# Procedure Qualification Record (PQR)

**Code:** AWS D1.1

**Company Name:** www.WPSAmerica.com  
**Address:** info@WPSAmerica.com, 1 (877) WPS-WELD

<table>
<thead>
<tr>
<th>Welding Process:</th>
<th>Process Type:</th>
<th>Position:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMAW</td>
<td>Manual</td>
<td>Flat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Base Metal Part I (Material Spec., type or grade):</th>
<th>Base Metal Part II (Material Spec., type or grade):</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A 516 Grade 60</td>
<td>ASTM A 516 Grade 60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thickness and Diameter (Pipe): mm (in)</th>
<th>Filler Metals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness of Test Coupon: 60 mm (2.36 in.), Plates</td>
<td>AWS Classification/AWS Specification:</td>
</tr>
<tr>
<td>Diameter of Test Coupon: N/A</td>
<td>E7018</td>
</tr>
<tr>
<td></td>
<td>A5.1</td>
</tr>
</tbody>
</table>

**Joint Details/Sketch:**

![Joint Details Image]

**Joint Design Used: mm (in)**

- Root Opening G: 0 to 1/8 in.
- Root Face RF: 3 mm (1/8 in.)
- Groove Angle: 60° (both sides)
- Radius (J-U): N/A

**Weld Type:**
- Complete Joint Penetration Groove Weld

**Joint Type:**
- Butt Joint

**Backing Option:**
- Back-gouge to sound metal

**Backing Material:**
- N/A

**Back Gouging Method:**
- Mechanical (Grinding)
### Electrical Characteristics:

- **Current Type/Polarity:** DCEP
- **Transfer Mode (GMAW):** N/A
- **Tungsten Electrode (GTAW):**
  - **Type:** N/A
  - **Size:** mm (in) N/A

### Shielding:

- **Gas Composition (Flux for SAW):** N/A
- **Gas Flow Rate:** lt/min. (CFH) N/A
- **Gas Cup Size:** N/A

### Welding Procedure

<table>
<thead>
<tr>
<th>Weld Layers</th>
<th>Pass No.</th>
<th>Process</th>
<th>Filler Metal Classification</th>
<th>Filler Metal Diameter mm (in)</th>
<th>Current Amps</th>
<th>Current Type &amp; Polarity</th>
<th>Wire Feed Speed (in/min)</th>
<th>Volts</th>
<th>Travel Speed (in/min)</th>
<th>Remarks</th>
<th>[Heat Input] J/mm (J/in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2</td>
<td>1 to 3</td>
<td>SMAW</td>
<td>E7018</td>
<td>4.0 mm (5/32)</td>
<td>160-200</td>
<td>DCEP</td>
<td>N/A</td>
<td>24-26</td>
<td>5-10 (in/min)</td>
<td>Root Pass</td>
<td></td>
</tr>
<tr>
<td>2 to n</td>
<td>4 to n</td>
<td>SMAW</td>
<td>E7018</td>
<td>4.8 mm (3/16)</td>
<td>220-250</td>
<td>DCEP</td>
<td>N/A</td>
<td>24-26</td>
<td>5-10 (in/min)</td>
<td>Fill and Cap</td>
<td></td>
</tr>
<tr>
<td>Side 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Backgouged</td>
<td></td>
</tr>
<tr>
<td>1 to n</td>
<td>1 to n</td>
<td>SMAW</td>
<td>E7018</td>
<td>4.8 mm (3/16)</td>
<td>220-250</td>
<td>DCEP</td>
<td>N/A</td>
<td>24-26</td>
<td>5-10 (in/min)</td>
<td>Fill and Cap</td>
<td></td>
</tr>
</tbody>
</table>

### Technique:

- **Stringer or Weave Bead:** *Stringer and Weave Bead*
- **Initial/Interpass Cleaning:** *Wire Brush, Grinding*
- **Number of Electrodes:** Single
- **Electrodes Spacing:**
  - **Longitudinal:** N/A
  - **Lateral:** N/A
  - **Angle:** N/A

### Heat Treatment:

- **Preheat Temp. Min °C (°F):** 150 °C
- **Interpass Temp. Min/Max °C (°F):** 150 °C
- **Postweld Heat Treatment: Temp. °C (°F):** 600 to 620 °C
- **Time:** 1 Hour per in.

### Additional Notes:

See Postweld Heat Treatment (PWHT) Specification No. PWHT-SMAW-01

### Manufacturer/ Contractor

**Welding Engineer:**

- **Name:** Jim Clark
- **Title:** Welding Engineer
- **Date:** 12,12,2005

**Authorized by:**

- **Name:** John Smith
- **Title:** QA Manager
- **Date:** 12,13, 2005
Heat Treatment (AWS Code’s Guideline):

PREHEAT TABLE:
AWS D1.1, Table 3.2 Prequalified Minimum Preheat and Interpass Temperature °F (°C):
Thickness 3 to 20 mm (1/8 to 3/4 in.) incl.: 32°F (0°C)
Over 20 thru 38 mm (3/4 to 1-1/2 in.) incl.: 50°F (10°C)
Over 38 thru 65 mm (1-1/2 to 2-1/2 in.) incl.: 150°F (65°C)
Over 65 mm (2-1/2 in): 225°F (110°C)
For SMAW process, above preheat data is with low hydrogen electrodes.
When the base metal temperature is below 32°F (0°C), preheated to a minimum of 70°F (20°C)
Preheat and interpass temperature shall be sufficient to prevent cold cracking.
Guideline on Alternative Methods for Determining Preheat/Interpass: See Annex XI of AWS D1.1

