



WOODLAND

WELD PROCEDURE

WE-01

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)
 (See QW-201.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0 By: Peter Woodcock, C.E.T
 *Welding Procedure Specification No. WE-01 Date September 12, 2000 Supporting PQR No.(s) 01L, 02L, 03L, 04L
 Revision No. 0 Date 0
 Welding Process(es) SMAW
 Types (Automatic, Manual, Machine, Semi-Auto.) Manual
 *FOR: ASME B31.1, B31.3, Section VIII, Division I

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----------------------------------|------------|------------|-----------------|--------------|----------------|-------|-----------|-----------|-------|----------|----------|-----------------------|--------------------|----------------------------------|------------|-------------------|-------------------|------------------|--|--|--------------|------------|------------|--------|------------|------------|-----------------------|------------|--|-----------------|------------|--|-------------------|------------|--|-------|------------|--|
| <p>JOINTS (QW-402) Joint Design <u>See attached (All A.S.M.E. Joint designs)</u> Backing (Yes) <input checked="" type="checkbox"/> (No) <input checked="" type="checkbox"/> Backing Material (Type) <u>Weld metal where applicable</u> (Refer to both backing and retainers) (No Retainers)</p> <p><input type="checkbox"/> Metal <input type="checkbox"/> Nonfusing Metal <input type="checkbox"/> Nonmetallic <input type="checkbox"/> Other</p> <p>Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.</p> <p>(At the option of the Mfr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process procedures, etc.)</p> | <p align="center">Details</p> <p align="center">ALBERTA BOILERS SAFETY ASSOCIATION PROVINCE OF ALBERTA SAFETY CODES ACT WELDING PROCEDURE</p> <p>Reg. No. WP <u>2273.2</u> Spec No. <u>WE-01</u> Weld Process <u>SMAW</u> Matl. Gr. P No. <u>1Gr142</u> to P No. <u>1Gr142</u> Elec. Gr. F No. <u>3+4</u> A No. <u>1</u> Th. Qual. For <u>2.75 to 19.1mm</u> PWHT <u>NO</u> <u>CVN-46°C</u></p> <p><u>9</u> Mo. <u>9</u> Day. <u>18</u> Signed <u>[Signature]</u> R. ROSEBERG, P.ENG WELDING SPECIALIST</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>*BASE METALS (QW-403) P-No. <u>1</u> Group No. <u>1 & 2</u> to P-No. <u>1</u> Group No. <u>1 & 2</u> OR Specification type and grade _____ to Specification type and grade _____ OR Chem. Analysis and Mech. Prop. _____ to Chem. Analysis and Mech. Prop. _____ Thickness Range: Base Metal: Groove <u>0.108" - 3/4"</u> Fillet <u>All</u> Pipe Dia. Range: Groove <u>Unlimited</u> Fillet <u>All</u> Other <u>No pass greater than 1/2" deposit</u></p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>*FILLER METALS (QW-404)</p> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;">Spec. No. (SFA)</td> <td style="width:30%;"><u>5.1</u></td> <td style="width:30%;"><u>5.1</u></td> </tr> <tr> <td>AWS No. (Class)</td> <td><u>E6010</u></td> <td><u>E7018-1</u></td> </tr> <tr> <td>F-No.</td> <td><u>F3</u></td> <td><u>F4</u></td> </tr> <tr> <td>A-No.</td> <td><u>1</u></td> <td><u>1</u></td> </tr> <tr> <td>Size of Filler Metals</td> <td><u>3/32", 1/8"</u></td> <td><u>1/8", 5/32", 3/16", 3/32"</u></td> </tr> <tr> <td>Weld Metal</td> <td><u>Up to 1/4"</u></td> <td><u>Up to 1/2"</u></td> </tr> <tr> <td>Thickness Range:</td> <td></td> <td></td> </tr> <tr> <td> Groove (MAX)</td> <td><u>All</u></td> <td><u>All</u></td> </tr> <tr> <td> Fillet</td> <td><u>All</u></td> <td><u>All</u></td> </tr> <tr> <td>Electrode-Flux(Class)</td> <td><u>N/A</u></td> <td></td> </tr> <tr> <td>Flux Trade Name</td> <td><u>N/A</u></td> <td></td> </tr> <tr> <td>Consumable Insert</td> <td><u>N/A</u></td> <td></td> </tr> <tr> <td>Other</td> <td><u>N/A</u></td> <td></td> </tr> </table> | | Spec. No. (SFA) | <u>5.1</u> | <u>5.1</u> | AWS No. (Class) | <u>E6010</u> | <u>E7018-1</u> | F-No. | <u>F3</u> | <u>F4</u> | A-No. | <u>1</u> | <u>1</u> | Size of Filler Metals | <u>3/32", 1/8"</u> | <u>1/8", 5/32", 3/16", 3/32"</u> | Weld Metal | <u>Up to 1/4"</u> | <u>Up to 1/2"</u> | Thickness Range: | | | Groove (MAX) | <u>All</u> | <u>All</u> | Fillet | <u>All</u> | <u>All</u> | Electrode-Flux(Class) | <u>N/A</u> | | Flux Trade Name | <u>N/A</u> | | Consumable Insert | <u>N/A</u> | | Other | <u>N/A</u> | |
| Spec. No. (SFA) | <u>5.1</u> | <u>5.1</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AWS No. (Class) | <u>E6010</u> | <u>E7018-1</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F-No. | <u>F3</u> | <u>F4</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A-No. | <u>1</u> | <u>1</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size of Filler Metals | <u>3/32", 1/8"</u> | <u>1/8", 5/32", 3/16", 3/32"</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weld Metal | <u>Up to 1/4"</u> | <u>Up to 1/2"</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thickness Range: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Groove (MAX) | <u>All</u> | <u>All</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fillet | <u>All</u> | <u>All</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrode-Flux(Class) | <u>N/A</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flux Trade Name | <u>N/A</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Consumable Insert | <u>N/A</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | <u>N/A</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

* Each base metal-filler metal combination should be recorded individually.

