WELDING PROCEDURE SPECIFICATION NO.: VOSL-1

WELDING PROCEDURE QUALIFICATION RECORD NO.(S): VOSL-1-1, VOSL-1-2

QUALIFIED FOR

Base Metal (Typical): P1 Groups 1 & 2 to P1 Groups 1 & 2
(SA 333 Gr.6, SA 350 Gr.LF2, SA 420 WPL6, SA 516 Gr.70 etc.)

Process(es): SMAW

Weld Types: GROOVE & FILLET

Position: ALL POSITIONS

Diameter: ALL DIAMETERS

Filler Metal: E6010, E7016-1

BASE METAL CONDITIONS & GROOVE THICKNESS RANGE QUALIFIED:
NOTCH TOUGHNESS APPLICATIONS TO -46°C AS WELDED
BASE METAL THICKNESS RANGE

3.2 to 25.4 mm (0.125 to 1.0 in.) inclusive

COMBINED DEPOSITED WELD METAL THICKNESS

| ASME B31.1 | 19.1 mm (0.750 in.) maximum |
| ASME B31.3 | 19.1 mm (0.750 in.) maximum |
| ASME SECTION VIII, DIVISION 1 | 25.4 mm (1.0 in.) maximum |

PROVINCIAL REGISTRATION

Prepared by LUDWIG ASSOCIATES LTD. in accordance with the requirements of ASME Section IX
Company Name: VETERAN OILFIELD SERVICES LTD.
Welding Procedure Specification No.: VOSSL-1  Date: July 25, 2011
Supporting PQR No.(s): VOSSL-1-1, VOSSL-1-2
Welding Process(es): Shielded Metal-Arc Welding (SMAW)

JOINTS (QW-402)
Joint Design: All ASME groove & fillet, reference construction drawing for joint details.
Root Opening: As per attached typical groove designs, see figures 1 to 15 attached
Backing: With or without Retainers: Not required

BASE METALS (QW-403)
P-Number: P1 Groups 1 & 2  To P-Number: P1 Groups 1 & 2
Thickness Range: Groove: See cover page for thickness qualified by governing code
Fillet: All base metal thicknesses
Pipe Diameter Ranges: Groove: All diameters
Fillet: All diameters
Deposited Weld Metal (Per Pass): E6010: 3.2 mm (0.125 in.) maximum
E7018-1: 4.8 mm (0.188 in.) maximum

FILLER METALS (QW-404)
Specification No. (SFA): SMAW
AWS No. (Class): E6010
F-No.: F3
A-No.: A1
Size: 3/32 to 3/16 in. inclusive
Deposited Weld Metal Thickness Range:
Groove: 4.8 mm (0.188 in.) max. (1) 20.6 mm (0.812 in.) max. (1)
Fillet: All fillet sizes
(1) Combined deposited weld metal thickness shall not exceed 19.1 mm (0.750 in.) for ASME B31.1, B31.3 and 25.4 mm (1.0 in.) for ASME Section VIII, Div.1

POSITION (QW-405)
Position of Groove: All positions  Position of Fillet: All positions
Weld Progression: F3: Vertical up or down  F4: Vertical up

PREHEAT (QW-406)
Preheat Temperature (Minimum): 10°C (50°F)
Interpass Temperature (Maximum): 260°C (500°F)
Preheat Maintenance: 10°C (50°F) prior to welding. Preheat maintenance is not required if welding is interrupted or after the completion of welding unless required by the code of construction.
POSTWELD HEAT TREATMENT (QW-407)
Temperature Range: N/A
Time Range: N/A

ELECTRICAL CHARACTERISTICS (QW-409)
Current: Direct
Amps: See Table #1
Polarity: Reverse, electrode positive
Volts: See Table #1

Maximum Heat Input
Base Metal Thickness Range
0.125 - 0.499 in.
0.50 - 1.0 in.
E6010 Electrode
30,350 J/in.
24,560 J/in.
E7018-1 Electrode
37,515 J/in.
53,750 J/in.

