

DATA SHEET

No.:

FCAW-10-CVN

Date:

May 5, 2008

Company Name: Mosher Engineering Wldg. Specification No: RTR-4
Address: 1358 Queen Street Reference WPQR:
Halifax Nova Scotia B3J 2H5 Ref. Standards: CSA W47.1, W59 & W48

Material Information:
Position: Horizontal Welding Process: FCAW Consumable: E491T-12MJ-H4

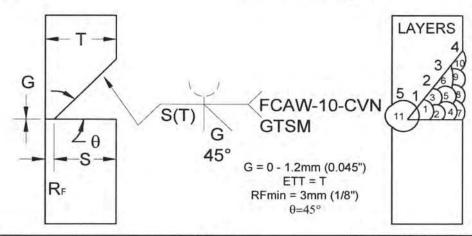
| Position:   | Horizontal          | Welding Process:  | FCAW              | Consumable:    | E491T-12MJ-  | H4    |
|-------------|---------------------|-------------------|-------------------|----------------|--------------|-------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: | Globular Transfer | Shielding Gas: | 75% Ar 25% C | 002   |
|             | Cat. 5 (27J @-40°C) | Process Mode:     | Semi-Automatic    | Gas Flow;      | 45           | ft3/h |
|             |                     | Tungsten Type:    |                   | Tungsten Dia.: |              | in    |

Cleaning: Wire brush and remove slag in between passes PHT Temp: 15°C or 59 °F

PWHT Temp: NA °F

Typical Joint Details:

Typical Pass & Layer Sequence:



| :                          | Joint De  | etails:  |   |   | Technique & Process Informati   | tion:   |  |
|----------------------------|---|--|---|---|---|---|--|
| Butt, Tee, Corner          | G =   | 0  | ⊙ (°) =   | 45  | Electrical Stickout:  | 3/4 ± 1/  | 8 in   |
| Complete Joint Penetration | R <sub>F</sub> =                                | 1/8  |   |   | Nozzle Diameter:  | 1/2   | in   |
| Backgouged to Sound Metal  |   |  |   |   | Average Deposition Rate:  | 7.0   | lbs/h  |
|                            | Butt, Tee, Corner<br>Complete Joint Penetration | Butt, Tee, Corner $G =$ Complete Joint Penetration $R_F =$ | Butt, Tee, Corner $G = 0$<br>Complete Joint Penetration $R_F = 1/8$ | Butt, Tee, Corner $G = 0  \Theta \ (^{\circ}) = $<br>Complete Joint Penetration $R_F = 1/8$ | Butt, Tee, Corner $G = 0$ $\Theta$ (°) = 45<br>Complete Joint Penetration $R_F = 1/8$ | Butt, Tee, Corner $G = 0$ $\Theta$ (°) = 45 Electrical Stickout:  Complete Joint Penetration $R_F = 1/8$ Nozzle Diameter: | Butt, Tee, Corner $G = 0$ $\Theta$ (°) = 45 Electrical Stickout: 3/4 $\pm$ 1/4 Complete Joint Penetration $R_F = 1/8$ Nozzle Diameter: 1/2 |

Welding Parameters:

| Weld | Size | Depth of<br>Prep'n | Side<br>No. | Lay | yer | No. | Pa  | SS | No. | Electro | de Size | Section April | nt ( |     | 100000000000000000000000000000000000000 |   | Speed<br>in) | 79(7)(9 | V<br>of | olts<br>ts) |      | el S | Speed<br>in) | Average<br>Heat Inpu |
|------|------|--------------------|-------------|-----|-----|-----|-----|----|-----|---------|---------|---------------|------|-----|---|---|--------------|---------|---------|-------------|------|------|--------------|----------------------|
| in.  | mm   | in                 |             | Min |     | Max | Min |    | Max | in.     | mm      | Min           |      | Max | Min                                     |   | Max          | Min     |         | Max         | Min  |      | Max          | (kJ/in)              |
| 3/8  | 9.5  | 1/4                | 1           | 1   | -   | 2   | 1   | -  | 3   | 0.045   | 1.2     | 200           | -    | 240 | 300                                     | - | 400          | 27      | -       | 29          | 22.6 | -    | 30.6         | 13.9                 |
|      |      |                    | 2           |     |     | 5   |     |    | 11  | 0.045   | 1.2     | 200           | -    | 240 | 300                                     | - | 400          | 27      | -       | 29          | 17.0 | -    | 23.0         | 18.5                 |
| 5/8  | 16   | 1/2                | 1           | 1   | -   | 3   | 1   | -  | 6   | 0.045   | 1.2     | 200           | -    | 240 | 300                                     | - | 400          | 27      | -       | 29          | 17.0 | -    | 23.0         | 18.5                 |
|      |      |                    | 2           |     |     | 5   |     |    | 11  | 0.045   | 1.2     | 200           | -    | 240 | 300                                     | - | 400          | 27      | -       | 29          | 17.0 | -    | 23.0         | 18.5                 |
| 3/4  | 19   | 5/8                | 1           | 1   | -   | 4   | 1   | -  | 10  | 0.045   | 1.2     | 200           | -    | 240 | 300                                     | - | 400          | 27      | -       | 29          | 18.1 | -    | 24.5         | 17.3                 |
|      |      |                    | 2           |     |     | 5   |     |    | 11  | 0.045   | 1.2     | 200           | -    | 240 | 300                                     | - | 400          | 27      | -       | 29          | 17.0 | -    | 23.0         | 18.5                 |

Revision Status: CWB Approval: Company's Approval:

| Date:      | Explanation: |  |
|------------|--------------|--|
| 22/07/2008 | P5744        |  |

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir
- 4. Tack weld parameters to be per main weld parameters
- 5. Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



Jul 25, 2008

Valid only if welding consumables are certified by the CWB





No.:

FCAW-11-CVN

## DATA SHEET

Tungsten Type:

Date:

Tungsten Dia.:

May 5, 2008

in

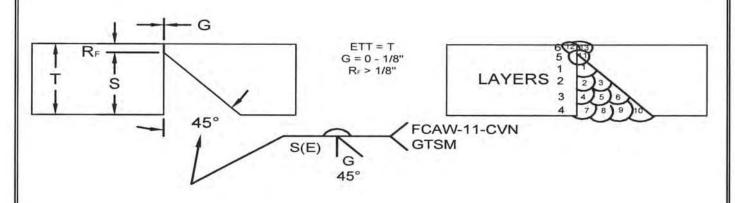
Company Name: Mosher Engineering Wldg. Specification No: RTR-4 Address: 1358 Queen Street Reference WPQR: Halifax Nova Scotia B3J 2H5 Ref. Standards: CSA W47.1, W59 & W48 Material Information: Vertical Up E491T-12MJ-H4 Position: Welding Process: **FCAW** Consumable: CAN G40.21 350WT Base Mat'l: Mode of Transfer: Globular Transfer Shielding Gas: 75% Ar 25% CO2 Cat. 5 (27J @-40°C) Process Mode: Semi-Automatic Gas Flow: ft3/h

Cleaning: Wire brush and remove slag in between passes PHT Temp: 15°C or 59 °F

PWHT Temp: NA °F

Typical Joint Details:

Typical Pass & Layer Sequence:



| Joint Configuration | :                          | Joint De         | tails: |       |    | Technique & Process Informa | tion:    |       |
|---------------------|----------------------------|------------------|--------|-------|----|-----------------------------|----------|-------|
| Joint Type:         | Butt, Tee, Corner          | G =              | 0      | (°) = | 45 | Electrical Stickout:        | 5/8 ± 1/ | 8 in  |
| Weld Type:          | Complete Joint Penetration | R <sub>F</sub> = | 1/8    |       |    | Nozzle Diameter:            | 5/8      | in    |
| Backgouging:        | Backgouged to Sound Metal  |                  |        |       |    | Average Deposition Rate:    | 6.5      | lbs/h |

### Welding Parameters:

| Weld | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | SS | No. | Electro | de Size | I KARAMARA | nt ( |     | 100 | eec | d Speed<br>in) | 1000 | c V | olts<br>ts) |      | el S        | Speed<br>in) | Average<br>Heat Inpu |
|------|------|--------------------|-------------|-----|-----|-----|-----|----|-----|---------|---------|------------|------|-----|-----|-----|----------------|------|-----|-------------|------|-------------|--------------|----------------------|
| in.  | mm   | in                 |             | Min |     | Max | Min |    | Max | in.     | mm      | Min        |      | Max | Min |     | Max            | Min  |     | Max         | Min  |             | Max          | (kJ/in)              |
| 3/8  | 9.5  | 1/4                | 1           | 1   | -   | 2   | 1   | -  | 3   | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | 1-  | 27          | 13.1 | 1-1         | 19.7         | 15.4                 |
|      |      |                    | 2           | 5   | -   | 6   | 11  | -  | 13  | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | T-  | 27          | 15.4 | 1-1         | 18.7         | 14.8                 |
| 1/2  | 13   | 3/8                | 1           | 1   | -   | 3   | 1   | -  | 6   | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | -   | 27          | 13.1 | -           | 19.7         | 15.4                 |
|      |      |                    | 2           | 5   | -   | 6   | 11  | -  | 13  | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | -   | 27          | 15.4 | -           | 18.7         | 17.5                 |
| 5/8  | 16   | 1/2                | 1           | 1   | -   | 3   | 1   | -  | 6   | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | -   | 27          | 13.1 | I-I         | 19.7         | 15.4                 |
|      | 1    |                    | 2           | 5   | -   | 6   | 11  | -  | 13  | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | -   | 27          | 15.4 | H           | 18.7         | 17.5                 |
| 3/4  | 19   | 5/8                | 1           | 1   | -   | 4   | 1   | -  | 10  | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | -   | 27          | 13.1 | <b>I</b> -I | 19.7         | 15.4                 |
|      | 1    |                    | 2           | 5   | -   | 6   | 11  | -  | 13  | 0.045   | 1.2     | 155        | -    | 175 | 175 | -   | 225            | 24   | 1-  | 27          | 15.4 | 1-1         | 18.7         | 17.5                 |

## Revision Status:

|            | Explanation: |
|------------|--------------|
| 22/07/2008 | P5744        |

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



CWB Approval:

Jul 25, 2008

Valid only if welding consumables are certified by the CWB





DATA SHEET

No.:

SMAW-06-CVN

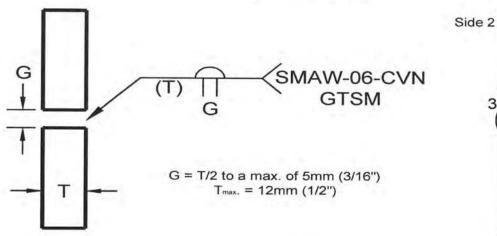
Date:

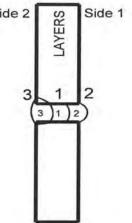
May 5, 2008

Company Name: Mosher Engineering Wldg. Specification No: RTR-1 Address: 1358 Queen Street Reference WPQR: Halifax Nova Scotia **B3J 2H5** Ref. Standards: CSA W47.1, W59 & W48 Material Information: Position: Horizontal Welding Process: E4918/E48018/E7018 SMAW Consumable: CAN G40.21 350WT Base Mat'l: Mode of Transfer: N/A Shielding Gas: N/A Cat. 5 (27J @-40°C) Process Mode: Manual Gas Flow: ft3/h Tungsten Type: Tungsten Dia.: in Cleaning: Wire brush and remove slag in between passes PHT Temp: °F 15°C or 59 PWHT Temp: ٥F

Typical Joint Details:

Typical Pass & Layer Sequence:





| Joint Configuration: |                            | Joint De         | etails: |       |   | Technique & Process Informa | tion:     |       |
|----------------------|----------------------------|------------------|---------|-------|---|-----------------------------|-----------|-------|
| Joint Type:          | Butt, Tee, Corner          | G =              | T/2     | (°) = | 0 | Electrical Stickout:        | 3/4 ± 1/8 | in    |
| Weld Type:           | Complete Joint Penetration | R <sub>F</sub> = | 0       |       |   | Nozzle Diameter:            | 1/2       | in    |
| Backgouging:         | Backgouged to Sound Metal  |                  |         |       |   | Average Deposition Rate:    | 2.6       | lbs/h |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | Lay | yer No |    | Pa  | SS | No. | Electrod | de Size |     | nt ( | Division of the last |     | ed Speed<br>min) | 1000000 | V<br>Vol | olts<br>ts) |     | Speed<br>min) | Average<br>Heat Inpu |
|--------|------|--------------------|-------------|-----|--------|----|-----|----|-----|----------|---------|-----|------|----------------------|-----|------------------|---------|----------|-------------|-----|---------------|----------------------|
| in.    | mm   | in                 |             | Min | M      | ax | Min |    | Max | in.      | mm      | Min |      | Max                  | Min | Max              | Min     |          | Max         | Min | Max           | (kJ/in)              |
| 1/4    | 6.4  | 1/4                | 1           |     |        |    |     |    | 1   | 3/32     | 2.4     | 75  | -    | 95                   |     |                  | 20      | -        | 22          | 5.7 | 7.7           | 16.0                 |
|        |      |                    | 2           |     | 1      | 2  |     |    | 2   | 3/32     | 2.4     | 75  | -    | 95                   |     |                  | 20      | -        | 22          | 5.7 | 7.7           | 16.0                 |
| 5/16   | 7.9  | 5/16               | 1           | 1   | - 2    | 2  | 1   | -  | 2   | 3/32     | 2.4     | 75  | -    | 95                   |     |                  | 20      | -        | 22          | 4.6 | 6.2           | 16.0                 |
|        |      |                    | 2           |     |        | 3  | 3   | -  | 3   | 3/32     | 2.4     | 75  | -    | 95                   |     |                  | 20      | -        | 22          | 5.7 | 7.7           | 16.0                 |
| 3/8    | 9.5  | 3/8                | 1           | 1   | - 2    |    | 1   | -  | 2   | 3/32     | 2.4     | 75  | -    | 95                   |     |                  | 20      | -        | 22          | 3.8 | 5.1           | 16.0                 |
|        | 120  |                    | 2           |     | 3      |    | 3   | -  | 3   | 3/32     | 2.4     | 75  | [-]  | 95                   |     | 12.00            | 20      | -        | 22          | 5.7 | 7.7           | 16.0                 |

Revision Status: CWB Approval: Company's Approval:

| I COVISION OLD | ituo.                        |  |
|----------------|------------------------------|--|
| Date:          | Explanation: Per PQR P65JR78 |  |
| 22/07/2008     | Per PQR P65JR78              |  |

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
   Weld Sizes represent effective weld throat thickness for
- Weld Sizes represent effective weld throat thickness for qualified T range.
- Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- 5. Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



Jul 25, 2008

Valid only if welding consumables are certified by the CWB





DATA SHEET

No.:

SMAW-07-CVN

May 5, 2008

°F

Date:

Company Name: Mosher Engineering Wldg. Specification No: 1358 Queen Street

Reference WPQR: Halifax Nova Scotia B3J 2H5 Ref. Standards:

CSA W47.1, W59 & W48

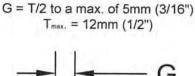
Material Information:

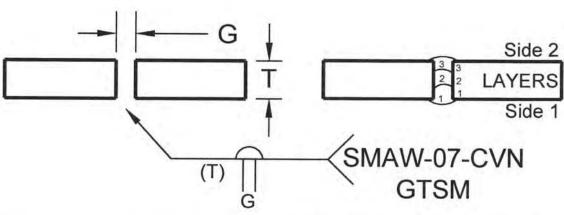
Address:

| Position:   | Vertical Up         | Welding Process:          | SMAW      | Consumable:    | E4918/E48018/E7018 |       |
|-------------|---------------------|---------------------------|-----------|----------------|--------------------|-------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer:         | N/A       | Shielding Gas: | N/A                |       |
|             | Cat. 5 (27J @-40°C) | Process Mode:             | Manual    | Gas Flow:      |                    | ft3/h |
|             |                     | Tungsten Type:            |           | Tungsten Dia.: |                    | în    |
| Cleaning:   | Wire brush and remo | ve slag in between passes | PHT Temp: |                | 175°C or 347       | °F    |

PWHT Temp: Typical Pass & Layer Sequence:

Typical Joint Details:





| Joint Configuration: |                            | Joint De         | etails: |       |   | Technique & Process Informat | ion: |       |       |
|----------------------|----------------------------|------------------|---------|-------|---|------------------------------|------|-------|-------|
| Joint Type:          | Butt, Tee, Corner          | G =              | T/2     | (°) = | 0 | Electrical Stickout:         | 3/4  | ± 1/8 | in    |
| Weld Type:           | Complete Joint Penetration | R <sub>F</sub> = | 0       |       |   | Nozzle Diameter:             | 1/2  |       | in    |
| Backgouging:         | Backgouged to Sound Metal  |                  |         |       |   | Average Deposition Rate:     | 2.5  |       | lbs/h |

Welding Parameters:

| in 1/4 |   | Min                  | Max                      | Min                                |      |      |      |   |   | CR   | 1987   | (11.1/1   | nin)  | ( (   | /olt   | ts)  | (11   | n/m   | n)  | Heat Inpu   |
|--------|---|----------------------|--------------------------|------------------------------------|------|------|------|---|---|--|--|---|---|---|--|--|---|---|---|---|
| 1/4    |   |                      |                          | LAMO                               |      | Max  | in.  | mm  | Min   |  | Max  | Min   | Max   | Min   |  | Max  | Min   |   | Max   | (kJ/in)   |
|        | 1 |                      | 1                        |                                    | П    | 1    | 3/32 | 2.4   | 75  | -  | 95   |   |   | 20  | -  | 22   | 2.8   | 1-1   | 3.2   | 35.7  |
|        | 2 |                      | 2                        |                                    |      | 2    | 3/32 | 2.4   | 75  | -  | 95   |   |   | 20  | -  | 22   | 2.8   | -   | 3.2   | 35.7  |
| 5/16   | 1 | 1                    | - 2                      | 1                                  | -    | 2    | 3/32 | 2.4   | 75  | -  | 95   |   |   | 20  | -  | 22   | 2.8   | 1-1   | 3.2   | 35.7  |
|        | 2 |                      | 3                        | 3                                  | -    | 3    | 3/32 | 2.4   | 75  | -  | 95   |   |   | 20  | -  | 22   | 2.8   | 1-1   | 3.2   | 35.7  |
| 3/8    | 1 | 1                    | - 2                      | 1                                  | -    | 2    | 3/32 | 2.4   | 75  | -  | 95   |   |   | 20  | -  | 22   | 2.8   | -   | 3.2   | 35.7  |
|        | 2 |                      | 2                        | 3                                  | -    | 3    | 3/32 | 2.4   | 75  | -  | 95   |   |   | 20  | -  | 22   | 2.8   | -   | 3.2   | 35.7  |
|        |   | 5/16 1<br>2<br>3/8 1 | 5/16 1 1<br>2<br>3/8 1 1 | 5/16 1 1 - 2<br>2 3<br>3/8 1 1 - 2 | 5/16 | 5/16 | 5/16 | 5/16     1     1     -     2     1     -     2     3/32       2     3     3     -     3     3/32       3/8     1     1     -     2     1     -     2     3/32 | 5/16     1     1     -     2     1     -     2     3/32     2.4       2     3     3     -     3     3/32     2.4       3/8     1     1     -     2     1     -     2     3/32     2.4 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75       2     3     3     -     3     3/32     2.4     75       3/8     1     1     -     2     1     -     2     3/32     2.4     75 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -       2     3     3     -     3     3/32     2.4     75     -       3/8     1     1     -     2     1     -     2     3/32     2.4     75     - | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95       2     3     3     -     3     3/32     2.4     75     -     95       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95       2     3     3     -     3     3/32     2.4     75     -     95       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95       2     3     3     -     3     3/32     2.4     75     -     95       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20       2     3     3     -     3     3/32     2.4     75     -     95     20       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -       2     3     3     -     3     3/32     2.4     75     -     95     20     -       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     - | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22       2     3     3     -     3     3/32     2.4     75     -     95     20     -     22       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22     2.8       2     3     3     -     3     3/32     2.4     75     -     95     20     -     22     2.8       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22     2.8 | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22     2.8     -       2     3     3     -     3     3/32     2.4     75     -     95     20     -     22     2.8     -       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22     2.8     - | 5/16     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22     2.8     -     3.2       2     3     3     -     3     3/32     2.4     75     -     95     20     -     22     2.8     -     3.2       3/8     1     1     -     2     1     -     2     3/32     2.4     75     -     95     20     -     22     2.8     -     3.2 |

