

Report # G2573

9323-37 Avenue, NW, Edmonton, Alberta T6E 5N4

SHOP: 780-462-1072 OFFICE: 780-462-9797 FAX: 780-462-4664

**EMAIL:** [shop@allcaninspection.com](mailto:shop@allcaninspection.com)      [www.allcaninspection.com](http://www.allcaninspection.com)

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## RADIOGRAPHIC EXAMINATION REPORT

## Report # G2572

**EMAIL:** [shop@allcaninspection.com](mailto:shop@allcaninspection.com) [www.allcaninspection.com](http://www.allcaninspection.com)

**CODES**

1. ASME B31.3 N/S
2. ASME B31.3 S/C
3. ASME Sec. VIII Div. 1 UW51
4. ASME Sec. VIII Div. 1 UW52
5. CSA Z662
6. CSA Z662 (Sour)
7. API 650
8. ASME IX (QW-191.2)

Work Description: K.WR

SNT-TC-1A No: \_\_\_\_\_

|                                           |      |                     |        |                        |        |                           |  |
|-------------------------------------------|------|---------------------|--------|------------------------|--------|---------------------------|--|
| Film Make / Brand                         |      | AGFA                |        | Film Class / Type:     |        | 1-D5                      |  |
| Screens                                   | Lead | Front               | 0.010" | Back                   | 0.010" | One (no.) film per screen |  |
| Film Density in H & D:                    |      | Min.                | 2.0    | Max.                   | 4.0    |                           |  |
| Panetrometer (ICI hole type) designation: |      | N/A                 |        | Recommended Max. U.G.: |        | 0.20"                     |  |
| Source Isotope:                           |      | IRIDIUM-192 (Gamma) |        | Wall Viewing:          |        | Single                    |  |
| Effective Focal Spot Size:                |      | 0.146 inches        |        | Processing:            |        | Automatic                 |  |

## RADIOGRAPHIC EXAMINATION REPORT

## Report # G2571

**EMAIL:** [shop@allcaninspection.com](mailto:shop@allcaninspection.com)     [www.allcaninspection.com](http://www.allcaninspection.com)

**CODES**

1. ASME B31.3 N/S
2. ASME B31.3 S/C
3. ASME Sec. VIII Div. 1 UW51
4. ASME Sec. VIII Div. 1 UW52
5. CSA Z662
6. CSA Z662 (Saur)
7. API 650
8. ASME IX (QW-191.2)

Work Description: T.MO

SNT-TC-1A Level: \_\_\_\_\_ SNT-TC-1A No: \_\_\_\_\_

|                                           |                     |                        |                           |
|-------------------------------------------|---------------------|------------------------|---------------------------|
| Film Make / Brand                         | AGFA                | Film Class / Type:     | I-D5                      |
| Screens                                   | Lead                | Front                  | 0.010"                    |
|                                           |                     | Back                   | 0.010"                    |
|                                           |                     |                        | One (no.) film per screen |
| Film Density in H & D:                    | Min. 2.0            | Max.                   | 4.0                       |
| Penetrometer (ICI hole type) designation: | N/A                 | Recommended Max. U.G.: | 0.20"                     |
| Source Isotope:                           | IRIDIUM-192 (Gamma) | Wall Viewing:          | Single                    |
| Effective Focal Spot Size:                | 0.146 inches        | Processing:            | Automatic                 |

## RADIOGRAPHIC EXAMINATION REPORT

# ALL CAN INSPECTION SERVICES (2011) INC.

Report # G2570

9323-37 Avenue, NW, Edmonton, Alberta T6E 5N4

SHOP: 780-462-1072 OFFICE: 780-462-9797 FAX: 780-462-4664

EMAIL: shop@allcaninspection.com www.allcaninspection.com

PAGE 1 OF 1

|                |                                  |                   |                       |                                                                                                                                                                                                     |
|----------------|----------------------------------|-------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Client:        | <b>Sub Arc Systems</b>           | Client Job #      | <b>Welder Coupons</b> | <b>CODES</b><br>1. ASME B31.3 N/S<br>2. ASME B31.3 S/C<br>3. ASME Sec. VIII Div 1 UW51<br>4. ASME Sec. VIII Div. 1 UW52<br>5. CSA Z662<br>6. CSA Z662 (Sour)<br>7. API 650<br>8. ASME IX (QW-191.2) |
| Address:       | <b>17 Exploration Way, Devon</b> | P.O. #            | <b>Toby</b>           |                                                                                                                                                                                                     |
| Contact:       | Name: <b>Toby</b>                | Date:             | <b>July 26/17</b>     |                                                                                                                                                                                                     |
|                | Phone:                           |                   |                       |                                                                                                                                                                                                     |
| Work Location: | <b>All Can Inspection Shop</b>   | Work Description: | <b>J.Hi</b>           |                                                                                                                                                                                                     |

| NDE No:       | Size & thickness<br>Plus Code Max.<br>reinforcement | Material | Code | IQI | Technique<br>Number | Source Side of<br>Object to Film<br>Distance | Source to Object<br>Distance | Number of<br>Exposures | Welder ID | LF - Lack of Fusion<br>IP - Incomplete Penetration<br>IC - Internal Concavity<br>BT - Burn Through<br>TI - Tungsten Inclusion<br>IU - Internal Undercut<br>EU - External Undercut<br>EP - Excessive Penetration<br>P - Porosity<br>S - Slag<br>HL - High-Low<br>C - Crack<br>AB - Arc Burn<br>HB - Hollow Bead | Severity | Accept | Reject |
|---------------|-----------------------------------------------------|----------|------|-----|---------------------|----------------------------------------------|------------------------------|------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|--------|
|               |                                                     |          |      |     |                     |                                              |                              |                        |           |                                                                                                                                                                                                                                                                                                                |          |        |        |
|               |                                                     |          |      |     |                     |                                              |                              |                        |           | Severity: 1 = Slight, 2 = Medium, 3 = Severe (Reject)                                                                                                                                                                                                                                                          |          |        |        |
|               |                                                     |          |      |     |                     |                                              |                              |                        |           | Continuity                                                                                                                                                                                                                                                                                                     |          |        |        |
| 20 SMAW-SAS 1 | 5/8" SPOT                                           | P1       | 8    | 2   | RT-2                | 0.750                                        | 25.000                       | 1                      | J.Hi      |                                                                                                                                                                                                                                                                                                                |          | V      |        |
| 30 SMAW-SAS 1 | 5/8" SPOT                                           | P1       | 8    | 2   | RT-2                | 0.750                                        | 25.000                       | 1                      | J.Hi      |                                                                                                                                                                                                                                                                                                                |          | V      |        |
| 40 SMAW-SAS 1 | 5/8" SPOT                                           | P1       | 8    | 2   | RT-2                | 0.750                                        | 25.000                       | 1                      | J.Hi      |                                                                                                                                                                                                                                                                                                                |          | V      |        |

|                                       |                      |                  |                             |                            |
|---------------------------------------|----------------------|------------------|-----------------------------|----------------------------|
| RT Technician: <u>Gordon Thomas</u>   | CGSB Level: <u>2</u> | Reg. #: <u>6</u> | SNT-TC-1A Level: <u>III</u> | SNT-TC-1A No: <u>6</u>     |
| RT Assistant # 1: <u>Adele Kezama</u> | CEDO #: <u>18988</u> |                  | SNT-TC-1A Level: <u>II</u>  | SNT-TC-1A No: <u>18988</u> |
| RT Assistant # 2: _____               | CEDO #: _____        |                  | SNT-TC-1A Level: _____      | SNT-TC-1A No: _____        |

IMPORTANT: See reverse side of this form for All Can Inspection Services (2011) Inc. LIMITED LIABILITY POLICY