TECHNIQUE (QW-410)
Manual or Automatic: Manual
Multiple or Single Pass Per Side: F3: Either, F4: Multiple
String or Weave: Either
Travel Speed: See Table #1
Initial & Interpass Cleaning: Brushing, chipping or grinding as required
Method of Back Gouging: Air carbon arc, back-grind as required
Peening: Not permitted
Use of Thermal Process: N/A

<table>
<thead>
<tr>
<th>TABLE 1 - WELDING PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>SMAW</td>
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<tr>
<td>SMAW</td>
</tr>
<tr>
<td>SMAW</td>
</tr>
</tbody>
</table>

Note: Welding parameters shall be adjusted to insure that the maximum heat input value specified in QW-409 above is not exceeded.
Heat Input (joules per inch) = (Amperage X Voltage X 60) / Travel Speed (inches per minute)
TYPICAL JOINT DESIGNS

Figure 1
Single Square Butt

Figure 2
Single Square Butt with Backing Strip

Figure 3
Double Square Butt

Figure 4
Single Vee Butt

Figure 5
Single Vee Butt with Backing Strip

Figure 6
Double Vee Butt

Figure 7
Single U Butt

Figure 8
Single U Butt with Backing Strip

Figure 9
Double U Butt

Figure 10
Single J Butt

Figure 11
Single J Butt with Backing Strip

Figure 12
Double J Butt

Figure 13
Single Bevel Butt

Figure 14
Single Bevel Butt with Backing Strip

Figure 15
Double Bevel Butt

Additional joint designs and internal misalignment on circumferential welds shall be within the dimensional limits stated on the approved construction drawing and/or the engineering design.
**QW-483 PROCEDURE QUALIFICATION RECORD (PQR)**

- **Company Name:** VETERAN OILFIELD SERVICES LTD.
- **Procedure Qualification Record No.:** VOSL-1-1
- **Welding Procedure Specification No.:** VOSL-1
- **Welding Process(es):** Shielded Metal-Arc Welding (SMAW)

### JOINTS (QW-402)
- **Type:** Butt joint, single vee groove, see next page

### BASE METALS (QW-403)
- **Material Specification No.:** SA 333 to SA 350
- **Type or Grade:** Gr. 6 to Gr. LF2
- **P-No.:** P1 Grp. 1
- **To P-No.:** P1 Grp. 2
- **Thickness:** 6.32 mm (0.249 in.)
- **Heat Number:** 264760 to 577V0
- **Carbon Equivalent:** 0.36 to 0.39
- **Diameter:** 168.3 mm (6.625 in.) O.D.
- **Other:** Schedule 80 m/c to 0.249 in.
- **Deposited Weld Metal (Per Pass):** Did not exceed 2.4 mm (0.094 in.) for E6010, and 3.2 mm (0.125 in.) for E7018-1
- **Per CSA Z662 Carbon Equivalent formula:** See attached chemical composition product analysis material test report

### FILLER METALS (QW-404)
- **Specification No. (SFA):** SFA 5.1
- **AWS No. (Class):**
  - E6010 (3)
  - E7018-1 (4)
- **Filler Metal F-No.:** F3
- **Filler Metal A-No.:** A1
- **Size of Electrode:** See attached sketch
- **Deposited Weld Metal Thickness:**
  - 2.4 mm (0.094 in.)
  - 3.9 mm (0.155 in.)
- **Lincoln Electric Company:** Lincoln Fleetweld 5P+
- **Air Liquide Canada Inc.:** LA 18 Plus

### POSITION (QW-405)
- **Position of Groove:** 5G
- **Weld Progression:** Vertical up

### PREHEAT (QW-406)
- **Preheat Temperature:** 10°C (50°F)
- **Interpass Temp. (Max.):** 204°C (400°F)

### POSTWELD HEAT TREATMENT (QW-407)
- **Temperature:** N/A
- **Time:** N/A

### ELECTRICAL CHARACTERISTICS (QW-409)
- **Current:** Direct
- **Polarity:** Reverse, electrode positive
- **Amps:** See next page
- **Volts:** See next page
- **Heat Input:** F3: 24,580 J/in. maximum
- **F4: 53,750 J/in. maximum