Revision Status:

Explanation:

22/07/2008 Per PQR P65JR78

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range.
- Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# CWB Accepted



CWB Approval:

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225





No.:

SMAW-10-CVN

Date:

May 5, 2008

NA

Company Name: Mosher Engineering Wldg. Specification No: RTR-1 Address: 1358 Queen Street Reference WPQR: Halifax Nova Scotia B3J 2H5 CSA W47.1, W59 & W48 Ref. Standards:

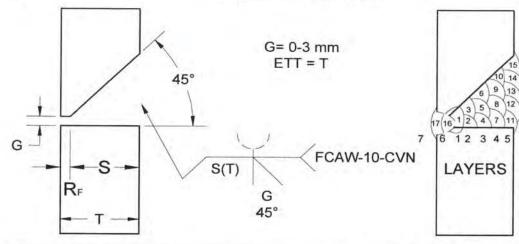
Material Information:

| Position:   | Horizontal          | Welding Process:  | SMAW      | Consumable:    | E4918/E48018/E7018 |       |
|---|---------------------|-------------------|-----------|----------------|--------------------|-------|
| Base Mat'l: CAN G40.21 350WT                          |                     | Mode of Transfer: | N/A       | Shielding Gas: | N/A                |       |
|   | Cat. 5 (27J @-40°C) | Process Mode:     | Manual    | Gas Flow:      |                    | ft3/h |
|   |                     | Tungsten Type:    |           | Tungsten Dia.: |                    | in    |
| Cleaning: Wire brush and remove slag in between passe |                     |                   | PHT Temp: |                | 15°C or 59         | °F    |

PWHT Temp:

Typical Joint Details:

Typical Pass & Layer Sequence:



| Joint Configuration: |                            | Joint De         | etails: |         |    | Technique & Process Informati | tion: |       |
|----------------------|----------------------------|------------------|---------|---------|----|-------------------------------|-------|-------|
| Joint Type:          | Butt, Tee, Corner          | G =              | 1/8     | ⊕ (°) = | 45 | Electrical Stickout:          |       | in    |
| Weld Type:           | Complete Joint Penetration | R <sub>F</sub> = | 1/8     |         |    | Nozzle Diameter:              |       | in    |
| Backgouging:         | Backgouged to Sound Metal  |                  |         |         |    | Average Deposition Rate:      | 3.5   | lbs/h |

Welding Parameters:

| Weld | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | SS | No. | Electro | de Size |     | nt ( |     | Wire Feed |     |     | c V | olts<br>ts) |     | ravel Speed<br>(in/min) |     | Average<br>Heat Inpu |
|------|------|--------------------|-------------|-----|-----|-----|-----|----|-----|---------|---------|-----|------|-----|-----------|-----|-----|-----|-------------|-----|-------------------------|-----|----------------------|
| in.  | mm   | in                 |             | Min |     | Max | Min |    | Max | in.     | mm      | Min |      | Max | Min       | Max | Min |     | Max         | Min |                         | Max | (kJ/in)              |
| 3/8  | 9.5  | 1/4                | 1           | 1   | -   | 3   | 1   | -  | 6   | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | T-  | 25          | 3.4 | -                       | 8.6 | 28.4                 |
|      |      |                    | 2           |     |     | 7   | 16  | -  | 17  | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | -   | 25          | 3.4 | П                       | 8.6 | 28.4                 |
| 1/2  | 13   | 3/8                | 1           | 1   | -   | 4   | 1   | -  | 10  | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | -   | 25          | 3.4 | П                       | 8.6 | 28.4                 |
|      |      |                    | 2           |     |     | 7   | 16  | -  | 17  | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | -   | 25          | 3.4 | П                       | 8.6 | 28.4                 |
| 5/8  | 16   | 1/2                | 1           | 1   | -   | 5   | 1   | -  | 10  | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | -   | 25          | 3.4 | П                       | 8.6 | 28.4                 |
|      |      |                    | 2           | 1   |     | 7   | 16  | -  | 17  | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | -   | 25          | 3.4 | П                       | 8.6 | 28.4                 |
| 3/4  | 19   | 5/8                | 1           | 1   | -   | 6   | 1   | -  | 15  | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | -   | 25          | 3.4 | П                       | 8.6 | 28.4                 |
|      |      |                    | 2           |     |     | 7   | 16  | -  | 17  | 1/8     | 3.2     | 115 | -    | 127 |           |     | 22  | -   | 25          | 3.4 | П                       | 8.6 | 28.4                 |

Revision Status:

| Date:      | Explanation: |  |
|------------|--------------|--|
| 22/07/2008 | P036388      |  |

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range.
- Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# CWB Accepted



CWB Approval:

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225





DATA SHEET

No.:

SMAW-11-CVN

Date:

May 5, 2008

175°C or 347

F

°F

Company Name: Mosher Engineering Wldg. Specification No: RTR-1 Address: 1358 Queen Street Reference WPQR: Halifax Nova Scotia **B3J 2H5** CSA W47.1, W59 & W48 Ref. Standards: Material Information: Position: Vertical Up Welding Process: SMAW E4918/E48018/E7018 Consumable: CAN G40.21 350WT Base Mat'l: Mode of Transfer: N/A Shielding Gas: N/A Cat. 5 (27J @-40°C) Process Mode: Manual Gas Flow: ft3/h Tungsten Type: Tungsten Dia.: in Wire brush and remove slag in between passes

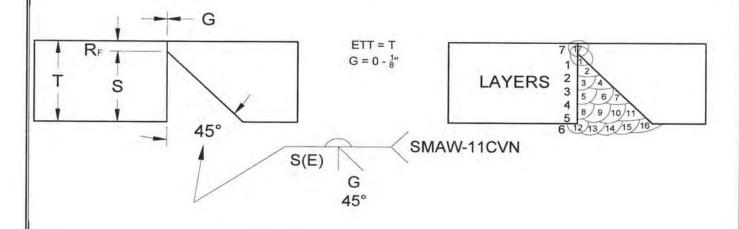
PHT Temp:

PWHT Temp:

Typical Joint Details:

Cleaning:

Typical Pass & Layer Sequence:



| Joint Configuration | 1                          | Joint D          | etails: |         |    | Technique & Process Informati | tion: |       |
|---------------------|----------------------------|------------------|---------|---------|----|-------------------------------|-------|-------|
| Joint Type:         | Butt, Tee, Corner          | G =              | 0       | ⊙ (°) = | 45 | Electrical Stickout:          |       | in    |
| Weld Type:          | Complete Joint Penetration | R <sub>F</sub> = | 1/16    |         |    | Nozzle Diameter:              |       | in    |
| Backgouging:        | Backgouged to Sound Metal  |                  |         |         |    | Average Deposition Rate:      | 2.5   | lbs/h |

Welding Parameters:

| Weld | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | SS | No. | Electro | de Size | 100.000 | nt ( | Amps) | Wire Fee<br>(in/r |     |     | Arc Volts<br>(Volts) |     | Trave<br>(in | el S      |     | Average<br>Heat Inpu |
|------|------|--------------------|-------------|-----|-----|-----|-----|----|-----|---------|---------|---------|------|-------|-------------------|-----|-----|----------------------|-----|--------------|-----------|-----|----------------------|
| in.  | mm   | in                 |             | Min |     | Max | Min |    | Max | in.     | mm      | Min     |      | Max   | Min               | Max | Min |                      | Max | Min          |           | Max | (kJ/in)              |
| 3/8  | 9.5  | 5/16               | 1           | 1   | -   | 3   | 1   | -  | 7   | 1/8     | 3.2     | 115     | -    | 127   |                   |     | 22  | 1-                   | 25  | 3.4          | <b>-T</b> | 8.6 | 28.4                 |
|      |      |                    | 2           |     | П   | 7   |     |    | 17  | 1/8     | 3.2     | 115     | -    | 127   |                   |     | 22  | -                    | 25  | 3.4          | П         | 8.6 | 28.4                 |
| 1/2  | 13   | 7/16               | 1           | 1   | -   | 4   | 1   | -  | 10  | 1/8     | 3.2     | 115     | -    | 127   |                   |     | 22  | -                    | 25  | 3.4          | П         | 8.6 | 28.4                 |
|      | 100  |                    | 2           |     |     | 7   |     |    | 17  | 1/8     | 3.2     | 115     | -    | 127   |                   | 133 | 22  | -                    | 25  | 3.4          | П         | 8.6 | 28.4                 |
| 5/8  | 16   | 9/16               | 1           | 1   | -   | 5   | 1   | -  | 11  | 1/8     | 3.2     | 115     | -    | 127   |                   |     | 22  | -                    | 25  | 3.4          | П         | 8.6 | 28.4                 |
|      | 150  |                    | 2           |     | П   | 7   |     |    | 17  | 1/8     | 3.2     | 115     | -    | 127   |                   |     | 22  | -                    | 25  | 3.4          | П         | 8.6 | 28.4                 |
| 3/4  | 19   | 11/16              | 1           | 1   | -   | 6   | 1   | -  | 16  | 1/8     | 3.2     | 115     | -    | 127   |                   |     | 22  | -                    | 25  | 3.4          |           | 8.6 | 28.4                 |
|      |      |                    | 2           |     | П   | 7   |     |    | 17  | 1/8     | 3.2     | 115     | -    | 127   |                   | / - | 22  | -                    | 25  | 3.4          | П         | 8.6 | 28.4                 |

Revision Status:

Date: Explanation: 22/07/2008 P036388

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range.
- Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



CWB Approval:

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225





No.:

SAW-06-CVN

## DATA SHEET

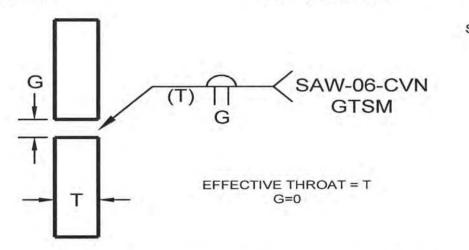
Date:

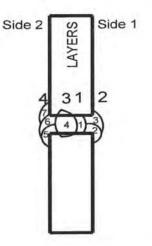
June 11, 2008

| Company Na<br>Address: | me: Mosher Engi<br>1358 Queen |                           |           | Wldg. Specificat<br>Reference |                | SAW-1            |           |       |
|------------------------|-------------------------------|---------------------------|-----------|-------------------------------|----------------|------------------|-----------|-------|
|                        | Halifax                       | Nova Scotia E             | 33J 2H5   | Ref. Sta                      | ndards:        | CSA W47.1, W59 8 | k W48     |       |
| Material Info          | rmation:                      |                           |           |                               |                |                  |           |       |
| Position:              | Horizontal                    | Welding Process:          | SAW       | 1                             | Consumable:    | F7A4-EN          | 112K-H8   |       |
| Base Mat'l:            | CAN G40.21 350WT              | Mode of Transfer:         | Spray Tra | nsfer                         | Shielding Gas: | N/               | A         |       |
|                        | Cat. 5 (27J @-40°C)           | Process Mode:             | Automa    | atic                          | Gas Flow:      | NA               |           | ft3/h |
|                        |                               | Tungsten Type:            |           |                               | Tungsten Dia.: | NA               |           | in    |
| Cleaning:              | Wire brush and remo           | ve slag in between passe: | s PHT     | Temp:                         |                | 15               | 5°C or 59 | °F    |
|                        |                               |                           | PWHT      | Temp:                         |                |                  | NA        | °F    |
| Treatment Indust.      | Deteller                      |                           | Touten    | I Dans & Laure Con            |                |                  |           |       |

Typical Joint Details:

Typical Pass & Layer Sequence:





| Joint Configuration | :                          | Joint De         | etails: |         |   | Technique & Process Information: |            |       |  |  |  |
|---------------------|----------------------------|------------------|---------|---------|---|----------------------------------|------------|-------|--|--|--|
| Joint Type:         | Butt                       | G =              | 3/32    | ⊙ (°) = | 0 | Electrical Stickout:             | 1 1/2 ± 1/ | 4 in  |  |  |  |
| Weld Type:          | Complete Joint Penetration | R <sub>F</sub> = | 0       |         |   | Nozzle Diameter:                 | 3/4        | in    |  |  |  |
| Backgouging:        | Backgouged to Sound Metal  |                  |         |         |   | Average Deposition Rate:         | 11.1       | lbs/h |  |  |  |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | ISS | No. | Electro | de Size |     | nt ( |     | 200 | eed | Speed<br>in) | 1 1 | V<br>Vol | olts<br>ts) |      | el S | peed<br>n) | Average<br>Heat Input |
|--------|------|--------------------|-------------|-----|-----|-----|-----|-----|-----|---------|---------|-----|------|-----|-----|-----|--------------|-----|----------|-------------|------|------|------------|-----------------------|
| in.    | mm   | in                 |             | Min |     | Max | Min |     | Max | in.     | mm      | Min |      | Max | Min |     | Max          | Min |          | Max         | Min  |      | Max        | (kJ/in)               |
| 3/8    | 9.5  |                    | 1           | 1   | -   | 2   | 1   | -   | 3   | 1/8     | 3.3     | 350 | -    | 450 | 415 | 1-1 | 505          | 25  | -        | 29          | 19.1 | -    | 25.3       | 30.3                  |
|        |      |                    | 2           | 3   | -   | 4   | 4   | -   | 6   | 1/8     | 3.3     | 350 | -    | 450 | 415 | -   | 505          | 25  | -        | 29          | 19.1 | -    | 25.3       | 30.3                  |
| 7/16   | 11   |                    | 1           | 1   | -   | 2   | 1   | -   | 3   | 1/8     | 3.3     | 350 | -    | 450 | 415 | -   | 505          | 25  | -        | 29          | 19.1 | -    | 25.3       | 30.3                  |
|        |      |                    | 2           | 3   | -   | 4   | 4   | -   | 6   | 1/8     | 3.3     | 350 | -    | 450 | 415 | -   | 505          | 25  | -        | 29          | 19.1 | -    | 25.3       | 30.3                  |
| 1/2    | 13   |                    | 1           | 1   | -   | 2   | 1   | -   | 2   | 1/8     | 3.3     | 350 | -    | 450 | 415 | -   | 505          | 25  | -        | 29          | 19.1 | -    | 25.3       | 30.3                  |
|        |      |                    | 2           | 3   | -   | 4   | 4   | ŀ   | 6   | 1/8     | 3.3     | 350 | -    | 450 | 415 | -   | 505          | 25  | -        | 29          | 19.1 | F    | 25.3       | 30.3                  |
|        |      |                    |             |     | Н   |     | _   | Н   |     |         |         |     | ╀    |     | -   | Н   |              | -   | ╀        | $\vdash$    |      | Н    |            |                       |

| Date:<br>7/22/08 | Explanation:  |
|------------------|---------------|
| 7/22/08          | Per PQR P5709 |

NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED





DATA SHEET

No.:

SAW-10-CVN

Date:

June 11, 2008

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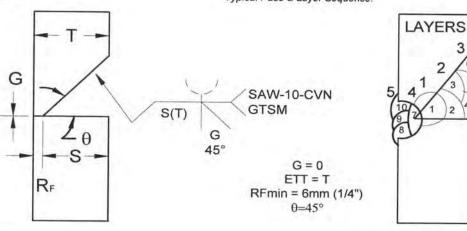
NA

Company Name: Mosher Engineering Wldg. Specification No: SAW-1 Address: 1358 Queen Street Reference WPQR: Halifax Nova Scotia B3J 2H5 CSA W47.1, W59 & W48 Ref. Standards: Material Information: Position: Horizontal Welding Process: SAW F7A4-EM12K-H8 Consumable: CAN G40.21 350WT Base Mat'l: Mode of Transfer: Spray Transfer Shielding Gas: N/A Cat. 5 (27J @-40°C) Process Mode: Automatic Gas Flow: NA ft3/h Tungsten Type: Tungsten Dia.: NA in Cleaning: Wire brush and remove slag in between passes PHT Temp: 15°C or 59 F

PWHT Temp:

Typical Joint Details:

Typical Pass & Layer Sequence:



| Joint Configuration |                            | Joint De         | etails: |            | Technique & Process Inform | ation:      |       |
|---------------------|----------------------------|------------------|---------|------------|----------------------------|-------------|-------|
| Joint Type:         | Butt                       | G =              | 0       | ⊖ (°) = 45 | Electrical Stickout:       | 1 1/4 ± 1/4 | in    |
| Weld Type:          | Complete Joint Penetration | R <sub>F</sub> = | 1/4     |            | Nozzle Diameter:           | 3/4         | in    |
| Backgouging:        | Backgouged to Sound Metal  |                  |         |            | Average Deposition Rate:   | 11.1        | lbs/h |

Welding Parameters:

| Weld S  | Size   | Depth of<br>Prep'n | Side<br>No. | La  | iyer | No. | Pa  | ass | No. | Electro | de Size |     | nt o  |     | 1 S K | eec | Speed | 1   | c V | olts<br>ts) |        |      |      | Average<br>Heat Inpu |
|---------|--------|--------------------|-------------|-----|------|-----|-----|-----|-----|---------|---------|-----|-------|-----|-------|-----|-------|-----|-----|-------------|--------|------|------|----------------------|
| in.     | mm     | in                 |             | Min |      | Max | Min |     | Max | in.     | mm      | Min |       | Max | Min   |     | Max   | Min |     | Max         | Min    |      | Max  | (kJ/in)              |
| 7/16    | 11     | 3/16               | 1           | 1   | -    | 2   | 1   | -   | 2   | 1/8     | 3.3     | 450 | 1-    | 550 | 415   | -   | 510   | 25  | 1-  | 29          | 15.4   | -    | 23.6 | 41.5                 |
|         |        |                    | 2           | 4   | -    | 5   | 7   | -   | 10  | 1/8     | 3.3     | 450 | -     | 550 | 415   | -   | 510   | 25  | -   | 29          | 15.4   | 1-   | 23.6 | 41.5                 |
| 1/2     | 13     | 1/4                | 1           | 1   | -    | 2   | 1   | -   | 2   | 1/8     | 3.3     | 450 | -     | 550 | 415   | -   | 510   | 25  | 1-  | 29          | 15.4   | -    | 23.6 | 41.5                 |
|         |        |                    | 2           | 4   | -    | 5   | 7   | -   | 10  | 1/8     | 3.3     | 450 | -     | 550 | 415   | -   | 510   | 25  | -   | 29          | 15.4   | 1-1  | 23.6 | 41.5                 |
| 5/8     | 16     | 3/8                | 1           | 1   | -    | 3   | 1   | -   | 5   | 1/8     | 3.3     | 450 | -     | 550 | 415   | -   | 510   | 25  | -   | 29          | 15.4   | 1-1  | 23.6 | 41.5                 |
|         |        |                    | 2           | 4   | -    | 5   | 7   | -   | 10  | 1/8     | 3.3     | 450 | -     | 550 | 415   | -   | 510   | 25  | -   | 29          | 15.4   | 1-1  | 23.6 | 41.5                 |
| 3/4     | 19     | 1/2                | 1           | 1   | -    | 3   | 1   | -   | 6   | 1/8     | 3.3     | 450 | -     | 550 | 415   | -   | 510   | 25  | -   | 29          | 15.4   | 1-1  | 23.6 | 41.5                 |
|         |        |                    | 2           | 4   | -    | 5   | 7   | -   | 10  | 1/8     | 3.3     | 450 | -     | 550 | 415   | -   | 510   | 25  | -   | 29          | 15.4   | 1-1  | 23.6 | 41.5                 |
| Revisio | n Stat | us:                |             |     |      |     |     |     |     | CWB A   | pprova  | 1:  | 101-0 |     |       | _   |       | Com | npa | ny's        | Approv | val: |      |                      |

| Rev | Sio | n Sta | itus: |
|-----|-----|-------|-------|
|-----|-----|-------|-------|

