input type="checkbox"/> Camber | Test Temp. :            | 25.0 °C      |
| area <input type="checkbox"/> Other : | Tensile Transverse Weld                                                                                                                      | Humidity :              | 44 %         |
| Reference Standard :                  | ASME Section IX: 2023                                                                                                                        | Test Standard :         | ASTM A370-21 |
| Measurement tools (1) :               | 1207216                                                                                                                                      | Measurement tools (2) : |              |

| Sample No.                                                                                     |                                              | 837-67- 1 TS 1 | 837-67- 1 TS 2 | 837-67-2 TS 1 | 837-67-2 TS 2 | 837-67- 3 TS 4 | 837-67- 3 TS 2 |       |
|------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|----------------|---------------|---------------|----------------|----------------|-------|
| Before                                                                                         | Thickness (T) (mm)                           | 1              | 5.09           | 5.05          | 10.15         | 10.15          | 5.07           | 5.07  |
|                                                                                                |                                              | 2              | 5.09           | 5.05          | 10.15         | 10.15          | 5.07           | 5.07  |
|                                                                                                |                                              | 3              | 5.09           | 5.05          | 10.15         | 10.15          | 5.07           | 5.07  |
|                                                                                                |                                              | Avg.           | 5.09           | 5.05          | 10.15         | 10.15          | 5.07           | 5.07  |
|                                                                                                | Width (W) / Diameter(D) (mm)                 | 1              | 13.02          | 13.00         | 19.00         | 19.00          | 13.00          | 13.00 |
|                                                                                                |                                              | 2              | 13.02          | 13.00         | 19.00         | 19.00          | 13.00          | 13.00 |
|                                                                                                |                                              | 3              | 13.02          | 13.00         | 19.00         | 19.00          | 13.00          | 13.00 |
|                                                                                                |                                              | Avg.           | 13.02          | 13.00         | 19.00         | 19.00          | 13.00          | 13.00 |
| After                                                                                          | Thickness (T) (mm)                           | 1              | -              | -             | -             | -              | -              | -     |
|                                                                                                |                                              | 2              | -              | -             | -             | -              | -              | -     |
|                                                                                                |                                              | 3              | -              | -             | -             | -              | -              | -     |
|                                                                                                |                                              | Avg.           | -              | -             | -             | -              | -              | -     |
|                                                                                                | Width (W) / Diameter(D) (mm)                 | 1              | -              | -             | -             | -              | -              | -     |
|                                                                                                |                                              | 2              | -              | -             | -             | -              | -              | -     |
|                                                                                                |                                              | 3              | -              | -             | -             | -              | -              | -     |
|                                                                                                |                                              | Avg.           | -              | -             | -             | -              | -              | -     |
| Area (mm^2)                                                                                    | Before                                       | 66.2719        | 65.6500        | 192.8500      | 192.8500      | 65.9100        | 65.3900        |       |
|                                                                                                | After                                        | -              | -              | -             | -             | -              | -              |       |
| Reduction of Area (%)                                                                          |                                              | -              | -              | -             | -             | -              | -              |       |
| Gauge length (mm)                                                                              | Before                                       | -              | -              | -             | -             | -              | -              |       |
|                                                                                                | After                                        | -              | -              | -             | -             | -              | -              |       |
| Elongation (%)                                                                                 |                                              | -              | -              | -             | -             | -              | -              |       |
| Yield <div><input type="checkbox"/> Upper</div> <div><input type="checkbox"/> ___ Offset</div> | Load (kN)                                    | -              | -              | -             | -             | -              | -              |       |
|                                                                                                | Strength (Mpa)                               | -              | -              | -             | -             | -              | -              |       |
| Tensile                                                                                        | Load (kN)                                    | 49.659         | 44.696         | 116.661       | 117.472       | 52.316         | 48.958         |       |
|                                                                                                | Strength (Mpa)                               | 749            | 726            | 605           | 609           | 794            | 749            |       |
| Fracture (IN/OUT)                                                                              | <input type="checkbox"/> Gauge length        | OUT weld       | OUT weld.      | OUT weld.     | OUT weld      | IN weld        | IN weld.       |       |
|                                                                                                | <input checked="" type="checkbox"/> 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 |                        |                      |                        |
| Name      | Thiraphong Chomphichit | PURIWAT / SUPERVISOR | Mr. Sattawat Naksathit |
| Position  | Technician             |                      | Project Engineer       |
| Date      | 30/9/2024              | 30/9/2024            | 1-10-24                |