| POSITIONS (QW-405) Position(s) of Groove <u>All</u> Welding Progression: Up <u>F4</u> Down <u>F3 or up</u> Position(s) of Fillet <u>All</u> | | | | POSTWELD HEAT TREATMENT (QW-407) Temperature Range <u>N/A</u> Time Range _____ | | | |
|--|---------|--------------|-------------|---|------------|--------------------|--|
| PREHEAT (QW - 406) Preheat Temp. Min <u>15.5° (60°F)</u> Interpass Temp. Max <u>177° (350°F)</u> Preheat Maintenance _____ (Continuous or special heating where applicable should be recorded) | | | | GAS (QW-408) Percent Composition <u>Gas(es)</u> <u>Mixture</u> <u>Flow Rate</u> Shielding <u>N/A</u> Trailing _____ Backing _____ | | | |
| ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC <u>DC</u> Polarity _____ Rev _____ Maximum Heat Input _____ Amps (Range) <u>See attached</u> Volts (Range) <u>Table</u> 51,000 Joules (Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.) Tungsten Electrode Size and Type <u>N/A</u> (Pure Tungsten, 2% Thoriated, etc.) Mode of Metal Transfer for GMAW <u>N/A</u> (Spray arc, short circuiting arc, etc.) Electrode Wire feed speed range <u>N/A</u> | | | | | | | |
| TECHNIQUE (QW-410) String or Weave Bead <u>Both</u> Orifice or Gas Cup Size <u>N/A</u> Initial and Interpass Cleaning (Brushing, Grinding, etc.) <u>Grind and/or Brush</u> Method of Back Gouging <u>Air carbon arc if required</u> Oscillation _____ Contact Tube to Work Distance _____ Multiple or Single Pass(per side) <u>Multiple</u> Multiple or Single Electrodes <u>Single</u> Travel Speed (Range) <u>2 - 8 I.P.M.</u> Peening <u>None</u> Other <u>N/A</u> | | | | | | | |
| Weld Layer(s) | Process | Filler Metal | Current | | Volt Range | Travel Speed Range | Other (e.g., Remarks, Comments, Hot Wire Addition, Technique, Torch Angle, Etc.) |
| | | Class Dia. | Type Polar. | Amp. Range | | | |
| | | See Attached | | | | | |

PREHEAT

- A. Welds joining pressure parts of attachments shall be preheated to not less than the minimum preheat temperature stated in F.
- B. The preheat temperature shall be maintained until welding is completed.
- C. If welding is interrupted, the weld joint and adjacent areas shall be re-heated to the minimum preheat temperature specified in F.
- D. The preheated area shall not be less than 50.8 mm (2 in.) wide on each side of the weld.
- E. Preheat temperatures shall be checked by the welder or inspector, using temperature indicating crayons or other reputable methods.
- F. Minimum preheating temperatures shall be as follows:

1. PRESSURE VESSELS

| <u>Nominal Wall Thickness</u> | <u>Minimum Preheat Temperature</u> |
|---|------------------------------------|
| 0 to 25.4 mm (0 to 1 in.) | 10°C (50°F) |
| Over 25.4 mm to 203 mm (over 1 to 8 in.) | 94°C (200°F) |
| Over 25.4 mm (1.0 in.) when max. carbon content exceeds 0.30% | 80°C (175°F) |

2. CHEMICAL PLANT AND PETROLEUM REFINERY PIPING IN ACCORDANCE WITH ANSI B31.3

| <u>Nominal Wall Thickness</u> | <u>Min. Specified Tensile Strength, Base Metal</u> | <u>Minimum Preheat Temperature</u> |
|-------------------------------|--|------------------------------------|
| <25.4 mm (1.0 in) | ≤490 mPa (71 Ksi) | 10°C (50°F) |
| ≥25.4 mm (1.0 in.) | All | 80°C (175°F) |
| All | >490 mPa (72 Ksi) | 80°C (175°F) |

3. POWER PIPING IN ACCORDANCE WITH ANSI B31.1

| <u>Nominal Wall Thickness</u> | <u>Minimum Preheat Temperature</u> |
|--|------------------------------------|
| >25.4 mm (1.0 in.) when maximum Carbon content exceeds 0.30% | 80°C (175°F) |
| All others | 10°C (50°F) |

POSTWELD HEAT TREATMENT

Postweld Heat Treatment is not mandatory for all thicknesses, however, when required the following shall apply:

1. PRESSURE VESSELS IN ACCORDANCE WITH ASME SEC. VIII, DIVISION 1, UW-40 & UCS-56

| <u>Holding Temperature</u> | <u>Holding Time, Based on Up to 50.8 mm (2 in.)</u> | <u>Nominal Wall Thickness Over 50.8 mm (2 in.)</u> |
|---------------------------------|---|---|
| 595 to 650° (1100 to 1200°F) | 15 minutes minimum, 1 hr. per 25.4 mm (in.) | 2 hr. plus 15 minutes for each additional 25.4 mm (in.) over 50.8 mm (2 in.) |

NOTES:

1. PWHT is mandatory on material over 38.1 mm (1½ in.).
2. PWHT is not mandatory on material over 31.8 mm (1¼ in.) up to and including 38.1 mm (1½ in.) when a minimum preheat of 93°C (200°F) is applied.

2. CHEMICAL PLANT & PETROLEUM REFINERY PIPING IN ACCORDANCE WITH ANSI B31.3

| <u>Holding Temperature</u> | <u>Holding Time, Based on 19.1 mm (¾ in.) or less</u> | <u>Nominal Wall Thickness Over 19.1 mm (¾ in.)</u> |
|---------------------------------|---|--|
| 595 to 650° (1100 to 1200°F) | None | 1 hr. minimum 1 hr. per 25.4 mm (in.) |

3. POWER PIPING IN ACCORDANCE WITH ANSI B31.1

| <u>Holding Temperature</u> | <u>Holding Time, Based on Up to 50.8 mm (2 in.)</u> | <u>Nominal Wall Thickness Over 50.8 mm (2 in.)</u> |
|---------------------------------|---|---|
| 595 to 650° (1100 to 1200°F) | 15 minutes minimum, 1 hr. per 25.4 mm (in.) | 2 hr. plus 15 minutes for each additional 25.4 mm (in.) over 50.8 mm (2 in.) |

NOTES:

PWHT is not mandatory when:

1. The nominal wall thickness is 19.1 mm ($\frac{3}{4}$ in.) or less, and
2. a minimum preheat of 93°C (200°F) is applied when the nominal wall thickness of either base metals exceed 25.4 mm (1 in.).