Technician Signature: [Signature] Date: July 26/17

Client Representative Signature: [Signature] Evaluation Date: \_\_\_\_\_

The above interpretation is a technical opinion, not a guarantee.  
 Client signature indicates acceptance of the report and results.  
 Clock tape marker and start arrow marked on weldment.  
 It is the customer's responsibility to map welds on drawings.

|                                           |                     |                           |             |
|-------------------------------------------|---------------------|---------------------------|-------------|
| Film Make / Brand                         | AGFA                | Film Class / Type:        | I-D5        |
| Screens                                   | Lead                | Front 0.010"              | Back 0.010" |
|                                           |                     | One (no.) film per screen |             |
| Film Density in H & C:                    | Min. 2.0            | Max. 4.0                  |             |
| Penetrometer (IQI hole type) designation: | N/A                 | Recommended Max. U.G.:    | 0.20"       |
| Source Isotope:                           | IRIDIUM-192 (Gamma) | Well Viewing:             | Single      |
| Effective Focal Spot Size:                | 0.146 inches        | Processing:               | Automatic   |

## RADIOGRAPHIC EXAMINATION REPORT

## Report # G2779

**EMAIL:** [shop@allcaninspection.com](mailto:shop@allcaninspection.com)     [www.allcaninspection.com](http://www.allcaninspection.com)

|                |                           |                   |                       |                               |
|----------------|---------------------------|-------------------|-----------------------|-------------------------------|
| Client:        | <b>Sub Arc Systems</b>    | Client Job #      | <b>Welder Coupons</b> | <b>CODES</b>                  |
| Address:       | 17 Exploration Way, Devon | P.O. #            | <b>Sebastian</b>      | 1. ASME B31.3 N/S             |
| Contact:       | Name: Sebastian           | Date:             | <b>May 22/18</b>      | 2. ASME B31.3 S/C             |
|                | Phone:                    |                   |                       | 3. ASME Sec. VIII Div 1 UW51  |
| Work Location: | All Can Inspection Shop   | Work Description: | L.MA                  | 4. ASME Sec. VIII Div. 1 UW52 |
|                |                           |                   |                       | 5. CSA Z662                   |
|                |                           |                   |                       | 6. CSA Z662 (Sour)            |
|                |                           |                   |                       | 7. API 650                    |
|                |                           |                   |                       | 8. Other:                     |

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|                  |                      |             |          |              |          |                  |            |               |              |
|------------------|----------------------|-------------|----------|--------------|----------|------------------|------------|---------------|--------------|
| RT Technician:   | <u>Gordon Thomas</u> | CGSB Level: | <u>2</u> | Reg. #:      | <u>6</u> | SNT-TC-1A Level: | <u>III</u> | SNT-TC-1A No: | <u>6</u>     |
| RT Assistant # 1 | <u>Ken Brunlees</u>  |             | CEDO #:  | <u>15425</u> |          | SNT-TC-1A Level: | <u>II</u>  | SNT-TC-1A No: | <u>15425</u> |
| RT Assistant # 2 |                      |             | CEDO #:  |              |          | SNT-TC-1A Level: |            | SNT-TC-1A No: |              |

|                                           |      |                     |        |                        |        |                           |  |
|-------------------------------------------|------|---------------------|--------|------------------------|--------|---------------------------|--|
| Film Make / Brand                         |      | AGFA                |        | Film Class / Type:     |        | 1-D5                      |  |
| Screens                                   | Lead | Front               | 0.010" | Back                   | 0.010" | One (no.) film per screen |  |
| Film Density in H & D:                    |      | Min.                | 2.0    | Max.                   | 4.0    |                           |  |
| Penetrometer (IQI hole type) designation: |      | N/A                 |        | Recommended Max. U.G.: |        | 0.20"                     |  |
| Source Isotope:                           |      | IRIDIUM-192 (Gamma) |        | Wall Viewing:          |        | Single                    |  |
| Effective Focal Spot Size:                |      | 0.146 inches        |        | Processing:            |        | Automatic                 |  |

## RADIOGRAPHIC EXAMINATION REPORT

## QUALITY CONTROL MANUAL

|                      |                                                        |                  |
|----------------------|--------------------------------------------------------|------------------|
| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
|----------------------|--------------------------------------------------------|------------------|

| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
|----------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|---------------|
|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| MATT MACKENZIE | W.M.A         | 06.21.17     | SAS 1                   | SMAW        | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2343  |
|                | W.M.A         | 06.21.17     | SAS 1                   | SMAW        | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2343  |
|                | W.M.A.        | 06.21.17     | SAS 1                   | SMAW        | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2343  |
|                | W.M.A.        | 08.01.17     | SAS 2                   | SAW         | F7AG      | 2G       | 1 1/4"          |                | X-Ray G 2615. |
|                |               |              |                         |             |           |          |                 |                |               |
|                |               |              |                         |             |           |          |                 |                |               |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN<br><br><b>SIGN:</b> | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b> 2017, 08, 01 |
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## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
|----------------------|--------------------------------------------------------|------------------|

| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
|----------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|--------------|
|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| MITCH GOULICER | M.GO          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray E2341  |
|                | M.GO          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray E2341  |
|                | M.GO          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G2341  |
|                | M.GO          | 08,01,17     | SAS 2                   | SAW         | F7AG      | 2G       | 1 1/4"          |                | X-Ray G2614. |
|                |               |              |                         |             |           |          |                 |                |              |
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QC (PRINT)

SIGN:

QA (PRINT) ROBERT HOFFMAN

SIGN:

DATE (yyyy-MM-dd):

DATE (yyyy-MM-dd):

2017, 08, 01

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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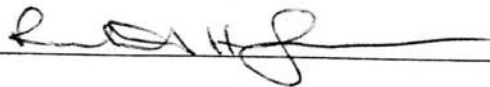
| WELDER NAME  | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS     |
|--------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|-------------|
|              |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |             |
| CHRIS JARVIS | C.JA          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G2339 |
|              | C.JA.         | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G2339 |
|              | C.JA.         | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G2339 |
|              | C.JA          | 08,01,17     | SAS 2                   | SAW         | FTAG      | 2G       | 1 1/4"          |                | X-Ray G2613 |
|              |               |              |                         |             |           |          |                 |                |             |
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QC (PRINT)

SIGN:

QA (PRINT) ROBERT HOFFMAN

SIGN:



DATE (yyyy-MM-dd):

DATE (yyyy-MM-dd):

2017, 08, 01

## QUALITY CONTROL MANUAL

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|----------------------|--------------------------------------------------------|------------------|
| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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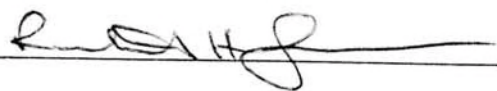
| WELDER NAME | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
|-------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|--------------|
|             |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| MATI TURMEL | M.TU          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2342 |
|             | M.TU          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2342 |
|             | M.TU          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2342 |
|             | M.TU          | 07,26,17     | SAS 2                   | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G 2575 |
|             |               |              |                         |             |           |          |                 |                |              |
|             |               |              |                         |             |           |          |                 |                |              |
|             |               |              |                         |             |           |          |                 |                |              |
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|-------------------------------------------------------------------------------------------|--------------------|
| QC (PRINT)                                                                                | DATE (yyyy-MM-dd): |
| SIGN:                                                                                     |                    |
| QA (PRINT) ROBERT HOFFMAN                                                                 | DATE (yyyy-MM-dd): |
| SIGN:  | 2017, 07, 26       |