### TECHNIQUE (QW-410)
- **Manual or Automatic:** Manual
- **Multiple or Single Pass Per Side:** F3: Single
- **String or Weave:** Root: String
- **Travel Speed:** See next page
- **Use of Thermal Process:** N/A

Prepared by LUDWIG ASSOCIATES LTD. in accordance with the requirements of ASME Section IX
<table>
<thead>
<tr>
<th>Pass</th>
<th>Process</th>
<th>Filler Metal</th>
<th>Diameter mm (in.)</th>
<th>Current &amp; Polarity</th>
<th>Amperage Range</th>
<th>Voltage Range</th>
<th>Travel Speed mm/min (i.p.m.)</th>
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<tbody>
<tr>
<td>1</td>
<td>SMAW</td>
<td>E6010</td>
<td>3.2 (1/8)</td>
<td>DCRP</td>
<td>90 - 92</td>
<td>25 - 27</td>
<td>119 (4.7)</td>
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<tr>
<td>2</td>
<td>SMAW</td>
<td>E7018-1</td>
<td>2.4 (3/32)</td>
<td>DCRP</td>
<td>77 - 79</td>
<td>21 - 23</td>
<td>80 (3.2)</td>
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<tr>
<td>3</td>
<td>SMAW</td>
<td>E7018-1</td>
<td>2.4 (3/32)</td>
<td>DCRP</td>
<td>77 - 79</td>
<td>21 - 23</td>
<td>70 (2.7)</td>
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Prepared by LUDWIG ASSOCIATES LTD. in accordance with the requirements of ASME Section IX
**TENSILE TEST (QW-150)**

<table>
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<th>Specimen No.</th>
<th>Width mm (in.)</th>
<th>Thickness mm (in.)</th>
<th>Area Sq. mm (Sq. in.)</th>
<th>Ultimate Load N (lbs.)</th>
<th>Ultimate Stress MPa (psi)</th>
<th>Character &amp; Fracture Location</th>
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<tbody>
<tr>
<td>T1</td>
<td>19.1</td>
<td>4.80</td>
<td>93.4</td>
<td>47 712</td>
<td>511</td>
<td>Partial Cup &amp; Cone</td>
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<td></td>
<td>(0.752)</td>
<td>(0.193)</td>
<td>(0.145)</td>
<td>(10,700)</td>
<td>(74,100)</td>
<td>Parent Metal (SA 350 Gr.LF2)</td>
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<td>T2</td>
<td>19.1</td>
<td>5.30</td>
<td>101</td>
<td>52 351</td>
<td>517</td>
<td>Partial Cup &amp; Cone</td>
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<td></td>
<td>(0.752)</td>
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<td>(75,000)</td>
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**GUIDED BEND TEST (QW-160)**

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<th>Type &amp; Figure No.</th>
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<th>Type &amp; Figure No.</th>
<th>Result</th>
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<td>QW-462.3a, TFB - F1</td>
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<td>QW-462.3a, TRB - R2</td>
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<td>QW-462.3a, TFB - F2</td>
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**NOTCH-TOUGHNESS TEST**