*When it is impractical to PWHT at specified temperatures, PWHT at lower temperatures over longer periods of time is permissible. See applicable Code.

TECHNIQUE QW-410 TABLE

| WELD LAYER | PROCESS | FILLER METAL | | CURRENT | | VOLT RANGE | TRAVEL SPEED RANGE mm/min. (ipm) | OTHER |
|------------|---------|--------------|--------------------|---------------|--------------|------------|-------------------------------------|---|
| | | CLASS | DIAMETER mm/in. | TYPE POLAR | AMP RANGE | | | |
| 1-2 | SHAW | E6010 | 2.38/(3/32) | DCRP | 40-80 | 19-24 | 38-300/(1.5-12) | Size of electrode, number of passes, amperage, voltage and speed of travel will differ with position, thickness and joint configuration |
| 1-2 | SHAW | as above | 3.18/(1/8) | DCRP | 70-120 | 20-25 | 38-350/(1.5-14) | |
| 1-2 | SHAW | as above | 3.97/(4/32) | DCRP | 100-160 | 21-26 | 50-400/(2-16) | |
| 1-2 | SHAW | as above | 4.76/(3/16) | DCRP | 140-210 | 22-28 | 75-500/(3-20) | |
| Remaining | SHAW | 7018-1 | 2.38/(3/32) | DCRP | 60-110 | 19-24 | 38-300/(1.5-12) | |
| Remaining | SHAW | as above | 3.18/(1/8) | DCRP | 90-140 | 20-25 | 38-350/(1.5-14) | |
| Remaining | SHAW | as above | 3.97/(5/32) | DCRP | 110-190 | 21-26 | 50-400/(2-16) | |
| Remaining | SHAW | as above | 4.76/(3/16) | DCRP | 180-275 | 21-27 | 75-500/(3-20) | |
| Remaining | SHAW | as above | 5.55/(7/32) | DCRP | 260-350 | 22-20 | 75-550/(3-22) | |
| Remaining | SHAW | as above | 6.35/(1/4) | DCRP | 300-400 | 23-30 | 125-625/(5-25) | |

