



WOODLAND
WELD PROCEDURE
WE-02

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-02 Date January 29, 2001 Supporting PQR No.(s) 01S, 02S, 03S, 04S, 05S
 Revision No. 0 Date 0
 Welding Process(es) SMAW
 Types (Automatic, Manual, Machine, Semi-Auto.) Manual

<p>JOINTS (QW-402) Joint Design <u>See attached (All A.S.M.E. Joint designs)</u> Backing (Yes) <input checked="" type="checkbox"/> <u>F4</u> (No) <input checked="" type="checkbox"/> <u>F3</u> Backing Material (Type) <u>Weld metal where applicable</u> (Refer to both backing and retainers) (No Retainers) <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 Mgr., 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"><i>Details</i></p> <p align="center">ALBERTA BOILERS SAFETY REGULATION PROVINCE OF ALBERTA SAFETY CODES ACT WELDING PROCEDURE</p> <p>Reg. No WP <u>2273.2</u> Spec No <u>WE-02</u> Weld Process <u>SMAW</u> Matl. Gr. P No. <u>L.G.142</u> to P No. <u>L.G.142</u> Elec. Gr. F No. <u>3+4</u> A No. <u>1</u> Th. Qual. For <u>25.4mm PWHT</u> <u>YES</u> MIN. Th. Qual <u>2.7mm</u> FOR CVN <u>-46°C</u></p> <p>Yr. <u>01</u> Mo. <u>02</u> Day <u>18</u> Signed <u>[Signature]</u> R. ROSENBERG, 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: <u>*2.7 mm to 25.4 mm</u> Base Metal: Groove <u>0.1185" to 1.0"</u> Fillet <u>All Thickness</u> Pipe Dia. Range: Groove <u>All Dia.</u> Fillet <u>All Thickness</u> Other <u>No weld pass to exceed 1/2".</u> * (Impact tested)</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:35%;"><u>5.1</u></td> <td style="width:35%;"><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", 5/32"</u></td> <td><u>3/32" to 3/16"</u></td> </tr> <tr> <td>Weld Metal</td> <td><u>Up to 1/4"</u></td> <td><u>Up to 3/4"</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", 5/32"</u>	<u>3/32" to 3/16"</u>	Weld Metal	<u>Up to 1/4"</u>	<u>Up to 3/4"</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>	
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* 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 _____	POSTWELD HEAT TREATMENT (QW-407) Temperature Range <u>1125°F +/- 25°F</u> Time Range <u>1 Hour Per Inch Thickness</u> (2.5 hours max.)
PREHEAT (QW - 406) Preheat Temp. Min <u>500°F</u> Interpass Temp. Max <u>200°F (Min) 550°F (Max)</u> Preheat Maintenance <u>Gas or Electric</u> (Continuous or special heating where applicable should be recorded)	GAS (QW-408) Percent Composition <u>Gas(es) Mixture Flow Rate</u> Shielding <u>N/A</u> Trailing _____ Backing _____

ELECTRICAL CHARACTERISTICS (QW-409)

Current AC or DC DC Polarity _____ Rev _____ Maximum Heat Input _____
 Amps (Range) 50-250 Volts (Range) 17-33 51,000 Joules (ALL THICKNESS RANGES)
 (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 N/A
 (Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW N/A
 (Spray arc, short circuiting arc, etc)

Electrode Wire feed speed range N/A

TECHNIQUE (QW-410)

String or Weave Bead Both
 Orifice or Gas Cup Size N/A
 Initial and Interpass Cleaning (Brushing, Grinding, etc.) Grind and/or Brush

Method of Back Gouging Grind and/or Brush, if required
 Oscillation _____
 Contact Tube to Work Distance _____
 Multiple or Single Pass(per side) Multiple
 Multiple or Single Electrodes Single
 Travel Speed (Range) 2 - 8 I.P.M.
 Peening None
 Other N/A

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</u>	
	<u>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</u>	
	<u>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</u>	
	<u>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 OW-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	50-600/(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	50-600/(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)	