<table>
<thead>
<tr>
<th>Type of Test</th>
<th>Charpy V-Notch</th>
<th>Orientation</th>
<th>Transverse Specimen Size</th>
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<tbody>
<tr>
<td>Test Temperature</td>
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<td>Specimen Size</td>
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<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Impact Values J (ft. lbs)</th>
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</thead>
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<td>R2.1</td>
<td>Weld Metal</td>
<td>29.8 (22.0)</td>
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<td>R2.2</td>
<td>Weld Metal</td>
<td>26.3 (19.4)</td>
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<td>R2.3</td>
<td>Weld Metal</td>
<td>25.0 (18.4)</td>
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<tr>
<td>R3.1</td>
<td>P1 Grp.1 - HAZ</td>
<td>12.2 (9.0)</td>
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<td>R3.2</td>
<td>P1 Grp.1 - HAZ</td>
<td>56.1 (41.4)</td>
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<tr>
<td>R3.3</td>
<td>P1 Grp.1 - HAZ</td>
<td>13.0 (9.6)</td>
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<tr>
<td>R4.1</td>
<td>P1 Grp.2 - HAZ</td>
<td>85.7 (63.2)</td>
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<tr>
<td>R4.2</td>
<td>P1 Grp.2 - HAZ</td>
<td>39.1 (28.8)</td>
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<tr>
<td>R4.3</td>
<td>P1 Grp.2 - HAZ</td>
<td>46.4 (34.2)</td>
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</table>

**OTHER TESTS**

Vickers Hardness - see attached laboratory test report

Welders Name: Trevor Weiss
Tests Conducted By: Ludwig Associates Ltd.
Laboratory Test No.: E11-621.1
Certificate File No.: W-17933

We certify 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: VETERAN OILFIELD SERVICES LTD.

Date: ___________________________ Signed: ___________________________
Company Name: VETERAN OILFIELD SERVICES LTD.

Procedure Qualification Record No.: VOSL-1-2

Date: July 13, 2011

Welding Procedure Specification No.: VOSL-1

Welding Process(es): Shielded Metal-Arc Welding (SMAW)

JOINTS (QW-402)

Type: Butt joint, single vee groove, see next page

BASE METALS (QW-403)

Material Specification No.: SA 516 to SA 516

Type or Grade: Gr.60 to Gr.70

P-No. P1 Grp.1 To P-No. P1 Grp.2

Thicknes: 12.7 mm (0.50 in.)

Heat Number: 344404 to 344404

Carbon Equivalent (5): 0.39 to 0.39

Other:

Deposit Metal Weld (Per Pass): Did not exceed 2.4 mm (0.094 in.) for E6010,

and 3.2 mm (0.125 in.) for E7018-1

(5) Per CSA Z662 Carbon Equivalent formula. See attached chemical composition product

analysis material test report

FILLER METALS (QW-404)

Specification No. (SFA): SFA 5.1

AWS No. (Class): E6010 (6) E7018-1 (7)

Filler Metal F-No.: F3 F4

Filler Metal A-No.: A1 A1

Size of Electrode: See attached sketch

Deposited Weld Metal Thickness: 2.4 mm (0.094 in.) 10.3 mm (0.406 in.)

(6) Lincoln Electric Company: Lincoln Fleetweld 5P+

(7) Air Liquide Canada Inc.: LA 18 Plus

POSITION (QW-405)

Position of Groove: 3G

Weld Progression: Vertical up

PREHEAT (QW-406)

Preheat Temperature: 10°C (50°F)

Interpass Temp. (Max.): 260°C (500°F)

POSTWELD HEAT TREATMENT (QW-407)

Temperature: N/A

Time: N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current: Direct

Amps: See next page

Heat Input: F3: 24,560 J/in. maximum

Vols: See next page

F4: 53,750 J/in. maximum

TECHNIQUE (QW-410)

