

# Engineering Procedure

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SAEP-1108

29 October, 2003

Welding Test Supplement S08 for GTAW, Nickel

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Document Responsibility: Inspection Department

## Saudi Aramco DeskTop Standards

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## 1 Scope

This welder performance qualification Test Supplement shall govern the testing of welders with the Gas Tungsten Arc Welding (GTAW) process, welding progression vertical up, for welding nickel-based alloy pipe.

## 2 Applicable Documents

The requirements contained in the following documents apply to the extent specified in this procedure.

### 2.1 Saudi Aramco References

Saudi Aramco Engineering Procedures

|                                  |                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------|
| <a href="#"><u>SAEP-321</u></a>  | <i>Performance Qualification Testing and Certification of Saudi Aramco Welders</i>   |
| <a href="#"><u>SAEP-1101</u></a> | <i>Welding Test Supplement S01 for SMAW, Carbon and Low Alloy Steel Pipe, Uphill</i> |
| <a href="#"><u>SAEP-1104</u></a> | <i>Welding Test Supplement S04 for SMAW, Stainless Steel/Nickel Backing</i>          |
| <a href="#"><u>SAEP-1105</u></a> | <i>Welding Test Supplement S05 for SMAW, Nickel, Single Sided</i>                    |
| <a href="#"><u>SAEP-1107</u></a> | <i>Welding Test Supplement S07 for GTAW, Stainless Steel</i>                         |

### 2.2 Industry Code(s) and Standard(s)

American Society of Mechanical Engineers

|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| <i>ASME SEC IX</i> | <i>Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators</i> |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|

## 3 Instructions

Conduct the Performance qualification testing of welders following the requirements of [SAEP-321](#) as supplemented by the subsequent instructions.

### 3.1 Applications

|           |     |
|-----------|-----|
| Piping    | Yes |
| Pipelines | Yes |

Pressure Vessels No

Tanks No

Structural No

Dissimilar Metals Yes \*

\* See restrictions in paragraph 3.9

### || 3.7 Testing and Inspection Requirements

Time Limit of Test Two (2) hours maximum

Radiography 100% (ASME QW-191)

Visual Inspection See paragraph 6.1.3 of [SAEP-321](#)

### 3.8 Qualification Limits

Material Form Plate or pipe

Joint Type Groove welds with and without backing, and fillet welds

Base Material Nickel (P41) and Ni-based alloys (P42-47) to themselves and to each other. Dissimilar metal welds include: Ni-based alloys to carbon steels, low alloy steels, stainless steels, nickel and Monel alloys; Monel alloys joined to carbon steels; nickel joined to stainless steels; and stainless steels joined to carbon steels.

Process GTAW

Filler Metal A5.14

Gas Backing Argon (2-5 CFH)

Base Metal Thickness 0.436" maximum

Diameter Range 1" NPS and greater

Positions All

Vertical Progression Uphill

### 3.9 Restrictions

Dissimilar Metal Welding (Piping, Pressure Vessels, Tanks, Pipelines) - nickel-based filler metals shall be used to weld ferritic steels to austenitic stainless steels, duplex stainless steels, or nickel based alloys.

#### **Revision Summary**

29 October, 2003

Minor revision to convert the text statements into a form layout (ASME SEC IX format).  
Revised the "Next Planned Update".



## WELDING PROCEDURE SPECIFICATION (WPS)

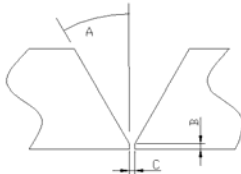
WPS S08

Rev. 0

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|                                                   |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------------|
| Procedure Qualification Record (PQR): <u>None</u> | Welding Process: <u>GTAW, manual</u>                                 |
| Scope: <u>For welder qualification only</u>       | Prior Qualification Requirements: <u>S01, S04 (or S05) &amp; S07</u> |