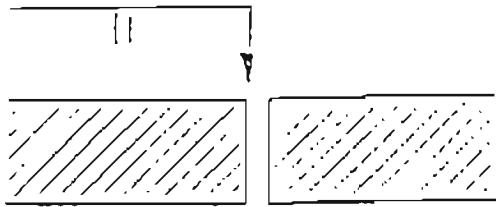


FIG.1
SINGLE SQUARE BUTT

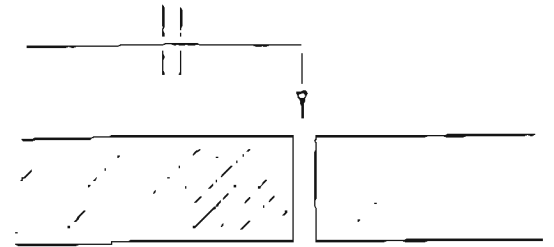


FIG.6
DOUBLE SQUARE BUTT

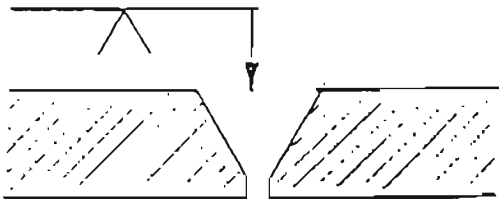


FIG.2
SINGLE VEE BUTT

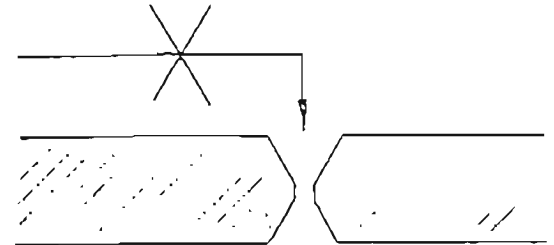


FIG.7
DOUBLE VEE BUTT

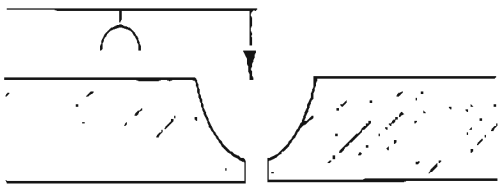


FIG.3
SINGLE U BUTT

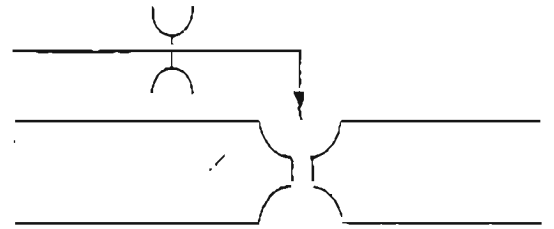