Manual or Automatic: Manual

Multiple or Single Pass Per Side: F3: Single F4: Multiple

String or Weave: Root: String Remainder: Weave

Travel Speed: See next page

Use of Thermal Process: N/A

Prepared by LUDWIG ASSOCIATES LTD. in accordance with the requirements of ASME Section IX
<table>
<thead>
<tr>
<th>Pass</th>
<th>Process</th>
<th>Filler Metal</th>
<th>Diameter mm (in.)</th>
<th>Current &amp; Polarity</th>
<th>Amperage Range</th>
<th>Voltage Range</th>
<th>Travel Speed mm/min (i.p.m.)</th>
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<tbody>
<tr>
<td>1</td>
<td>SMAW</td>
<td>E6010</td>
<td>3.2 (1/8)</td>
<td>DCRP</td>
<td>87 - 91</td>
<td>23 - 25</td>
<td>133 (5.2)</td>
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<tr>
<td>2</td>
<td>SMAW</td>
<td>E7018-1</td>
<td>2.4 (3/32)</td>
<td>DCRP</td>
<td>76 - 80</td>
<td>20 - 22</td>
<td>93 (3.7)</td>
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<tr>
<td>3</td>
<td>SMAW</td>
<td>E7018-1</td>
<td>2.4 (3/32)</td>
<td>DCRP</td>
<td>76 - 80</td>
<td>20 - 22</td>
<td>52 (2.4)</td>
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<td>4</td>
<td>SMAW</td>
<td>E7018-1</td>
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<td>78 - 82</td>
<td>20 - 22</td>
<td>181 (7.1)</td>
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<td>5</td>
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<td>E7018-1</td>
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<td>83 - 87</td>
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<td>2.4 (3/32)</td>
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<td>128 (5.0)</td>
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<td>2.4 (3/32)</td>
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<td>82 - 86</td>
<td>21 - 23</td>
<td>120 (4.7)</td>
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<td>8</td>
<td>SMAW</td>
<td>E7018-1</td>
<td>3.2 (1/8)</td>
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<td>22 - 24</td>
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### TENSILE TEST (QW-150)

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<th>Specimen No.</th>
<th>Width mm (in.)</th>
<th>Thickness mm (in.)</th>
<th>Area Sq. mm (Sq. in.)</th>
<th>Ultimate Load N (lbs.)</th>
<th>Ultimate Stress MPa (psi)</th>
<th>Character &amp; Fracture Location</th>
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<tbody>
<tr>
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<td>11.3</td>
<td>216</td>
<td>115 065</td>
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<tr>
<td>T2</td>
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<td>12.0</td>
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<td>120 963</td>
<td>528</td>
<td>Partial Cup &amp; Cone</td>
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### GUIDED BEND TEST (QW-160)

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<th>Result</th>
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<th>Result</th>
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<tbody>
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<td>QW-462.2, TSB - S3</td>
<td>Pass</td>
</tr>
<tr>
<td>QW-462.2, TSB - S2</td>
<td>Pass</td>
<td>QW-462.2, TSB - S4</td>
<td>Pass</td>
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### NOTCH-TOUGHNESS TEST

- **Type of Test**: Charpy V-Notch
- **Test Temperature**: -46°C (-50°F)
- **Orientation**: Specimen Size 10 X 10 mm

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Impact Values J (ft. lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2.1</td>
<td>Weld Metal</td>
<td>66.8 (64.0)</td>
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<tr>
<td>S2.2</td>
<td>Weld Metal</td>
<td>66.2 (63.6)</td>
</tr>
<tr>
<td>S2.3</td>
<td>Weld Metal</td>
<td>58.6 (43.2)</td>
</tr>
<tr>
<td>S3.1</td>
<td>P1 Grp.1 - HAZ</td>
<td>74.6 (55.0)</td>
</tr>
<tr>
<td>S3.2</td>
<td>P1 Grp.1 - HAZ</td>
<td>114 (84.0)</td>
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<tr>
<td>S3.3</td>
<td>P1 Grp.1 - HAZ</td>
<td>&gt;145 (&gt;107)</td>
</tr>
<tr>
<td>S4.1</td>
<td>P1 Grp.2 - HAZ</td>
<td>108 (79.4)</td>
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<tr>
<td>S4.2</td>
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<td>S4.3</td>
<td>P1 Grp.2 - HAZ</td>
<td>50.4 (37.2)</td>
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### OTHER TESTS

- **Vickers Hardness**: see attached laboratory test report

**Welders Name**: Trevor Weiss  
**Certificate File No.**: W-17933

**Tests Conducted By**: Ludwig Associates Ltd  
**Laboratory Test No.**: E11-521.2

We certify 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**: VETERAN OILFIELD SERVICES LTD.