Explanation: Date: 22/07/2008 P5710

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- 5. Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

Tel: (902) 835-7225





B3J 2H5

No.:

FCAW-1

Date: RTR-4 July 22, 2008

F

Company Name: Mosher Engineering Address:

1358 Queen Street Halifax Nova Scotia Wldg. Specification No:

Ref. Standards:

Reference WPQR:

CSA W47.1, W59 & W48

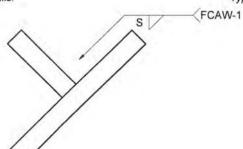
Material Information:

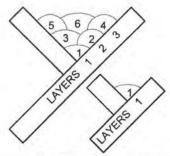
| Position:   | Flat                | Welding Process:          | FCAW          | Consumable:    | E491T-9MJ-H16/E4801T-9     | 9CH   |
|-------------|---------------------|---------------------------|---------------|----------------|----------------------------|-------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: S       | pray Transfer | Shielding Gas: | 75% Ar 25% CO2             |       |
|             | Cat. 5 (27J @-40°C) | Process Mode: Se          | emi-Automatic | Gas Flow:      | 35                         | ft3/h |
|             |                     | Tungsten Type:            |               | Tungsten Dia.: |                            | in    |
| Cleaning:   | Wire brush and remo | ve slag in between passes | PHT Temp:     | A              | s per Table 5.3 of CSA W59 | °F    |

PWHT Temp:

Typical Pass & Layer Sequence:

Typical Joint Details:





| Joint Configuration: |                  | Joint Details:      | Technique & Process Informa | tion: |        |
|----------------------|------------------|---------------------|-----------------------------|-------|--------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:        | 3/4 ± | 1/8 in |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:            | 1/2   | in     |
| Backgouging:         | N/A              |                     | Average Deposition Rate:    | 8.0   | lbs/h  |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | Lay | er l | No. | Pa    | SS | No. | Electro | de Size | September 1 | nt ( | Cherrie Co. | A STARTER | eed<br>n/m | Speed<br>in) | 100000 | V<br>ol | olts<br>ts) | Travel Speed (in/min) |   | Average<br>Heat Inpu |         |
|--------|------|--------------------|-------------|-----|------|-----|-------|----|-----|---------|---------|-------------|------|-------------|-----------|------------|--------------|--------|---------|-------------|-----------------------|---|----------------------|---------|
| in.    | mm   | in                 |             | Min |      | Max | Min   |    | Max | in.     | mm      | Min         |      | Max         | Min       |            | Max          | Min    |         | Max         | Min                   |   | Max                  | (kJ/in) |
| 3/16   | 4.8  |                    | 1           |     | П    | 1   |       | П  | 1   | 0.045   | 1.2     | 225         | -    | 275         | 380       | -          | 460          | 29     | -       | 31          | 20.0                  | - | 24.0                 | 20.5    |
| 1/4    | 6.4  |                    | 1           |     | П    | 1   |       | П  | 1   | 0.045   | 1.2     | 225         | -    | 275         | 380       | -          | 460          | 29     | -       | 31          | 20.0                  | - | 24.0                 | 20.5    |
| 5/16   | 7.9  |                    | 1           |     | П    | 1   | 10.00 |    | 1   | 0.045   | 1.2     | 225         | -    | 275         | 380       | -          | 460          | 29     | -       | 31          | 16.6                  | - | 22.4                 | 20.5    |
| 3/8    | 9.5  |                    | 1           | 1   | -    | 2   | 1     | -  | 3   | 0.045   | 1.2     | 225         | -    | 275         | 380       | -          | 460          | 29     | -       | 31          | 17.3                  | - | 23.4                 | 22.1    |
| 1/2    | 13   |                    | 1           | 1   | -    | 2   | 1     | -  | 3   | 0.045   | 1.2     | 225         | -    | 275         | 380       | -          | 460          | 29     | -       | 31          | 12.4                  | - | 16.8                 | 30.8    |
| 5/8    | 16   |                    | 1           | 1   | F    | 3   | 1     | -  | 6   | 0.045   | 1.2     | 226         | -    | 275         | 380       | -          | 460          | 29     | -       | 31          | 12.4                  | ŀ | 16.8                 | 30.8    |
|        |      |                    |             |     |      |     |       |    |     |         |         |             |      |             |           | H          |              |        |         |             |                       | H |                      |         |
|        |      |                    |             |     | H    |     |       |    |     |         |         |             |      |             |           | П          | 1 3          |        |         |             | - 1                   | П |                      |         |

Revision Status:

Explanation: 22/07/2008 Per PQR P5745

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range.

Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

**CWB** Accepted



CWB Approval:

Sep 09, 2008

Valid only if welding consumables are certified by the CWB

Prepared by: FORGERON ENGINEERING LIMITED

Tel: (902) 835-7225





WELDING PROCEDURE FCAW-2 No.: DATA SHEET Date: July 22, 2008 Wldg. Specification No: RTR-4 Company Name: Mosher Engineering Address: 1358 Queen Street Reference WPQR: CSA W47.1, W59 & W48 Ref. Standards: Halifax B3J 2H5 Nova Scotia Material Information: E491T-9MJ-H16/E4801T-9-CH Welding Process: **FCAW** Consumable: Horizontal Position: CAN G40.21 350WT 75% Ar 25% CO2 Mode of Transfer: Spray Transfer Shielding Gas: Base Mat'l: Cat. 5 (27J @-40°C) Gas Flow: ft3/h Process Mode: Semi-Automatic 35 Tungsten Dia. in Tungsten Type: °F As per Table 5.3 of CSA W59 PHT Temp: Cleaning: Wire brush and remove slag in between passes "F PWHT Temp: Typical Pass & Layer Sequence: Typical Joint Details: FCAW-2 3 5 **LAYERS** 3 2

| Joint Configuration: |                  | Joint Details:      | Technique & Process Informa | ition:  |       |
|----------------------|------------------|---------------------|-----------------------------|---------|-------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:        | 3/4 ± 1 | /8 in |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:            | 1/2     | in    |
| Backgouging:         | N/A              |                     | Average Deposition Rate:    | 8.0     | lbs/h |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | Lay | yer | No. | Pa  | SS | No. | Electro | de Size | 0.000 | nt (     |     |     | eed | Speed<br>in) |     |   | olts (ts) | Travel Speed (in/min) |     |      | Average<br>Heat Inpu |
|--------|------|--------------------|-------------|-----|-----|-----|-----|----|-----|---------|---------|-------|----------|-----|-----|-----|--------------|-----|---|-----------|-----------------------|-----|------|----------------------|
| in.    | mm   | in                 |             | Min |     | Max | Min |    | Max | in.     | mm      | Min   |          | Max | Min |     | Max          | Min |   | Max       | Min                   |     | Max  | (kJ/in)              |
| 3/16   | 4.8  |                    | 1           |     | П   | 1   |     | П  | 1   | 0.045   | 1.2     | 225   | -        | 275 | 380 | -   | 460          | 29  | - | 31        | 20.0                  | [-] | 24.0 | 20.5                 |
| 1/4    | 6.4  |                    | 1           |     | П   | 1   |     | П  | 1   | 0.045   | 1.2     | 225   | -        | 275 | 380 | -   | 460          | 29  | - | 31        | 20.0                  | -   | 24.0 | 20.5                 |
| 5/16   | 7.9  |                    | 1           |     | П   | 1   |     | П  | 1   | 0.045   | 1.2     | 225   | -        | 275 | 380 | -   | 460          | 29  | - | 31        | 16.6                  | -   | 22.4 | 20.5                 |
| 3/8    | 9.5  |                    | 1           | 1   | -   | 2   | 1   | -  | 3   | 0.045   | 1.2     | 225   | -        | 275 | 380 | -   | 460          | 29  | - | 31        | 17.3                  | -   | 23.4 | 22.1                 |
| 1/2    | 13   |                    | 1           | 1   | -   | 2   | 1   | -  | 3   | 0.045   | 1.2     | 225   | -        | 275 | 380 | -   | 460          | 29  | - | 31        | 12.4                  | -   | 16.8 | 30.8                 |
| 5/8    | 16   |                    | 1           | 1   | -   | 3   | 1   | -  | 6   | 0.045   | 1.2     | 226   | -        | 275 | 380 | -   | 460          | 29  | - | 31        | 12.4                  | ŀ   | 16.8 | 30.8                 |
|        |      |                    |             |     | Н   |     |     | Н  |     |         |         |       |          |     |     | Н   |              |     |   |           |                       | Н   |      |                      |
|        |      |                    |             |     |     |     |     | П  |     |         |         |       |          |     |     | П   |              |     | L |           |                       | П   |      |                      |
|        |      |                    |             |     | Н   |     |     | Н  |     |         |         | 1     | $\vdash$ |     |     | H   |              | -   | H |           |                       | H   |      |                      |

## **Revision Status:**

| Date:      | Explanation:  |  |
|------------|---------------|--|
| 22/07/2008 | Per PQR P5745 |  |
|            |               |  |

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



CWB Approval:

Sep 09, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225





Process Mode:

No.

Gas Flow:

FCAW-3

Date

35

July 22, 2008

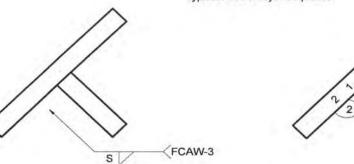
RTR-4 Company Name: Mosher Engineering Wldg. Specification No: Address: 1358 Queen Street Reference WPQR: CSA W47.1, W59 & W48 Halifax Nova Scotia **B3J 2H5** Ref. Standards: Material Information: E491T-9MJ-H16/E4801T-9CH **FCAW** Welding Process: Consumable: Position: Vertical Up CAN G40.21 350WT 75% Ar 25% CO2 Base Mat'l: Mode of Transfer: Spray Transfer Shielding Gas: Cat. 5 (27J @-40°C) ft3/h

Tungsten Type: Tungsten Dia.: in "F Cleaning: Wire brush and remove slag in between passes PHT Temp: As per Table 5.3 of CSA W59 PWHT Temp: °F

Semi-Automatic

Typical Joint Details:





| Joint Configuration: |                  | Joint Details:      | Technique & Process Informa | tion:   |       |
|----------------------|------------------|---------------------|-----------------------------|---------|-------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:        | 3/4 ± 1 | /8 in |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:            | 1/2     | in    |
| Backgouging:         | N/A              |                     | Average Deposition Rate:    | 5.0     | lbs/h |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | Lay | er N | No. | Pa  | ISS | No. | Electrod | de Size | 100000000000000000000000000000000000000 | nt ( |     |     | eed         | Speed<br>in) | 1000 | V<br>ol | olts<br>ts)   |      | el S | peed<br>in) | Average<br>Heat Inpu |
|--------|------|--------------------|-------------|-----|------|-----|-----|-----|-----|----------|---------|---|------|-----|-----|-------------|--------------|------|---------|---------------|------|------|-------------|----------------------|
| in.    | mm   | in                 |             | Min | 1    | Max | Min |     | Max | in.      | mm      | Min                                     |      | Max | Min |             | Max          | Min  |         | Max           | Min  |      | Max         | (kJ/in)              |
| 3/16   | 4.8  |                    | 1           |     | П    | 1   |     | П   | 1   | 0.045    | 1.2     | 150                                     | -    | 250 | 200 | -           | 300          | 26   | -       | 29            | 28.8 | -    | 38.9        | 9.7                  |
| 1/4    | 6.4  |                    | 1           |     | П    | 1   |     | П   | 1   | 0.045    | 1.2     | 150                                     | -    | 250 | 200 | 1-1         | 300          | 26   | -       | 29            | 16.2 | -    | 21.9        | 17.3                 |
| 5/16   | 7.9  |                    | 1           | -   |      | 1   |     | П   | 1   | 0.045    | 1.2     | 150                                     | -    | 250 | 200 | -           | 300          | 26   | -       | 29            | 10.4 | -    | 14.0        | 26.0                 |
| 3/8    | 9.5  |                    | 1           | 1   | -    | 2   | 1   | -   | 3   | 0.045    | 1.2     | 150                                     | -    | 250 | 200 | <b>I</b> -I | 300          | 26   | -       | 29            | 10.8 | -    | 14.6        | 26.0                 |
| 1/2    | 13   |                    | 1           | 1   | -    | 2   | 1   | -   | 3   | 0.045    | 1.2     | 150                                     | -    | 250 | 200 | -           | 300          | 26   | -       | 29            | 6.1  | -    | 8.2         | 46.2                 |
|        | -    |                    |             |     | +    |     |     | Н   |     |          |         |   | Н    |     | -   | H           |              |      | H       | $\vdash$      |      | Н    |             |                      |
|        | -    |                    |             | _   | +    | _   | _   | +   | _   |          |         |   | Н    | _   |     | ++          |              | -    | Н       | $\rightarrow$ |      | H    |             | _                    |

PREVIOUS TESTS **ACCUMULATED** BY THE CWB **Revision Status:** 

CWB Approval:

## Company's Approval:

## 22/07/2008

Explanation: Date:

Per PQR P5745

### NOTES:

Use stringer beads only. Restrict weld bead to ≤ 16 mm.

2. Weld Sizes represent effective weld throat thickness for qualified T range.

3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

**CWB** Accepted



Sep 09, 2008

On the Basis of

Valid only if welding consumables are certified by the CWB

Prepared by: FORGERON ENGINEERING LIMITED





No.:

FCAW-4

Date:

July 22, 2008

Company Name: Mosher Engineering Wldg. Specification No: RTR-4

Address: 1358 Queen Street Reference WPQR:

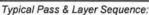
Halifax Nova Scotia B3J 2H5 Ref. Standards: CSA W47.1, W59 & W48

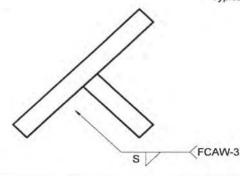
Material Information:

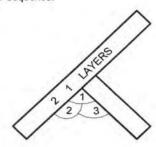
| Position:   | Overhead            | Welding Process:  | FCAW           | Consumable:    | E491T-9MJ-H16/E4801T-9 | 9CH   |
|-------------|---------------------|-------------------|----------------|----------------|------------------------|-------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: | Spray Transfer | Shielding Gas: | 75% Ar 25% CO2         |       |
| ASC WIGHT.  | Cat. 5 (27J @-40°C) | Process Mode:     | Semi-Automatic | Gas Flow:      | 35                     | ft3/h |
|             |                     | Tungsten Type:    |                | Tungsten Dia.: |                        | in    |
| 01 1        |                     |                   |                |                | T 11 TO 1001 11150     | ot em |

Cleaning: Wire brush and remove slag in between passes PHT Temp: As per Table 5.3 of CSA W59 °F
PWHT Temp: N/A °F

Typical Joint Details:







| Joint Configuration: |                  | Joint Details:      | Technique & Process Informa | tion: |       |       |
|----------------------|------------------|---------------------|-----------------------------|-------|-------|-------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:        | 3/4   | ± 1/8 | in    |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:            | 1/2   |       | in    |
| Backgouging:         | N/A              |                     | Average Deposition Rate:    | 5.0   |       | lbs/h |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | Lay | yer | No. | Pa  | ISS | No. | Electro | de Size |     | nt ( |     | 100000000000000000000000000000000000000 | eed<br>n/mi | Speed<br>n) | 10000 | Volt | olts<br>ts) |      | el S | Speed<br>in) | Average<br>Heat Input |
|--------|------|--------------------|-------------|-----|-----|-----|-----|-----|-----|---------|---------|-----|------|-----|---|-------------|-------------|-------|------|-------------|------|------|--------------|-----------------------|
| in.    | mm   | in                 | 1.10        | Min |     | Max | Min |     | Max | in.     | mm      | Min |      | Max | Min                                     |             | Max         | Min   |      | Max         | Min  |      | Max          | (kJ/in)               |
| 3/16   | 4.8  |                    | 1           | 4   | П   | 1   |     | П   | 1   | 0.045   | 1.2     | 150 | -    | 250 | 200                                     | 1-1         | 300         | 26    | -    | 29          | 28.8 | [-]  | 38.9         | 9.7                   |
| 1/4    | 6.4  |                    | 1           |     | П   | 1   |     |     | 1   | 0.045   | 1.2     | 150 | -    | 250 | 200                                     | 1-1         | 300         | 26    | -    | 29          | 16.2 | 1-   | 21.9         | 17.3                  |
| 5/16   | 7.9  |                    | 1           | VE  | П   | 1   |     |     | 1   | 0.045   | 1.2     | 150 | -    | 250 | 200                                     | 1-1         | 300         | 26    | -    | 29          | 16.2 | -    | 21.9         | 17.3                  |
| 3/8    | 9.5  |                    | 1           | 1   | -   | 2   | 1   | -   | 3   | 0.045   | 1.2     | 150 | -    | 250 | 200                                     | 1-1         | 300         | 26    | -    | 29          | 10.8 | -    | 14.6         | 26.0                  |
| 1/2    | 13   |                    | 1           | 1   | -   | 2   | 1   | -   | 3   | 0.045   | 1.2     | 150 | -    | 250 | 200                                     | 1-          | 300         | 26    | -    | 29          | 6.1  | -    | 8.2          | 46.2                  |
|        |      |                    |             |     |     |     |     |     |     |         |         |     |      |     |   | П           |             |       |      | 1           |      | П    |              |                       |
|        |      |                    |             |     | П   | ==- |     | П   | 1_  | - 1     |         |     | П    | 9   |   | П           | 3 - 3       |       | П    |             |      | П    |              |                       |

On the Basis of PREVIOUS TESTS
ACCUMULATED
BY THE CWB

Date: Explanation:
22/07/2008 Per PQR P5745

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

**CWB** Accepted



Sep 09, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225



Company's Approval:

Prepared by: FORGERON ENGINEERING LIMITED

RTR FORM S-101, 1992 to CSA W47.1

## RTR ENGINEERING WELDING PROCEDURE

No.