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
|----------------------|--------------------------------------------------------|------------------|

| WELDER NAME   | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
|---------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|--------------|
|               |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| JOEL OVEREARD | J.O.V         | 06.21.17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2340 |
|               | J.O.V         | 06.21.17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2340 |
|               | J.O.V         | 06.21.17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2340 |
|               | J.O.V         | 07.26.17     | SAS 2                   | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G 2574 |
|               |               |              |                         |             |           |          |                 |                |              |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN<br><br><b>SIGN:</b>  | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b><br>2017, 07, 26 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|

## QUALITY CONTROL MANUAL

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|----------------------|--------------------------------------------------------|------------------|
| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
|----------------------|--------------------------------------------------------|------------------|

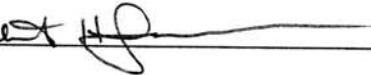
| WELDER NAME  | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS     |
|--------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|-------------|
|              |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |             |
| KEVIN WRIGHT | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | E3, F4    | 2G       | 1 1/4"          |                | X-Ray G2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | E3, F4    | 3G       | 1 1/4"          |                | X-Ray G2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | E3, F4    | 4G       | 1 1/4"          |                | X-Ray G2572 |
|              | K.W.R.        | 07.26.17     | SAS 2                   | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G2572 |
|              |               |              |                         |             |           |          |                 |                |             |
|              |               |              |                         |             |           |          |                 |                |             |
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|              |               |              |                         |             |           |          |                 |                |             |

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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN<br><br><b>SIGN:</b>  | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b><br>2017, 07, 28 |
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## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS        |
|----------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|----------------|
|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |                |
| JOEL OVERGAUND | J.OV          | 07.26.17     | SAS 2                   | SAW         | FTAG      | 2G       | 1 1/4"          |                | X Ray # G 2574 |
|                |               |              |                         |             |           |          |                 |                |                |
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| QC (PRINT)                                                                                | DATE (yyyy-MM-dd): |
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| QA (PRINT) ROBERT HOFFMAN                                                                 | DATE (yyyy-MM-dd): |
| SIGN:  | 2017, 07, 28       |

**QUALITY CONTROL MANUAL**

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| JOE NIEDERHOFF | J.NI          | 07.26.17     | SAS 1                   | SMAN        | F3, F4    | 3G       | 1 1/4"          |                | XRAY # E2573 |
|                | J.NI          | 07.26.17     | SAS 1                   | SMAN        | F3, F4    | 4G       | 1 1/4"          |                | XRAY # E2573 |
|                | J.NI          | 08.01.17     | SAS 1                   | SMAN        | F3, F4    | 2G       | 1 1/4"          |                | XRAY E 2616. |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN                        | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b> 2017, 08, 01 |
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**QUALITY CONTROL MANUAL**

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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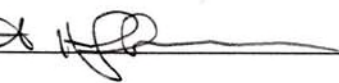
| WELDER NAME | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
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|             |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| Justin Hill | J.HI          | 07.26.17     | SAS 1                   | SMaw        | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2570 |
|             | J.HI          | 07.26.17     | SAS 1                   | SMaw        | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2570 |
|             | J.HI          | 07.26.17     | SAS 1                   | SMaw        | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2570 |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b>                                                                                                    | <b>DATE (yyyy-MM-dd):</b>                 |
| <b>QA (PRINT)</b> ROBERT HOFFMAN<br><br><b>SIGN:</b>  | <b>DATE (yyyy-MM-dd):</b><br>2017, 07, 28 |

**QUALITY CONTROL MANUAL**

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| <b>Sub-Arc Systems Inc.</b> | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | <b>Exhibit 8, Rev A</b> |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| JOE NIEDERHOFF | J.NI          | 07.26.17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X Ray # E2573 |
|                | J.NI          | 07.26.17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X Ray # E2573 |
|                |               |              |                         |             |           |          |                 |                |               |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b>                                                            | <b>DATE (yyyy-MM-dd):</b> |
| <b>QA (PRINT)</b> ROBERT HOFFMAN                                                                 | <b>DATE (yyyy-MM-dd):</b> |
| <b>SIGN:</b>  | 2017, 07, 28              |

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
|-------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|---------------|
|             |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| MATT TURNER | M.T.U.        | 07, 26, 17   |                         | SAW         | E7AG      | 2E       | 1 1/4"          |                | X Ray # G2575 |
|             |               |              |                         |             |           |          |                 |                |               |
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| QA (PRINT) ROBERT HOFFMAN                                                                 | DATE (yyyy-MM-dd): |
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## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
|----------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|---------------|
|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| JOEL OVERGAARD | J.OV          | 07.26.17     |                         | SAW         | F7A6      | 2G       | 1 1/4"          |                | X Ray # G2574 |
|                |               |              |                         |             |           |          |                 |                |               |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN                        | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b> 2017, 07, 28 |
| <b>SIGN:</b>  |                                                                         |

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME  | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
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|              |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| KEVIN WRIGHT | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2572 |
|              | K.W.R.        | 07.26.17     |                         | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G 2572 |
|              |               |              |                         |             |           |          |                 |                |              |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b>                                                                                                    | <b>DATE (yyyy-MM-dd):</b>                     |
| <b>QA (PRINT)</b> ROBERT HOFFMAN<br><br><b>SIGN:</b>  | <b>DATE (yyyy-MM-dd):</b><br><br>2017, 07, 28 |

## QUALITY CONTROL MANUAL

Sub-Arc Systems Inc.

WELDERS' QUALIFICATION RECORD  
API 650

Exhibit 8, Rev A

| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
|----------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|--------------|
|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| TYLER MONCRIEF | T. MO         | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 2G       | 1 1/4"          |                | xRay # G2571 |
|                | T. MO         | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 3G       | 1 1/4"          |                | xRay # G2571 |
|                | T. MO         | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 4G       | 1 1/4"          |                | xRay # G2571 |
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## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| MATT MACKENZIE | W.M.A         | 06.21.17     | SAS 1                   | SMAW        | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2343  |
|                | W.M.A         | 06.21.17     | SAS 1                   | SMAW        | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2343  |
|                | W.M.A.        | 06.21.17     | SAS 1                   | SMAW        | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2343  |
|                | W.M.A.        | 08.01.17     | SAS 2                   | SAW         | F7AG      | 2G       | 1 1/4"          |                | X-Ray G 2615. |
|                |               |              |                         |             |           |          |                 |                |               |
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## QUALITY CONTROL MANUAL

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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| MITCH GOULICER | M.GO          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray E2341   |
|                | M.GO          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray E2341   |
|                | M.GO          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G2341   |
|                | M.GO          | 08,01,17     | SAS 2                   | SAW         | F7AG      | 2G       | 1 1/4"          |                | X-Ray G 2614. |
|                |               |              |                         |             |           |          |                 |                |               |
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## QUALITY CONTROL MANUAL

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|              |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |             |
| CHRIS JARVIS | C.JA          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G2339 |
|              | C.JA.         | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G2339 |
|              | C.JA.         | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G2339 |
|              | C.JA          | 08,01,17     | SAS 2                   | SAW         | FTAG      | 2G       | 1 1/4"          |                | X-Ray G2613 |
|              |               |              |                         |             |           |          |                 |                |             |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN<br><br><b>SIGN:</b> | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b><br>2017, 08, 01 |
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| WELDER NAME | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
|-------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|--------------|
|             |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| MATI TURMEL | M.TU          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2342 |
|             | M.TU          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2342 |
|             | M.TU          | 06,21,17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2342 |
|             | M.TU          | 07,26,17     | SAS 2                   | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G 2575 |
|             |               |              |                         |             |           |          |                 |                |              |
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| QC (PRINT)                                                                                | DATE (yyyy-MM-dd): |
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| QA (PRINT) ROBERT HOFFMAN                                                                 | DATE (yyyy-MM-dd): |
| SIGN:  | 2017, 07, 26       |

