



**API WELDING PROCEDURE SPECIFICATION**

**WPS:** API 1000-4      **REV. NO.:** 0      **PROCESS:** SMAW      **DATE:** 9/9/2004

**API-1104 QUALIFIED RANGES**

**Diameter:** Less than 2.375" o.d.      **Filler Metal Group:** API Group 1  
**Thickness:** 0.188" thru 0.750"      **Joint Type:** Butt/fillet/socket  
**Material:** Yield less than or equal to 42 kpi  
**Positions:**      **Fixed:**       **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 (GSW)

**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):**

|       |      |  |  |
|-------|------|--|--|
| 3/32" | 1/8" |  |  |
|-------|------|--|--|

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

**BASE MATERIALS:**      **Spec:** ASTM A 53 or A 106 A/B      **to Spec:** ASTM A 53 or A 106 A/B  
**Thickness Welded:** 0.188" - 0.750"      **to** 0.188" - 0.750"  
**Pipe Diameter:** Less than 2.375" o.d.      **to Pipe Diameter** Less than 2.375" o.d.  
**ASME P No.:** 1      **Group:** 1      **to P No.:** 1      **Group:** 1

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

**PREHEAT:**      **Minimum Temp ° F:** 70 deg.      **GAS: Shielding:** N/A      **Backing:** N/A  
**NOTE:** See time between passes.      **Composition:** N/A  
**INTERPASS TEMP. ° F :** 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. 2 hrs for all subsequent beads or passes.

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**WELDING TECHNIQUE:**

**Line-Up Clamp:** Optional, if line-up clamp is used, it must be left in place until 50% of the root bead is complete.

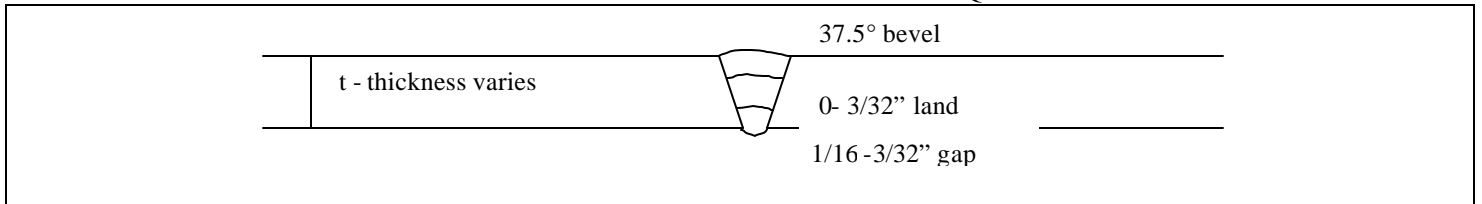
**Stringer or Weave Bead:** (S)  Y  (W)  Y  **Single Pass**  N/A  **Multi Pass**  Y

**Cleaning and/or Grinding:** Stiff wire brush or power grinder. Grind tacks & stringer bead to a smooth contour.

**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



**NOTE: Weld layers are representative only <sup>3</sup>/<sub>4</sub> actual number of passes and layer sequence may vary due to variation in joint design, thickness and fit-up.**

**TYPICAL WELDING PARAMETERS**

| Pass Number | Filler/ Electrode | Size | Amps   | Volts | Travel Speed in/min. | Other |
|-------------|-------------------|------|--------|-------|----------------------|-------|
| 1           | E-6010            | 3/32 | 55-80  | 22-26 | 4-9                  |       |
| 2           | E-6010            | 3/32 | 55-80  | 22-26 | 4-9                  |       |
| 3           | E-6010            | 1/8  | 65-100 | 22-26 | 5-10                 |       |
| 4           |                   |      |        |       |                      |       |
| 5           |                   |      |        |       |                      |       |
| 6           |                   |      |        |       |                      |       |
| 7           |                   |      |        |       |                      |       |
| 8           |                   |      |        |       |                      |       |

**PREPARED BY:** Kelly Bingham **DATE:** 9/9/2004  
Signature on File

**APPROVED BY:** Tobin Oruch **DATE:** 9/9/2004  
Signature on File

**API WELDING PROCEDURE QUALIFICATION TEST REPORT  
TEST PARAMETERS**

Two Coupons Tested

**Point Type:** Open Butt Single V Full Penetration      **Diameter:** 1.66" o.d.

**Thickness:** 0.191" wall      **Filler:** 3/32" & 1/8" E-6010 (6P+)

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

**Position:** 5G Fixed      **Current:** DCEP      **Amps:** 55-70

**Progression:** Down      **Volts:** 18-24

**Max Time Between Passes:** 5 Minutes      **Travel Speed:** 4-10

**GUIDED BEND TESTS**

| No. | Type | Result                 | No. | Type | Result |
|-----|------|------------------------|-----|------|--------|
| 1.  | Root | Acc. Minor indications | 5.  | N/A  |        |
| 2.  | Root | Acc. Minor indications | 6.  | N/A  |        |
| 3.  | N/A  |                        | 7.  | N/A  |        |
| 4.  | N/A  |                        | 8.  | N/A  |        |

**TENSILE TESTS**

| No. | Specimen Type | Area Sq./ in | Applied Load | Ultimate Tensile | Character of failure and location |
|-----|---------------|--------------|--------------|------------------|-----------------------------------|
| 1.  | N/A           |              |              |                  |                                   |
| 2.  | N/A           |              |              |                  |                                   |
| 3.  | N/A           |              |              |                  |                                   |
| 4.  | N/A           |              |              |                  |                                   |

**NICK-BREAK TESTS**

| No. | Type     | Remarks on Nick-Break tests     |
|-----|----------|---------------------------------|
| 1.  | Figure 5 | Acc. One minor pore.            |
| 2.  | Figure 5 | Acc. Several minor indications. |
| 3.  | N/A      |                                 |
| 4.  | N/A      |                                 |

**Welders Name:** William McIntosh  
**Tests Conducted By:** Kelly Bingham

**Z No.:** 86261

**Stamp:** PF009

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

**Authorized By:** Kelly Bingham  
 Signature on File

**Date:** 09/30/92