**Date**  
**Signed**
# LABORATORY TEST REPORT

**Customer:** Veteran Oilfield Services Ltd.  
**Box 149**  
**Whitecourt, AB**  
**T7S 1P3**  

**Laboratory Test No.:** E11-621.1  
**Date:** July 21, 2011  

**Attention:** Cody Young  

**PQR No.:** VOSL-1-1  
**Material:** SA 333 Gr. 6 to SA 350 Gr. LF2  
**Size:** 168.3 mm (6.625 in.) O.D. x 6.32 mm (0.249 in.) w.t.  
**Thermal Condition:** As Welded  

---

## TENSILE TEST QW-150

<table>
<thead>
<tr>
<th>SAMPLE NUMBER</th>
<th>WIDTH mm (in.)</th>
<th>THICKNESS mm (in.)</th>
<th>AEA sq. mm (sq. in.)</th>
<th>ULTIMATE LOAD N (lbs)</th>
<th>UTS MPa (psi)</th>
<th>FRACTURE TYPE</th>
<th>FRACTURE LOCATION</th>
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<tbody>
<tr>
<td>T1</td>
<td>19.1</td>
<td>4.80</td>
<td>93.4</td>
<td>47,712</td>
<td>511</td>
<td>Partial Cup &amp; Cone</td>
<td>Parent Metal (SA 350 Gr. LF2)</td>
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<tr>
<td>T2</td>
<td>19.1</td>
<td>5.30</td>
<td>101</td>
<td>52,351</td>
<td>517</td>
<td>Partial Cup &amp; Cone</td>
<td>Parent Metal (SA 350 Gr. LF2)</td>
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<tr>
<td>QW-462.1(b)</td>
<td>(0.752)</td>
<td>(0.193)</td>
<td>(0.145)</td>
<td>(10,700)</td>
<td>(74,100)</td>
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<td></td>
</tr>
<tr>
<td>QW-462.1(b)</td>
<td>(0.752)</td>
<td>(0.209)</td>
<td>(0.157)</td>
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<td></td>
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<td></td>
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</tbody>
</table>

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## GUIDED-BEND TEST QW-160

<table>
<thead>
<tr>
<th>SAMPLE WIDTH:</th>
<th>38.1 mm (1.50 in.)</th>
<th>PLUNGER SIZE:</th>
<th>22.2 mm (0.875 in.)</th>
<th>SAMPLE THICKNESS:</th>
<th>6.32 mm (0.249 in.)</th>
<th>YOKE SIZE:</th>
<th>41.1 mm (1.62 in.)</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>QW-462.3(a)</td>
<td>Face Bend</td>
<td>Face Bend</td>
<td>Root Bend</td>
<td>Root Bend</td>
<td>Pass</td>
<td>Pass</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>SAMPLE NUMBER(S)</td>
<td>F1</td>
<td>F2</td>
<td>R1</td>
<td>R2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

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**Samples associated with this report will be discarded in 30 days.**

---

**Laboratory Test Conducted By:**  
Feng Cao, T.T. / Natasha Collier, C.E.T.
LUDWIG ASSOCIATES LTD.
Materials and Welding Consulting

LABORATORY TEST REPORT

Customer: Veteran Oilfield Services Ltd.
Box 149
Whitecourt, AB
T7S 1P3

Attention: Cody Young

PQR No.: VOSL-1-1
Material: SA 333 Gr. 6 to SA 350 Gr. LF2
Size: 168.3 mm (6.625 in.) O.D. x 6.32 mm (0.249 in.) w.t.
Thermal Condition: As Welded

Laboratory Test No.: E11-621.1
Date: July 21, 2011
Heat No.: 264760 to 577V0

CHARPY V-NOTCH IMPACT TEST

SPECIMEN SIZE: 10 x 5 mm (0.394 x 0.197 in.)
ORIENTATION: Transverse
TEST TEMP.: -48°C (-55°F)