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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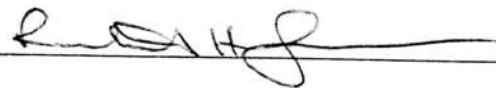
| WELDER NAME   | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
|---------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|--------------|
|               |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| JOEL OVEREARD | J.O.V         | 06.21.17     | SAS 1                   | SMW         | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2340 |
|               | J.O.V         | 06.21.17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2340 |
|               | J.O.V         | 06.21.17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2340 |
|               | J.O.V         | 07.26.17     | SAS 2                   | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G 2574 |
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2017, 07, 26

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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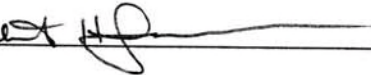
| WELDER NAME  | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS     |
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|              |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |             |
| KEVIN WRIGHT | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G2572 |
|              | K.W.R.        | 07.26.17     | SAS 2                   | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G2572 |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN<br><br><b>SIGN:</b> | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b><br>2017, 07, 28 |
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## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS        |
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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |                |
| JOEL OVERGAUND | J.OV          | 07.26.17     | SAS 2                   | SAW         | FTAG      | 2G       | 1 1/4"          |                | X Ray # G 2574 |
|                |               |              |                         |             |           |          |                 |                |                |
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| QC (PRINT)                                                                                | DATE (yyyy-MM-dd): |
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| QA (PRINT) ROBERT HOFFMAN                                                                 | DATE (yyyy-MM-dd): |
| SIGN:  | 2017, 07, 28       |

**QUALITY CONTROL MANUAL**

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| JOE NIEDERHOFF | J.NI          | 07.26.17     | SAS 1                   | SMAN        | F3, F4    | 3G       | 1 1/4"          |                | XRAY # E2573 |
|                | J.NI          | 07.26.17     | SAS 1                   | SMAN        | F3, F4    | 4G       | 1 1/4"          |                | XRAY # E2573 |
|                | J.NI          | 08.01.17     | SAS 1                   | SMAN        | F3, F4    | 2G       | 1 1/4"          |                | XRAY E 2616. |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN                        | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b> 2017, 08, 01 |
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**QUALITY CONTROL MANUAL**

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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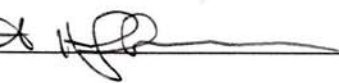
| WELDER NAME | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
|-------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|--------------|
|             |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| Justin Hill | J.HI          | 07.26.17     | SAS 1                   | SMaw        | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2570 |
|             | J.HI          | 07.26.17     | SAS 1                   | SMaw        | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2570 |
|             | J.HI          | 07.26.17     | SAS 1                   | SMaw        | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2570 |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN<br><b>SIGN:</b>  | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b> 2017, 07, 28 |
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## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
|----------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|---------------|
|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| JOE NIEDERHOFF | J.NI          | 07.26.17     | SAS 1                   | SMW         | F3, F4    | 3G       | 1 1/4"          |                | x Ray # E2573 |
|                | J.NI          | 07.26.17     | SAS 1                   | SMW         | F3, F4    | 4G       | 1 1/4"          |                | x Ray # E2573 |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b>                                                            | <b>DATE (yyyy-MM-dd):</b> |
| <b>QA (PRINT)</b> ROBERT HOFFMAN                                                                 | <b>DATE (yyyy-MM-dd):</b> |
| <b>SIGN:</b>  | 2017, 07, 28              |

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
|-------------|---------------|--------------|-------------------------|-------------|-----------|----------|-----------------|----------------|---------------|
|             |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| MATT TURNER | M.T.U.        | 07, 26, 17   |                         | SAW         | F7AG      | 2E       | 1 1/4"          |                | X Ray # G2575 |
|             |               |              |                         |             |           |          |                 |                |               |
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| QA (PRINT) ROBERT HOFFMAN                                                                 | DATE (yyyy-MM-dd): |
| SIGN:  | 2017, 07, 28       |

## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS       |
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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |               |
| JOEL OVERGAARD | J.OV          | 07,26,17     |                         | SAW         | F7A6      | 2G       | 1 1/4"          |                | X Ray # G2574 |
|                |               |              |                         |             |           |          |                 |                |               |
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| <b>QC (PRINT)</b><br><br><b>SIGN:</b><br><b>QA (PRINT)</b> ROBERT HOFFMAN                        | <b>DATE (yyyy-MM-dd):</b><br><br><b>DATE (yyyy-MM-dd):</b> 2017, 07, 28 |
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## QUALITY CONTROL MANUAL

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| Sub-Arc Systems Inc. | <b>WELDERS' QUALIFICATION RECORD</b><br><b>API 650</b> | Exhibit 8, Rev A |
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| WELDER NAME  | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
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|              |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| KEVIN WRIGHT | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 2G       | 1 1/4"          |                | X-Ray G 2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 3G       | 1 1/4"          |                | X-Ray G 2572 |
|              | K.W.R.        | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 4G       | 1 1/4"          |                | X-Ray G 2572 |
|              | K.W.R.        | 07.26.17     |                         | SAW         | F7A6      | 2G       | 1 1/4"          |                | X-Ray G 2572 |
|              |               |              |                         |             |           |          |                 |                |              |
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2017, 07, 28

## QUALITY CONTROL MANUAL

Sub-Arc Systems Inc.

WELDERS' QUALIFICATION RECORD  
API 650

Exhibit 8, Rev A

| WELDER NAME    | WELDER SYMBOL | DATE QUALIF. | QUALIFICATION PROCEDURE | LIMITATIONS |           |          |                 |                | REMARKS      |
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|                |               |              |                         | PROCESS     | ELECTRODE | POSITION | THICKNESS RANGE | DIAMETER RANGE |              |
| TYLER MONCRIEF | T. MO         | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 2G       | 1 1/4"          |                | xRay # G2571 |
|                | T. MO         | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 3G       | 1 1/4"          |                | xRay # G2571 |
|                | T. MO         | 07.26.17     | SAS 1                   | SMAW        | F3, F4    | 4G       | 1 1/4"          |                | xRay # G2571 |
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DATE (yyyy-MM-dd):

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2017, 07, 28

## **Field Erected Fuel Storage Tank Handover Package**

### **Item 4 – Inspector Qualification**

#### **Contents**

1. In House & 3<sup>rd</sup> Party Inspector Qualifications



Certificate Number: EM1-RT-1-CA

THIS IS TO CERTIFY THAT

Étienne Munger

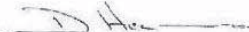
Has been examined and found to satisfy the requirements of SGS Canada inc Company Written Practice – Document No. NEP-01 rev. 16, which is in accordance with, ASNT Recommended Practice No. SNT-TC-1A and is hereby certified in the following method.

Level: Two  
Products: Industrial components  
Specific to: ASTM E94

Method: Radiographic Testing  
Technique: X-Ray and Gamma Ray

Issue Date: January 9<sup>th</sup>, 2014  
Expiry Date: January 8<sup>th</sup>, 2019

Examiner Name: Douglas Hanna  
Examiner Certificate Number: 112320

Signature of Employer's Certifying Authority: 

Examiner Signature: 

The examination records, results notice and relevant training records are held on file at the SGS facility and can be made available on request.

SGS Canada Inc.