Date

FCAW-4-INI MARCH 28, 2002

|                      |                                  |            |                           | 1              | DAI     | A SHEE!              |                     |   |   | 1011111111   | THE MESS                    |
|----------------------|----------------------------------|------------|---------------------------|----------------|---------|----------------------|---------------------|---|---|--|-----------------------------|
| Company              | MOSHER                           | ENGIN      | EERING L                  | IMITED         |         |                      |                     | WPS No  | RTR-4(                                  | (A)  |                             |
| Name and<br>Complete | 2089 Upp                         | er Wate    | er Street                 |                |         |                      |                     | Applicat  |   |  | <b>V</b> 59                 |
| Address              | Halifax. N                       | ova Sc     | otia, B3J 2               | 2R7            |         |                      |                     | Standard  | OC VIPO                                 |  |                             |
| Welding              | SMAW [                           | SAW        | CONTRACTOR                | V (Tungsten)   | Type:   |                      |                     | Electrod<br>Classific                                     | ation X=1                               | 191  | 1-H16                       |
| Process ·            | X FCAW                           | GMA        |                           | sw             | Size:   |                      |                     | -   |   |  |                             |
| &<br>Mode            | Manual                           | ×          | Semi-Automati             | c 🗆            | Machine |                      | Automatic           | X Preh  | eat Minimum as<br>r                     | per CSA  | W59                         |
| Material             |                                  |            | & 3 of Tab                |                |         | Weldir               | g Position          | Interpa   | Minimum                                 | as ab  | ove                         |
| Designation          |                                  |            | ut color m<br>egard to in |                |         | F                    | LAT                 | Tempera   | Maximum                                 | 500 d  | eg. F                       |
|                      | 0-1/32<br>0-1/mr                 | R=5mm      |                           |                |         |                      | LAYERS              | 8 2 4 4 2 3 3 E S 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | 4 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 |  |                             |
|                      | Sketch Of Typ                    | ical Joint | Preperation               |                |         |                      |                     | Typical Pass  | and Layer Seque                         | ence   |                             |
|                      | oove Weld                        | -11        | , Groo                    | ove Weld       | -       |                      | Туре                |   | Automatic or Se                         | mi-Auto  | matic                       |
|                      | Joint Penetrat                   |            |                           | int Penetratio |         | as per C             | SA W59              | Electrical  | 3/4'                                    | " +/- 3/1  | 16"                         |
|                      | uged to sound<br>onto steel back |            | Others                    | as per CSA     | W59     | <b>X</b> Butt        | Tec                 | Stickout<br>Shielding                                     |   |  | 44                          |
| Other                |                                  | ,          | 11 5 22 2 2 2             | et Weld        | 7.55    | Edge                 | Lap                 | Gas   | 75Ar/25CO                               | 2 /hr  | 313-415                     |
| Material             | -                                | Lou        |                           | as per CSA     | 7       |                      | Corner              | Flux  |   |  |                             |
| Thickness            | ETT, or<br>Fillet Size           | No.        | Layer<br>Number           | Pass<br>Number |         | ectrode<br>Size (mm) | Current<br>Polarity | Amperes<br>+/-8%  | Wire Feed<br>Speed (in/min)             | Volts + /-8%   | Arc Travel<br>Speed (in/min |
| /4" 6mm              |                                  | 1          | 1                         | 1              | .045    | 1.2                  | DCRP                | 180   | 250-325                                 | 23   | 11 +/- 3                    |
|                      | 15-                              | 2          | 6                         | B1*            | .045    | 1.2                  | DCRP                | 180   | 250-325                                 | 23   | 12 +/- 4                    |
| /16" 8mm             |                                  | 1          | 1                         | 1/2            | .045    | 1.2                  | DCRP                | 180   | 250-325                                 | 23   | 11 +/- 3                    |
|                      |                                  | 2          | 5-6                       | B1-B2*         | .045    | 1.2                  | DCRP                | 180   | 250-325                                 | 23   | 12 +/- 4                    |
| /8" 10mm             |                                  | 1          | 1-2                       | 1-2            | .045    | 1.2                  | DCRP                | 190   | 265-340                                 | 23   | 11 +/- 3                    |
|                      | 45 - 25                          | 2          | 5-6                       | B1-B3*         | .045    | 1.2                  | DCRP                | 190   | 265-340                                 | 23   | 12 +/- 4                    |
| /2" 12mm             | C.                               | 1 -        | 1-3                       | 1-3            | .045    | 1.2                  | DCRP                | 200   | 275-350                                 | 24   | 11 +/- 3                    |
|                      |                                  | 2          | 5-6                       | B1-B3*         | .045    | 1.2                  | DCRP                | 200   | 275-350                                 | 24   | 12 +/- 4                    |
| /8" 16mm             |                                  | 1          | 1-3                       | 1-4            | 1/18    | 1.6                  | DCRP                | 275   | 230-300                                 | 27   | 11 +/- 3                    |
|                      |                                  | 2          | 4-6                       | B1-B4*         | 1/18    | 1.6                  | DCRP                | 275   | 230-300                                 | 27   | 12 +/- 4                    |
| Revision Date        |                                  | Exp        | olanation                 |                | _       | C                    | WB Approve          | al  |   | ngineer's  |                             |
|                      |                                  |            |                           | -              |         | MA                   | 100                 | onto  | 7) 6                                    | PROFESS  | SIONAL                      |
| -                    | 1 200                            |            |                           |                | C       | VVD                  | ACC                 | epte  | U / (50)                                | NATE II  | 18/10                       |
| NOTES: "N            | UMBER OF F                       | PASSES     | MAY RE INCE               | EASED TO       | /       |                      |                     |   | 1 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | The state of the s | 9/02/10/2                   |
|                      | LL BACK-GOUG                     |            | DE INCA                   | LACED TO       | (0      | WB)                  | Sep 16              | 6, 2008   | E 6                                     | S. KE  | -                           |
|                      |                                  |            |                           |                | /       | /                    |                     | 2.126.6   | 1 2                                     |  |                             |
|                      |                                  |            |                           |                | Valid   | d only if            | velding co          | onsumable   | es Ver                                  | CE OF N  | 1 SOF                       |



## DATA SHEET

No.:

SAW-06-CVN

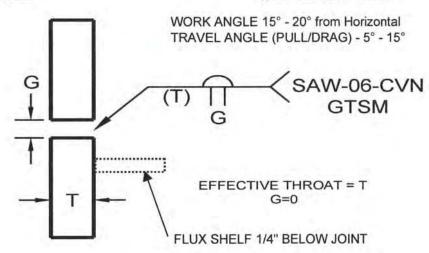
Date:

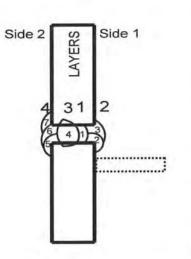
June 11, 2008

SAW-1 Company Name: Mosher Engineering Wldg. Specification No: Reference WPQR: Address: 1358 Queen Street CSA W47.1, W59 & W48 Halifax Nova Scotia **B3J 2H5** Ref. Standards: Material Information: F7A4-EM12K-H8 Horizontal Welding Process: SAW Consumable: Position: CAN G40.21 350WT N/A Mode of Transfer: Spray Transfer Shielding Gas: Base Mat'l: Cat. 5 (27J @-40°C) ft3/h Process Mode: Automatic Gas Flow: NA Tungsten Dia.: NA in Tungsten Type: F Cleaning: Wire brush and remove slag in between passes PHT Temp: 15°C or 59 PWHT Temp: °F NA

Typical Joint Details:

Typical Pass & Layer Sequence:





| Joint Configuration: |                            | Joint De         | etails: |       |   | Technique & Process Inform | ation:     |       |
|----------------------|----------------------------|------------------|---------|-------|---|----------------------------|------------|-------|
| Joint Type:          | Butt                       | G=               | 3/32    | (°) = | 0 | Electrical Stickout:       | 1 1/2 ± 1/ | 4 in  |
| Weld Type:           | Complete Joint Penetration | R <sub>F</sub> = | 0       |       |   | Nozzle Diameter:           | 3/4        | in    |
| Backgouging:         | Backgouged to Sound Metal  |                  |         |       |   | Average Deposition Rate:   | 11.1       | lbs/h |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | SS | No. | Electro | de Size | Description of | nt ( |     | 100000000000000000000000000000000000000 | eed        | Speed<br>in) | 1000 | V<br>ol | olts<br>ts) |      | el S | peed<br>in) | Average<br>Heat Inpu |
|--------|------|--------------------|-------------|-----|-----|-----|-----|----|-----|---------|---------|----------------|------|-----|---|------------|--------------|------|---------|-------------|------|------|-------------|----------------------|
| in.    | mm   | in                 |             | Min |     | Max | Min |    | Max | in.     | mm      | Min            |      | Max | Min                                     |            | Max          | Min  |         | Max         | Min  |      | Max         | (kJ/in)              |
| 3/8    | 9.5  |                    | 1           | 1   | -   | 2   | 1   | -  | 3   | 1/8     | 3.3     | 350            | -    | 450 | 41                                      | 1-1        | 51           | 25   | -       | 29          | 19.1 | -    | 25.3        | 30.3                 |
|        |      |                    | 2           | 3   | -   | 4   | 4   | -  | 6   | 1/8     | 3.3     | 350            | -    | 450 | 41                                      | -          | 51           | 25   | -       | 29          | 19.1 | 1-1  | 25.3        | 30.3                 |
| 7/16   | 11   |                    | 1           | 1   | -   | 2   | 1   | -  | 3   | 1/8     | 3.3     | 350            | -    | 450 | 41                                      | -          | 51           | 25   | -       | 29          | 19.1 | -    | 25.3        | 30.3                 |
|        |      |                    | 2           | 3   | -   | 4   | 4   | -  | 6   | 1/8     | 3.3     | 350            | 4    | 450 | 41                                      | <b>I-I</b> | 51           | 25   | -       | 29          | 19.1 | -    | 25.3        | 30.3                 |
| 1/2    | 13   |                    | 1           | 1   | -   | 2   | 1   | -  | 2   | 1/8     | 3.3     | 350            | -    | 450 | 41                                      | 1-1        | 51           | 25   | -       | 29          | 19.1 | -    | 25.3        | 30.3                 |
|        |      |                    | 2           | 3   | -   | 4   | 4   | -  | 6   | 1/8     | 3.3     | 350            | -    | 450 | 41                                      | -          | 51           | 25   | -       | 29          | 19.1 | -    | 25.3        | 30.3                 |
|        |      |                    |             |     | П   |     |     | П  |     |         | 16 6    |                |      |     |   | 11         |              |      |         |             |      | П    |             |                      |

**Revision Status:** 

Date: Explanation: 7/22/08 Per PQR P5709

NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

CWB Approval:

# **CWB** Accepted



Jul 28, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225





## **DATA SHEET**

No.:

SAW-10-CVN

Date:

June 11, 2008

15°C or 59

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°F

Company Name: Mosher Engineering Wldg. Specification No: SAW-1 Reference WPQR: Address: 1358 Queen Street CSA W47.1, W59 & W48 Ref. Standards: **B3J 2H5** Halifax Nova Scotia Material Information: F7A4-EM12K-H8 Consumable: Position: Horizontal Welding Process: SAW CAN G40.21 350WT Mode of Transfer: Spray Transfer Shielding Gas: N/A Base Mat'l: Cat. 5 (27J @-40°C) NA ft3/h Process Mode: Automatic Gas Flow: NA Tungsten Type: Tungsten Dia.: in

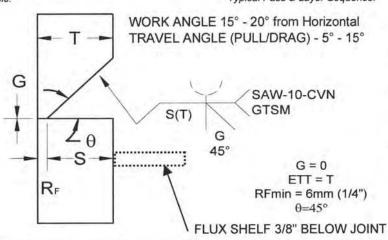
PHT Temp:

PWHT Temp:

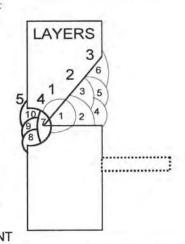
Typical Joint Details:

Cleaning:

Typical Pass & Layer Sequence:



Wire brush and remove slag in between passes



| Joint Configuration: |                            | Joint D          | etails: |       |    | Technique & Process Inform | ation:      |       |
|----------------------|----------------------------|------------------|---------|-------|----|----------------------------|-------------|-------|
| Joint Type:          | Butt                       | G=               | 0       | (°) = | 45 | Electrical Stickout:       | 1 1/4 ± 1/4 | in    |
| Weld Type:           | Complete Joint Penetration | R <sub>F</sub> = | 1/4     |       |    | Nozzle Diameter:           | 3/4         | in    |
| Backgouging:         | Backgouged to Sound Metal  |                  |         |       |    | Average Deposition Rate:   | 11.1        | lbs/h |

Welding Parameters:

| Weld S  | Size            | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | ISS   | No.    | Electro | de Size |     | nt ( | Amps) |     | eed<br>n/mi | Speed<br>n) | 1000 | c V   | olts<br>ts) |      | el S | peed<br>in) | Average<br>Heat Inpu |
|---------|-----------------|--------------------|-------------|-----|-----|-----|-----|-------|--------|---------|---------|-----|------|-------|-----|-------------|-------------|------|-------|-------------|------|------|-------------|----------------------|
| in.     | mm              | in                 |             | Min |     | Max | Min |       | Max    | in.     | mm      | Min |      | Max   | Min |             | Max         | Min  |       | Max         | Min  |      | Max         | (kJ/in)              |
| 7/16    | 11              | 3/16               | 1           | 1   | -   | 2   | 1   | 1-1   | 2      | 1/8     | 3.3     | 450 | -    | 550   | 42  | 1-1         | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
|         |                 |                    | 2           | 4   | -   | 5   | 7   | 1-1   | 10     | 1/8     | 3.3     | 450 | -    | 550   | 42  | 1-          | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
| 1/2     | 13              | 1/4                | 1           | 1   | -   | 2   | 1   | -     | 2      | 1/8     | 3.3     | 450 | -    | 550   | 42  | 1-          | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
|         |                 |                    | 2           | 4   | -   | 5   | 7   | -     | 10     | 1/8     | 3.3     | 450 | -    | 550   | 42  | -           | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
| 5/8     | 16              | 3/8                | 1           | 1   | -   | 3   | 1   | -     | 5      | 1/8     | 3.3     | 450 | -    | 550   | 42  | -           | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
|         | 7               |                    | 2           | 4   | -   | 5   | 7   | -     | 10     | 1/8     | 3.3     | 450 | -    | 550   | 42  | 1-1         | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
| 3/4     | 19              | 1/2                | 1           | 1   | -   | 3   | 1   | -     | 6      | 1/8     | 3.3     | 450 | -    | 550   | 42  | -           | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
|         |                 |                    | 2           | 4   | -   | 5   | 7   | 1-    | 10     | 1/8     | 3.3     | 450 | -    | 550   | 42  | 1-1         | 51          | 25   | -     | 29          | 15.4 | -    | 23.6        | 41.5                 |
| Revisio | evision Status: |                    |             |     |     |     |     | CWB A | pprova | 1:      |         |     |      |       |     | Соп         | npa         | ny's | Appro | val:        |      |      |             |                      |

Explanation: Date:

22/07/2008 P5710

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



Jul 28, 2008

Valid only if welding consumables are certified by the CWB





No.:

FCAW-1-CVN

Date: July 22, 2008

Company Name: Mosher Engineering Wldg. Specification No: RTR-4

Address: 1358 Queen Street Reference WPQR:
Halifax Nova Scotia B3J 2H5 Ref. Standards: CSA W47.1, W59 & W48

| Material | Infor | mat | ion: |
|----------|-------|-----|------|
|          |       |     |      |

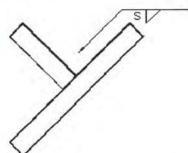
| Position:   | Flat                | Welding Process:  | FCAW           | Consumable:    | E491T-9MJ-H16/E4 | 801T-9CH |
|-------------|---------------------|-------------------|----------------|----------------|------------------|----------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: | Spray Transfer | Shielding Gas: | 75% Ar 25% (     | 002      |
| 2001100     | Cat. 5 (27J @-40°C) | Process Mode:     | Semi-Automatic | Gas Flow:      | 35               | ft3/h    |
|             |                     | Tungsten Type:    |                | Tungsten Dia.: |                  | in       |

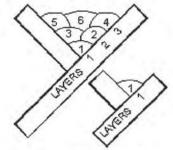
Cleaning: Wire brush and remove slag in between passes PHT Temp: As per Table 5.3 of CSA W59 °F
PWHT Temp: N/A °F

Typical Joint Details:

Typical Pass & Layer Sequence:







| Joint Configuration: |                  | Joint Details:      | Technique & Process Informa | ation:   |       |
|----------------------|------------------|---------------------|-----------------------------|----------|-------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:        | 3/4 ± 1/ | 8 in  |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:            | 1/2      | in    |
| Backgouging:         | N/A              | - 6                 | Average Deposition Rate:    | 8.0      | lbs/h |

Welding Parameters:

| Weld \$ | Size | Depth of<br>Prep'n | Side<br>No. | Lay | er l | No. | Pas | ss I | No. | Electrod | de Size |     | nt ( |     | Wire F | eed |     |     | Volt | olts<br>s) |      | el S | peed<br>in) | Average<br>Heat Inpu |
|---------|------|--------------------|-------------|-----|------|-----|-----|------|-----|----------|---------|-----|------|-----|--------|-----|-----|-----|------|------------|------|------|-------------|----------------------|
| in.     | mm   | in                 |             | Min |      | Max | Min |      | Max | in.      | mm      | Min |      | Max | Min    |     | Max | Min |      | Max        | Min  |      | Max         | (kJ/in)              |
| 3/16    | 4.8  |                    | 1           |     | П    | 1   | 1.1 | П    | 1   | 0.045    | 1.2     | 225 | -    | 275 | 380    | 1-1 | 460 | 29  | -    | 31         | 20.0 | -    | 24.0        | 20.5                 |
| 1/4     | 6.4  |                    | 1           |     | П    | 1   | Tal | T    | 1   | 0.045    | 1.2     | 225 | -    | 275 | 380    | 1-1 | 460 | 29  | -    | 31         | 20.0 | -    | 24.0        | 20.5                 |
| 5/16    | 7.9  | 12                 | 1           |     | П    | 1   |     | П    | 1   | 0.045    | 1.2     | 225 | -    | 275 | 380    | -   | 460 | 29  | -    | 31         | 16.6 | -    | 22.4        | 20.5                 |
| 3/8     | 9.5  |                    | 1           | 1   | -    | 2   | 1   | -    | 3   | 0.045    | 1.2     | 225 | -    | 275 | 380    | T-I | 460 | 29  | -    | 31         | 17.3 | -    | 23.4        | 22.1                 |
| 1/2     | 13   |                    | 1           | 1   | -    | 2   | 1   | -    | 3   | 0.045    | 1.2     | 225 | -    | 275 | 380    | 1-1 | 460 | 29  | -    | 31         | 12.4 | -    | 16.8        | 30.8                 |
| 5/8     | 16   |                    | 1           | 1   | -    | 3   | 1   | 4    | 6   | 0.045    | 1.2     | 226 | -    | 275 | 380    | F   | 460 | 29  | -    | 31         | 12.4 | -    | 16.8        | 30.8                 |
|         |      |                    |             |     |      |     |     | +    |     |          |         |     | H    |     |        | Ħ   |     | H   |      |            |      | H    |             |                      |
|         |      |                    |             |     | H    |     |     | H    |     |          |         | FV  | Н    |     | 1 1    | ††  | -   |     | H    |            |      | H    |             |                      |

evision Status: CWB Approval:

| Kevision Sta | atus.                             |
|--------------|-----------------------------------|
| Date:        | Explanation:                      |
| 7/22/2008    | Per PQR P5745                     |
| 2/10/2009    | Rev. WPDSnumber, added "CVN" to # |
|              |                                   |

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
   Weld Sizes represent effective weld throat thickness for
- qualified T range.

Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

**CWB** Accepted



Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225



Company's Approval:

Prepared by: FORGERON ENGINEERING LIMITED



No.:

FCAW-2-CVN

Date:

July 22, 2008

°F

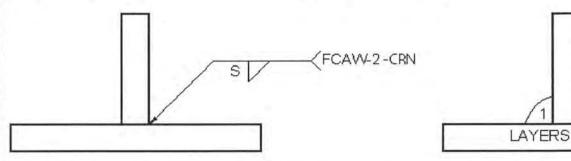
RTR-4 Company Name: Mosher Engineering Wldg. Specification No: Address: 1358 Queen Street Reference WPQR: CSA W47.1, W59 & W48 Halifax Nova Scotia B3J 2H5 Ref. Standards: Material Information:

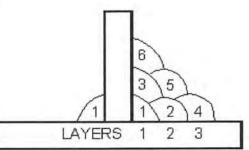
| Position:                               | Horizontal          | Welding Process:          | FCAW           | Consumable:    | E491T-9-H16/E4801T-9-0   | CH    |
|---|---------------------|---------------------------|----------------|----------------|--------------------------|-------|
| Base Mat'l:                             | CAN G40.21 350WT    | Mode of Transfer:         | Spray Transfer | Shielding Gas: | 75% Ar 25% CO2           |       |
| 355000000000000000000000000000000000000 | Cat. 5 (27J @-40°C) | Process Mode: S           | Semi-Automatic | Gas Flow:      | 35                       | ft3/h |
|   |                     | Tungsten Type:            |                | Tungsten Dia.: |                          | in    |
| Cleaning:                               | Wire brush and remo | ve slan in hetween nasses | PHT Temp:      | Δ              | ner Table 5.3 of CSA W59 | °F    |

PWHT Temp:

Typical Joint Details:

Typical Pass & Layer Sequence:





| Joint Configuration: |                  | Joint Details:      | Technique & Process Informa | tion: |        |
|----------------------|------------------|---------------------|-----------------------------|-------|--------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:        | 3/4 ± | 1/8 in |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:            | 1/2   | in     |
| Backgouging:         | N/A              |                     | Average Deposition Rate:    | 8.0   | lbs/h  |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | Lay | yer | No. | Pa  | Pass No. |     | Electrode Size |     | Current (Amps) DCRP |   | Wire Feed Speed<br>(in/min) |     |             | Arc Volts<br>(Volts) |     |   | Trav | el S | Average<br>Heat Inpu |      |         |
|--------|------|--------------------|-------------|-----|-----|-----|-----|----------|-----|----------------|-----|---------------------|---|-----------------------------|-----|-------------|----------------------|-----|---|------|------|----------------------|------|---------|
| in.    | mm   | in                 |             | Min |     | Max | Min |          | Max | in.            | mm  | Min                 |   | Max                         | Min |             | Max                  | Min |   | Max  | Min  |                      | Max  | (kJ/in) |
| 3/16   | 4.8  |                    | 1           |     | П   | 1   |     | П        | 1   | 0.045          | 1.2 | 225                 | - | 275                         | 380 | 1-1         | 460                  | 29  | - | 31   | 20.0 | -                    | 24.0 | 20.5    |
| 1/4    | 6.4  |                    | 1           | -   | П   | 1   |     | П        | 1   | 0.045          | 1.2 | 225                 | - | 275                         | 380 | 1-1         | 460                  | 29  | - | 31   | 20.0 | -                    | 24.0 | 20.5    |
| 5/16   | 7.9  |                    | 1           |     | П   | 1   |     | П        | 1   | 0.045          | 1.2 | 225                 | - | 275                         | 380 | 1-1         | 460                  | 29  | - | 31   | 16.6 | -                    | 22.4 | 20.5    |
| 3/8    | 9.5  |                    | 1           | 1   | -   | 2   | 1   | -        | 3   | 0.045          | 1.2 | 225                 | - | 275                         | 380 | -           | 460                  | 29  | - | 31   | 17.3 | -                    | 23.4 | 22.1    |
| 1/2    | 13   |                    | 1           | 1   | -   | 2   | 1   | -        | 3   | 0.045          | 1.2 | 225                 | - | 275                         | 380 | -           | 460                  | 29  | - | 31   | 12.4 | -                    | 16.8 | 30.8    |
| 5/8    | 16   |                    | 1           | 1   | -   | 3   | 1   | +        | 6   | 0.045          | 1.2 | 226                 | - | 275                         | 380 | -           | 460                  | 29  | - | 31   | 12.4 | -                    | 16.8 | 30.8    |
|        |      |                    |             |     |     |     |     |          |     |                |     |                     |   |                             |     | $\parallel$ |                      |     |   |      |      | H                    |      |         |
| -      |      |                    |             |     | H   | _   |     | H        |     |                |     |                     | H |                             |     | H           |                      |     | H |      |      | H                    |      |         |

Revision Status: CWB Approval:

| Date:     | Explanation:                       |
|-----------|------------------------------------|
| 7/22/2008 | Per PQR P5745                      |
| 2/10/2009 | Rev. WPDS number, added "CVN" to # |

Use stringer beads only. Restrict weld bead to ≤ 16 mm.

2. Weld Sizes represent effective weld throat thickness for qualified T range.

3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

**CWB Accepted** 



Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225



Company's Approval:

Prepared by: FORGERON ENGINEERING LIMITED



Nova Scotia

No. Date: FCAW-3-CVN July 22, 2008

F

RTR-4 Company Name: Mosher Engineering Wldg. Specification No: Reference WPQR: Address: 1358 Queen Street

**B3J 2H5** 

Ref. Standards:

CSA W47.1, W59 & W48

Material Information:

Typical Joint Details:

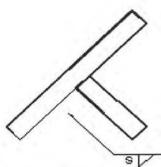
| Position:   | Vertical Up         | Welding Process:          | FCAW          | Consumable:    | E491T-9MJ-H16/E4801T-9     | 9CH   |
|-------------|---------------------|---------------------------|---------------|----------------|----------------------------|-------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: S       | pray Transfer | Shielding Gas: | 75% Ar 25% CO2             |       |
|             | Cat. 5 (27J @-40°C) | Process Mode: Se          | emi-Automatic | Gas Flow:      | 35                         | ft3/h |
|             |                     | Tungsten Type:            |               | Tungsten Dia.: |                            | in    |
| Cleaning:   | Wire brush and remo | ve slag in between passes | PHT Temp:     | A              | s per Table 5.3 of CSA W59 | "F    |

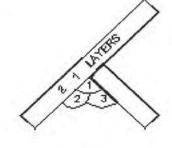
Cleaning: Wire brush and remove slag in between passes

Halifax

PWHT Temp:

Typical Pass & Layer Sequence:





CFCAWJ-3-CRN

| Joint Configuration: |                  | Joint Details:      | Technique & Process Informatio | n:        |       |
|----------------------|------------------|---------------------|--------------------------------|-----------|-------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:           | 3/4 ± 1/8 | in    |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:               | 1/2       | in    |
| Backgouging:         | N/A              |                     | Average Deposition Rate:       | 5.0       | lbs/h |

Welding Parameters:

| Weld S | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pass No. |   | No. | Electrode Size |     | Current (Amps) DCRP |     | Wire Feed Speed<br>(in/min) |     |             | Arc Volts<br>(Volts) |     |   | Trav | el S | Average<br>Heat Inpu |      |         |
|--------|------|--------------------|-------------|-----|-----|-----|----------|---|-----|----------------|-----|---------------------|-----|-----------------------------|-----|-------------|----------------------|-----|---|------|------|----------------------|------|---------|
| in.    | mm   | in                 |             | Min |     | Max | Min      |   | Max | in.            | mm  | Min                 |     | Max                         | Min |             | Max                  | Min |   | Max  | Min  |                      | Max  | (kJ/in) |
| 3/16   | 4.8  |                    | 1           |     | П   | 1   |          |   | 1   | 0.045          | 1.2 | 150                 | 1-1 | 250                         | 200 | 1-1         | 300                  | 26  | - | 29   | 28.8 | -                    | 38.9 | 9.7     |
| 1/4    | 6.4  |                    | 1           |     | П   | 1   |          | П | 1   | 0.045          | 1.2 | 150                 | -   | 250                         | 200 | -           | 300                  | 26  | - | 29   | 16.2 | [-]                  | 21.9 | 17.3    |
| 5/16   | 7.9  |                    | 1           | 1   | -   | 2   | 1        | - | 3   | 0.045          | 1.2 | 150                 | -   | 250                         | 200 | -           | 300                  | 26  | - | 29   | 10.4 | -                    | 14.0 | 26.0    |
| 3/8    | 9.5  |                    | 1           | 1   | -   | 2   | 1        | - | 3   | 0.045          | 1.2 | 150                 | -   | 250                         | 200 | <b>I</b> -I | 300                  | 26  | - | 29   | 10.8 | -                    | 14.5 | 26.0    |
| 1/2    | 13   |                    | 1           | 1   | -   | 2   | 1        | - | 3   | 0.045          | 1.2 | 150                 | -   | 250                         | 200 | -           | 300                  | 26  | - | 29   | 6.1  | -                    | 8.2  | 46.2    |
|        |      |                    |             |     | Н   |     |          | Н |     |                |     |                     | Н   |                             |     | H           |                      | -   | H |      | -    | H                    |      |         |
|        |      |                    |             |     |     |     |          |   |     |                | 100 |                     | Н   |                             |     | H           |                      | -   | H |      | _    | H                    |      |         |

On the Basis of PREVIOUS TESTS **ACCUMULATED** BY THE CWB

CWB Approval: **Revision Status:** 

| Date:     | Explanation:                       |
|-----------|------------------------------------|
| 7/22/2008 | Per PQR P5745                      |
| 9/10/2009 | Rev. WPDS number, added "CVN" to # |

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.

3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

Prepared by: FORGERON ENGINEERING LIMITED

CWB Accepted



Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225





No.:

FCAW-4-CVN

Date:

July 22, 2008

Company Name: Mosher Engineering Wldg. Specification No: RTR-4

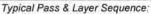
Address: 1358 Queen Street Reference WPQR:
Halifax Nova Scotia B3J 2H5 Ref. Standards: CSA W47.1, W59 & W48

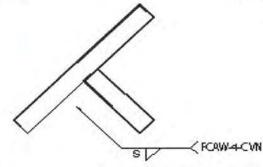
Material Information:

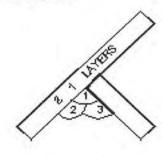
| Position:   | Overhead            | Welding Process:  | FCAW           | Consumable:    | E491T-9MJ-H16/E4801T-9CH |       |  |  |  |  |
|-------------|---------------------|-------------------|----------------|----------------|--------------------------|-------|--|--|--|--|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: | Spray Transfer | Shielding Gas: | 75% Ar 25% C             | :02   |  |  |  |  |
|             | Cat. 5 (27J @-40°C) | Process Mode:     | Semi-Automatic | Gas Flow:      | 35                       | ft3/h |  |  |  |  |
|             |                     | Tungsten Type:    |                | Tungsten Dia.: |                          | in    |  |  |  |  |

Cleaning: Wire brush and remove slag in between passes PHT Temp: As per Table 5.3 of CSA W59 "F PWHT Temp: N/A "F

Typical Joint Details:







| Joint Configuration: |                  | Joint Details:      | Technique & Process Informa | tion: |        |
|----------------------|------------------|---------------------|-----------------------------|-------|--------|
| Joint Type:          | Tee, Corner, Lap | G = 0-1/16" Q (°) = | Electrical Stickout:        | 3/4 ± | 1/8 in |
| Weld Type:           | Fillet Weld      | R <sub>F</sub> =    | Nozzle Diameter:            | 1/2   | in     |
| Backgouging:         | N/A              |                     | Average Deposition Rate:    | 5.0   | lbs/h  |

Welding Parameters:

| Weld : | Size | Depth of<br>Prep'n | Side<br>No. | La  | Layer No. |                      | Pa  | Pass No. |     | Electrode Size |     | Current (Amps)<br>DCRP |   | Wire Feed Speed<br>(in/min) |     |     | Arc Volts<br>(Volts) |     |   | Travel Speed (in/min) |      |             | Average<br>Heat Inpu |         |
|--------|------|--------------------|-------------|-----|-----------|----------------------|-----|----------|-----|----------------|-----|------------------------|---|-----------------------------|-----|-----|----------------------|-----|---|-----------------------|------|-------------|----------------------|---------|
| in.    | mm   | in                 |             | Min |           | Max                  | Min |          | Max | in.            | mm  | Min                    |   | Max                         | Min |     | Max                  | Min |   | Max                   | Min  |             | Max                  | (kJ/in) |
| 3/16   | 4.8  |                    | 1           | HE? | П         | 1                    |     | П        | 1   | 0.045          | 1.2 | 150                    | - | 250                         | 200 | 1-1 | 300                  | 26  | - | 29                    | 28.8 | <b>I-</b> I | 38.9                 | 9.7     |
| 1/4    | 6.4  |                    | 1           |     | П         | 1                    |     | П        | 1   | 0.045          | 1.2 | 150                    | - | 250                         | 200 | 1-1 | 300                  | 26  | - | 29                    | 16.2 | -           | 21.9                 | 17.3    |
| 5/16   | 7.9  |                    | 1           |     | П         | 1                    |     | П        | 1   | 0.045          | 1.2 | 150                    | - | 250                         | 200 | 1-1 | 300                  | 26  | - | 29                    | 16.2 | -           | 21.9                 | 17.3    |
| 3/8    | 9.5  |                    | 1           | 1   | -         | 2                    | 1   | -        | 3   | 0.045          | 1.2 | 150                    | - | 250                         | 200 | -   | 300                  | 26  | - | 29                    | 10.8 | -           | 14.6                 | 26.0    |
| 1/2    | 13   |                    | 1           | 1   | -         | 2                    | 1   |          | 3   | 0.045          | 1.2 | 150                    | - | 250                         | 200 | F   | 300                  | 26  | - | 29                    | 6.1  | -           | 8.2                  | 46.2    |
|        |      |                    | -           |     |           |                      |     |          | _   | -              |     |                        | H |                             |     | H   |                      |     | F |                       |      | H           |                      |         |
|        |      |                    |             | PRE | V         | he Ba<br>IOUS<br>UMU | TE  | S        | rs  |                |     |                        |   |                             |     |     |                      |     |   |                       |      |             |                      |         |

Revision Status:

ACCUMULATE
BY THE CWB

CWB Approval:

Company's Approval:

| Date:     | Explanation:                       |
|-----------|------------------------------------|
| 7/22/2008 | Per PQR P5745                      |
| 2/10/2009 | Rev. WPDS number, added "CVN" to # |
| 2/10/2009 | Nev. VVI Do Humber, added OVN to   |

## NOTES:

- 1. Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

**CWB** Accepted



Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225



Prepared by: FORGERON ENGINEERING LIMITED



No.:

FCAW-8-CVN

Date:

Febuary 10, 2009

N/A

F

Wldg. Specification No: RTR-4 Mosher Engineering Company Name: Reference WPQR: Address: 1358 Queen Street CSA W47.1, W59 & W48 Ref. Standards: Halifax Nova Scotia **B3J 2H5** 

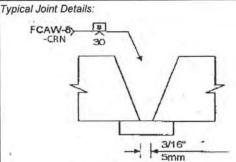
Material Information:

| Position:   | Flat                | Welding Process:          | FCAW            | Consumable:    | E491T-12MJ-H4  |       |
|-------------|---------------------|---------------------------|-----------------|----------------|----------------|-------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: Glo     | obular Transfer | Shielding Gas: | 75% Ar 25% CO2 |       |
|             | Cat. 5 (27J @-40°C) | Process Mode: Se          | emi-Automatic   | Gas Flow:      | 45             | ft3/h |
|             |                     | Tungsten Type:            |                 | Tungsten Dia.: |                | in    |
| Cleaning:   | Wire brush and remo | ve slag in hetween passes | PHT Temp:       |                | 15°C or 59     | °F    |

PHT Temp:

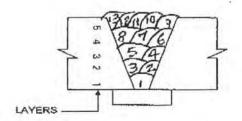
Cleaning:

PWHT Temp: Typical Pass & Layer Sequence:





Wire brush and remove slag in between passes



Typical Pass and Layer Sequence

| Joint Configuration | :                          | Joint Details:   |         | Technique & Process Informa | tion:     |       |  |  |  |
|---------------------|----------------------------|------------------|---------|-----------------------------|-----------|-------|--|--|--|
| Joint Type:         | Butt                       | G = 3/16"        | Q (°) = | Electrical Stickout:        | 3/4 ± 1/3 | 3 in  |  |  |  |
| Weld Type:          | Complete Joint Penetration | R <sub>F</sub> = |         | Nozzle Diameter:            | 1/2       | in    |  |  |  |
| Backgouging:        | N/A                        |                  |         | Average Deposition Rate:    | 7.0       | lbs/h |  |  |  |

Welding Parameters:

| Weld | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | iss | No. | Electro | de Size | 100 | nt ( | Amps) |     | eed | Speed<br>in) |     |   | olts<br>(ts) |      | el S | Speed<br>in) | Average<br>Heat Input |
|------|------|--------------------|-------------|-----|-----|-----|-----|-----|-----|---------|---------|-----|------|-------|-----|-----|--------------|-----|---|--------------|------|------|--------------|-----------------------|
| in.  | mm   | in                 |             | Min |     | Max | Min |     | Max | în.     | mm      | Min |      | Max   | Min |     | Max          | Min |   | Max          | Min  |      | Max          | (kJ/in)               |
| 3/8  | 10   | 3/8                | 1           | 1   | Ŀ   | 2   | 1.  | -   | 3   | 0.045   | 1.2     | 200 | -    | 240   | 300 | -   | 400          | 27  | - | 29           | 17.0 | Ŀ    | 23.0         | 18.5                  |
| 1/2  | 13   | 1/2                | 1           | 1   | -   | 3   | 1   | -   | 5   | 0.045   | 1.2     | 200 | ,    | 240   | 300 | -   | 400          | 27  | - | 29           | 17.0 |      | 23.0         | 18.5                  |
| 5/8  | 16   | 5/8                | 1           | 1   | -   | 4   | 1   | -   | 8   | 0.045   | 1.2     | 200 | -    | 240   | 300 |     | 400          | 27  |   | 29           | 17.0 | Ė    | 23.0         | 18.5                  |
| 3/4  | 19   | 3/4                | 1           | 1   | -   | 5   | 1   | -   | 13  | 0.045   | 1.2     | 200 | -    | 240   | 300 | -   | 400          | 27  | - | 29           | 17.0 | -    | 23.0         | 18.5                  |
|      |      |                    |             |     | t   |     |     | t   | T   |         |         |     |      |       |     | Ħ   |              |     | - |              |      | t    |              |                       |
|      | -    |                    |             |     | +   |     |     | +   |     |         |         |     | t    |       |     | T   |              |     |   |              |      |      |              |                       |

Revision Status:

Explanation: 7/22/2008 Per PQR P5744

## NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir

Prepared by: FORGERON ENGINEERING LIMITED

**CWB** Accepted



CWB Approval:

Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225





## DATA SHEET

No.:

FCAW-15-CVN

Date:

December 1, 2008

Company Name: Mosher Engineering Wldg. Specification No: RTR-4

Address: 1358 Queen Street Reference WPQR:

Halifax Nova Scotia B3J 2H5 Ref. Standards: CSA W47.1, W59 & AWS D1.1

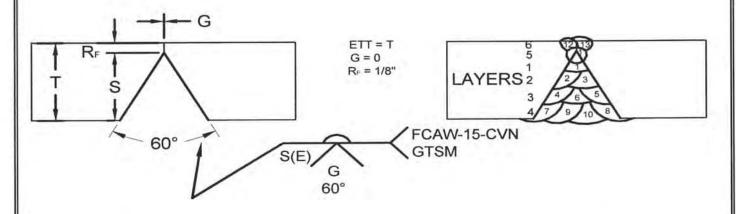
Material Information:

| Position:   | Vertical Up         | Welding Process:  | FCAW              | Consumable:    | E491T-12MJ   | -H4   |
|-------------|---------------------|-------------------|-------------------|----------------|--------------|-------|
| Base Mat'l: | CAN G40.21 350WT    | Mode of Transfer: | Globular Transfer | Shielding Gas: | 75% Ar 25% ( | CO2   |
|             | Cat. 5 (27J @-40°C) | Process Mode:     | Semi-Automatic    | Gas Flow:      | 38           | ft3/h |
|             |                     | Tungsten Type:    |                   | Tungsten Dia.: |              | in    |

Cleaning: Wire brush and remove slag in between passes PHT Temp: 15°C or 59 °F
PWHT Temp: NA °F

Typical Joint Details:

Typical Pass & Layer Sequence:



| Joint Configuration: |                            | Joint De         | tails: |           |   | Technique & Process Information | s Information: |       |       |  |  |
|----------------------|----------------------------|------------------|--------|-----------|---|---------------------------------|----------------|-------|-------|--|--|
| Joint Type:          | Butt                       | G=               | 0      | Q (°) = 6 | 0 | Electrical Stickout:            | 5/8            | ± 1/8 | in    |  |  |
| Weld Type:           | Complete Joint Penetration | R <sub>F</sub> = | 1/8    |           |   | Nozzle Diameter:                | 5/8            | A     | in    |  |  |
| Backgouging:         | Backgouged to Sound Metal  |                  |        |           |   | Average Deposition Rate:        | 6.5            |       | lbs/h |  |  |

Welding Parameters:

| Weld | Size | Depth of<br>Prep'n | Side<br>No. | La  | yer | No. | Pa  | ISS | No. | Electro | de Size | 100000 | nt ( | and the second | 10000000000000000000000000000000000000 | eec | Speed<br>in) | 100000 | V/ol | olts<br>ts) |      | el S | speed<br>in) | Average<br>Heat Inpu |
|------|------|--------------------|-------------|-----|-----|-----|-----|-----|-----|---------|---------|--------|------|----------------|--|-----|--------------|--------|------|-------------|------|------|--------------|----------------------|
| in.  | mm   | in                 |             | Min |     | Max | Min |     | Max | in.     | mm      | Min    |      | Max            | Min                                    |     | Max          | Min    |      | Max         | Min  | -    | Max          | (kJ/in)              |
| 3/8  | 9.5  | 1/4                | 1           | 1   | -   | 2   | 1   | T-  | 3   | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 21.0 | -    | 28.0         | 15.4                 |
|      |      |                    | 2           | 5   | -   | 6   | 11  | 1-  | 13  | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 15.4 | -    | 18.7         | 14.8                 |
| 1/2  | 13   | 3/8                | 1           | 1   | -   | 3   | 1   | -   | 6   | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 20.3 | -    | 27.5         | 15.4                 |
|      |      |                    | 2           | 5   | -   | 6   | 11  | -   | 13  | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 15.4 | -    | 18.7         | 17.5                 |
| 5/8  | 16   | 1/2                | 1           | 1   | -   | 3   | 1   | -   | 6   | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 19.0 | -    | 25.7         | 15.4                 |
|      |      |                    | 2           | 5   | -   | 6   | 11  | -   | 13  | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 15.4 | -    | 18,7         | 17.5                 |
| 3/4  | 19   | 5/8                | 1           | 1   | -   | 4   | 1   | -   | 10  | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 18.0 | -    | 24.0         | 15.4                 |
|      |      |                    | 2           | 5   | -   | 6   | 11  | -   | 13  | 0.045   | 1.2     | 155    | -    | 175            | 175                                    | -   | 225          | 24     | -    | 27          | 15.4 | -    | 18.7         | 17.5                 |

Revision Status:

Date: Explanation: 7/22/2008 P5744

NOTES:

- Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- Weld Sizes represent effective weld throat thickness for qualified T range.
- 3. Target heat inputs at calc'd average. Max. Heat Input to 46.7 kJ/ir
- 4. Tack weld parameters to be per main weld parameters
- Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



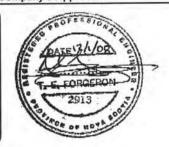
CWB Approval:

Dec 04, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225

On the Basis of PREVIOUS TESTS ACCUMULATED BY THE CWB



RTR FORM S-101, 1992

# RTR ENGINEERING WELDING PROCEDURE

No.