MACHINE: Satec SI-1K3, S/N: 1503
CAPACITY: 407 J (300 ft-lbf)
VERIFIED RANGE: 3.4-145 J (2.5-107 ft-lbf)

<table>
<thead>
<tr>
<th>Specimen Number</th>
<th>Notch Location</th>
<th>Impact Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Joules</td>
</tr>
<tr>
<td>R2.1</td>
<td>Weld Metal within 1/16&quot; of root</td>
<td>29.8</td>
</tr>
<tr>
<td>R2.2</td>
<td>Weld Metal within 1/16&quot; of root</td>
<td>26.3</td>
</tr>
<tr>
<td>R2.3</td>
<td>Weld Metal within 1/16&quot; of root</td>
<td>25.0</td>
</tr>
<tr>
<td>R3.1</td>
<td>Gr. 6 – HAZ</td>
<td>12.2</td>
</tr>
<tr>
<td>R3.2</td>
<td>Gr. 6 – HAZ</td>
<td>56.1</td>
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<tr>
<td>R3.3</td>
<td>Gr. 6 – HAZ</td>
<td>13.0</td>
</tr>
<tr>
<td>R4.1</td>
<td>Gr. LF2 - HAZ</td>
<td>85.7</td>
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<tr>
<td>R4.2</td>
<td>Gr. LF2 - HAZ</td>
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</tr>
<tr>
<td>R4.3</td>
<td>Gr. LF2 - HAZ</td>
<td>46.4</td>
</tr>
</tbody>
</table>

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Laboratory Test Conducted By: Wilson Symington, T.T. / Natashua Collier, C.E.T.
LABORATORY TEST REPORT

Customer: Veteran Oilfield Services Ltd.
Box 149
Whitecourt, AB
T7S 1P3

Laboratory Test No.: E11-621.1
Date: July 21, 2011

Attention: Cody Young

PQR No.: VOSL-1-1
Heat No.: 264760 to 577V0
Material: SA 333 Gr. 6 to SA 350 Gr. LF2
Size: 168.3 mm (6.625 in.) O.D. x 6.32 mm (0.249 in.) w.t.
Thermal Condition: As Welded

HARDNESS TEST

Type of Test: Vickers 10kg (HV10)  Instrument: Buehler 5112

We certify the test results in this report and that the specimen(s) were prepared and tested in accordance with the requirements of ASTM E384-10. Material information has been provided by the Customer whose name appears on this report.

Samples associated with this report will be discarded in 30 days

Laboratory Test Conducted By: ____________________________
Michelle Marien, T.T. / Natashua Collier, C.E.T.
LABORATORY TEST REPORT

Customer: Veteran Oilfield Services Ltd.
Box 149
Whitecourt, AB
T7S 1P3

Laboratory Test No.: E11-621.2
Date: July 19, 2011

Attention: Cody Young

PQR No.: VOSL-1-2
Material: SA 516 Gr. 60 to SA 516 Gr. 70
Thickness: 12.7 mm (0.500 in.)
Thermal Condition: As Welded

Heat No.: 354637 to 354637

TENSILE TEST QW-150

<table>
<thead>
<tr>
<th>SAMPLE NUMBER</th>
<th>WIDTH mm (in.)</th>
<th>THICKNESS mm (in.)</th>
<th>REA sq. mm (sq. in.)</th>
<th>ULTIMATE LOAD N (lbs)</th>
<th>UTS MPa (psi)</th>
<th>FRACATURE TYPE</th>
<th>FRACATURE LOCATION</th>
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<tbody>
<tr>
<td>T1</td>
<td>19.1</td>
<td>11.3</td>
<td>216</td>
<td>115 065</td>
<td>533</td>
<td>Partial Cup &amp; Cone</td>
<td>Parent Metal (SA 516 Gr. 60)</td>
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<tr>
<td>T2</td>
<td>19.1</td>
<td>12.0</td>
<td>229</td>
<td>120 963</td>
<td>528</td>
<td>Partial Cup &amp; Cone</td>
<td>Parent Metal (SA 516 Gr. 70)</td>
</tr>
</tbody>
</table>