Industrial Services 3420, Boulevard St-Joseph Est, Montréal (Québec) H1X 1W6 p (800) 361-1679 f (514) 252-0071 [www.sgs.ca](http://www.sgs.ca)

**SGS**Certificate Number: EC-S-MT-002A*This is to certify that***Étienne Munger**

Has been examined and found to satisfy the requirements of **SGS Canada** Company Written Practice - Document No **NEP-01**, which is in accordance with, ASNT Recommended Practice No **SNT-TC-1A(2006)** and is hereby certified in the following method

Level: *Two*Method: *Magnetic Testing*Products: *Engineering, Materials and components  
Sector*Technique: *Fixed installations & Portable equipment*Specific to: *ASMT V Article 7, ASTM E 709 & GEN-MP-32(E)*

On Behalf of Third Party (SGS NDT Training &amp; Examination Centre)

Examiner Name: Kai NingIssue Date: **Apr. 28, 2014**Examiner Certificate Number: 181065Expiry Date: **Apr. 27, 2019**

Signature of Employer's Certifying Authority: \_\_\_\_\_

Examiner Signature: \_\_\_\_\_



The examination records, results notice and relevant training records are held on file at the SGS facility and can be made available on request.

**SGS**Certificate Number: EC-S-PT-002A*This is to certify that***Étienne Munger**

Has been examined and found to satisfy the requirements of **SGS Canada** Company Written Practice - Document No **NEP-01**, which is in accordance with, ASNT Recommended Practice No. **SNT-TC-1A(2006)** and is hereby certified in the following

Level: **Two**Method: **Penetrant Testing**Products: **Engineering, Materials and components Sector**Technique: **Dye penetrants & Fluorescent penetrants**Specific to: **ASTM E165:2012 & GEN-LP-27(E)**

On Behalf of Third Party (SGS NDT Training &amp; Examination Centre)

Issue Date: **Apr.28,2014**Examiner Name: **Kai Ning**Expiry Date: **Apr.27,2019**Examiner Certificate Number: **181065**

Signature of Employer's Certifying Authority: \_\_\_\_\_

Examiner Signature: \_\_\_\_\_



The examination records, results notice and relevant training records are held on file at the SGS facility and can be made available on request.

**SGS**Certificate Number: EC-S-UT-002 A

This is to certify that

**Étienne Munger**

Has been examined and found to satisfy the requirements of **SGS Canada** Company Written Practice - Document No **NEP-01**, which is in accordance with, ASNT Recommended Practice No. **SNT-TC-1A(2006)** and is hereby certified in the following

Level: **Two**Method: **Ultrasonic Testing**Products: **Engineering, Materials and components  
Sector**Technique: **PULSE ECHO DIRECT CONTACT**Specific to: **ASME Section V article 4,5 and 23 Section VIII, Division I, Appendix 12; GEN-UT-63(E)**

On Behalf of Third Party (SGS NDT Training &amp; Examination Centre)

Examiner Name: **Kai Ning**Issue Date: **Apr.29, 2014**Examiner Certificate Number: **181065**Expiry Date: **Apr.28, 2019**

Signature of Employer's Certifying Authority: \_\_\_\_\_

Examiner Signature: \_\_\_\_\_



The examination records, results notice and relevant training records are held on file at the SGS facility and can be made available on request.



## Inspecteur en Soudage Certifié

**ETIENNE MUNGER**

**No. Enr# 2711**

**est un Inspecteur en soudage certifié de Niveau2 et satisfait aux exigences de la norme CSA W178.2 « Qualification des inspecteurs en soudage ».**

**Valide jusqu'au                      avril 30, 2021**

**Cette certification est valide pour le(s) code(s) et/ou la norme(s) suivant(es) :**

**CSA W47.1-09/W59-03**

**Expiration de recertification après 6 ans                      avril 30, 2024**

## Conditions

1. La possession de cette carte ne signifie nullement que son détenteur représente un organisme d'inspection certifiée en vertu de la norme CSA W178.1 et ayant du personnel et des procédures approuvées par le Bureau canadien de soudage.
2. Cette carte demeure la propriété du Bureau et peut être rappelée en tout temps.
3. L'usage de la présente carte à des fins frauduleuses peut entraîner son annulation.

Pour toute question concernant cette qualification, veuillez communiquer avec :

**1-800-844-6790 | [www.cwbgroup.org](http://www.cwbgroup.org)**





Natural Resources  
Canada

Ressources naturelles  
Canada



Name/  
Nom

Etienne Munger

Reg. No./  
No. matricule

4778

Issue Date/  
Date d'émission

2016/01/04

This card does not identify the stated individual to be an employee or representative of Natural Resources Canada, Government of Canada.

Cette carte n'identifie pas l'individu d'être un employé ou un représentant de Ressources naturelles Canada, Gouvernement du Canada.

Corrective lenses for ☒ near ☐ far vision.

Verres correctifs pour la vision de ☒ près ☐ distance.

Signature :

Canada





Natural Resources  
Canada

Ressources naturelles  
Canada

Certified to / Certifié selon : CAN / CGSB-48 9712

4778

| Method<br>Méthode | Level<br>Niveau | Sector<br>Secteur | Cert. Date<br>Date cert. | Date recert.<br>Date recert. | Expires<br>Expiration |
|-------------------|-----------------|-------------------|--------------------------|------------------------------|-----------------------|
| MT                | 2               | EMC               | 1994/04/18               |                              | 2020/02/15            |
| PT                | 1               | EMC               | 1990/07/03               |                              | 2020/02/15            |
| RT                | 2               | EMC               | 1996/05/31               |                              | 2020/02/15            |
| UT                | 1               | EMC               | 1993/11/04               |                              | 2020/02/15            |

For verification of certification status, policies and definitions, visit website:  
<http://nrc.ca/can.gc.ca/> Pour la vérification de la certification, les politiques, et les définitions,  
visitez le site web: <http://nrc.ca/can.gc.ca/>

Manager, Certifying Agency

Gestionnaire, Organisme de certification

**Etienne Munger**  
**4778**

Registration Number  
Numéro de matricule



is certified by the Canadian  
Nuclear Safety Commission  
as an Exposure Device  
Operator.

est accrédité par la Commission  
canadienne de sûreté nucléaire  
à titre d'opérateur d'appareil  
d'exposition.

**2013/02/01**

Issue Date  
Date d'émission

**2019/10/01**

Expiry Date  
Date d'expiration

A handwritten signature in black ink, appearing to read 'Cam D...'.

Designated Officer  
Fonctionnaire désigné



Canadian Nuclear  
Safety Commission

Commission canadienne  
de sûreté nucléaire

Canada

This card, when accompanied by the photo identification card issued by the NRCan National NTD Certification Body bearing the same registration number, is evidence that the holder has been certified by the Canadian Nuclear Safety Commission pursuant to Section 25 of the Nuclear Substance and Radiation Devices Regulations.

The card holder is authorized to operate an exposure device in Canada

Cette carte, lorsqu'elle est accompagnée de la carte d'identité avec photo portant le même numéro de matricule, émise par l'Organisme national de certification en END RNCan, est reconnue comme une preuve que le titulaire a été accrédité par la Commission canadienne de sûreté nucléaire en vertu de l'article 25 du Règlement sur les substances nucléaires et les appareils à rayonnement.