|                                                                                                                                                                           |  |                                                                     |  |                                     |  |                       |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------|--|-------------------------------------|--|-----------------------|--|
| <br><b>Qualitech</b><br>บริษัท ควอลิเทค จำกัด (มหาชน)<br>Qualitech Public Company Limited |  | <b>บันทึกผลการทดสอบความต้านแรงดึง</b><br><b>Tensile Test Record</b> |  |                                     |  | รหัสเอกสาร : FM-TS-01 |  |
|                                                                                                                                                                           |  |                                                                     |  | หน้าที่ : 1 / 1                     |  |                       |  |
|                                                                                                                                                                           |  |                                                                     |  | แก๊สครั้งที่ : 04                   |  |                       |  |
|                                                                                                                                                                           |  |                                                                     |  | วันที่บังคับใช้ : 28 พฤศจิกายน 2560 |  |                       |  |
| Test No. : 837-67                                                                                                                                                         |  |                                                                     |  | Test Date : 30/9/2024               |  |                       |  |
| Shape of Crossection : <input checked="" type="checkbox"/> Rectangular <input type="checkbox"/> Round <input type="checkbox"/> Pipe <input type="checkbox"/> Camber       |  |                                                                     |  | Test Temp. : <u>25.0</u> °C         |  |                       |  |
| area <input type="checkbox"/> Other : Tensile Transverse Weld                                                                                                             |  |                                                                     |  | Humidity : <u>44</u> %              |  |                       |  |
| 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          | 10.03         | 10.07 |
|                                                                      |                                                                                       | 2                            | 8.67                    | 9.75                  | 4.65          | 4.62          | 10.03         | 10.07 |
|                                                                      |                                                                                       | 3                            | 8.67                    | 9.75                  | 4.66          | 4.62          | 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                   | 19.02                 | 19.02         | 19.00         | 19.01         | 19.03 |
|                                                                      |                                                                                       | 2                            | 19.01                   | 19.02                 | 19.02         | 19.00         | 19.01         | 19.03 |
|                                                                      |                                                                                       | 3                            | 19.01                   | 19.02                 | 19.02         | 19.00         | 19.01         | 19.03 |
|                                                                      |                                                                                       | Avg.                         | 19.01                   | 19.02                 | 19.02         | 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 <sup>2</sup> )                                              | Before                                                                                | 168.6187                     | 185.4450                | 68.1430               | 60.0600       | 190.6703      | 191.63210     |       |
|                                                                      | After                                                                                 | -                            | -                       | -                     | -             | -             | -             |       |
| Reduction of Area (%)                                                |                                                                                       | -                            | -                       | -                     | -             | -             | -             |       |
| Gauge length (mm)                                                    | Before                                                                                | -                            | -                       | -                     | -             | -             | -             |       |
|                                                                      | After                                                                                 | -                            | -                       | -                     | -             | -             | -             |       |
| Elongation (%)                                                       |                                                                                       | -                            | -                       | -                     | -             | -             | -             |       |
| Yield <input type="checkbox"/> Upper <input type="checkbox"/> 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)                                                    | <input type="checkbox"/> Gauge length<br><input checked="" type="checkbox"/> 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                                                            |                                                                                       | Signature                    |                         | Signature             |               |               |               |       |
| Name                                                                 |                                                                                       | Name                         |                         | Name                  |               |               |               |       |
| Position                                                             |                                                                                       | Position                     |                         | Position              |               |               |               |       |
| Date                                                                 |                                                                                       | Date                         |                         | Date                  |               |               |               |       |