FIG.8
DOUBLE U BUTT

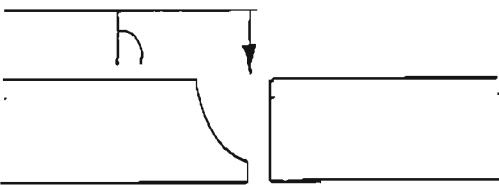


FIG.4
SINGLE J BUTT

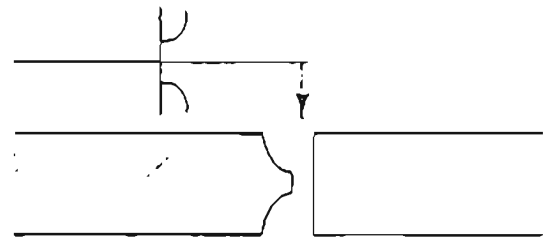


FIG.9
DOUBLE J BUTT

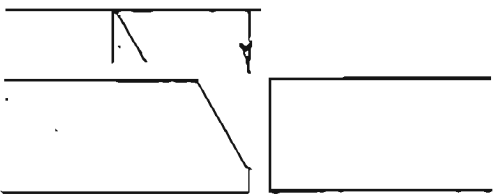


FIG.5
SINGLE BEVEL BUTT

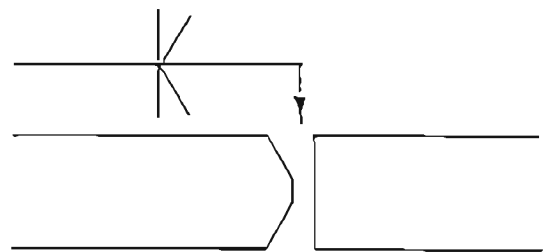
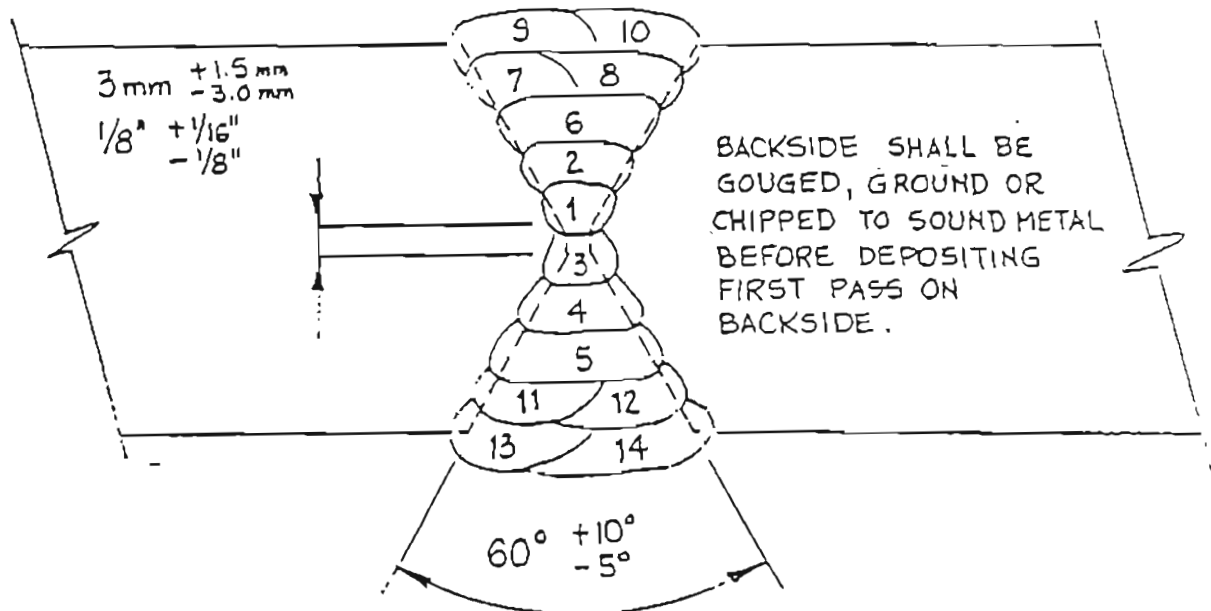
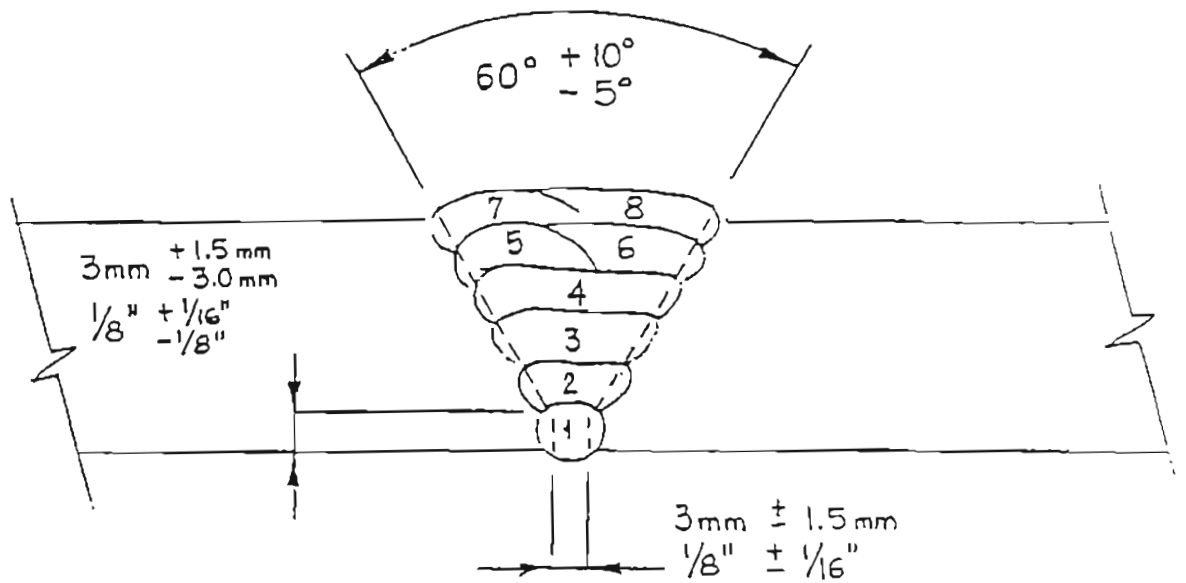