Le titulaire de la carte est autorisé à faire fonctionner un appareil d'exposition au Canada

## **Field Erected Fuel Storage Tank Handover Package**

### **Item 5 – Weld Procedures**

#### **Contents**

1. Approved Weld Procedures

## SUB-ARC SYSTEMS INC.

## Welding Procedure Specification

in accordance with

## ASME Section IX

**Welding Procedure Specification No.:** **SAS-1 Revision 1<sup>1</sup>**

**Supporting PQR No. (s):** SAS-1-1, SAS-1-2, SAS-1-3 Revision 1, SAS-1-4

## Qualified for

|                            |                                                                                                                                                                                                                                                                                         |                      |                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------|
| <b>Process(es):</b>        | SMAW / SMAW / SAW                                                                                                                                                                                                                                                                       | <b>Position(s):</b>  | All / All / Flat or Horizontal <sup>2</sup> |
| <b>Filler Metal F-No.:</b> | F-3 / F-4 / F-6                                                                                                                                                                                                                                                                         | <b>A-No.:</b>        | A-1 / A-1 / A-1                             |
| <b>AWS Classification:</b> | E6010 / E7018-1 / F7A6-EM12K                                                                                                                                                                                                                                                            | <b>Weld Type(s):</b> | Groove, Fillet, Weld buildup                |
| <b>Base Metal:</b>         | P-1 Group 1 or 2                                                                                                                                                                                                                                                                        | <b>To:</b>           | P-1 Group 1 or 2                            |
| <b>Typical Materials:</b>  | This procedure is qualified for all P-1 materials as specified in Table QW-422 of ASME Section IX for applications where proven notch toughness properties are not required, and P-1 Group 1 or 2 materials only for applications where proven notch toughness properties are required. |                      |                                             |
| <b>Diameter Range:</b>     | All diameters                                                                                                                                                                                                                                                                           | <b>Condition(s):</b> | As welded                                   |

|                  |                   | Normal Service   | Impact Tested to -50°F |
|------------------|-------------------|------------------|------------------------|
| Thickness Range: | ASME Section IX   | 0.062" to 1.500" | 0.125" to 1.500"       |
|                  | ASME Section VIII | 0.062" to 1.500" | 0.125" to 1.500"       |
|                  | ASME B31.1        | 0.062" to 0.750" | 0.125" to 0.750"       |
|                  | ASME B31.3        | 0.062" to 0.750" | 0.125" to 0.750"       |

<sup>1</sup>Revision 1: Revision to accommodate revision of PQR SAS-1-3 as well as the addition PQR SAS-1-4 to expand the base metal thickness range where proven notch toughness properties are required at -50°F.

<sup>2</sup>SAW position limited by process usability.

## Provincial Registration

Provincial Registration

**ABSA**

**SAFETY CODES ACT - PROVINCE OF ALBERTA  
WELDING PROCEDURE**

Reg. No. WP 2389.2

Spec No. SAS-1 (Rev 1)

Weld Process SMAW / SMAW / SAW

Matl. Gr. P No. 1 Gr 1+2 to P No. 1 Gr 1+2

Elect Gr. F No. 3+4+6 A No. 1

Th. Qual For 38.1mm P.W.H.T. NO

MIN TH QUAL 3.2mm, CVN -46°C

Yr. 14 Mo. 11 Day 5 Signed JRH  
JASON REINHART, P.ENG.  
WELDING SPECIALIST

## Provincial Registration

## Provincial Registration

**WELDING PROCEDURE SPECIFICATION (WPS) QW-482**  
(Section IX, ASME Boiler and Pressure Vessel Code)

|                                                                        |                                           |
|------------------------------------------------------------------------|-------------------------------------------|
| <b>Company Name:</b> Sub-Arc Systems Inc.                              | <b>By:</b> Gary Kohlman                   |
| <b>WPS No.:</b> SAS-1                                                  | <b>Date:</b> January 4, 2002              |
| <b>Revision No.:</b> 1 <sup>1</sup>                                    | <b>Revision Date:</b> July 15, 2014       |
| <b>Supporting PQR's:</b> SAS-1-1, SAS-1-2, SAS-1-3 Revision 1, SAS-1-4 |                                           |
| <b>Welding Process(es):</b> SMAW / SMAW / SAW                          | <b>Type(s):</b> Manual / Manual / Machine |

| JOINTS QW-402                                                                                        |                                                                                      | Joint Details                                            |                           |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------|
| <b>Joint Design:</b>                                                                                 | Butt, Tee, Lap, Corner, etc.                                                         | <b>All ASME joint designs.</b> Reference construction    |                           |
| <b>Backing:</b>                                                                                      | F-3 SMAW with or without backing.                                                    | drawings for joint details. Where joint details are not  |                           |
|                                                                                                      | F-4 SMAW with backing only.                                                          | specified, refer to typical joint detail sheet provided. |                           |
|                                                                                                      | SAW with backing only.                                                               | -----                                                    |                           |
| <b>Backing Material (Type):</b> Similar base or weld metal or backwelding as required. No Retainers. |                                                                                      |                                                          |                           |
| BASE METALS QW-403                                                                                   |                                                                                      |                                                          |                           |
| <b>P-No.:</b> P-1                                                                                    | <b>Group No.:</b> *1 or 2                                                            | <b>to P-No.:</b> P-1                                     | <b>Group No.:</b> *1 or 2 |
| OR                                                                                                   |                                                                                      |                                                          |                           |
| <b>Spec. type &amp; grade:</b>                                                                       | Not Applicable                                                                       | <b>to Spec. type &amp; grade:</b>                        | Not Applicable            |
| OR                                                                                                   |                                                                                      |                                                          |                           |
| <b>Chem. Analysis &amp; Mech. Prop.:</b>                                                             | Not Applicable                                                                       | <b>to Chem. Analysis &amp; Mech. Prop.:</b>              | Not Applicable            |
| <b>Thickness Range</b>                                                                               |                                                                                      |                                                          |                           |
| <b>Base Metal: Groove:</b>                                                                           | <b>Normal Service</b>                                                                | <b>Impact Tested to -50°F</b>                            |                           |
|                                                                                                      | Section IX                                                                           | 0.062" to 1.500"                                         | 0.125" to 1.500"          |
|                                                                                                      | Section VIII                                                                         | 0.062" to 1.500"                                         | 0.125" to 1.500"          |
|                                                                                                      | B31.1                                                                                | 0.062" to 0.750"                                         | 0.125" to 0.750"          |
|                                                                                                      | B31.3                                                                                | 0.062" to 0.750"                                         | 0.125" to 0.750"          |
| <b>Pipe Dia Range: Groove:</b>                                                                       | All diameters                                                                        |                                                          | <b>Fillet:</b> All        |
| <b>Other:</b>                                                                                        | Maximum thickness of any weld layer shall not exceed 0.500"                          |                                                          |                           |
| *Limited to P-1 Group 1 or 2 only when proven notch toughness properties are required.               |                                                                                      |                                                          |                           |
| FILLER METALS QW-404                                                                                 |                                                                                      |                                                          |                           |
| <b>Process:</b>                                                                                      | SMAW                                                                                 | SMAW                                                     | SAW                       |
| <b>Specification No. (SFA):</b>                                                                      | 5.1                                                                                  | 5.1                                                      | 5.17                      |
| <b>AWS Classification No.:</b>                                                                       | E6010                                                                                | E7018-1                                                  | EM12K                     |
| <b>F-No.:</b>                                                                                        | F-3                                                                                  | F-4                                                      | F-6                       |
| <b>A-No.:</b>                                                                                        | A-1                                                                                  | A-1                                                      | A-1                       |
| <b>Size of Filler Metals:</b>                                                                        | 3/32", 1/8", 5/32"                                                                   | 3/32", 1/8", 5/32, 3/16", 1/4"                           | 3/32", 1/8", 5/32", 3/16" |
| <b>Weld Metal Thickness - Groove:</b>                                                                | 0.250" max.                                                                          | 1.500" max.                                              | 1.500" max.               |
| <b>- Fillet:</b>                                                                                     | Unlimited                                                                            | Unlimited                                                | Unlimited                 |
| <b>Electrode-Flux (Class):</b>                                                                       | Not Applicable                                                                       | Not Applicable                                           | F7A6-EM12K-H8             |
| <b>Manufacturer:</b>                                                                                 | Not Applicable                                                                       | Not Applicable                                           | Lincoln Electric          |
| <b>Tradename:</b>                                                                                    | Not Applicable                                                                       | Not Applicable                                           | LA-61                     |
| <b>Flux Trade Name:</b>                                                                              | Not Applicable                                                                       | Not Applicable                                           | Lincoln 882 Flux          |
| <b>Alloy Flux:</b>                                                                                   | Not Applicable                                                                       | Not Applicable                                           | Neutral                   |
| <b>Consumable Insert:</b>                                                                            | Not Applicable                                                                       | Not Applicable                                           | Not Applicable            |
| <b>Supplemental Filler Metals:</b>                                                                   | Not Applicable                                                                       | Not Applicable                                           | Not Applicable            |
| <b>Product Form:</b>                                                                                 | Covered Electrode                                                                    | Covered Electrode                                        | Coiled Solid Wire         |
| <b>Other:</b>                                                                                        | E6010 limited to root pass only when proven notch toughness properties are required. |                                                          |                           |

<sup>1</sup>Revision 1: Revision to accommodate revision of PQR SAS-1-3 as well as the addition PQR SAS-1-4 to expand the base metal thickness range where proven notch toughness properties are required at -50°F.