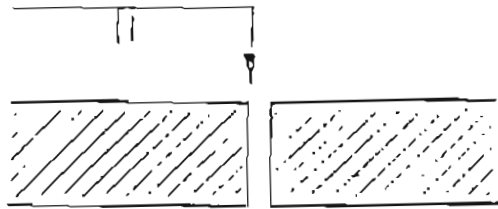


FIG.1
SINGLE SQUARE BUTT

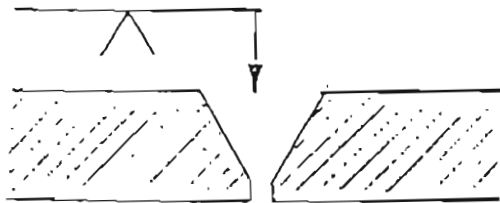


FIG.2
SINGLE VEE BUTT

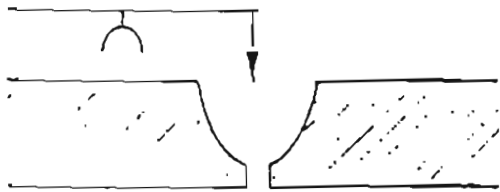


FIG.3
SINGLE U BUTT

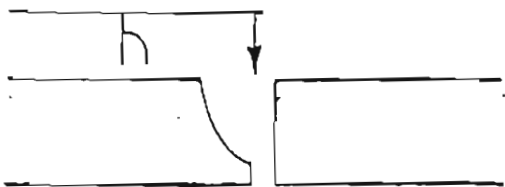


FIG.4
SINGLE J BUTT

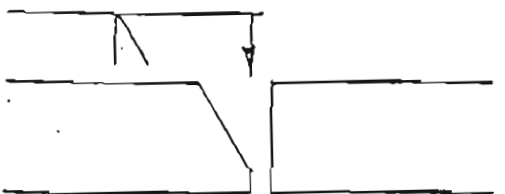


FIG.5
SINGLE BEVEL BUTT

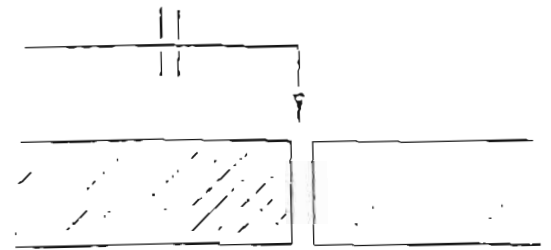


FIG.6
DOUBLE SQUARE BUTT

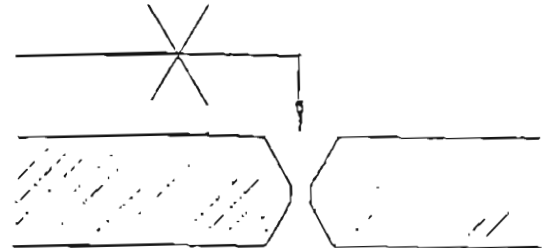


FIG.7
DOUBLE VEE BUTT

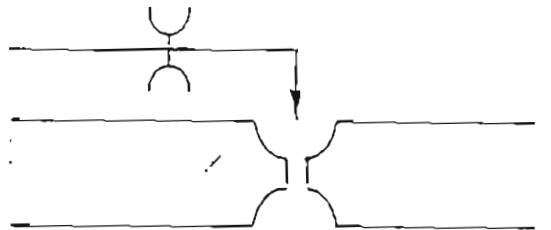


FIG.8
DOUBLE U BUTT

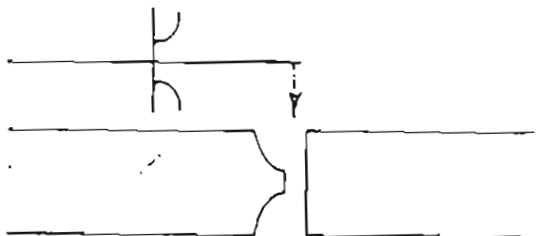


FIG.9
DOUBLE J BUTT

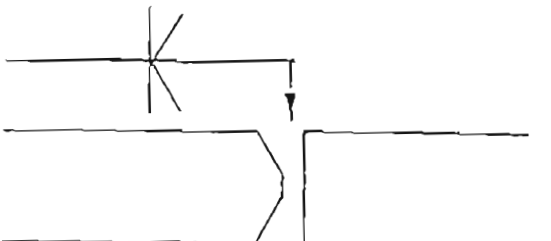
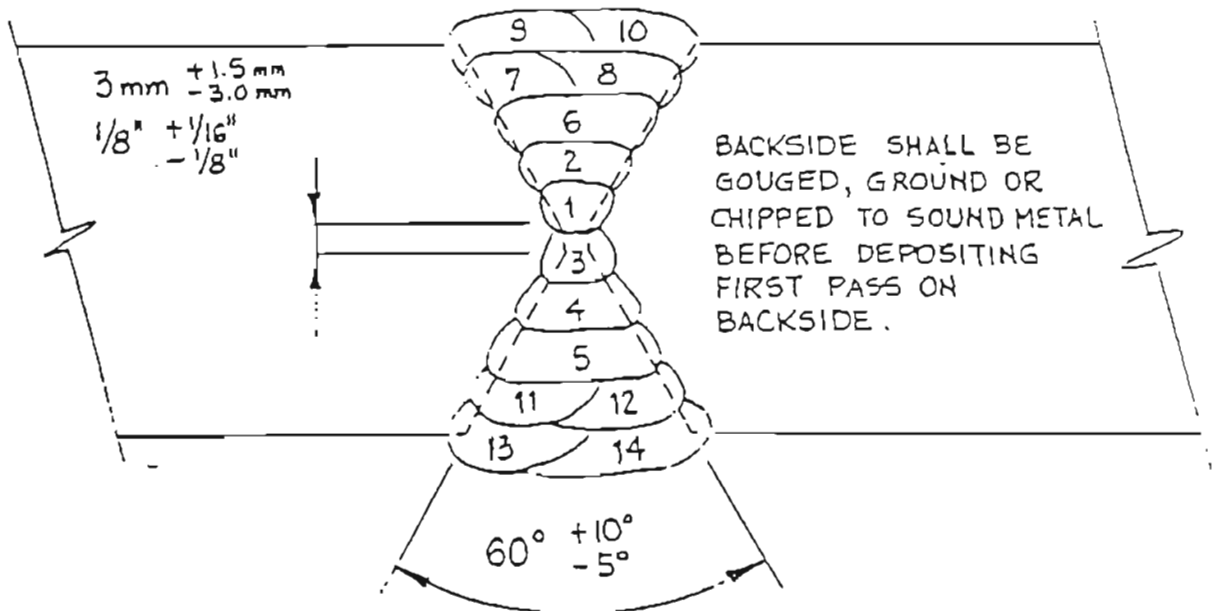
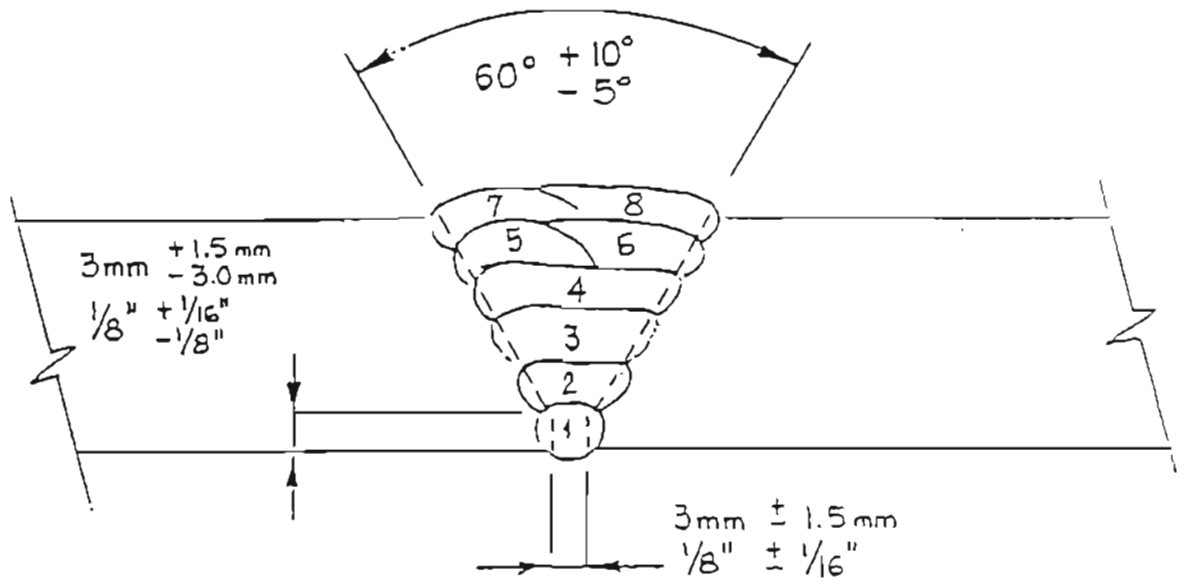


FIG.10
DOUBLE BEVEL BUTT

GROOVE DESIGN



TYPICAL JOINT DESIGN

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
 (See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
 Record Actual Conditions Used to Weld Test Coupon

Company Name Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0
 Procedure Qualification Record No. 01L Date September 12, 2000
 WPS No. WE-01
 Welding Process(es) S.M.A.W.
 Types (Manual, Automatic, Semi-Auto.) Manual