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

| 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       | 216.9896       | 210.3300       | 454.8600       | 458.6832       |
|                                                                                            |                                                                                                          | After  | -              | -              | -              | -              | -              | -              |
| Reduction of Area (%)                                                                      |                                                                                                          |        | -              | -              | -              | -              | -              | -              |
| Gauge length (mm)                                                                          |                                                                                                          | Before | -              | -              | -              | -              | -              | -              |
|                                                                                            |                                                                                                          | After  | -              | -              | -              | -              | -              | -              |
| Elongation (%)                                                                             |                                                                                                          |        | -              | -              | -              | -              | -              | -              |
| Yield <div><input type="checkbox"/> Upper</div> <div><input type="checkbox"/> Offset</div> | Load (kN)                                                                                                |        | -              | -              | -              | -              | -              | -              |
|                                                                                            | 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)                                                                          | <div><input type="checkbox"/> Gauge length</div> <div><input checked="" type="checkbox"/> Weldment</div> |        | 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 |                      |                         |
| Name      | PURIWAT / SUPERVISOR | Mr. Suttanant Nabanthit |
| Position  |                      | Project Engineer        |
| Date      | 30/9/2024            | 30/9/2024               |

| <div><div>Qualitech</div><div>บริษัท ควอลิเทค จำกัด (มหาชน)<br/>Qualitech Public Company Limited</div></div> |          | <div>บันทึกผลชิ้นงานทดสอบการดัดโค้ง</div> <div>Guided-Bend Test Record</div> |                                |        |                    |                                    |                                               |                                |                               |  |  | <div>รหัสเอกสาร : FM-BD-01</div> <div>หน้าที่ : 1 / 1</div> <div>แก้ไขครั้งที่ : 04</div> <div>วันที่บังคับใช้ : 28 พฤศจิกายน 2560</div> |  |
|--------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------|--------------------------------|--------|--------------------|------------------------------------|-----------------------------------------------|--------------------------------|-------------------------------|--|--|------------------------------------------------------------------------------------------------------------------------------------------|--|
| Reference code/Standard : ASME Section IX: 2023                                                              |          |                                                                              | Test Standard : ASME IX : 2023 |        |                    | Testing room temperature : 24.5 °C |                                               |                                | Humidity : 42 %               |  |  |                                                                                                                                          |  |
| Test No. : 837-67                                                                                            |          |                                                                              | Measurement Tools : 110 7112   |        |                    |                                    |                                               |                                |                               |  |  |                                                                                                                                          |  |
| 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                                           |                                | PQR No : PQR-TNC-005          |  |  |                                                                                                                                          |  |
| "                                                                                                            | "        | 5.49                                                                         | 14.20                          | 200.00 | 20                 | 180°                               | N/A                                           |                                | GTAW / 6G / 5.54 mm.          |  |  |                                                                                                                                          |  |
| "                                                                                                            | RB1      | 5.56                                                                         | 14.10                          | 200.00 | 20                 | 180°                               | 0.50 mm                                       |                                | Pipe 2 " / A335GR.P11         |  |  |                                                                                                                                          |  |
| "                                                                                                            | RB2      | 5.52                                                                         | 14.10                          | 200.00 | 20                 | 180°                               | N/A                                           |                                | "                             |  |  |                                                                                                                                          |  |
| 837-67-6                                                                                                     | SB1      | 11.90                                                                        | 10.25                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | PQR No : PQR-TNC-006          |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB2      | 11.95                                                                        | 10.26                          | 200.00 | 40                 | 180°                               | 0.50 mm                                       |                                | GTAW + SMAW / 6G / 10.97 mm.  |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB3      | 11.90                                                                        | 10.26                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | Pipe 6 " / A335GR.P11         |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB4      | 11.93                                                                        | 10.25                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | "                             |  |  |                                                                                                                                          |  |
| 837-67-7                                                                                                     | SB1      | 25.49                                                                        | 10.21                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | PQR No : PQR-TNC-007          |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB2      | 25.49                                                                        | 10.24                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | FCAW / Plate Thk.25.0 mm.     |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB3      | 25.49                                                                        | 10.25                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | A36 + A36                     |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB4      | 25.47                                                                        | 10.26                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | "                             |  |  |                                                                                                                                          |  |
| 837-67-8                                                                                                     | SB1      | 11.95                                                                        | 10.29                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | PQR No : PQR-TNC-008          |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB2      | 11.96                                                                        | 10.26                          | 200.00 | 40                 | 180°                               | 0.50 mm                                       |                                | SMAW / Plate Thk.12.0 mm.     |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB3      | 11.99                                                                        | 10.25                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | SS400 + SS400                 |  |  |                                                                                                                                          |  |
| "                                                                                                            | SB4      | 11.94                                                                        | 10.24                          | 200.00 | 40                 | 180°                               | N/A                                           |                                | "                             |  |  |                                                                                                                                          |  |
| Additional Detail :                                                                                          |          |                                                                              |                                |        |                    |                                    |                                               |                                |                               |  |  |                                                                                                                                          |  |
| Result : (NSD) = No Surface Discontinuity                                                                    |          |                                                                              |                                |        |                    |                                    |                                               |                                |                               |  |  |                                                                                                                                          |  |
| (OSD) = Open Surface Discontinuity                                                                           |          |                                                                              |                                |        |                    |                                    |                                               |                                |                               |  |  |                                                                                                                                          |  |
| (CC) = Corner Crack                                                                                          |          |                                                                              |                                |        |                    |                                    |                                               |                                |                               |  |  |                                                                                                                                          |  |
| Reviewed by                                                                                                  |          |                                                                              | Tested by                      |        |                    | Reviewed by                        |                                               |                                | Witnessed by                  |  |  |                                                                                                                                          |  |
|                                                                                                              |          |                                                                              |                                |        |                    |                                    |                                               |                                |                               |  |  |                                                                                                                                          |  |
| PURWAT / SUPERVISOR                                                                                          |          |                                                                              | Sutthi / Supervisor            |        |                    | PURWAT / SUPERVISOR                |                                               |                                | Mr. Sutthi / Project Engineer |  |  |                                                                                                                                          |  |
| 30/9/2024                                                                                                    |          |                                                                              | 30/9/2024                      |        |                    | 30/9/2024                          |                                               |                                | 1 - 10 - 24                   |  |  |                                                                                                                                          |  |