FIG.10
DOUBLE BEVEL BUTT

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. 01S Date January 29, 2001
 WPS No. WE-02
 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-106</u> Type or Grade <u>B</u> P-No. <u>1</u> P-No. <u>1</u> Thickness of Test Coupon <u>0.375"</u> Diameter of Test Coupon <u>6" (machined)</u> Other _____	POSTWELD HEAT TREATMENT (QW-407) Temperature <u>1125°F +/- 25°F</u> Time <u>2 Hr</u> 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", 1/8"</u> <u>3/32", 1/8"</u> Other _____ Weld Metal Thickness $T=0.125"$ $T=0.25"$	GAS (QW-408) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Gas(es)</th> <th style="text-align: left; border-bottom: 1px solid black;">Percent Composition Mixture</th> <th style="text-align: left; border-bottom: 1px solid black;">Flow Rate</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>	Gas(es)	Percent Composition Mixture	Flow Rate	Shielding <u>N/A</u>			Trailing _____			Backing _____		
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Shielding <u>N/A</u>													
Trailing _____													
Backing _____													
POSITION (QW-405) Position of Groove <u>5G</u> Weld Progression (Uphill, Downhill) <u>Uphill</u> Other _____	ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>60-90</u> Volts <u>10-20</u> Tungsten Electrode Size <u>N/A</u> Other _____												
PREHEAT (QW-406) Preheat Temp. <u>50°F</u> Interpass Temp. <u>200°F Min. 550°F Max.</u> Other _____	TECHNIQUE (QW-410) Travel Speed <u>2 - 8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation <u>N/A</u> Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____												

QW-483 (Back)

PQR No. 01S

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	0.739	0.353	0.261	18,190	69,700	D.P.M
#6	0.743	0.347	0.258	18,140	70,400	D.P.M

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
#1 Side Bend	Pass
#2 Side Bend	Pass
#3 Side Bend	Pass
#4 Side Bend	Pass

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 _____

Deposit Analysis _____

Other _____

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

Tests conducted by: Alfor Metallurgical Laboratory Test No. 01-043

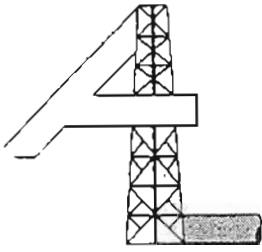
We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

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

Date January 29, 2001

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 #01-043

WPS #WE-02; PQR #01S

January 25, 2001

METAL TEST REPORT

Material Description: ASME SA-106, Grade B; NPS6 X 0.375" W.T. pipe; SMAW welded;
E6010 Root + E7018-1 Fill & Cap; PWHT 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:	0.739 in.	0.743 in.
Thickness:	0.353 in.	0.347 in.
Area:	0.261 sq. in.	0.258 sq. in.
Ultimate Load:	18 190 lb	18 140 lb
Ultimate Tensile Strength:	69 700 psi	70 400 psi
Fracture Character:	Ductile	Ductile
Fracture Location:	Parent	Parent

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

Yours very truly,

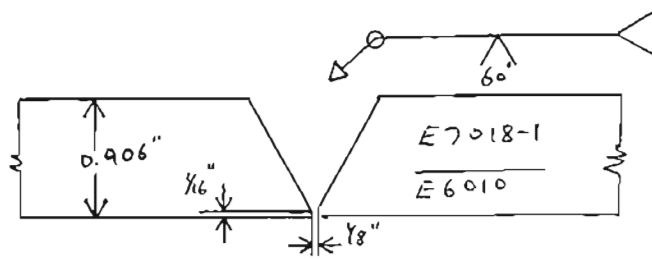
ALFOR METALLURGICAL COMPANY LTD.