| JOINTS (QW-402) <div style="text-align: center; margin: 10px 0;"> </div> <p align="center">Groove Design of Test Coupon (For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)</p> | | | | | | | | | | | | | | | | |
|---|---|-----------|---------------------|-----------|---------|---------|--|-----------|------------|-------|----------|-------|-------|---------|-------|-------|
| BASE METALS (QW-403) Material Spec. <u>A-106</u> Type or Grade <u>B</u> P-No. <u>1 - G1</u> P-No. <u>1 - G2</u> Thickness of Test Coupon <u>0.375"</u> Diameter of Test Coupon _____ Other _____ | POSTWELD HEAT TREATMENT (QW-407) Temperature <u>N/A</u> Time _____ Other _____ | | | | | | | | | | | | | | | |
| FILLER METALS (QW-404) SFA Specification <u>5.1</u> <u>5.1</u> AWS Classification <u>E6010</u> <u>E7018</u> Filler Metal F-No. <u>3</u> <u>4</u> Weld Metal Analysis A-No. <u>1</u> <u>1</u> Size of Filler Metal <u>3/32</u> <u>5/32", 1/8", 3/16"</u> Other _____ Weld Metal Thickness <u>T=0.108"</u> <u>T=0.108"</u> | GAS (QW-408) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:30%;"></th> <th style="width:30%;">Percent Composition</th> <th style="width:40%;">Flow Rate</th> </tr> <tr> <th>Gas(es)</th> <th>Mixture</th> <th></th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>N/A</u></td> <td>_____</td> </tr> <tr> <td>Trailing</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Backing</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table> | | Percent Composition | Flow Rate | Gas(es) | Mixture | | Shielding | <u>N/A</u> | _____ | Trailing | _____ | _____ | Backing | _____ | _____ |
| | Percent Composition | Flow Rate | | | | | | | | | | | | | | |
| Gas(es) | Mixture | | | | | | | | | | | | | | | |
| Shielding | <u>N/A</u> | _____ | | | | | | | | | | | | | | |
| Trailing | _____ | _____ | | | | | | | | | | | | | | |
| Backing | _____ | _____ | | | | | | | | | | | | | | |
| POSITION (QW-405) Position of Groove <u>5G</u> Weld Progression (Uphill, Downhill) <u>F3, F4 Uphill</u> Other _____ | ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>80-130</u> Volts <u>12-22</u> Tungsten Electrode Size <u>N/A</u> Other <u>Max. Heat Input 51,000 J/IN</u> | | | | | | | | | | | | | | | |
| PREHEAT (QW-406) Preheat Temp. <u>60°F</u> Interpass Temp. <u>450°F</u> Other _____ | TECHNIQUE (QW-410) Travel Speed <u>2"-8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation _____ Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____ | | | | | | | | | | | | | | | |

QW-483 (Back)

PQR No. 01L

Tensile Test (QW-150)

| Specimen No. | Width (in) | Thickness (in) | Area (in ²) | Ultimate Total Load lb | Ultimate Unit Stress psi | Type of Failure & Location |
|--------------|------------|----------------|-------------------------|------------------------|--------------------------|----------------------------|
| #5 | 0.745 | 0.361 | 0.269 | 21,700 | 80,700 | D.P.M. |
| #6 | 0.738 | 0.372 | 0.275 | 22,000 | 80,100 | D.W.M. |
| | | | | | | |
| | | | | | | |

Guided-Band Tests (QW-160)

| Type and Figure No. | Result |
|---------------------|--------|
| | |
| | |
| | |
| | |

Toughness Tests (QW-170)

(See Attached)

| Specimen No. | Notch Location | Notch Type | Test Temp. | Impact Values | Lateral Exp. | | Drop Weight | |
|--------------|----------------|------------|------------|---------------|--------------|------|-------------|-----------|
| | | | | | % Shear | Mils | Break | No. Break |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Fillet-Weld Test (QW-180)

Result-Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes ___ No ___

Macro-Results _____

Other Tests

Type of Test _____

Deposit Analysis _____

Other _____

Welder's Name Doug Bencharski Clock No. W-13057 Stamp No. _____

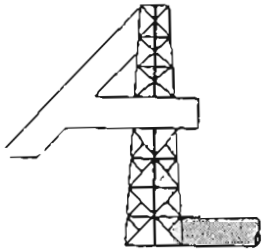
Tests conducted by: Alfor Metallurgical Laboratory Test No. 00-294

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer: Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0

Date September 12, 2000 By Terry Wood

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of test required by the Code.)



ALFOR METALLURGICAL COMPANY LTD.
CONSULTING ENGINEERS

Grande Prairie Regional College
10726 - 106 Avenue
Grande Prairie, Alberta T8V 4C4

FILE #00-294

WPS #W.E.-01; PQR #01L

August 30, 2000

METAL TEST REPORT

Material Description: ASME SA-106, Grade B; 0.375" W.T. pipe; SMAW welded (E6010/E7018-1); as-welded condition.

Specimen Type: Reduced-section tensile, as per Figure QW-462.1(b) of the ASME Code; guided side bend, as per Figure QW-462.2 of the ASME Code.

| Results: | <u>Sample 5</u> | <u>Sample 6</u> |
|----------------------------|-----------------|-----------------|
| Width: | 0.745 in. | 0.738 in. |
| Thickness: | 0.361 in. | 0.372 in. |
| Area: | 0.269 sq. in. | 0.275 sq. in. |
| Ultimate Load: | 21 700 lb | 22 000 lb |
| Ultimate Tensile Strength: | 80 700 psi | 80 100 psi |
| Fracture Character: | Ductile | Ductile |
| Fracture Location: | Parent | Weld |

Guided side bend samples 1, 2, 3, and 4: Pass Tests.

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CM
8/30/00
CHARLES. E. MOZESON, P. Eng.

CM
Aug. 30, 2000

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
 (See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
 Record Actual Conditions Used to Weld Test Coupon

Company Name Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0
 Procedure Qualification Record No. 02L Date September 12, 2000
 WPS No. WE-01
 Welding Process(es) S.M.A.W.
 Types (Manual, Automatic, Semi-Auto.) Manual