บันทึกผลชิ้นงานทดสอบการดัดโค้ง  
Guided-Bend Test Record

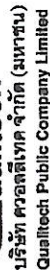
รหัสเอกสาร : FM-BD-01  
หน้าที่ : 1 / 1  
แก้ไขครั้งที่ : 04  
วันที่บังคับใช้ : 28 พฤศจิกายน 2560

Reference code/Standard : ASME Section IX: 2023  
Test No. : 837-67  
Test Standard : ASME IX : 2023  
Testing room temperature : 24.5 °C  
Measurement Tools : 12.07211  
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      | 11.61                  | 10.24 | 200.00 | 40                 | 180°  | N/A                                           | N/A                            | PQR No : PQR-TNC-004         |
| "          | SB2      | 11.61                  | 10.24 | 200.00 | 40                 | 180°  | N/A                                           | N/A                            | GTAW + SMAW / 6G / 10.97 mm. |
| "          | SB3      | 11.61                  | 10.24 | 200.00 | 40                 | 180°  | N/A                                           | N/A                            | Pipe 6 " / A312GR.TP304      |
| "          | SB4      | 11.61                  | 10.24 | 200.00 | 40                 | 180°  | N/A                                           | N/A                            | "                            |

Additional Detail : \_\_\_\_\_

|                                                                                                        |                                     |                                                       |                                |
|--------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------|--------------------------------|
| Result : (NSD) = No Surface Discontinuity<br>(OSD) = Open Surface Discontinuity<br>(CC) = Corner Crack | Tested by<br>SPT<br>Sudhiti Aukhich | Reviewed By<br>SPT<br>Mr. Sathawat / Project Engineer | Witnessed by<br>SPT<br>1-10-24 |
| Signature                                                                                              | PURWAT / SUPERVISOR                 |                                                       |                                |
| Name / Position                                                                                        | 30/9/2024                           |                                                       |                                |
| Date                                                                                                   |                                     |                                                       |                                |



หนังสือเอกสาร : FM-BD-01

|        |         |
|--------|---------|
| หน้า ๑ | : ๑ / ๑ |
|--------|---------|

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 : 1207212

## Humidity

257 %

[illegible]

Additional Detail :

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

**Witnessed by**

Reviewed By 

Tested by

Signature \_\_\_\_\_

|                 |  |
|-----------------|--|
| Signature       |  |
| Name / Position |  |

|        |      |      |
|--------|------|------|
| Signal | Name | Date |
|--------|------|------|

(CC) = Coner Crack

Mr. Sottarant / Project Engineer

1-10-24