**WELDING PROCEDURE SPECIFICATION (WPS) QW-482**  
(Section IX, ASME Boiler and Pressure Vessel Code)

WPS # SAS-1 Rev.1

| POSITIONS QW-405                         |                                                                                                                                                                                                                                                                            |               | POSTWELD HEAT TREATMENT QW-407 |                    |            |                    |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------|--------------------|------------|--------------------|
| Position(s) of Groove:                   | All                                                                                                                                                                                                                                                                        |               | Temp. Range:                   |                    |            |                    |
| Welding Progression:                     | F-3 SMAW Vertical Up or Down                                                                                                                                                                                                                                               |               | Time Range:                    |                    |            |                    |
|                                          | F-4 SMAW Vertical Up or Down                                                                                                                                                                                                                                               |               | Heating:                       | (None – As Welded) |            |                    |
|                                          | F-6 SAW Flat or Horizontal <sup>1</sup>                                                                                                                                                                                                                                    |               | Cooling:                       |                    |            |                    |
| Position(s) of Fillet:                   | All                                                                                                                                                                                                                                                                        |               |                                |                    |            |                    |
| PREHEAT QW-406                           |                                                                                                                                                                                                                                                                            |               | GAS QW-408                     |                    |            |                    |
| Temperature Min.:                        |                                                                                                                                                                                                                                                                            |               | Shielding Gas(es):             |                    |            |                    |
| Interpass Temp. Max.:                    | (See Next Page)                                                                                                                                                                                                                                                            |               | Composition:                   |                    |            |                    |
| Interpass Min.:                          |                                                                                                                                                                                                                                                                            |               | Flow Rate:                     | (Not Applicable)   |            |                    |
| Preheat Maintenance:                     | Monitor using tempilstiks, pyrometer or other suitable methods.                                                                                                                                                                                                            |               | Gas Backing:                   |                    |            |                    |
|                                          |                                                                                                                                                                                                                                                                            |               | Other:                         |                    |            |                    |
| ELECTRICAL CHARACTERISTICS QW-409        |                                                                                                                                                                                                                                                                            |               |                                |                    |            |                    |
| Current:                                 | F-3 SMAW:                                                                                                                                                                                                                                                                  | Direct - DC   | F-4 SMAW:                      | Direct - DC        | F-6 SAW:   | Direct - DC        |
| Polarity:                                | F-3 SMAW:                                                                                                                                                                                                                                                                  | Reverse - EP  | F-4 SMAW:                      | Reverse - EP       | F-6 SAW:   | Reverse - EP       |
| Amps (Range):                            | F-3 SMAW:                                                                                                                                                                                                                                                                  | 50 - 180      | F-4 SMAW:                      | 50 - 360           | F-6 SAW:   | 250 - 750          |
| Volts (Range):                           | F-3 SMAW:                                                                                                                                                                                                                                                                  | 18 - 34       | F-4 SMAW:                      | 18 - 34            | F-6 SAW:   | 22 - 38            |
| Travel Speed (Range):                    | F-3 SMAW:                                                                                                                                                                                                                                                                  | 1 - 16        | F-4 SMAW:                      | 1 - 20             | F-6 SAW:   | 4 - 35             |
| Maximum Heat Input: 0.125" to 0.625":    | F-3 SMAW:                                                                                                                                                                                                                                                                  | 25 200 J/in   | F-4 SMAW:                      | 29 640 J/in        | F-6 SAW:   | 36 428 J/in        |
| 0.625" to 1.500":                        | F-3 SMAW:                                                                                                                                                                                                                                                                  | 69 300 J/in   | F-4 SMAW:                      | 63 000 J/in        | F-6 SAW:   | 73 636 J/in        |
| Electrode Wire feed speed range:         | 50 - 550 ipm                                                                                                                                                                                                                                                               |               |                                |                    |            |                    |
| Tungsten Electrode Size & Type:          | Not Applicable                                                                                                                                                                                                                                                             |               |                                |                    |            |                    |
| Mode of Metal Transfer for GMAW:         | Not Applicable                                                                                                                                                                                                                                                             |               |                                |                    |            |                    |
| Other:                                   | Maximum heat input mandatory only when proven notch toughness is required.                                                                                                                                                                                                 |               |                                |                    |            |                    |
| TECHNIQUE QW-410                         |                                                                                                                                                                                                                                                                            |               |                                |                    |            |                    |
| String or Weave Bead:                    | String and weave. Weave size shall be controlled to prevent exceeding maximum heat inputs.                                                                                                                                                                                 |               |                                |                    |            |                    |
| Orifice or Gas Cup Size:                 | Not Applicable                                                                                                                                                                                                                                                             |               |                                |                    |            |                    |
| Initial Cleaning:                        | Base material must be thoroughly cleaned of all foreign material (scale, rust, oil, grease, paint, tar, etc.) at least 1" back on each side of the joint prior to welding. All surfaces to be welded shall be smooth, uniform and free from notches, slag, fins and burrs. |               |                                |                    |            |                    |
| Interpass Cleaning:                      | Perform by wire brush, chipping hammer, power brushing, grinding, etc. after each weld layer.                                                                                                                                                                              |               |                                |                    |            |                    |
| Method of Back Gouging:                  | Arc air, gouge, grind, etc., grind to clean metal where thermal processes are used if required.                                                                                                                                                                            |               |                                |                    |            |                    |
| Oscillation:                             | Not Applicable                                                                                                                                                                                                                                                             |               |                                |                    |            |                    |
| Contact Tube to Work Distance:           | 1/4" to 1 1/4"                                                                                                                                                                                                                                                             |               |                                |                    |            |                    |
| Multiple or Single Pass (per side):      | Single or multiple passes per side, multiple only when proven notch toughness properties are required.                                                                                                                                                                     |               |                                |                    |            |                    |
| Multiple or Single Electrodes & Spacing: | Single or Multiple, multiple only when proven notch toughness properties are required.                                                                                                                                                                                     |               |                                |                    |            |                    |
| Peening:                                 | Peening is not allowed                                                                                                                                                                                                                                                     |               |                                |                    |            |                    |
| TYPICAL WELDING PARAMETERS               |                                                                                                                                                                                                                                                                            |               |                                |                    |            |                    |
| Process                                  | Filler Metal                                                                                                                                                                                                                                                               |               | Type & Polarity                | Current            |            | Travel Speed (IPM) |
|                                          | AWS Classification                                                                                                                                                                                                                                                         | Diameter (in) |                                | Amp. Range         | Volt Range |                    |
| SMAW                                     | E6010                                                                                                                                                                                                                                                                      | 3/32          | DC EP                          | 50 - 100           | 18 - 30    | 1 - 12             |
| SMAW                                     | E6010                                                                                                                                                                                                                                                                      | 1/8           | DC EP                          | 50 - 150           | 20 - 32    | 2 - 14             |
| SMAW                                     | E6010                                                                                                                                                                                                                                                                      | 5/32          | DC EP                          | 60 - 180           | 22 - 34    | 4 - 16             |
| SMAW                                     | E7018-1                                                                                                                                                                                                                                                                    | 3/32          | DC EP                          | 50 - 130           | 18 - 28    | 1 - 14             |
| SMAW                                     | E7018-1                                                                                                                                                                                                                                                                    | 1/8           | DC EP                          | 70 - 180           | 19 - 30    | 2 - 16             |
| SMAW                                     | E7018-1                                                                                                                                                                                                                                                                    | 5/32          | DC EP                          | 90 - 230           | 20 - 32    | 3 - 18             |
| SMAW                                     | E7018-1                                                                                                                                                                                                                                                                    | 3/16          | DC-EP                          | 130 - 290          | 20 - 34    | 4 - 19             |
| SMAW                                     | E7018-1                                                                                                                                                                                                                                                                    | 1/4           | DC-EP                          | 180 - 360          | 22 - 34    | 4 - 20             |
| SAW                                      | F7A6-EM12K                                                                                                                                                                                                                                                                 | 3/32          | DC EP                          | 250 - 750          | 22 - 38    | 4 - 35             |
| SAW                                      | F7A6-EM12K                                                                                                                                                                                                                                                                 | 1/8           |                                |                    |            |                    |
| SAW                                      | F7A6-EM12K                                                                                                                                                                                                                                                                 | 5/32          |                                |                    |            |                    |
| SAW                                      | F7A6-EM12K                                                                                                                                                                                                                                                                 | 3/16          |                                |                    |            |                    |
| Notes:                                   | Number of weld layers and size of filler metal may vary with thickness of base material and position of weld.                                                                                                                                                              |               |                                |                    |            |                    |

