**API WELDING PROCEDURE SPECIFICATION**

**WPS:** API 1000-1  
**REV. NO.:** 0  
**PROCESS:** SMAW  
**DATE:** 9/9/2004

### API-1104 QUALIFIED RANGES

**Diameter:** 2.375” od. thru 12.75” o.d.  
**Filler Metal Group:** API Group 1

**Thickness:** .187” thru .750”  
**Joint Type:** Butt/fillet/socket

**Material:** Yield less or equal to than 42 KPI

**Positions:**  
- **Fixed:** X  
- **Rolled:** N/A  
- **Progression:** Down

**NOTE:** This WPS shall be used in conjunction with the applicable sections of the Los Alamos National Laboratories Welding Standards Manual (GWS)

### WELD JOINT

**Type:** Butt  
**Class:** Full Penetration

**Joint Description:** Open Butt single V- welded from one side only.

**Sketch Number:** See pg. 2 for typical sketch and bead sequence.

### FILLER MATERIALS

**API Group No.:** 1  
**AWS Class:** E-6010  
**SFA Class:** 5.1  
**F No.:** 3  
**Sizes (s):** 1/8 | 5/32 | 5/32

**Number of Beads:** See pg. 2 for typical number and of beads

### BASE MATERIALS

**Spec:** ASTM A-53 or A-106 A/B  
**Thickness Welded:** .187” - .750”  
**Pipe Diameter:** 2.375” o.d. thru 12.75” o.d. pipe  
**Pipe Diameter:** Less than 12.75” o.d.

**ASME P No.:** 1  
**Group:** 1  
**P No.:** 1  
**Group:** 1

### POSITIONS

**Fixed:** X  
**Rolled:** N/A  
**PWHT:** Time @ ° F Temp.: N/A  
**Progression:** Down  
**Temperature Range ° F:** N/A

### PREHEAT

**Minimum Temp ° F:** 70  
**GAS:** Shielding: N/A  
**Backling:** N/A

**NOTE:** See time between passes.  
**Composition:** N/A

### INTERPASS TEMP.

**N/A**  
**Flow Rate:** CFH  
**N/A**

### ELECTRICAL CHARACTERISTICS

**Current:** DC  
**Polarity:** EP  
**Ranges Amps:** See pg. 2

**Transfer Mode:** N/A  
**WFS/IPM:** N/A  
**Volts:** See pg. 2

**Electrode size and Type** See pg. 2  
**Travel/IPM** See pg. 2

### MAX. TIME BETWEEN PASSES

5 minutes between root pass and second pass. 2hrs. for all subsequent beads or passes.
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WELDING TECHNIQUE:

Line-Up Clamp: Full encirclement line-up clamp shall be used: line-up clamp shall be left until 50% of root bead is complete

Stringer or Weave Bead: (S) Y (W) Y Single Pass N/A Multi Pass Y

Cleaning and/or Grinding: Stiff wire brush or power grinder

PROCEDURE QUALIFIED FOR: Charpy V Notch N/A NDTT N/A D.T. N/A

Maximum K/J Heat Input: N/A

JOINT SKETCH AND BEAD NUMBER AND SEQUENCE

37.5° Bevel

0 – 3/32” land

1/16 – 3/32” gap

t thickness varies

NOTE: Weld layers are representative only — actual number of passes and layer sequence may vary due to variation in joint design, thickness and fit-up.

TYPICAL WELDING PARAMETERS

<table>
<thead>
<tr>
<th>Pass Number</th>
<th>Filler/ Electrode</th>
<th>Size</th>
<th>Amps</th>
<th>Volts</th>
<th>Travel Speed in/min.</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E-6010</td>
<td>1/8</td>
<td>70-100</td>
<td>22-26</td>
<td>9 – 12”</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>E-6010</td>
<td>1/8</td>
<td>100-120</td>
<td>22-26</td>
<td>9 – 13</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>E-6010</td>
<td>5/32</td>
<td>125-132</td>
<td>22-26</td>
<td>9 – 13</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>E-6010</td>
<td>5/32</td>
<td>125-132</td>
<td>22-26</td>
<td>9 – 13</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>E-6010</td>
<td>5/32</td>
<td>125-132</td>
<td>22-26</td>
<td>9 – 13</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>E-6010</td>
<td>5/32</td>
<td>125-132</td>
<td>22-26</td>
<td>9 – 13</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>E-6010</td>
<td>5/32</td>
<td>125-132</td>
<td>22-26</td>
<td>9 – 13</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>E-6010</td>
<td>5/32</td>
<td>125-132</td>
<td>22-26</td>
<td>9 – 13</td>
<td></td>
</tr>
</tbody>
</table>

PREPARED BY: Kelly L. Bingham  DATE: 9/9/2004
Signature on file

APPROVED BY: Tobin Oruch  DATE: 9/9/2004
Signature on file
API WELDING SPECIFICATION PROCEDURE

TEST PARAMETERS

Point Type: Full penetration Butt
Diameter: 6.625 o.d.

Thickness: .432 wall
Filler: 1/8 & 5/32 E-6010

Material: ASTM A-106 gr B
Preheat: 70° F

Position: 6G Fixed
Current: DCEP

Progression: Down
Volts: 22-26

GUIDED BEND TESTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Result</th>
<th>No.</th>
<th>Type</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Face</td>
<td>Acc. No indications</td>
<td>5.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Root</td>
<td>Acc. One indication</td>
<td>6.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Face</td>
<td>Acc. No indications</td>
<td>7.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Root</td>
<td>Acc. No indications</td>
<td>8.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

TENSILE TESTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Specimen Type</th>
<th>Area Sq./in</th>
<th>Applied Load</th>
<th>Ultimate Tensile</th>
<th>Character of failure and location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Figure 4</td>
<td>.402</td>
<td>37231 lbs.</td>
<td>92,614 psi</td>
<td>Heat effected zone base</td>
</tr>
<tr>
<td>2.</td>
<td>Figure 4</td>
<td>.389</td>
<td>34521 lbs.</td>
<td>88,742 psi</td>
<td>Heat effected zone base</td>
</tr>
<tr>
<td>3.</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NICK-BREAK TESTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Remarks on Nick-Break tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Figure 5</td>
<td>Acc. Break is clean.</td>
</tr>
<tr>
<td>2.</td>
<td>Figure 5</td>
<td>Acc. One minor indication.</td>
</tr>
<tr>
<td>3.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Welders Name: Merel Johnson
Z No.: 05881
Stamp: PF005
Tests Conducted By: Kelly Bingham

We certify that the statements herein are correct and that the tests were conducted in accordance with API-1104.

Authorized By: Kelly Bingham
Date: 09/30/92
Signature on File