| JOINTS (QW-402) <div style="text-align: center; margin: 10px 0;"> </div> <p align="center">Groove Design of Test Coupon (For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)</p> | | | | | | | | | | | | | | | | | | | | | |
|--|--|-----------|---------------------|--|--|---------|---------|-----------|--|-----------|------------|--|-------|----------|-------|--|-------|---------|-------|--|-------|
| BASE METALS (QW-403) Material Spec. <u>SA-333</u> <u>SA350</u> Type or Grade <u>GR6</u> <u>GRLF2</u> P-No. <u>1-G1</u> P-No. <u>1-G2</u> Thickness of Test Coupon <u>0.216"</u> Diameter of Test Coupon <u>3"</u> Other _____ | POSTWELD HEAT TREATMENT (QW-407) Temperature <u>N/A</u> Time _____ Other _____ | | | | | | | | | | | | | | | | | | | | |
| FILLER METALS (QW-404) SFA Specification <u>5.1</u> <u>5.1</u> AWS Classification <u>E8010</u> <u>E7018-1</u> Filler Metal F-No. <u>3</u> <u>4</u> Weld Metal Analysis A-No. <u>1</u> <u>1</u> Size of Filler Metal <u>3/32</u> <u>3/32", 1/8"</u> Other _____ Weld Metal Thickness <u>T=0.108"</u> <u>T=0.108"</u> | GAS (QW-408) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th colspan="2" style="text-align: center;">Percent Composition</th> <th style="width: 20%;"></th> </tr> <tr> <th style="text-align: center;">Gas(es)</th> <th style="text-align: center;">Mixture</th> <th colspan="2" style="text-align: center;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td align="center" colspan="2"><u>N/A</u></td> <td>_____</td> </tr> <tr> <td>Trailing</td> <td colspan="2">_____</td> <td>_____</td> </tr> <tr> <td>Backing</td> <td colspan="2">_____</td> <td>_____</td> </tr> </tbody> </table> | | Percent Composition | | | Gas(es) | Mixture | Flow Rate | | Shielding | <u>N/A</u> | | _____ | Trailing | _____ | | _____ | Backing | _____ | | _____ |
| | Percent Composition | | | | | | | | | | | | | | | | | | | | |
| Gas(es) | Mixture | Flow Rate | | | | | | | | | | | | | | | | | | | |
| Shielding | <u>N/A</u> | | _____ | | | | | | | | | | | | | | | | | | |
| Trailing | _____ | | _____ | | | | | | | | | | | | | | | | | | |
| Backing | _____ | | _____ | | | | | | | | | | | | | | | | | | |
| POSITION (QW-405) Position of Groove <u>5G</u> Weld Progression (Uphill, Downhill) <u>F3, F4 Uphill</u> Other _____ | ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rév</u> Amps. <u>60-80</u> Volts <u>23-25</u> Tungsten Electrode Size <u>N/A</u> Other <u>Max. Heat Input 51,000 J/IN</u> | | | | | | | | | | | | | | | | | | | | |
| PREHEAT (QW-406) Preheat Temp. <u>60°F</u> Interpass Temp. <u>450°F</u> Other _____ | TECHNIQUE (QW-410) Travel Speed <u>2"-8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation _____ Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____ | | | | | | | | | | | | | | | | | | | | |

Tensile Test (QW-150)

| Specimen No. | Width (in) | Thickness (in) | Area (In ²) | Ultimate Total Load lb | Ultimate Unit Stress psi | Type of Failure & Location |
|--------------|------------|----------------|-------------------------|------------------------|--------------------------|----------------------------|
| | | | | | | |
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Guided-Bend Tests (QW-160)

| Type and Figure No. | Result |
|---------------------|--------|
| | |
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Toughness Tests (QW-170)

(See Attached)

| Specimen No. | Notch Location | Notch Type | Test Temp. | Impact Values | Lateral Exp. | | Drop Weight | |
|--------------|----------------|------------|------------|---------------|--------------|------|-------------|-----------|
| | | | | | % Shear | Mils | Break | No. Break |
| | | | | | | | | |
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| | | | | | | | | |

Fillet-Weld Test (QW-180)

Result-Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes ___ No ___

Macro-Results _____

Other Tests

Type of Test _____

Deposit Analysis _____

Other _____

Welder's Name Doug Bencharki Clock No. W-13057 Stamp No. _____

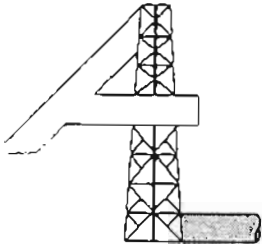
Tests conducted by: Alfor Metallurgical Laboratory Test No. 00-294

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer: Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0

Date September 12, 2000 By Terry Wood

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of test required by the Code.)



ALFOR METALLURGICAL COMPANY LTD.
CONSULTING ENGINEERS

FILE #00-294

Grande Prairie Regional College
10726 - 106 Avenue
Grande Prairie, Alberta T8V 4C4

WPS #W.E.-01; PQR #02L

August 30, 2000

CHARPY V-NOTCH IMPACT TEST RESULTS

Material Description: ASME SA-333, Grade 6 to SA-350, Grade LF2; NPS3 X 0.216" W T.
SMAW welded (E6010/E7018-1); as-welded condition.

Specimen Type: Charpy V-notch 0.198 inch (5.03 mm)-sized weld zone and heat-affected zone impact specimen, as per Part UG-84 of the ASME Code.

Testing Temperature: -50 F.

Results:

Weld zone: 22, 20, 17 ft-lb;

SA-333 Heat-affected zone: 71, 72, 77 ft-lb;

SA-350 Heat-affected zone: 36, 25, 29 ft-lb.

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CEM
8/30/00
CHARLES E. MOZESON, P. Eng.

CEM
Aug. 30, 2000

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
 (See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
 Record Actual Conditions Used to Weld Test Coupon

Company Name Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0
 Procedure Qualification Record No. 03L Date September 12, 2000
 WPS No. WE-01
 Welding Process(es) S.M.A.W
 Types (Manual, Automatic, Semi-Auto.) Manual