<sup>1</sup>SAW position limited by process usability.

**WELDING PROCEDURE SPECIFICATION (WPS) QW-482**  
(Section IX, ASME Boiler and Pressure Vessel Code)

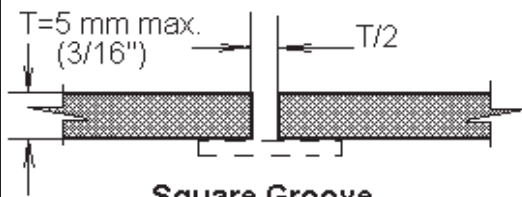
WPS # SAS-1 Rev.1

| PREHEAT & INTERPASS TEMPERATURE MINIMUM AND MAXIMUM |                                                                                            |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Section VIII :</b>                               | 50°F minimum for all P-1 materials except as listed below :                                |
|                                                     | 175°F if the joint thickness exceeds 1.000" and the specified carbon content exceeds 0.30% |
|                                                     | 200°F if the joint thickness is 1.250" to 1.500"                                           |
| <b>B31.1 :</b>                                      | 50°F minimum for all P-1 materials                                                         |
| <b>B31.3 :</b>                                      | 50°F for all P-1 materials except as listed below:                                         |
|                                                     | 175°F if the specified minimum tensile strength of the base material exceeds 71 ksi        |
| <b>Max. Interpass Temp.:</b>                        | 650°F for normal service, 550°F for applications where proven notch toughness is required  |

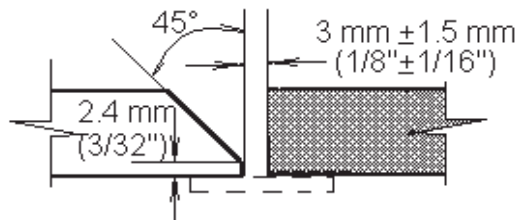
Reference to relevant construction codes is mandatory prior to production welding to determine any supplementary restrictions.

# Typical Joint Details QW-482

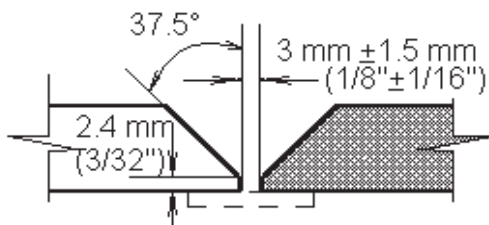
Prepared by: Qualimet



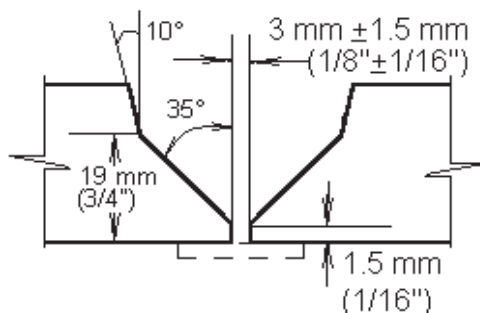
**Square Groove**



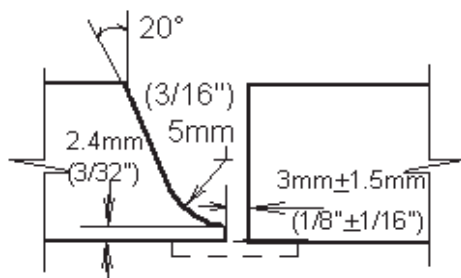
**Single Bevel Groove**



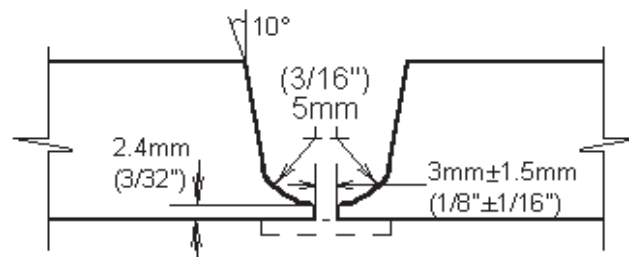
**Single Vee Groove**



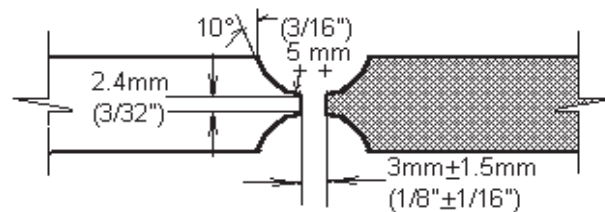
**Modified Single Vee Groove**



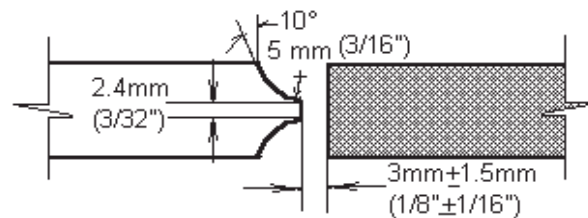
**Single J Groove**



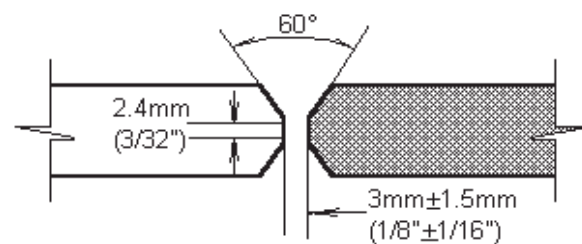
**Single U Groove**



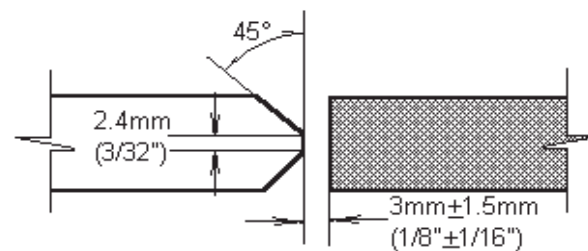
**Double U Groove**



**Double J Groove**



**Double Vee Groove**



**Double Bevel Groove**