CEM
1/25/01
CHARLES. E. MOZESON, P. Eng.

CEM
Jan. 25, 2001

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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-106</u> Type or Grade <u>B</u> P-No. <u>P1</u> to P-No. <u>P1</u> Thickness of Test Coupon <u>0.906"</u> Diameter of Test Coupon <u>Pipe 8"</u> <u>PIPE</u> Other <u>SCH160</u>	POSTWELD HEAT TREATMENT (QW-407) Temperature <u>1125°F +/- 25°F</u> Time <u>2 Hr.</u> 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>F3</u> <u>F4</u> Weld Metal Analysis A-No. <u>1</u> <u>1</u> Size of Filler Metal <u>3/32", 1/8"</u> <u>1/8", 1/4"</u> Other _____ Weld Metal Thickness <u>T=0.125"</u> <u>0.781"</u>	GAS (QW-408) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Gas(es)</th> <th style="text-align: left;">Percent Composition Mixture</th> <th style="text-align: left;">Flow Rate</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>	Gas(es)	Percent Composition Mixture	Flow Rate	Shielding <u>N/A</u>			Trailing _____			Backing _____		
Gas(es)	Percent Composition Mixture	Flow Rate											
Shielding <u>N/A</u>													
Trailing _____													
Backing _____													
POSITION (QW-405) Position of Groove <u>5G</u> Weld Progression (Uphill, Downhill) <u>Uphill</u> Other _____	ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>90-180</u> Volts <u>10-24</u> Tungsten Electrode Size <u>N/A</u> Other _____												
PREHEAT (QW-406) Preheat Temp. <u>50°F</u> Interpass Temp. <u>200°F Min. 550°F Max.</u> Other _____	TECHNIQUE (QW-410) Travel Speed <u>2 - 8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation <u>N/A</u> Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____												

QW-483 (Back)

PQR No. 02S

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	0.733	0.831	0.609	43,700	71,700	D.P.M.
#6	0.754	0.873	0.658	47,150	71,600	D.P.M.

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
#1 Side Bend	Pass
#2 Side Bend	Pass
#3 Side Bend	Pass
#4 Side Bend	Pass

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 _____

Deposit Analysis _____

Other _____

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

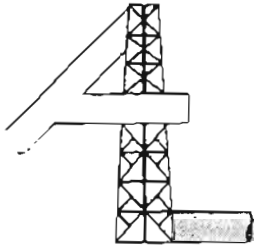
Tests conducted by: Alfor Metallurgical Laboratory Test No. 01-043

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 January 29, 2001 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 #01-043

WPS #WE-02; PQR #02S

January 25, 2001

METAL TEST REPORT

Material Description: ASME SA-106, Grade B; NPS8 X 0.906" W.T. pipe; SMAW welded;
E6010 Root + E7018-1 Fill & Cap; PWHT 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:	0.733 in.	0.754 in.
Thickness:	0.831 in.	0.873 in.
Area:	0.609 sq. in.	0.658 sq. in.
Ultimate Load:	43 700 lb	47 150 lb
Ultimate Tensile Strength:	71 700 psi	71 600 psi
Fracture Character:	Ductile	Ductile
Fracture Location:	Parent	Parent