Date

|                     | to CSA W4                     | 7.1       |  |                            | DATA   | SHEE   | r                 | SI                    | WAW   | V-2            | MAR         | CH 28, 2002   |
|---------------------|-------------------------------|-----------|--|----------------------------|--|--|-------------------|-----------------------|-------|----------------|-------------|---------------|
| Company             | MOSHER E                      | NGIN      | EERING L   | IMITED                     |  |  |                   | WPS No.               |       | RTR-1(         | ۹)          |               |
| Name and            | 2089 Upper                    | Wate      | r Street   |                            |  |  |                   | Applicab              |       | CSA W          |             | /59           |
| Complete<br>Address |                               |           | The state of the s | D7                         |  | -  |                   | Standard              | i(s)  | & W48.         |             |               |
|                     | Halifax, No                   |           |  |                            |  |  |                   | Electrod<br>Classific |       | E48018         |             |               |
| Welding<br>Process  | x SMAW                        | SAW       |  | V (Tungsten)               | - D-   |  |                   | - Cidsailic           | ation |                |             |               |
| &                   | FCAW L                        | GMA       | _  | sw                         | Size:  |  |                   |                       |       | tinimum as     | per CSA     | W59           |
| Mode                | <b>★</b> Manual               |           | Semi-Automati  | С                          | Machine  |  | Automatic         | Othe                  | r     |                |             |               |
| Material            | Steel group                   |           |  |                            |  | Weldi  | ng Position       | Interpa               | ss    | Minimum        | As at       | ove           |
| Designation         | for type A (<br>type T (with  |           |  |                            |  | HOR  | ZONTAL            | Tempera               |       | Maximum        | 450 d       | eg. F         |
|                     | typo i (wa                    | iout,     | ogula to ii  | iipaot vait                | 100/   |  |                   |                       |       | ye we unusu ac |             |               |
|                     | 1/32" 1mm  Stotch Of Tunio    | and Joint |  | 1/8                        | * = T</th <th><!--=1 1/</th--><th>4*</th><th></th><th>ERS</th><th>123</th><th>}</th><th></th></th> | =1 1/</th <th>4*</th> <th></th> <th>ERS</th> <th>123</th> <th>}</th> <th></th> | 4*                |                       | ERS   | 123            | }           |               |
|                     | Sketch Of Typic               | al Joint  |  |                            |  |  |                   | Typical Pass          | _     |                |             |               |
|                     | oove Weld<br>Joint Penetratio | n         |  | ove Weld<br>int Penetratio | on l   |  | t Type<br>CSA W59 | Electrical            | Autor | matic or Se    | mi-Auto     | matic         |
| _                   | uged to sound m               |           |  | as per CSA                 |  | _  | _                 | Stickout              |       |                |             |               |
| Welded              | onto steel backin             | - 11      | Others   |                            | L  | Butt   | X Tee             | Shielding             |       |                | cu          |               |
| Other               |                               | I         |  | et Weld                    |  | Edge   | X Corner          | Gas                   |       |                | /hr         |               |
| Material            | ETT, or                       | Side      | Layer  | Pass                       | -  | trode  | Current           | Amperes               | Ιw    | ire Feed       | Volts       | Arc Travel    |
| Thickness           | Fillet Size                   | No.       | Number   | Number                     | 100000000000000000000000000000000000000  | ze (mm)  | Polarity          |                       |       | ed (in/min)    |             | Speed (in/mir |
|                     | 1/8" 3mm                      |           | 1  | 1                          | 3/32   | 2.5  | DCRP              | 75-95                 |       |                |             |               |
|                     | 3/16" 5mm                     |           | 1  | 1                          | 1/8  | 3.2  | DCRP              | 110-140               |       |                |             |               |
|                     | 1/4" 6mm                      |           | 1  | 1                          | 1/8  | 3.2  | DCRP              | 110-140               |       |                |             |               |
|                     | 5/16" 8mm                     |           | 1-2  | 1-3                        | 1/8  | 3.2  | DCRP              | 110-140               |       |                |             |               |
|                     | OR                            |           | 1-2  | 1-2                        | 5/32   | 4.0  | DCRP              | 160-200               |       |                |             |               |
|                     | 3/8" 10mm                     |           | 1-3  | 1-4*                       | 5/32   | 4.0  | DCRP              | 160-200               |       |                |             |               |
|                     | OR                            |           | 1-2  | 1-3                        | 3/16   | 5.0  | DCRP              | 225-275               |       |                |             |               |
|                     | 1/2" 12mm                     |           | 1-3  | 1-5*                       | 3/16   | 5.0  | DCRP              | 225-275               |       |                |             |               |
|                     |                               | 2.1       |  |                            |  |  | NA/D A            |                       |       |                | - draer's   | SE CHISINEEA  |
| Revision Dat        | 9                             | Exp       | lanation   |                            |  | 3.   | WB Approva        |                       |       |                | AGIII GOL I | tamp          |



SMAW-06-CVN

DATA SHEET

May 5, 2008

|                       |                     | DATASI                    |            |                                     |                |   |       |
|-----------------------|---------------------|---------------------------|------------|-------------------------------------|----------------|---|-------|
| Company Na<br>Address | me: Mosher Engir    |                           |            | Widg, Specification<br>Reference WP |                | RTR-1   |       |
| Address.              | Halifax             |                           | J 2H5      | Ref Standa                          |                | SA W47 1, W59 & W48                                     |       |
| Material Inf          |                     |                           |            |                                     |                |   |       |
| Position:             | Horizontal          | Welding Process           | SMAV       | /                                   | Consumable:    | E4918/E48018/E701                                       | 8     |
| Base Math             | CAN G40 21 350WT    | Mode of Transfer          | N/A        |                                     | Shielding Gas: | N/A   |       |
|                       | Gat. 5 (27J @-40°C) | Process Mode              | Manua      | 1                                   | Gas Flow:      |   | ft3/f |
|                       |                     | Tungsten Type:            |            |                                     | Tungsten Dia   |   | 10    |
| Cleaning              | Wire brush and remo | ve slag in between passes | PHT        | Temp:                               |                | CSA W47.1, W59 & W48  le: E4918/E48018/E7018 as: N/A w: | F     |
|                       |                     |                           | PWHT       | Temp                                |                |   | F     |
|                       |                     |                           |            |                                     |                |   |       |
|                       | G                   | (T)   G                   | <b>√</b> § | SMAW-06-<br>GTSM                    |                | 3 1 2   |       |

| Joint Configuration: |                            | Joint Details:     |           | Technique & Process Informa | tion:   |         |
|----------------------|----------------------------|--------------------|-----------|-----------------------------|---------|---------|
| Joint Type           | Butt, Tee, Corner          | G = T/2            | F (*) = 0 | Electrical Stickout         | 3/4 ± 1 | /8 in.  |
| Weld Type            | Complete Joint Penetration | R <sub>F</sub> = 0 |           | Nozzle Diameter:            | 1/2     | ir;     |
| Backgouging:         | Backgouged to Sound Metal  |                    |           | Average Deposition Rate:    | 2.6     | Itselft |

Welding Parameters:

| Weld S | ize | Depth of<br>Prep'n | Side<br>No. | Lay | er No. | Pa  | SS | No. | Electrod | de Size |     | nt ( | 1,000 |     | nin) |     | Violt | oits<br>s) |     | Speed<br>min) | Average<br>Heat Inpu |
|--------|-----|--------------------|-------------|-----|--------|-----|----|-----|----------|---------|-----|------|-------|-----|------|-----|-------|------------|-----|---------------|----------------------|
| in     | mm  | in                 |             | Min | Max    | Min |    | Max | in.      | mm      | Min |      | Max   | Min | Max  | Min |       | Max        | Min | Max           | {kJ/m}               |
| 1/4    | 6.4 | 1/4                | 1           |     | 1      |     |    | 1   | 3/32     | 2.4     | 75  | -    | 95    |     |      | 20  | -     | 22         | 5.7 | 7.7           | 16.0                 |
|        |     |                    | 2           |     | 2      |     | П  | 2   | 3/32     | 2.4     | 75  | -    | 95    |     |      | 20  | -     | 22         | 5.7 | 7.3           | 16.0                 |
| 5/16   | 7.9 | 5/16               | 1           | 1   | - 2    | 1   | -  | 2   | 3/32     | 2.4     | 75  | -    | 95    |     |      | 20  | -     | 22         | 4.6 | 6.2           | 16.0                 |
|        |     |                    | 2           |     | 3      | 3   | -  | 3   | 3/32     | 2.4     | 75  | -    | 95    |     |      | 20  | -     | 22         | 5.7 | 7.7           | 16.0                 |
| 3/8    | 9.5 | 3/8                | 1           | 1   | - 2    | 1   | -  | 2   | 3/32     | 2.4     | 75  | -    | 95    |     |      | 20  | -     | 22         | 3.5 | 51            | 16.0                 |
|        |     |                    | 2           |     | 3      | 3   | -  | 3   | 3/32     | 2.4     | 75  | -    | 95    |     |      | 20  | -     | 22         | 57  | 7.7           | 16.0                 |

Revision Status:

| Date:      | Explanation:    |   |
|------------|-----------------|---|
| 22/07/2008 | Per PQR P65JR78 | Ī |

- 1. Use stringer beads only. Restrict weld bead to ≤ 16 mm.
- 2. Weld Sizes represent effective weld throat thickness for qualified T range
- 3. Target heat inputs at calculated average.
- 4. Tack weld parameters to be per main weld parameters

Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED

# **CWB** Accepted



CWB Approval:

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Tel: (902) 835-7225



RTR FORM S-101, 1992 to CSA W47.1

## RTR ENGINEERING WELDING PROCEDURE DATA SHEET

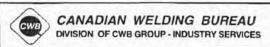
No.

Date

SMAW-31

MARCH 28, 2002

| Company              | MOSHER E                       | NGIN    | IEERING L     | IMITED                      |   |  |                             | WPS No.                | _               | TR-1(    |           | 150                         |
|----------------------|--------------------------------|---------|---------------|-----------------------------|---|--|-----------------------------|------------------------|-----------------|----------|-----------|-----------------------------|
| Name and<br>Complete | 2089 Upper                     | Wat     | er Street     |                             |   |  |                             | Applicab<br>Standard   |                 | W48.     | 47.1, V   | Voa                         |
| Address              | Halifax, No                    | va Sr   | otia B3.12    | PR7                         |   |  |                             |                        | -               | 41011    |           |                             |
|                      |                                |         |               |                             | Time  |  |                             | Electrode<br>Classific |                 | 41011    |           |                             |
| Welding<br>Process   | SMAW<br>FCAW                   | SAW     |               | V (Tungsten)                | -   |  |                             | -                      | _               |          |           |                             |
| &<br>Mode            | × Manual                       | GMA     | Semi-Automati | c N                         | Size:<br>Machine  |  | Automatic                   | Y Preh                 | eat Minir       | num as   | per CSA   | 4 W59                       |
| Material             | Steel group                    |         |               |                             |   | Weldi  | ng Position                 | Interpa                | ss Mi           | inimum   | As at     | oove                        |
| Designation          | Gr. 50, A57                    |         |               |                             | 70  | HOR  | IZONTAL                     | Tempera                | tura            | aximum   | 450 d     | leg. F                      |
| 1, 9                 | -1/16"                         | 1       | /<br>         |                             |   |  |                             | E LAY                  | TERS            | 1 2 3    |           |                             |
|                      | Sketch Of Typic                | al Join |               |                             | 5" = 1</td <td><!--=11</td--><td></td><td>Typical Pass</td><td>and Laye</td><td></td><td></td><td>matia</td></td> | =11</td <td></td> <td>Typical Pass</td> <td>and Laye</td> <td></td> <td></td> <td>matia</td> |                             | Typical Pass           | and Laye        |          |           | matia                       |
|                      | roove Weld<br>Joint Penetratio | n       |               | ove Weld<br>Int Penetration | on  |  | t Type<br>CSA W59           | Electrical             | Automat         | ic or se | mi-Auto   | mauc                        |
| Back-go              | uged to sound m                | etal    | Minimum       | as per CSA                  | W59 r   |  | X Tee                       | Stickout               |                 |          |           |                             |
|                      | onto steel backir              | ng      | Others        |                             | L   | Butt   | X Lap                       | Shielding              |                 |          | cu.       |                             |
| Other                |                                |         |               | et Weld                     |   | Edge   | X Corner                    | Gas                    |                 |          | /hr       | •                           |
| Material             | ETT, or                        | Side    | X Minimum     | Pass                        | -   | ctrode   | Current                     | Flux                   | 1 40-           | - 1      | 1/-1-     |                             |
| Thickness            | Fillet Size                    | No.     | Number        | Number                      | 1   | ize (mm)   | Polarity                    | Amperes                | Wire<br>Speed ( |          | Volts     | Arc Travel<br>Speed (in/min |
|                      | 3/16" 5mm                      |         | 1             | 1                           | 3/32  | 2.5  | DCRP                        | 55-75                  |                 |          |           |                             |
|                      | 1/4" 6mm                       |         | 1             | 1                           | 1/8   | 3.2  | DCRP                        | 95-115                 |                 |          |           |                             |
|                      | OR                             |         | 1             | 1                           | 5/32  | 4.0  | DCRP                        | 130-160                |                 |          |           |                             |
|                      | 5/16" 8mm                      |         | 1-2           | 1-3*                        | 5/32  | 4.0  | DCRP                        | 130-160                |                 |          |           |                             |
|                      | 3/8" 10mm                      |         | 1-3           | 1-5*                        | 5/32  | 4.0  | DCRP                        | 130-160                |                 |          |           |                             |
|                      | OR                             |         | 1-2           | 1-3*                        | 3/16  | 5.0  | DCRP                        | 170-190                |                 |          |           |                             |
|                      | 1/2" 12mm                      |         | 1-3           | 1-5*                        | 3/16  | 5.0  | DCRP                        | 170-190                |                 |          |           |                             |
|                      |                                |         |               |                             |   |  |                             |                        |                 |          |           |                             |
| Revision Dat         | 0                              | Exp     | planation     |                             |   | (  | CWB Approve                 | al .                   |                 | Er       | ngineer's | SSIONAL CHESINEES           |
|                      |                                |         |               |                             | Tital   | -leff D  |                             |                        |                 | /        | OOFE.     | 55100                       |
|                      |                                |         |               |                             | W   |  | rocedure D<br>proved to CS. |                        |                 | 10       | -         | 1                           |
|                      |                                |         |               |                             |   |  |                             |                        | 1               | TE       | к. Т.     | ROSE 6                      |
| NOTES: *1            | NUMBER OF PAS                  | SES M   | AY VARY BY    | +/-1 PASS                   | 579   | AP   | 0 4 20                      | 02                     |                 | EGISTER  | 271       | an Z                        |
|                      |                                |         |               |                             | C   | dsmusno  | elid only whe               |                        | -   \           | 13. Post | \$15HA    | 128 N                       |
|                      |                                |         |               |                             | 10  | 1.0.2.2.1,   | CSA W47.1)                  | AM                     |                 | 1        | TAL BEN   | SIL SCUID                   |