| JOINTS (QW-402) <div style="text-align: center; margin: 10px 0;"> </div> <p align="center">Groove Design of Test Coupon (For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used)</p> | | | | | | | | | | | | | | | | |
|---|--|-----------|---------------------|-----------|---------|---------|--|----------------------|--|--|----------------|--|--|---------------|--|--|
| BASE METALS (QW-403) Material Spec. <u>SA-333 SA350</u> Type or Grade <u>GR6 LF2</u> P-No. <u>1 - G1</u> P-No. <u>1 - G2</u> Thickness of Test Coupon <u>0.432"</u> Diameter of Test Coupon <u>6"</u> Other _____ | POSTWELD HEAT TREATMENT (QW-407) Temperature _____ Time _____ Other _____ | | | | | | | | | | | | | | | |
| FILLER METALS (QW-404) SFA Specification <u>5.1 5.1</u> AWS Classification <u>E6010 E7018-1</u> Filler Metal F-No. <u>3 4</u> Weld Metal Analysis A-No. <u>1 1</u> Size of Filler Metal <u>3/32 3/32, 1/8"</u> Other _____ Weld Metal Thickness <u>T=0.125" T=0.307"</u> | GAS (QW-408) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 40%;">Percent Composition</th> <th style="width: 30%;">Flow Rate</th> </tr> <tr> <th style="text-align: center;">Gas(es)</th> <th style="text-align: center;">Mixture</th> <th></th> </tr> </thead> <tbody> <tr> <td>Shielding <u>N/A</u></td> <td></td> <td></td> </tr> <tr> <td>Trailing _____</td> <td></td> <td></td> </tr> <tr> <td>Backing _____</td> <td></td> <td></td> </tr> </tbody> </table> | | Percent Composition | Flow Rate | Gas(es) | Mixture | | Shielding <u>N/A</u> | | | Trailing _____ | | | Backing _____ | | |
| | Percent Composition | Flow Rate | | | | | | | | | | | | | | |
| Gas(es) | Mixture | | | | | | | | | | | | | | | |
| Shielding <u>N/A</u> | | | | | | | | | | | | | | | | |
| Trailing _____ | | | | | | | | | | | | | | | | |
| Backing _____ | | | | | | | | | | | | | | | | |
| POSITION (QW-405) Position of Groove <u>5G</u> Weld Progression (Uphill, Downhill) <u>F3, F4 Uphill</u> Other _____ | ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>60-100</u> Volts <u>23-26</u> Tungsten Electrode Size <u>N/A</u> Other <u>Max. Heat Input 51,000 J/IN</u> | | | | | | | | | | | | | | | |
| PREHEAT (QW-406) Preheat Temp. <u>60°F</u> Interpass Temp. <u>450°F</u> Other _____ | TECHNIQUE (QW-410) Travel Speed <u>2"-8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation _____ Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____ | | | | | | | | | | | | | | | |

Tensile Test (QW-150)

| Specimen No. | Width (in) | Thickness (in) | Area (in ²) | Ultimate Total Load lb | Ultimate Unit Stress psi | Type of Failure & Location |
|--------------|------------|----------------|-------------------------|------------------------|--------------------------|----------------------------|
| | | | | | | |
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Guided-Band Tests (QW-160)

| Type and Figure No. | Result |
|---------------------|--------|
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Toughness Tests (QW-170)

(See Attached)

| Specimen No. | Notch Location | Notch Type | Test Temp. | Impact Values | Lateral Exp. | | Drop Weight | |
|--------------|----------------|------------|------------|---------------|--------------|------|-------------|-----------|
| | | | | | % Shear | Mils | Break | No. Break |
| | | | | | | | | |
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Fillet-Weld Test (QW-180)

Result-Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes ___ No ___
 Macro-Results _____

Other Tests

Type of Test Hardness Test See Attached
 Deposit Analysis _____
 Other _____

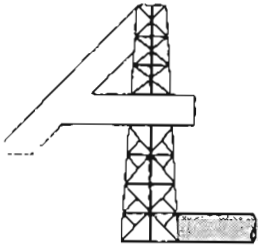
Welder's Name Doug Bencharski Clock No. W-13057 Stamp No. _____
 Tests conducted by: Alfor Metallurgical Laboratory Test No. 00-294

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0

Date September 12, 2000 By Terry Wood

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of test required by the Code.)



ALFOR METALLURGICAL COMPANY LTD.
CONSULTING ENGINEERS

Grande Prairie Regional College
10726 - 106 Avenue
Grande Prairie, Alberta T8V 4C4

FILE #00-294

WPS #W.E.-01; PQR #03L

August 30, 2000

CHARPY V-NOTCH IMPACT TEST RESULTS

Material Description: ASME SA-333, Grade 6 to SA-350, Grade LF2; NPS6 X 0.432" W.T.;
SMAW welded (E6010/E7018-1); as-welded condition.

Specimen Type: Charpy V-notch full-sized weld zone and heat-affected zone impact specimen,
as per Part UG-84 of the ASME Code.

Testing Temperature: -50 F.

Results:

Weld zone: 49, 52, 31 ft-lb;

SA-333 Heat-affected zone: 68, 60, 71 ft-lb;

SA-350 Heat-affected zone: 69, 64, 56 ft-lb.

ALFOR METALLURGICAL COMPANY LTD.
Aug. 30, 2000
CE

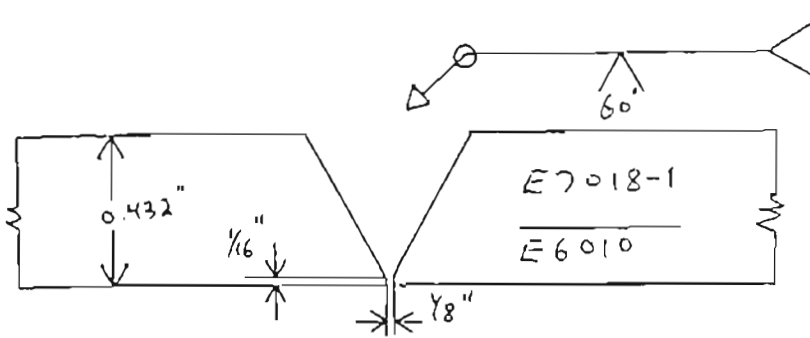
Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CE
8/30/00
CHARLES E. MOZESON, P. Eng.

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
 (See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
 Record Actual Conditions Used to Weld Test Coupon

Company Name Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0
 Procedure Qualification Record No. 04L Date September 12, 2000
 WPS No. WE-01
 Welding Process(es) S.M.A.W
 Types (Manual, Automatic, Semi-Auto.) Manual