POSTWELD HEAT TREATMENT:
PWHT requirements shall be based on Welding Procedure Specification (WPS).
AWS D1.1, 5.8 Stress-Relief Heat Treatment: Where required by the contract
drawings or specifications, welded assemblies shall be stress relieved by heat treating.
(See AWS D1.1, 5.8.1, Requirements for stress-relief treatment;
Table 5.2, Minimum Holding Time; Table 5.3, Alternate Stress-Relief Heat Treatment)
See AWS D1.1, 5.8.3, Steels Not Recommended for PWHT

PQR Qualified Range (AWS Code’s Guideline):

Qualified Position: F (CJP/PJP Groove, Fillet) on Plate, Pipe, Box Tube (Table 4.1 AWS D1.1)

Qualified Thicknesses (CJP Groove): 1/8 in. (3 mm) Min., Unlimited
Plus any size of fillet or PJP groove weld for any thicknesses or diameter (Table 4.2 AWS D1.1)

WPS Base Metal Group Allowed by PQR: Any Steels in Group I to Any Steels in Group I of Table 3.1 of AWS D1.1 (Table 4.8 AWS D1.1)

Qualified WPS Filler Metal Allowed by PQR: For SMAW process, only same electrode type (change from
low hydrogen to non-low hydrogen is not allowed) and same flux-electrode classification for SAW process.
Also same (or lower) strength electrode tested in PQR for SMAW, GMAW and FCAW processes. [No
increase in diameter from size tested in PQR is allowed, except that an increase on electrode size of only 1/32
in. (0.8 mm) in SMAW and increase up to 1/16 in. (1.6 mm) in GTAW is acceptable for use in WPS. For
GMAW, only same electrode diameter size tested in PQR is allowed in WPS (Table 4.5 AWS D1.1).]
Test Results

TENSILE TEST

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Width mm (in)</th>
<th>Thickness mm (in)</th>
<th>Area sq. mm (in)</th>
<th>Ultimate Tensile Load kg (lb)</th>
<th>Ultimate Unit Stress MPa (psi)</th>
<th>Character of Failure and Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA1</td>
<td>25,1</td>
<td>30</td>
<td>753</td>
<td>36212 Kg</td>
<td>471 (MPa)</td>
<td>Ductile out Weld</td>
</tr>
<tr>
<td>TA2</td>
<td>25,1</td>
<td>30</td>
<td>753</td>
<td>36712 Kg</td>
<td>477 (MPa)</td>
<td>Ductile out Weld</td>
</tr>
<tr>
<td>TB1</td>
<td>25</td>
<td>30</td>
<td>750</td>
<td>35712 Kg</td>
<td>466 (MPa)</td>
<td>Ductile out Weld</td>
</tr>
<tr>
<td>TB2</td>
<td>25,1</td>
<td>30</td>
<td>753</td>
<td>35612 Kg</td>
<td>463 (MPa)</td>
<td>Ductile out Weld</td>
</tr>
</tbody>
</table>

GUIDED BEND TEST

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Type of Bend</th>
<th>Results</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Side bend</td>
<td>Satisfactory</td>
<td>Ductile</td>
</tr>
<tr>
<td>T2</td>
<td>Side bend</td>
<td>Satisfactory</td>
<td>Ductile</td>
</tr>
<tr>
<td>T3</td>
<td>Side bend</td>
<td>Satisfactory</td>
<td>Ductile</td>
</tr>
<tr>
<td>T4</td>
<td>Side bend</td>
<td>Satisfactory</td>
<td>Ductile</td>
</tr>
</tbody>
</table>

VISUAL INSPECTION:
Appearance: Good appearance
Undercut: No
Piping porosity: No
Convexity: Acceptable
Test Date: 11,11, 2005
Witnessed By: Jim Clark

Other Tests (Notes):

Radiographic-ultrasonic examination:
RT report no: 1230-RT Result: O.K.
UT report no: 2310-UT Result: O.K.

FILLET WELD TEST RESULTS:
Max. size single pass: Macroetch
1: N/A
2: _
3: _

Min. size multiple pass: Macroetch
1: N/A
2: _
3: _

All-weld-metal tension test:
Tensile strength, MPa (psi): N/A
Yield point/strength, MPa (psi): _
Elongation in 2 in.,%: _
Laboratory test no.: _

Welder’s name: Welder Guy
Tests conducted by: Quality Weld Lab, Inc.
Laboratory Tests Number: TN-46547

Clock No.: 123-12-1234 Stamp No.: JS-02

We, the undersigned, certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in conformance with the requirements of Section 4 of AWS D1.1, (Year:2004) Structural Welding Code Steel.

Signed (Manufacturer):
Name: John Smith
Title: QA Manager
Date: 12,12,2005

Per: WPSAmerica.com