| <b>BASE MATERIAL (QW-403)</b><br>Test coupon type: <u>Pipe</u><br>Material Spec, type or Grade: <u>Carbon Steel</u><br>Diameter of test coupon: <u>2" NPS</u><br>Thickness of test coupon: <u>0.218"</u><br>To Material spec. type or grade: <u>Carbon Steel</u><br>Tack Welds: <u>Three (3) made by the welder and incorporated into the root pass</u> |       | <b>POST WELD HEAT TREATMENT (QW-407)</b><br>Temperature: <u>None</u><br>Time: _____<br>Other: _____                                                                                                                                                                                                                                                           |            |  |     |           |            |           |       |  |       |         |       |  |     |          |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--|-----|-----------|------------|-----------|-------|--|-------|---------|-------|--|-----|----------|--|--|--|
| <b>FILLER METALS (QW-404)</b><br>Weld Metal Analysis Number: <u>NA</u><br>Filler Metal F No.: <u>43</u><br>AWS specification: <u>A 5.14</u><br>AWS Classification: <u>ERNiCR-3</u><br>Electrode: <u>EWTh-2 (2.4mm)</u>                                                                                                                                  |       | <b>GAS (QW-408)</b> <table border="1"> <thead> <tr> <th></th> <th>Gas</th> <th>Composite</th> <th>Flow (CFH)</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td>Argon</td> <td></td> <td>10-20</td> </tr> <tr> <td>Backing</td> <td>Argon</td> <td></td> <td>2-5</td> </tr> <tr> <td>Trailing</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> |            |  | Gas | Composite | Flow (CFH) | Shielding | Argon |  | 10-20 | Backing | Argon |  | 2-5 | Trailing |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                         | Gas   | Composite                                                                                                                                                                                                                                                                                                                                                     | Flow (CFH) |  |     |           |            |           |       |  |       |         |       |  |     |          |  |  |  |
| Shielding                                                                                                                                                                                                                                                                                                                                               | Argon |                                                                                                                                                                                                                                                                                                                                                               | 10-20      |  |     |           |            |           |       |  |       |         |       |  |     |          |  |  |  |
| Backing                                                                                                                                                                                                                                                                                                                                                 | Argon |                                                                                                                                                                                                                                                                                                                                                               | 2-5        |  |     |           |            |           |       |  |       |         |       |  |     |          |  |  |  |
| Trailing                                                                                                                                                                                                                                                                                                                                                |       |                                                                                                                                                                                                                                                                                                                                                               |            |  |     |           |            |           |       |  |       |         |       |  |     |          |  |  |  |
| <b>POSITION (QW-405)</b><br>Position of Groove: <u>2G &amp; 5G</u><br>Weld Progression: <u>Uphill</u>                                                                                                                                                                                                                                                   |       | <b>TECHNIQUE</b><br>String or weave: <u>Stringer or Weave</u><br>Oscillation: _____<br>Multiple or Single pass per side: <u>Multiple</u><br>Single or multiple electrode: <u>Single</u><br>Other: _____                                                                                                                                                       |            |  |     |           |            |           |       |  |       |         |       |  |     |          |  |  |  |
| <b>PREHEAT (QW 406)</b><br>Preheat Temperature: <u>10°C</u><br>Interpass temperature: <u>177°C</u><br>Other: _____                                                                                                                                                                                                                                      |       |                                                                                                                                                                                                                                                                                                                                                               |            |  |     |           |            |           |       |  |       |         |       |  |     |          |  |  |  |



Joint Design: Single Vee

A = 30° +/- 2.5°  
B = 1.6 +/- 0.8mm  
C = 3.2 +/- 0.8mm

|  |         | <b>WELDING PROCEDURE<br/>SPECIFICATION (WPS)</b> |              |          |        | WPS S08<br>Rev. 0<br>Page 2 of 2 |                          |
|-----------------------------------------------------------------------------------|---------|--------------------------------------------------|--------------|----------|--------|----------------------------------|--------------------------|
| WELD LAYER                                                                        | PROCESS | FILLER METAL                                     |              | CURRENT  |        | VOLTAGE                          | TRAVEL SPEED<br>(cm/min) |
|                                                                                   |         | Class                                            | Dia.<br>(mm) | Polarity | Amps.  |                                  |                          |
| Root                                                                              | GTAW    | ERNiCr-3                                         | 2.4          | DCEN     | 80-140 | 10-12                            | 3.8-8.9                  |
| Hot                                                                               | GTAW    | ERNiCr-3                                         | 2.4          | DCEN     | 70-100 | 10-12                            | 3.8-10.2                 |
| Fill                                                                              | GTAW    | ERNiCr-3                                         | 2.4          | DCEN     | 90-160 | 10-12                            | 3.8-14                   |
| Cap                                                                               | GTAW    | ERNiCr-3                                         | 2.4          | DCEN     | 90-160 | 10-12                            | 5.0-15.2                 |