| JOINTS (QW-402)  <p align="center">Groove Design of Test Coupon (For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)</p> | | | | | | | | | | | | | | | | |
|---|--|-----------|---------------------|-----------|---------|---------|--|-----------|-----|--|----------|--|--|---------|--|--|
| BASE METALS (QW-403) Material Spec. <u>SA-333 SA350</u> Type or Grade <u>GR6 LF2</u> P-No. <u>1-G1</u> P-No. <u>1-G2</u> Thickness of Test Coupon <u>0.432"</u> Diameter of Test Coupon <u>6"</u> Other _____ | POSTWELD HEAT TREATMENT (QW-407) Temperature _____ Time _____ Other _____ | | | | | | | | | | | | | | | |
| FILLER METALS (QW-404) SFA Specification <u>5.1</u> <u>5.1</u> AWS Classification <u>E6010</u> <u>E7018-1</u> Filler Metal F-No. <u>3</u> <u>4</u> Weld Metal Analysis A-No. <u>1</u> <u>1</u> Size of Filler Metal <u>3/32</u> <u>3/32", 1/8"</u> Other _____ Weld Metal Thickness <u>T=0.125"</u> <u>T=0.307"</u> | GAS (QW-408) <table border="1" style="width:100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="width:30%;"></th> <th style="width:40%;">Percent Composition</th> <th style="width:30%;">Flow Rate</th> </tr> <tr> <th>Gas(es)</th> <th>Mixture</th> <th></th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td align="center">N/A</td> <td></td> </tr> <tr> <td>Trailing</td> <td></td> <td></td> </tr> <tr> <td>Backing</td> <td></td> <td></td> </tr> </tbody> </table> | | Percent Composition | Flow Rate | Gas(es) | Mixture | | Shielding | N/A | | Trailing | | | Backing | | |
| | Percent Composition | Flow Rate | | | | | | | | | | | | | | |
| Gas(es) | Mixture | | | | | | | | | | | | | | | |
| Shielding | N/A | | | | | | | | | | | | | | | |
| Trailing | | | | | | | | | | | | | | | | |
| Backing | | | | | | | | | | | | | | | | |
| POSITION (QW-405) Position of Groove <u>5G</u> Weld Progression (Uphill, Downhill) <u>F3, F4 Uphill</u> Other _____ | ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>60-100</u> Volts <u>23-26</u> Tungsten Electrode Size <u>N/A</u> Other <u>Max. Heat Input 51,000 J/IN</u> | | | | | | | | | | | | | | | |
| PREHEAT (QW-406) Preheat Temp. <u>60°F</u> Interpass Temp. <u>450°F</u> Other _____ | TECHNIQUE (QW-410) Travel Speed <u>2"-8 I.P.M.</u> String or Waave Bead <u>Both</u> Oscillation _____ Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____ | | | | | | | | | | | | | | | |

Tensile Test (QW-150)

| Specimen No. | Width (in) | Thickness (In) | Area (in ²) | Ultimate Total Load lb | Ultimate Unit Stress psi | Type of Failure & Location |
|--------------|------------|----------------|-------------------------|------------------------|--------------------------|----------------------------|
| | | | | | | |
| | | | | | | |
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Guided-Bend Tests (QW-160)

| Type and Figure No. | Result |
|---------------------|--------|
| | |
| | |
| | |
| | |

Toughness Tests (QW-170)

| Specimen No. | Notch Location | Notch Type | Test Temp. | Impact Values | Lateral Exp. | | Drop Weight | |
|--------------|----------------|------------|------------|---------------|--------------|------|-------------|-----------|
| | | | | | % Shear | Mils | Break | No. Break |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Fillet-Weld Test (QW-180)

Result-Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes ___ No ___
 Macro-Results _____

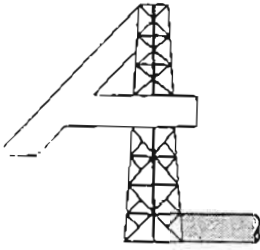
Other Tests

Type of Test Hardness Test See Attached
 Deposit Analysis _____
 Other _____

Welder's Name Doug Bencharski Clock No. W-13057 Stamp No. _____
 Tests conducted by: Alfor Metallurgical Laboratory Test No 00-294

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer Woodland Enterprises, Box 718, Spirit River, Alberta T0H 3G0
 Date September 12, 2000 By Terry Wood
 (Detail of record of tests are illustrative only and may be modified to conform to the type and number of test required by the Code.)



ALFOR METALLURGICAL COMPANY LTD.
CONSULTING ENGINEERS

Grande Prairie Regional College
10726 - 106 Avenue
Grande Prairie, Alberta T8V 4C4

FILE #00-294

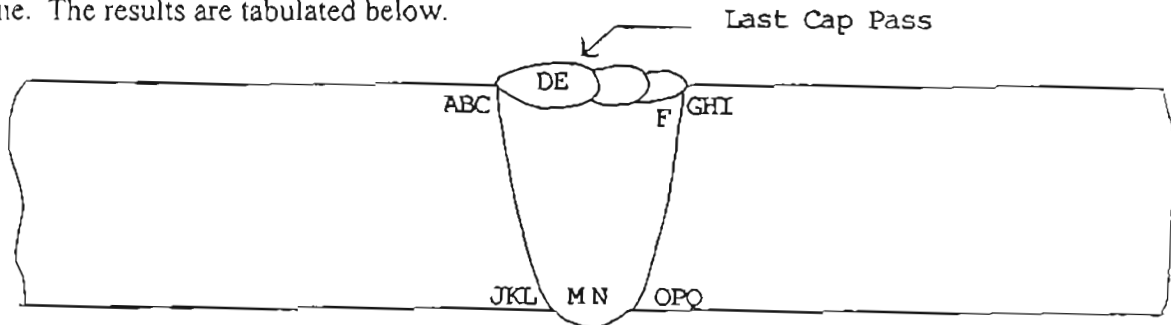
WPS #W.E.-01; PQR #04L

August 30, 2000

VICKERS HARDNESS TESTING OF STEEL WELDMENT

Material Description: ASME SA-333, Grade 6 to SA-350, Grade LF2; NPS6 X 0.432" W T.; SMAW welded (E6010/E7018-1); as-welded condition.

Vickers hardness testing at 1 kg mass (HV1) was performed on a prepared cross-section of the weldment, in accordance with ASTM E 92. All tests were performed at 1.5 mm below the surface; heat-affected zone tests were performed at 0.5 mm, 1.0 mm, and 1.5 mm from the fusion line. The results are tabulated below.



| Location | SA-333 HV1 | Location | HV1 | SA-350 Location | HV1 |
|----------|---------------|----------|-----|--------------------|-----|
| A | 208 | G | 218 | M | 182 |
| B | 211 | H | 222 | N | 191 |
| C | 222 | I | 214 | O | 208 |
| D | 188 | J | 185 | P | 199 |
| E | 176 | K | 185 | Q | 191 |
| F | 180 | L | 187 | | |

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CM
Aug. 30, 2000

CM
8/30/00
CHARLES E. MOZESON, P. Eng.