WELDING PROCEDURE SPECIFICATION

WPS: 5000-xxxx-HY80/HSLA100D1.1
REV. NO.: 1
DATE: 7/3/2012
**APPLICABILITY**

WELDING PROCESS: SAW
CODE: AWS D1.1
OTHER:

SUPPORTING PQR: 5000-HY80/HSLA100

**APPLICABILITY**

JOINT: 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: Butt
Class: Full & Partial Penetration & Fillets
See GWS 1-06 and WFP's for joint details.
Root Opening: N/A
Preparation: Thermal or Mechanical
Backgrind Root: When required
Backing: Metal
Backgrind Method: Gouge, Chip, Grind
GTAW Flux: N/A
Backing Retainer: No

FILLER METALS:

Class: Mill-100S-1
A No: N/A
SFA Class: N/A and N/A
F No: N/A and N/A
Insert: N/A
Insert Type: N/A
Size: .045 1/16 3/32 1/8

Weld Metal Thickness Ranges:
AWS Root Pass: .125 thru .250
AWS Balance: .375 thru 99
ASME Root Pass: 0 thru 0
ASME Balance: 0 thru 0

BASE MATERIAL:

Spec.: HY80 or HSLA100
Grade: N/A
Gr No.: N/A
Gr No.: N/A to Spec.: HY80 or HSLA100
Gr No.: N/A

Qualified Pipe Dia. Range: >=
AWS: 24
ASME: 0

Qualified Thickness Range:
AWS: 0.375 thru 99
ASME: 0 thru 0

QUALIFIED POSITIONS:

AWS: 1G
ASME: N/A
Vert. Prog.: N/A

Preheat Min. Temp.: 200
GAS: Shielding: N/A or N/A
Interpass Max. Temp.: 400 °F
Gas Composition: N/A / N/A / N/A %
Preheat Maintenance: 200 °F
Gas Flow Rate cfm: 0 to 0
0 to 0
PWHT: Time @ °F Temp.: 0
Backig Gas/Comp: N/A
N/A%
Temperature Range: N/A °F to N/A °F
Backig Gas Flow cfm: 0
N/A
Trailing Gas/Comp: N/A
N/A%

WELDING CHARACTERISTICS:

Current: DCEN
Tungsten Type: N/A
Transfer Mode: N/A
Ranges: Amps: 200
Tungsten Dia.: N/A
Pulsing Cycle: 0 to 0
Volts: 18
Background Current: 0

Fuel Gas: N/A
Flame: N/A
Braze Temp °F: N/A to N/A

WELDING TECHNIQUE: For fabrication specific requirements such as fitup, cleaning, grinding, PWHT and inspection criteria, refer to Volume 2, Welding Fabrication Procedures.

Technique: Machine
Cleaning Method: Chip/grind/file/wire brush

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Single or Multi Pass: Multi
Stringer or Weave Bead (S/W): S or N/A
Oscillation: N/A
GMAW Gun Angle: 0° to 0°
Forehand or Backhand for GMAW: N/A
No Pass > 1/2": N/A
GMAW/FCAW Tube to Work Distance (in): N/A
Maximum K/J Heat Input: 62000 KJ/in
Travel Speed: N/A
Gas Cup Size: N/A

PROCEDURE QUALIFIED FOR:
Charpy "V" Notch: Yes
Nil-Ductile Transition Temperature: No
Dynamic Tear: Yes

Comments:
Note 1.) Welds are qualified with DT of weld material @-40° F of 614 ft-lbs. Westmoreland Report #2-64863
Note 2.) Welds are qualified with Charpy of weld material @-90° F of 68 ft-lbs. Sherry Labs Report #B12051281

Table:
<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>SAW</td>
<td>Mill-100S-1</td>
<td>0.045</td>
<td>200 to 240</td>
<td>18 to 22</td>
<td>2.3 to 3.0</td>
<td>0 to 0</td>
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</tr>
<tr>
<td>2</td>
<td>1/16</td>
<td>345 to 390</td>
<td>24</td>
<td>28</td>
<td>8 to 12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3/32</td>
<td>340 to 600</td>
<td>26</td>
<td>34</td>
<td>9 to 12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1/8</td>
<td>350 to 600</td>
<td>26</td>
<td>34</td>
<td>9 to 12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REM. * Weld layers are representative only - actual number of passes and layer sequence may vary.

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 the reason of Subcontractor's and their employees possession and use of LANL procedures and qualifications.

APPROVAL: Signatures on file at ES-DE
DATE: 7/11/2012