## WELDING PROCEDURE QUALIFICATION REPORT

P 036339

| 1.             | APPLICABLE STANDARD |                      |               |           |               |          | Company Code                     |   |            |  |              | WPDS No. A3332-1H |                    |                        |                    |         |         |
|----------------|---------------------|----------------------|---------------|-----------|---------------|----------|----------------------------------|---|------------|--|--------------|-------------------|--------------------|------------------------|--------------------|---------|---------|
| O 6            | 24<br>DAY           | 20 YE                |               | CS        | A W47.1       | CS.      | A W47.2                          | D                                       | FB         | A  | R 2          |                   |                    | VPDS No.<br>VPS No.    |                    | 100     |         |
|                | DATE O              | F TEST               |               |           | A W186<br>HER | ☐ AW     | S D1.3                           |   |            |  | _            |                   |                    |                        |                    |         |         |
|                |                     |                      |               |           |               |          |                                  | HETE                                    | ST V       | YES  | NO           | _                 |                    | EQUIRED                |                    | YES     | NO      |
| QUAL           | LIFICATIO           | N REQU               | ESTED B       | Y: [4     | COMPA         | NY       | СМВ                              | l Hauss                                 | on Site    |  |              |                   | ICING D            | 1000                   |                    |         |         |
| Comp           | anv -               |                      |               |           | _             |          |                                  |   | Travelli   | _  |              |                   | ° 80.              | -                      | HR. = /2           |         |         |
| Name           | D                   | . F.                 | Ray           | nes       | Ho            |          |                                  |   | etres (kr  | -  |              |                   | @ 80.              |                        | HR. = 4<br>KM. = / |         |         |
| Locati         |                     | 1                    | ,             | 10.0      |               |          | - V                              | 1000                                    | Expens     |  | 1            | NM.               | 0 0.               | 40 "                   | KM. = /            | 1.76    |         |
| of Tes         | st                  | 500                  | 1ds           |           |               |          |                                  | 7.00                                    | harges     | 62   |              | HRS.              |                    |                        | HR. =              | -       | PR-08   |
|                |                     | 1                    |               | 111.      | Test Plat     | е ,      | 2.0                              | 172                                     | -          | essment  | 1            | HRS.              |                    |                        | HR. =              |         | PR-04   |
| CMB            | Witness             | Ley                  | ) rel         | than      | Number        |          | 202                              |   | eering C   | Department of  | -            | HRS.              |                    |                        | HR. =              |         | PR-05   |
|                | ture of<br>Rep.     | lan                  | hes           | 5         |               |          |                                  |   | de Lab. C  |  |              |                   |                    |                        | 111                |         | PR-06   |
|                |                     | - NEW                | . 11          | -         | Tres          |          |                                  |   | na Proce   | ss   | -            | roces             | s Mode             | Method                 | of Backs           | nouging |         |
| Name           | "s We               | de                   | LH            | illier    | Weld<br>N.T.  |          | ☐ Yes<br>uired ☐ No              |   | AW         | GTAV   | v [          | Mar               | nual               |                        | NIZ                | 1       |         |
| S.I.N.         |                     |                      |               |           |               |          |                                  | HS.                                     | MAW        | GMAN   |              |                   | ni-Automa<br>chine | Depth o                | of Backgo          | uging   |         |
| J. W.          |                     |                      | 100           | w 7 21    | 1 00          | 101      | ,                                |   | THER_      | - GMA  |              | -                 | omatic             |                        |                    |         |         |
| Base<br>Materi | 1. S                | Specifical           | Mon AS II     | M DZ      | 1-02 Grad     | de (406  | 1-1651                           |   |            | Class  | sification   |                   | Tra                | ide Name               |                    | Mani    | facture |
| waten          | 2. 5                | Specifical           |               |           |               |          | -76511                           | -                                       |            | The state of the s | ASSESSED FOR | -                 |                    |                        |                    |         |         |
| Prehe          | at 1                |                      | 250           | Interpas  | s             | IIN A I  | MAX                              | Filler                                  | Metal A    | ER5  | 356          |                   |                    |                        |                    | Tink    | UCE     |
|                | at<br>erature A     | bien                 | #             | rempera   | ature NoT     | 'Ke      | corder                           | 100000000000000000000000000000000000000 | Metal B    |  |              |                   |                    |                        |                    |         |         |
| Post-V         |                     | 11.                  | ne            |           |               |          |                                  | Flux                                    | -          |  |              |                   |                    |                        |                    |         |         |
|                | 0.75000             |                      |               | -         |               |          |                                  | 100                                     |            |  |              |                   |                    |                        |                    |         |         |
| Cleani         | ing Proces          | dures                | 11/11-        | D Ru      | 156           | Cu       | nder                             | Tungs                                   | ten Type:  | Eh   | P            | 1.                |                    | Tungste                | n Diamet           |         |         |
| Weldin         | 20 [                | FLAT                 |               | RTICAL U  | -             | S-VII    | racr                             | Gas                                     | ing Av     | gon  |              | Flo               | W 104              | lmin                   | Nozzle<br>Size     | 2 m     | M       |
| Positio        |                     | HORIZ                |               | ERTICAL D | =             | OVERHE.  | AU                               | Cottone                                 | 3U         | L L  | Yes          |                   |                    | CHF                    | Electro            | de      | -       |
| 144            | 100.00              | - N. 21 - St. A. St. |               |           |               |          |                                  |   | ode Used   | _  | No           | and               | Polarity           | CHE                    | Extensi            | ion     |         |
| Weld           | ding Sequ           | ience                | Fille         | r Metal   | Arc           | Paramet  | ers                              | Wel                                     | ding Sec   | uence  |              | Filler            | Metal              | Arc                    | c Parame           | eters   |         |
| Side           | Layer               | Pass                 | Size          | W. Feed   | Amperes       | Volts    | Arc Travel                       | Side                                    | Layer      | Pass   | Size         |                   | W. Feed            | Amperes                | Volts              | Ar      | c Trave |
|                | 11111111            |                      | 1 m 4 5 5 5 5 | Speed     |               |          | Speed                            |   | Land State |  | -            |                   | Speed              |                        | TUE                | S       | peed    |
|                | UNITS               |                      | (mm)          | (NA)      | Α             | V        | min                              |   | UNITS      |  | (            | ) (               | )                  | Α                      | V                  | (       |         |
| 1              | 1                   | 1                    | 3.2           |           | 298           | 19       | 69                               |   | 7          |  |              | T                 |                    |                        |                    |         |         |
|                |                     |                      |               |           |               |          |                                  |   |            |  |              |                   |                    |                        |                    |         |         |
|                | ace below           |                      |               | geometry. | ool.          | c)<br>d) | Pass/layer seq<br>Test specimen: | uence d                                 | Spe        | ecime<br>Pey (   | n EX         | typ               | ctel<br>47.2       | LABORA<br>TEST         | TORYE NO.          |         | TION    |
|                |                     |                      | 7             |           | (0)           | 121      |                                  |   | F19        |  |              |                   |                    | Root Bend              |                    | _       |         |
|                | //                  | 1.                   | 1             |           | 6.            |          |                                  |   |            |  |              |                   |                    | Face Bend              |                    |         |         |
| - 1            | TIOM                | mb/                  | 1             | -         |               | H        |                                  | Factor                                  | led        | due  | - +0         | La                | 2ck                | Side Bend              |                    |         |         |
|                | 1                   | /                    | 11            | 2         |               | 4        | 1)                               | 06                                      | Done       | tre  | +101         | 1 1               | 7                  | Tensile                |                    | -       |         |
| 1              | 11                  | DMM                  | //            | 1         | 1             | _        | 7                                | 7                                       | 111        | re s   | spe          | CIP               | wan.               | Macro Etch<br>Fracture |                    |         |         |
| -              | V                   | 1                    | 200           |           |               | _        |                                  | Fra                                     | _,         | 4  |              |                   | 1                  | Other(s)               |                    | _       |         |
| -              |                     | Jul.                 | -             | K         |               |          |                                  |   |            |  |              |                   |                    |                        |                    |         |         |
| 150            | DAIN(-              | X                    | 1             | 7 )       | 4             |          |                                  |   |            |  |              |                   | -                  | NOTES                  | _                  |         | , [     |
|                |                     | (b)                  | - 1           | 10        | 10            |          |                                  |   |            |  |              |                   | 1                  | NOTES F                | FAILE              | Ed o    | due     |
|                |                     | (0)                  |               | 1         | 1             |          |                                  |   |            |  |              |                   |                    | 1000                   | 061                | Par     | TE      |
|                |                     |                      |               | _         | 7 *           |          | 7                                |   |            |  |              |                   | 1                  | L Book                 | TO                 | Zad     | -       |
|                |                     |                      |               |           | (             |          |                                  |   |            |  |              |                   |                    | ,//-                   | 11:                | V       |         |
| -              | ,                   |                      |               |           |               |          |                                  |   |            |  |              |                   |                    | / EN                   | VALUATIO           | NBY     |         |
| G              | =0                  | mm                   |               |           |               |          |                                  |   |            |  |              |                   | 0                  | ATE O                  | 709                | 20      | 00      |
|                |                     |                      |               |           |               |          |                                  |   |            |  |              |                   |                    |                        | TH DAY             |         | EAR     |
|                |                     |                      |               |           |               |          |                                  |   |            |  |              |                   |                    |                        |                    |         |         |

| (ava) | CANADIAN                    | WELDING       | BUREAU      |
|-------|-----------------------------|---------------|-------------|
|       | CANADIAN<br>DIVISION OF CWB | GROUP - INDUS | TRYSERVICES |

(a)

# WELDING PROCEDURE 0 4 2008

CWB Form 130E/99-1

REPORT OF \_ **APPLICABLE STANDARD** 2008 Company Code CSA W47.1 CSA W47.2 WPDS No. A MONTH DAY YEAR **CSA W186** ☐ AWS D1.3 DATE OF TEST OTHER WPS No. A3300 QUALIFICATION REQUESTED BY: COMPANY CWB RETEST YES NO LAB WORK REQUIRED YES WNO Company F. Barnes INVOICING DATA Name Hours on Site HRS. @ 80.00 120.00 of Test Hours Travelling HRS. @ /HR. = 80.00 40.00 Test Plate ettham 202 CWB Witness A Kilometres (kms) Number /KM. = Signature of Travel Expenses Comp. Rep. Welding Process Process Mode Welder's Wa Method of Backgouging Welders Yes SAW GTAW Manual N.T. Card Required No SMAW PAW Semi-Automatic S.I.N. Depth of Backgouging FCAW GMAW Machine OTHER Automatic 1. Specification ASTM \$ 221-02Grade 6061-T651 Base Classification Trade Name Manufacturer 2. Specification ASTM 8 221-01 Grade 6061 - 77-51 Materials Filler Metal A ER5356 Preheat Indalco Interpass Temperature Ambient Temperature Filler Metal B Post-Weld None Treatment Flux Stauless Steel Wire Brush Tungsten Type: EWP Tungsten Diameter: 4.0 MM Shielding Flow Nozzle Size OVERHEAD FLAT VERTICAL UP Welding HORIZ Current Type, and Polarity AC VERTICAL DOWN Certified Yes Position(s) Electrode Extension Electrode Used? Welding Sequence Filler Metal **Arc Parameters** Welding Sequence Filler Metal **Arc Parameters** Side Laver Pass Size W. Feed Amperes Volts Arc Travel Side Laver Pass Size W. Feed Amperes Arc Travel Volts Speed Speed Speed Speed (MIMIN) UNITS (MM) UNITS V 3.2 298 19 (d) Specimen Extract as per CSA, W47.2 ABORATORY EVALUATION Joint geometry. Full welding symbol. In the space below c) Pass/layer sequence.
 d) Test specimens required. make a sketch to show: TEST NO. SAT. NA (C) Root Bend Face Bend Side Bend Failed due to leck of penetration in Fracture specimen 1 Tensile Macro Etch Fracture N D Other(s) 000 G= OMM



## WELDING PROCEDURE QUALIFICATION REPORT

P 036341

| DATE OF TEST   | 01          | 06262008 APPLICABLE STANDARD |            |           |             |          |           | Company Code      |            |             |  |          | WPDS No.     |                    |           |  |  |
|--|-------------|------------------------------|------------|-----------|-------------|----------|-----------|-------------------|------------|-------------|--|----------|--------------|--------------------|-----------|--|--|
| DATE OF TEST   | MONTH       | DAY                          |            |           | CS.         | A W47.1  | CSA       | W47.2             | M          |             | 1,11   |          |              |                    |           |  |  |
| DUALIFICATION REQUESTED BY:   COMPANY   CWB  | _           | _                            |            |           | □ CS        | A W186   | AW:       | S D1.3            |            |             |  | 2        |              |                    |           | -  |  |
| DOLALIFICATION REQUESTED BY:   COMPANY   CWB   |             |                              |            |           |             |          | 113       |                   | RETE       | ST          | YES V  | -        |              |                    | VY        | ES NO  |  |
| Company   Metal   Mov1   Move   Metal   Mov1   Move   Metal   Mov2   Metal   Mov2   Metal   Mov2   Metal   Mov2   Metal   Mov2   Metal   Mov2   Metal   Meta   | QUAI        | IFICATIO                     | N REOU     | ESTEDRY   | . 5         | COMPA    | uv        | CWB               |            |             |  |          |              |                    |           |  |  |
| Classification   St.   John's   NL   St.   |             |                              |            |           |             | _ COMPAI |           |                   |            |             |  |          |              | .00 A              | IR. = 32  | PR-01  |  |
| Travel Expenses  Welding Sequence  Filter Metal  Arc Parameters  Welding Seque |             | any M                        | .1.        | 1.1.      | LIVE        |          |           |                   | Hours      | Travelli    | ng   |          |              |                    | R. = 4    | VYES NO.  32000 PR-01  4000 PR-02  960 PR-02  PR-08  PR-08  PR-08  Ackgouging  Manufacture  AIV  Liquide  SAF  Meter:  2226 August  Arc Trave  Speed  V WMM  No. SAT. SAT. NO.  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  2-5 341  2-5 366  |  |
| Test   ST  |             |                              | ta         | i we      | ria         |          |           |                   | Kilome     | etres (kn   | ns)  | 20 KM    | 0            |                    |           |  |  |
| Test Plate   Tes   |             | on S                         | +          | John      | IS.         | NL       |           |                   | Travel     | Expens      | es   |          |              |                    |           | PR-08  |  |
| Signature of   Corp. Rep   C   |             |                              |            | - '       |             | _        |           |                   | Lab Ch     | arges       |  | HR       | S. @         | /                  | R. =      | PR-04  |  |
| Signature of   Corp.   Pictor   Picto   | CWB         | Witness                      | eω         | Feith     | am          |          | 2         | 20                | Specin     | nen Ass     | essment  | HR       | S. @         | /H                 | R. =      | PR-05  |  |
| Comp. Rep.  Wilders Name JOE Felder NT. Card Required No.  N.T. Card Required  |             |                              | _          |           |             | • 100    |           |                   | Engine     | ering Cl    | harge  | HR       | S. @         | /H                 | (R. =     | PR-09  |  |
| Wolding Process Mote   |             |                              | U.         | MM        | 1dem        | nel      |           |                   | Outsid     | e Lab. C    | harges   |          |              |                    |           | PR-06  |  |
| Sample   S   | Welde       | r's T                        |            | - 0       | -           |          | lers      | □ Yes             |            |             |  |          |              | Method             | of Backgo | uging  |  |
| Sample   S   | Name        | 300                          | - 1        | -ewe      | r           |          |           |                   | S          | W           |  | N N      | lanual       |                    | ILA .     |  |  |
| 1. Specification   |             |                              |            |           |             |          |           |                   | LE FC      | WAS         | The state of the s | U N      | lachine      | Depth o            |           | ging   |  |
| Classification   Trade Name   Manufacture    | Base        | 1, 5                         | Specificat | tion EN   | 0225        | Grad     | de \$3:   | 55 G10            |            | INEK_       | 100000   |          |              |                    | -         |  |  |
| Proheat all   Filler Metal   A   E   S   S   C   L   A   S   S   A   C   C   C   C   C   C   C   C   C   |             |                              |            |           |             |          |           |                   |            |             | Classi   | fication | Tr           | rade Name          |           | the second of the second of the  |  |
| Temperature   75   | D           |                              | p connuci  | -11       |             |          |           |                   | Filler N   | letal A     | ESS  | 201      | 10           | da .a              |           |  |  |
| Processive   Nove   Processive   Nove   Processive   Nove   Processive   Nove   Processive   Nove   Processive   Process   |             |                              | 75         | °C        | Tempera     | ture do  | c         |                   |            | to the last | regarden to  |          |              |                    |           | ugulde   |  |
| Cleaning Procedures    Tungsten Type:   Tungsten Diameter  | Post-V      | A                            | 115        |           |             | 80 8     |           | IWC.              | -          | letal B     | 8171   | -NII     | SAFI         | DUAL I             | 128       | SAF  |  |
| Specific    | Transition. |                              |            |           |             |          |           |                   |            | -           |  | -        |              | 1 2 30 000         | -         |  |  |
| Welding Sequence   | The san     | Proced                       | Han        | mer       | Wive        | Brush    | ar        | indov             | -          |             |  | T        | Jan.         |                    |           |  |  |
| Welding Sequence   |             |                              |            | _         |             | 19/223   |           |                   | Gas 7      | 39 A        | × 25%  | C02 F    | ate 22       | Llmin              | Size //   | enm  |  |
| Welding Sequence   Filler Metal   Arc Parameters   Welding Sequence   Filler Metal   Arc Parameters  |             |                              |            |           |             |          |           | AU                | Certifie   | d           |  | Yes C    | Current Type | 0                  | Flactrode | n  |  |
| Side   Layer   Pass   Size   W. Feed   Amperes   Volts   Speed   Spe   |             |                              |            | 1         |             |          |           |                   |            |             | _  | INO IS   | nd Polanty   | UCRP               | Extensio  | 16-201   |  |
| UNITS (MM) (MMM) A V (MMMM)    1   | Wel         | aing Sequ                    | ence       | Fille     | r Metal     | Arc      | Paramet   | ers               | Weld       | ding Seq    | uence  | Fille    | er Metal     | Arc                | Paramete  | ers  |  |
| 1   1   3.2   N/A   132   21   45   5.0   262   22.5   268   1   2   2   1.6   4.4   2.40   2.3   191   6   9   1.6   5.0   2.75   22.5   306   1   3   3   1.6   4.4   2.38   2.3   2.91   1   6   10   1.6   5.0   2.65   22.5   341   3   4   1.6   5.0   2.50   2.3   3.15   1   6   11   1.6   5.0   2.75   22.5   341   3   4   1.6   5.0   2.50   2.3   2.50   1   7   12-16   1.6   5.0   2.75   22.5   3.66   1   4   5   1.6   5.0   2.75   22.5   3.66   1   4   5   1.6   5.0   2.70   22.5   3.70   1   5   7   1.6   5.0   2.70   22.5   3.70   1   1.6   1.6   5.0   2.70   22.5   3.70   1   1.6   1.6   5.0   2.70   22.5   3.70   1   1.6     | Side        |                              | Pass       |           | Speed       |          |           | Speed             | Side       |             | 1  | 0.50     | Speed        | Amperes            | Volts     | Speed  |  |
| 1 2 2 1.6 4.4 240 23 191   6 9 1.6 5.0 275 22.5 306   3 3 1.6 4.4 238 23 291   6 10 1.6 5.0 265 22.5 341   3 4 1.6 5.0 250 23 3.65   6 11 6 11 6 5.0 275 22.5 366   7 12-16 1.6 5.0 275 22.5 366   7 12-16 1.6 5.0 275 22.5 366   7 12-16 1.6 5.0 279 22.5 366   7 12-16 1.6 5.0 275 22 |             | UNITS                        |            | (MM)      | (Pymin      | A        | ٧         | (Minun            |            | UNITS       |  | (MM)     | Munu         | A                  | ٧         | min  |  |
| 3   3   1.6   4.14   238   23   291   1   6   10   1.6   5.0   265   22.5   341     3   4   1.6   5.0   250   23   3.65   1   6   11   1.6   5.0   275   22.5   366     4   5   1.6   5.0   24.5   23   250   1   7   12-16   1.6   5.0   279   12.5   43.5     4   6   1.6   5.0   282   22.5   297     4   6   1.6   5.0   270   22.5   370     5   7   1.6   5.0   270   22.5   370     5   7   1.6   5.0   270   22.5   370     5   7   1.6   5.0   270   22.5   370     6   1   1   1   1   1     7   12-16   1.6   5.0   279   12.5   43.5     8   1   1   1   1   1     9   1   1   1   1     9   1   1   1   1     1   1   1   1     1   1   | 1           | 1                            | 1          | 3.2       | N/A         |          | 21        | 45                | 1          | 5           | 8  | 16       | 5.0          | 262                | 22.5      | 268  |  |
| 3   3   1.6   4.14   238   23   291   1   6   10   1.6   5.0   265   22.5   341     3   4   1.6   5.0   250   23   3.65   1   6   11   1.6   5.0   275   22.5   366     4   5   1.6   5.0   24.5   23   250   1   7   12-16   1.6   5.0   279   12.5   43.5     4   6   1.6   5.0   282   22.5   297     4   6   1.6   5.0   270   22.5   370     5   7   1.6   5.0   270   22.5   370     5   7   1.6   5.0   270   22.5   370     5   7   1.6   5.0   270   22.5   370     6   1   1   1   1   1     7   12-16   1.6   5.0   279   12.5   43.5     8   1   1   1   1   1     9   1   1   1   1     9   1   1   1   1     1   1   1   1     1   1   | 1           | 2                            | 2          | 1.6       | 4.4         | 240      | 23        | 191               |            | 6           | 9  | 1.6      | 5.0          | 275                | 22.5      | 306  |  |
| 3  | 1           | 3                            | 3          |           |             |          |           |                   | 1          |             | 10   |          | 17 C 10 11 1 |                    |           |  |  |
| 4   5   16   5.0   245   23   250   1   7   12-16   1.6   5.0   279   12.5   435     4   6   1.6   5.0   282   22.5   297     the space below all Joint geometry. The space below also a sketch to show. B   Full welding symbol. C) Pass/layer sequence all Specimen Extracted of Test specimens required as Par Client's Trest   No. SAT. W. No. S   | 1           |                              | 11/200     | LOW TOWN  |             |          | 7 202 253 | 200 CA 200 CA     | 1          |             | 100  | 1000     |              |                    |           |  |  |
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| the space below a) Joint geometry. a) Joint geometry. b) Full welding symbol. c) Pass/layer sequence of Specimen Extracted (Test No. Sat. UN. Root Bend (C)  | 1           | 4                            | 2          | 16        |             |          | 23        | 250               |            | 7           | 12-16  | 1.6      | 5.0          | 279                | 12.5      | 435  |  |
| the space below a) Joint geometry.  ake a sketch to show:  b) Full welding symbol.  c) Pass/layer sequence of Spectimen Extracted (Test Specimens required as Per Clients  Tustructions  Tustructions  Ratiography  Action 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   | 1           | 4                            | 6          | 1.6       | 5.0         | 282      | 22.5      | 297               |            |             |  | O'THE    |              |                    |           |  |  |
| the space below a) Joint geometry.  b) Full welding symbol.  c) Pass/ayer sequenced/Specimen Extracted tables a sketch to show:  b) Full welding symbol.  c) Pass/ayer sequenced/Specimen Extracted tables a sketch to show:  b) Full welding symbol.  c) Pass/ayer sequenced/Specimen Extracted tables a sketch to show:  b) Full welding symbol.  c) Pass/ayer sequenced/Specimen Extracted tables a sketch to show:  TEST NO. SAT. SAT. SAT. SAT. SAT. SAT. SAT. SAT          | 1           | 5                            | 7          | 1.6       |             |          |           |                   |            |             | 1  |          | - 10         |                    |           | 1000   |  |
| Tustructions  Root Bend  Face Bend  Side Bend  Tensile  Macro Etch  Fracture  Other(s)  NOTES PAILED RADIO  NOTES PAILED RADIO  NOTES PAILED RADIO  NOTES PAILED RADIO  LOCAL TO SLASTA  LOCAL TO | the sn      | ace below                    |            | a) Joint  | eometry     |          |           |                   | unnah      | Spor        | imen   | EX+VA    | ctel         | LABORA             | TORY EV   | ALUATION   |  |
| The structions    Common   Com |             |                              |            | b) Full w | elding symb | ol.      | d)        | Test specimen     | s required | as i        | ger C  | lent's   | _            |                    |           |  |  |
| Tensile  Tomin   |             |                              | //         | 1         | 1           | OI T     |           | 7                 |            | TUS         | truct  | ions     |              | Root Bend          | maril .   |  |  |
| nomin plant point and point point point point part of the point part of the point plant point part of the pa |             | //                           |            |           | (           | -/       |           | 1                 |            | Syreth      |  |          |              | Face Bend          |           |  |  |
| nomin plant point and point point point point part of the point part of the point plant point part of the pa | - +         | 100                          | MADI       |           |             | 1        |           | 1                 |            |             |  |          |              | Side Bend          | 9024      |  |  |
| nomination of the state of the  | 1           | 10                           | 1          | 1         | 7           |          | 100       | 10                |            |             |  |          |              | 1, 5,300,140,500,1 | _         |  |  |
| NOTES PAILED RANGE TO SLAS INCLUSION OF SLAS INC |             |                              | /          | i PI      | 1           |          | 16        | STAP .            |            | Г           | ,  | 1        |              |                    |           |  |  |
| -300 mm x and 1 234567 RANGEMPLY  OUTES FAILED RANGE  150 LEVALUATION BY  2-3mm  | /           | 1                            | DOWN       | //        | 1           |          | A         | Wat S             |            | 1           | Aile   | 4        |              | 10.400.000.000     |           |  |  |
| 4-5 mm  2-3 mm  Aue to 5 Lag Inclusion  NOTES FAILED RANGE  NOTES  | /           | 1                            | 10         | 100       | M           | 4        | ₹£        | KIM               |            | 6           | LAC.   | 1        |              | Omer(s)            |           | 000  |  |
| 4-5 mm Stag Index 2-3 mm Evaluation By   |             |                              | 1          | 5         | 1           | -        |           | 111               | 1          | V           | macog  | when     | 4            |                    |           | 000  |  |
| 4-5 mm Stag Index 10 Stag Index 2-3 mm Stag Index 10 Stag  |             | 300 M                        | W. W.      |           | 1           | otex?    | 224       | 567               | 1          | 1           | 100  | 5/1      | -            | NOTES              | 1'/-      | 1 1.   |  |
| 4-5 mm Stag Index 2-3 mm Evaluation By   |             |                              |            | n         | 1           | 1        | 237       | 361               |            | -           | -  |          |              | , 17               | tilled    | KAdie  |  |
| 4-5mm 2-3mm Devation By  |             | -                            | (de)       | 1         | 140         |          |           |                   |            |             | INCL   | usier    |              | ade.               | TO 5      | LAST   |  |
| 2-3mm DEVACUATION BY   |             | -                            | 1          |           | 1 50        |          |           |                   |            |             |  |          |              | 1                  | 1         | 1  |  |
|  |             |                              | -          | V         |             | Y        |           |                   |            |             |  |          |              | D                  | ALUATION  | BY   |  |
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TABLE

