WELDING PROCEDURE SPECIFICATION

WPS - 1000-D1.8-1    REV. NO.: 1    DATE: 5/1/2008

WELDING PROCESS: SMAW and SMAW    ASME: AWS: X    OTHER: AISC-341 Demand Critical

SUPPORTING PQR: PQT No. 1000-D1.8-1

**APPLICABILITY**

This WPS shall be used in conjunction with the General Welding Standards (GWS) and Welding Fabrication Procedure (WFP) sections and criteria for joint details, repairs, NDE, inspection etc.

Weld Joint Type: Groove & Fillet welds

See GWS 1-06 and WFP’s for joint details

Root Opening: .25 - .500

Backgrind root: When specified

Bkgrd Method: Thermal or mechanical

FILLER METALS

<table>
<thead>
<tr>
<th>Class:</th>
<th>AWS Root Pass:</th>
<th>ASME Root Pass:</th>
</tr>
</thead>
<tbody>
<tr>
<td>F7018</td>
<td>0.125 thru 0.250</td>
<td>thru</td>
</tr>
</tbody>
</table>

AWS: 7018-SR or 7018-1

Filler Metal Note: Welder shall use ESAB Atom Arc 7018-SR or 7018-1 for this Procedure

BASE MATERIAL

<table>
<thead>
<tr>
<th>Spec. No.</th>
<th>P/S No.</th>
<th>Gr No. 1 to: P/S No. Gr No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS: 24</td>
<td>ASME: 99.000</td>
<td>thru</td>
</tr>
</tbody>
</table>

Qualified Pipe Dia. Range: ≥ 24

Qualified Thickness Range: ≥ 24

QUALIFIED POSITIONS:

<table>
<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50 °F</td>
<td>N/A</td>
<td>550 °F</td>
<td>/</td>
<td>50 °F</td>
<td>to</td>
<td>N/A</td>
<td>N/A</td>
<td>0 °F</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

PWHT: Time @ °F Temp. N/A

Temp. Range: N/A

APPROVAL: Signatures on file at ENG

DATE: 5/1/2008

WPS NO: 1000-D1.8-1

WELDING CHARACTERISTICS:

Thursday, May 08, 2008
WELDING TECHNIQUE: For fabrication specific requirements such as fittup, cleaning, grinding, PWHT and inspection criteria refer to Volume 2, Welding Fabrication Procedures

Technique: Manual
Cleaning Method: Chipping, Grinding
Single Pass or Multi Pass: Multi
Stringer or Weave bead (S/W): S or W
Oscillation: 3x
GMAW Gun Angle °: to
Forehand or Backhand for GMAW (F/B): N/A
No Pass >1/2": True
GMAW/FCAW Tube to work distance: N/A
Maximum K/J Heat Input: Travel speed: Varies 3 - 12
Gas Cup Size: N/A

PROCEDURE QUALIFIED FOR:
Charpy "V" Notch: Yes
Nil-Ductil Transition Temperature: No
Dynamic Tear: No
Comments: This WPS is specifically qualified for Demand Critical welds required by AISC 341-05 & AWS D1.8
Siesmic Welding including qualified for Charpy-V-Notch in weld metal to 115 ftlbs@ -20°F. HAZ +1mm qualified to 75 ftlbs@+50 F°. HAZ +5mm is qualified to 89 ftlbs@ +50 F°.

<table>
<thead>
<tr>
<th>Weld Layer</th>
<th>Manual Process</th>
<th>Filler Metals</th>
<th>Size</th>
<th>Amp Range</th>
<th>Volt Range</th>
<th>Travel/ipm</th>
<th>Nozzle Angle</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMAW</td>
<td>E7018</td>
<td>3/32</td>
<td>70 to 100</td>
<td>14 to 16</td>
<td>3 to 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SMAW</td>
<td>E7018</td>
<td>1/8</td>
<td>120 to 140</td>
<td>15 to 17</td>
<td>4 to 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SMAW</td>
<td>E7018</td>
<td>5/32</td>
<td>140 to 170</td>
<td>16 to 18</td>
<td>4 to 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SMAW</td>
<td>E7018</td>
<td>5/32</td>
<td>140 to 170</td>
<td>17 to 19</td>
<td>6 to 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SMAW</td>
<td>E7018</td>
<td>5/32</td>
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</tr>
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REM. * Weld layers are representative only - actual number of passes and layer sequence may vary due to variations in joint design, thickness and fitup.

Use of LANL Welding Procedures and Welder Qualifications for non-LANL work shall be at the sole risk and responsibility of the Subcontractor, and the Subcontractor shall indemnify and save LANL and the Government harmless from any and all claims, demands, actions or causes of action, and for any expense or loss by reason of Subcontractor’s and their employees possession and use of LANL procedures and qualifications.