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

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CEM
Jan-25, 2001

CEM
1/25/01
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. 03S Date January 29, 2001
 WPS No. WE-02
 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>6 LF2</u> P-No. <u>P1 - G1</u> P-No. <u>P1 - G2</u> Thickness of Test Coupon <u>0.249"</u> Diameter of Test Coupon <u>SCH 80 Mach. 4"</u> Other _____	POSTWELD HEAT TREATMENT (QW-407) Temperature <u>1125°F +/- 25°F</u> Time <u>2 Hr.</u> 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", 1/8" 3/32", 1/8"</u> Other _____ Weld Metal Thickness <u>T=0.1245" T=0.1245"</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>Gas(es)</th> <th>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>Uphill</u> Other _____	ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>60-90</u> Volts <u>10-20</u> Tungsten Electrode Size <u>N/A</u> Other _____															
PREHEAT (QW-406) Preheat Temp. <u>50°F</u> Interpass Temp. <u>200°F Min. 550°F Max.</u> Other _____	TECHNIQUE (QW-410) Travel Speed <u>2 - 8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation <u>N/A</u> Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____															

QW-483 (Back)

PQR No. 03S

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

Guided-Bend 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. _____

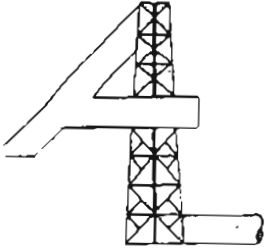
Tests conducted by: Alfor Metallurgical Laboratory Test No. 01-043

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 January 29, 2001 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 #01-043

WPS #WE-02; PQR #03S

January 25, 2001

CHARPY V-NOTCH IMPACT TEST RESULTS

Material Description: ASME SA-333, Grade 6 to SA-350, Grade LF2; NPS4 X 0.249" W.T.; SMAW welded; E6010 Root + E7018-1 Fill & Cap; PWHT condition.

Specimen Type: Charpy V-notch 0.221 inch (5.61 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: 39, 26, 37 ft-lb;

SA-333 Heat-affected zone: 49, 63, 72 ft-lb;

SA-350 Heat-affected zone: 23, 27, 34 ft-lb.

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CLM
Jan 25, 2001

CLM
1/25/01

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. 04S Date January 29, 2001
 WPS No. WE-02
 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 style="text-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>6</u> <u>LF2</u> P-No. <u>P1 - G1</u> P-No. <u>P1 - G2</u> Thickness of Test Coupon <u>0.5"</u> Diameter of Test Coupon <u>8" SCH 80</u> Other _____	POSTWELD HEAT TREATMENT (QW-407) Temperature <u>1125°F +/- 25°F</u> Time <u>2 Hr.</u> 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", 1/8"</u> <u>1/8", 5/32"</u> Other _____ Weld Metal Thickness <u>T=0.125"</u> <u>0.375"</u>	GAS (QW-406) <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Gas(es)</th> <th style="text-align: left; border-bottom: 1px solid black;">Percent Composition Mixture</th> <th style="text-align: left; border-bottom: 1px solid black;">Flow Rate</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>	Gas(es)	Percent Composition Mixture	Flow Rate	Shielding <u>N/A</u>			Trailing _____			Backing _____		
Gas(es)	Percent Composition Mixture	Flow Rate											
Shielding <u>N/A</u>													
Trailing _____													
Backing _____													
POSITION (QW-405) Position of Groove <u>5G</u> Weld Progression (Uphill, Downhill) <u>Uphill</u> Other _____	ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>60-90</u> Volts <u>10-20</u> Tungsten Electrode Size <u>N/A</u> Other _____												
PREHEAT (QW-406) Preheat Temp. <u>50°F</u> Interpass Temp. <u>200°F Min. 550°F Max.</u> Other _____	TECHNIQUE (QW-410) Travel Speed <u>2 - 8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation <u>N/A</u> Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____												

QW-483 (Back)

PQR No. 045

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

Guided-Bend 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. _____

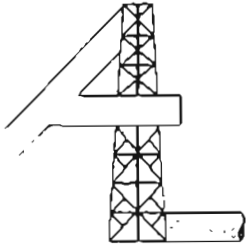
Tests conducted by: Alfor Metallurgical Laboratory Test No. 01-043

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 January 29, 2001 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 #01-043

WPS #WE-02; PQR #04S

January 25, 2001

CHARPY V-NOTCH IMPACT TEST RESULTS

Material Description: ASME SA-333, Grade 6 to SA-350, Grade LF2; NPS8 X 0.500" W.T.;
SMAW welded; E6010 Root + E7018-1 Fill & Cap; PWHT 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: 38, 33, 25 ft-lb;

SA-333 Heat-affected zone: 52, 81, 74 ft-lb;

SA-350 Heat-affected zone: 68, 55, 61 ft-lb.