GUIDED-BEND TEST QW-160

<table>
<thead>
<tr>
<th>SAMPLE WIDTH: 9.52 mm (0.375 in.)</th>
<th>SAMPLE THICKNESS: 12.7 mm (0.500 in.)</th>
<th>YOKE SIZE: 60.3 mm (2.375 in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLUNGER SIZE: 38.1 mm (1.50 in.)</td>
<td>Side Bend</td>
<td>Side Bend</td>
</tr>
<tr>
<td>QW-462.2</td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>SAMPLE NUMBER(S)</td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td>RESULTS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Samples associated with this report will be discarded in 30 days.

Laboratory Test Conducted By: Michelle Marien, T.T. / Natasha Collier, C.E.T.
# Laboratory Test Report

**Customer:** Veteran Oilfield Services Ltd.  
Box 149  
Whitecourt, AB  
T7S 1P3

**Laboratory Test No.:** E11-621.2  
**Date:** July 19, 2011

**Attention:** Cody Young

<table>
<thead>
<tr>
<th>PQR No.</th>
<th>Heat No.</th>
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<tbody>
<tr>
<td>VOSL-1-2</td>
<td>354637 to 354637</td>
</tr>
</tbody>
</table>

**Material:** SA 516 Gr. 60 to SA 516 Gr. 70  
**Thickness:** 12.7 mm (0.500 in.)  
**Thermal Condition:** As Welded

## Charpy V-Notch Impact Test

**Specimen Size:** 10 x 10 mm (0.394 x 0.394 in.)  
**Orientation:** Transverse  
**Test Temp.:** -46°C (-50°F)

<table>
<thead>
<tr>
<th>Specimen Number</th>
<th>Notch Location</th>
<th>Impact Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Joules</td>
</tr>
<tr>
<td>S2.1</td>
<td>Weld Metal within 1/16&quot; of root</td>
<td>86.8</td>
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<tr>
<td>S2.2</td>
<td>Weld Metal within 1/16&quot; of root</td>
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<tr>
<td>S2.3</td>
<td>Weld Metal within 1/16&quot; of root</td>
<td>58.6</td>
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<tr>
<td>S3.1</td>
<td>Gr. 60 – HAZ</td>
<td>74.6</td>
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<td>S3.2</td>
<td>Gr. 60 – HAZ</td>
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<td>S3.3</td>
<td>Gr. 60 – HAZ</td>
<td>&gt;145</td>
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<tr>
<td>S4.1</td>
<td>Gr. 70 - HAZ</td>
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<tr>
<td>S4.3</td>
<td>Gr. 70 - HAZ</td>
<td>50.4</td>
</tr>
</tbody>
</table>

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*Laboratory Test Conducted By:* Wilson Symington, T.T. / Natasha Collier, C.E.T.
LABORATORY TEST REPORT

Customer: Veteran Oilfield Services Ltd.
Box 149
Whitecourt, AB
T7S 1P3

Laboratory Test No.: E11-621.2
Date: July 19, 2011

Attention: Cody Young

PQR No.: VOSL-1-2
Material: SA 516 Gr. 60 to SA 516 Gr. 70
Thickness: 12.7 mm (0.500 in.)
Thermal Condition: As Welded

Heat No.: 354637 to 354637

HARDNESS TEST

Type of Test: Vickers 10kg (HV10)
Instrument: Buehler 5112

SA 516 Gr. 60

<table>
<thead>
<tr>
<th>Parent Metal</th>
<th>HAZ</th>
<th>Weld Metal</th>
<th>HAZ</th>
<th>Parent Metal</th>
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SA 516 Gr. 70

<table>
<thead>
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<th>HAZ</th>
<th>Weld Metal</th>
<th>HAZ</th>
<th>Parent Metal</th>
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Laboratory Test Conducted By:

Michelle Marien, T.T. / Natashua Collier, C.E.T.