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CLM
Jan 25, 2001

CLM
1/25/01

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. 05S Date January 29, 2001
 WPS No. WE-02
 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>5</u> <u>LF2</u> P-No. <u>P1-G1</u> P-No. <u>P1-G2</u> Thickness of Test Coupon <u>0.5"</u> Diameter of Test Coupon <u>8" SCH 80</u> Other _____	POSTWELD HEAT TREATMENT (QW-407) Temperature <u>1125°F +/- 25°F</u> Time <u>2 Hr.</u> 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> Size of Filler Metal <u>3/32", 1/8"</u> <u>1/8", 5/32"</u> Other _____ Weld Metal Thickness <u>T=0.125"</u> <u>0.375"</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>Gas(es)</th> <th>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>Uphill</u> Other _____	ELECTRICAL CHARACTERISTICS (QW-409) Current <u>D.C.</u> Polarity <u>Rev</u> Amps. <u>60-90</u> Volts <u>10-20</u> Tungsten Electrode Size <u>N/A</u> Other _____															
PREHEAT (QW-406) Preheat Temp. <u>50°F</u> Interpass Temp. <u>200°F Min. 550°F Max.</u> Other _____	TECHNIQUE (QW-410) Travel Speed <u>2-8 I.P.M.</u> String or Weave Bead <u>Both</u> Oscillation <u>N/A</u> Multipass or Single Pass (per side) <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____															

QW-483 (Back)

PQR No. 055

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

Guided-Bend 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 Vickers Hardness Test (See attached) _____

Deposit Analysis _____

Other _____

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

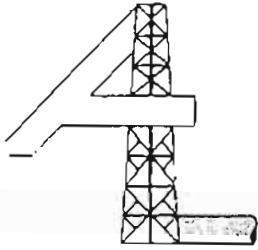
Tests conducted by: Alfor Metallurgical Laboratory Test No. 01-043

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 January 29, 2001 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 #01-043

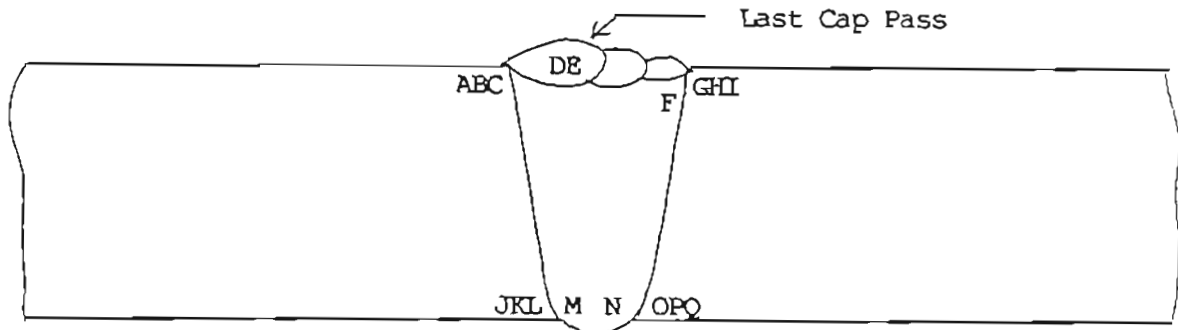
WPS #WE-02; PQR #05S

January 25, 2001

VICKERS HARDNESS TESTING OF STEEL WELDMENT

Material Description: ASME SA-333, Grade 6 to SA-350, Grade LF2; NPS8 X 0.500" W.T.; SMAW welded; E6010 Root + E7018-1 Fill & Cap; PWHT 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.



<u>SA-333</u>		<u>SA-350</u>	
Location	HV1	Location	HV1
A	187	G	180
B	196	H	175
C	205	I	172
D	186	J	161
E	185	K	166
F	152	L	169
		M	156
		N	162
		O	155
		P	148
		Q	154

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

Jan. 25, 2001

1/25/01

CHARLES E. MOZESON, P. Eng.