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Reserved by GWB pursuant to CBA W47.1

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WELDING STANDARDS to CSA W47.1

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**GENERAL NOTES** 

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## 1. General Notes

- 1.1 The Welding Standards of this firm are prepared in accordance with CSA Standard W47.1 1992. All welding will be performed in conformance with CSA Standard W59 M1989, and to any revisions to the above mentioned Codes.
- 1.2 All welding operators employed will be qualified in accordance with CSA W47.1 and will be allowed to weld only the classifications (T and S), and positions for which they are qualified. They shall use only those welding processes and electrode classifications for which they are qualified.
- 1.3 Any welding sub-contracted by this form will be sublet only to firms approved and certified to CSA W47.1 1992 by the Canadian Welding Bureau. Drawings and welding procedures will be issued to the above sub-contractor so that welding quality is insured. (The subcontractor's CWB approved welding procedure may be used if satisfactory to the prime contractor.)
- 1.4 Changes in welding methods or welding engineering standards and additions to joints welded will be submitted to CWB for approval in accordance with Clause 6.4 of CSA Standard 47.1 before being used in production.
- 1.5 Only electrodes approved under CSA electrode standard or those conditionally approved under CSA Standard W47.1 shall be used. Each welding procedure data sheet will designate the electrode(s) to be used for the joint, the applicable codes and the number of the welding procedure specification which governs the data sheet application.
- 1.6 The individual data sheets will show the material specification(s) which may be welded.

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## WELDING STANDARDS to CSA W47.1

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## **GENERAL NOTES**

- 1.7 Unless called for otherwise on a specific data sheet, vertical welds shall be made with progression of each pass in an upward direction.
- 1.8 All slag or flux remaining on any bead of welding shall be removed before laying down the next successive bead. Similarily with any new cracks, blow holes or porosity.
- 1.9 Metal surface to be welded shall be dry, clean and free from loose scale, paint and grease.
- 1.10 Specially designed anti- spatter compounds shall be used where called for on shop drawings.
- 1.11 No welding shall be done when temperature of the base metal is lower than -18 C (0 F) except with the express consent of the engineer. At temperatures below 0 C (32 F) the surfaces of all areas within 75mm (3") of the joint where a weld is to be deposited, shall be heated to a temperature at least warm to the hand before welding is commenced.
- 1.12 The operator and the work shall be adequately protected against the direct effect of wind, snow and rain.

# MOSHER ENGINEERING LIMITED 2089 Upper Water Street Halifax, Nova Scotia, B3J 2R7 WELDING STANDARDS to CSA W47.1 CWB APPROVAL ENGINEERS STAMP R. T. ROSE R. T. ROSE

 Welding symbols shall be as shown in AWS Standard A2.4, Symbols for Welding and Nondestructive Testing. See Appendix D of CSAW59-M1989 for symbols from that Standard and additional conventions developed for incorporation into this Standard. Special requirements shall be fully explained by notes or details.

Detail of butt joints, corner joints, T-joints, lap joints and edge joints are shown in Appendix D, CSA W59-M1989. Standard location on elements of a welding symbol are also shown in this appendix.

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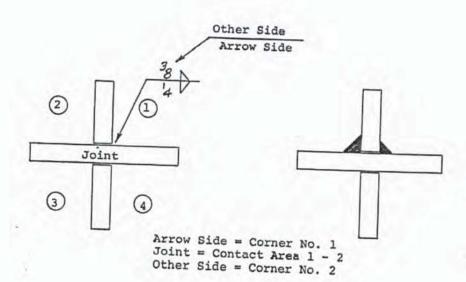
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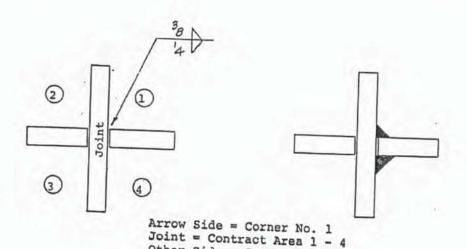
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2.b CLARIFICATION OF "ARROW" AND "OTHER" SIDE

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Other Side = Corner No. 4

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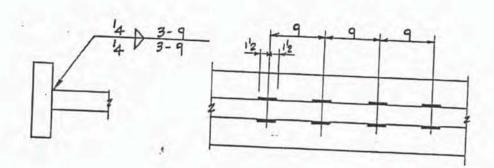
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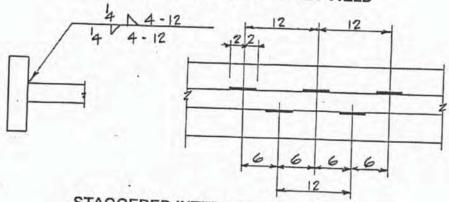
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2.c CLARIFICATION OF INTERMITTENT AND STAGGERED FILLET WELDS





## CHAIN INTERMITTENT FILLET WELD



STAGGERED INTERMITTENT FILLET WELD

Note:

- (a) When intermittent fillet welding is used by itself, the symbol indicates that increments shall be located at the ends of the dimensioned length.
- (b) If required by actual length of the joint the length of increment of the welds at the end of the joint should be increased to terminate the weld at the end of the joint.

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2.d GENERAL DRAFTING AND DESIGN INFORMATION



(1) Welds on both sides of the joint shall be shown by placing weld symbols on both sides of the reference line. The size of a fillet weld or groove weld (Depth unless it is complete joint penetration) shall be shown to the left of the weld symbol.

The length of a fillet or groove weld, when indicated on the welding symbol, shall be shown to the right of the weld symbol. Unless otherwise indicated on the welding symbol all welds shall be continuous.

When no general note governing the dimensions of fillet welds or groove welds appears on the drawing the dimensions of fillet welds and groove welds on both sides of the joint shall be shown as follows.

- (a) When both welds have the same dimensions, both shall be dimensioned.
- (b) When the welds differ in dimensions, both shall be dimensioned.
- (2) Symbols apply between abrupt changes in the direction of the welding or to the extent of hatching or dimension lines. Weld extending beyond abrupt changes in the direction of the welding shall be indicated by means of additional arrow points to each section of the joint to be welded. The above applies except when the weld all around symbol is used.
- (3) When desired, General Notes, may be placed on a drawing to provide detailed information pertaining to predominant welds.
  - i.e. Unless otherwise indicated all fillet welds are 8mm (5/16") in size.

Such information need not be repeated on the symbol.

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## WELDING STANDARDS to CSA W47.1

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2.d GENERAL DRAFTING AND DESIGN INFORMATION



- (4) When only one member of a joint is to be prepared the arrow shall point with a definite break toward that member.
- (5) All welds to be called up in Imperial Units unless drawing is designated as a metric drawing in which case all welds will be in Metric Units.
- (6) The following finishing symbols, indicate the method, not the degree, of finish required for a weld.

C - Chipping

R - Rolling

G - Grinding

H - Hammering

M - Matching

The above does not include for normal cleaning which is always required after each weld pass.

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## 3.a Fillet Welds

- The effective area of a fillet weld shall be the effective weld length multiplied by the effective throat thickness.
- The effective length of a fillet weld shall be the overall length of the full-size fillet, including end returns. No reduction in effective length shall be made for either the start or termination of the weld if the weld is full size throughout its length.
- The effective length of a curved fillet weld shall be measured along the centreline of the effective throat.
- 4. The effective throat thickness shall be the shortest distance from the root to the face of the diagrammatic weld for all processes except SAW which will be governed by CSA W59-4.3.2.4.
- Fillet welds may be used in skewed T-joints having a dihedral angle of not less than 60 degrees nor more than 120 degrees as shown in figure 4-2 and clause 4.3.2.5 of CSA W59-M1989

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## WELDING STANDARDS to CSA W47.1

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3 SUPPLEMENTARY WELD INFORMATION

### 3.A Fillet Welds

- 4. The maximum fillet weld size permitted along the edge of material shall be:
  - (a) The thickness of the material for material less than 6mm (1/4") thick.
  - (b) 2mm(1/16") less than the thickness of material for 6mm (1/4") or more in thickness unless the weld is designated on the detail drawing to be built out to obtain full throat thickness.
  - (c) The size of fillet welds on top of groove welds when required by the engineer for smoother transiton in "T" and corner joints shall not be less that t/4 where it is the thickness of the groove welded member, but need not to be more than 10mm (3/8"). They shall be mandatory for T-Joint subject to tension normal to the axis of the weld.
- The minimum effective length of a fillet weld shall be 40mm (1 1/2") or 4 times the size of the fillet whichever is larger.
- Fillet welds may be continous or intermittent except for CSA W59-12.4.14.
   d which notes restriction on the use of intermittent welds in dynamically loaded structures.
- 7. The minimum overlap of parts in stress carrying lap joints shall be 5 times the thickness of the thinner part joined. Unless lateral deflection of the parts is prevented, they shall be connected by two transverse lines of fillet, or by longitudinal fillet welds along the edges or in slots.

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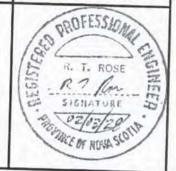
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## WELDING STANDARDS to CSA W47.1

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3 SUPPLEMENTARY WELD INFORMATION



## 3.A Fillet Welds

- Fillet welds shall not terminate at corners of parts of members but shall be returned continously, full size around the corner for a length equal to twice the weld size where such return can be made in the same plane.
- 9. The minimum fillet size as measured shall be shown in the table below (Table 3-1). Except that the weld size need not exceed the thickness of the thinner part joined unless a larger size is required by calculated stress. For this exception particular care shall be taken to provide sufficient heat input to ensure weld soundness.

When welding attachments to members which do not carry calculated stress, the requirements of the table below need not apply.

## TABLE 3-1 MINIMUM FILLET SIZE

| MATERIAL THICKNESS OF<br>THICKER PART JOINED IN<br>MILLIMETERS (INCHES) | MINIMUM S<br>WELD IN M<br>(INCHES) | SIZE OF FILLET<br>ILLIMETERS |
|---|------------------------------------|------------------------------|
| To 12mm (1/2") Inclusive  | 5mm (3/16")                        |                              |
| Over 12mm (1/2") to 20mm (3/4")   | 6mm (1/4")                         | Single Pass<br>welds Must    |
| Over 20mm (3/4")  | 8mm (5/16")                        | be used                      |

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## WELDING STANDARDS to CSA W47.1

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3 SUPPLEMENTARY WELD INFORMATION

## 3.b Groove Welds

- A complete penetration groove weld is defined as one made from one side on a backing bar or on both sides combined with back gouging to provide complete penetration and fusion of weld and base metal throughout the depth of the joint.
- The effective area of a groove weld shall be the effective weld length multiplied by the efective throat thickness.
- The effective throat thickness of a complete joint penetration groove weld shall be the thickness of the thinner part joined. (No increase is permitted for weld reinforcement.).
- The minimum groove depth of single partial joint penetration groove welds or on each side of double partial joint penetration groove welds shall be in accordance with the Table 3.2 on page 12.
- For details of Plug and Slot Welds refer to section 4.4.2 of CSA W59-M1989
- For details of Flare Grooves and their effective throats refer to Section 4.3.1.6 of CSA W59-M1989

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3 SUPPLEMENTARY WELD INFORMATION

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MINIMUM GROOVE DEPTH FOR PARTIAL JOINT PENETRATION GROOVE WELDS (NOT COMBINED WITH FILLET WELDS) TABLE 3-2

|  | MINIMUM GROOM                             | VE DEPTH                                 |
|--|---|--|
| THICKNESS OF THICKER PART JOINED IN MILLIMETERS  | Groove Angle<br>At Root                   | Groove Angle<br>At Root                  |
|  | > 45<br>< 60<br>(V, Bevel Grooves)        | > 60<br>(V, bevel<br>J-,U-Grooves)       |
| To 12mm (1/2") Inclusive<br>Over 12mm (1/2") to 20mm (3/4") Inclusive<br>Over 20mm (3/4") to 40mm (1 1/2") Inclusive | 8mm (5/16")<br>10mm (3/8")<br>12mm (1/2") | 5mm (3/16")<br>6mm (1/4")<br>8mm (5/16") |
| Over 40mm (1 1/2") to 60mm (2 1/4") Inclusive<br>Over 60mm (2 1/4") Inclusive  | 14mm (9/16")<br>16mm (5/8")               | 10mm (3/8")<br>12mm (1/2")               |

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3 SUPPLEMENTARY WELD INFORMATION

### 3.b Groove Welds

- The effective throat thickness of a partial joint penetration groove weld for joints with no root openingshall be the depth of camfer less 3mm (1/8") for grooves having an included angle at the root of the groove less than 60 but not less than 45.
- The effective throat thickness of a partial joint penetration groove weld shall be the depth of camfer for grooves having an included angle at the root of the groove of 60 or greater.
- 7. The effective throat thickness of a partial joint penetration groove weld reinforced with a fillet weld shall be the shortest distance between the root of the groove and the surface of the fillet less 3mm (1/8") where such reduction is required by Paragraph (5).
- 8. For hollow structural sections the effective throat thickness of Flare-V and Flare-Bevel Groove welds shall be established by the contractor. Unless otherwise approved by the engineer, this shall be done by means of trial welds for each set of procedural conditions shall then be sectioned and measured to establish welding techniques which will ensure that the design throat thickness is achieved in production.

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## WELDING STANDARDS to CSA W47.1

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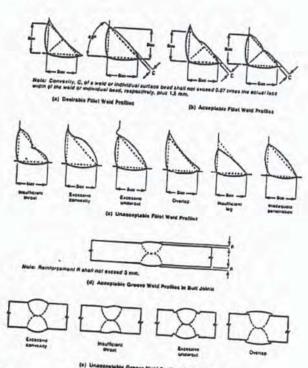
**ENGINEERS STAMP** 



SHOP STANDARDS

4.a Acceptable and Unacceptable Weld Profiles

## TABLE - 1



No tass:

(1) The loces of fillet welds may be slightly convex, flat, or slightly concave. Except at outside corner joints, the convexity shall not exceed 0.07 x width of loce or boad + 1.5 mm.

(2) The finishing poster of all groove welds in butt joints shall provide a reinforcement at the centre of weld a maximum at the centre of the weld. There shall be built up uniformly from the surface of the parent metal to the weld. There shall be no valley or groove along the edge or in the centre of the weld. The deposited metal shall be smooth and uniform in cross-section.

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## WELDING STANDARDS to CSA W47.1

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4 SHOP STANDARDS



## 4.b Splicing

- Connections or splices in beams or girders when made by groove welds shall be complete penetration groove welds, unless otherwise approved by the Engineer.
- Splices of tension members made by groove welds shall be complete joint penetration groove welds unless otherwise approved by the Engineer.
- All shop splices in each component of a cover-plated or built-up member shall be made before such component part is welded to other component parts of the member.
- 4. Tension butt joints in plates of different material thickness or widths shall be made in such a manner that the slope through the transistion zone is not steeper thatn 1 in 2 1/2. The transisiton shall be accomplished by chamfering the thicker part, tapering the wider part, slopeing the weld metal, or by any combination of these.
- Compression butt joints do not require a transistion zone in members of different thickness or width, if approved by the Engineer.

## MOSHER ENGINEERING LIMITED 2089 Upper Water Street Halifax, Nova Scotia, B3J 2R7 WELDING STANDARDS to CSA W47.1 A SHOP STANDARDS SHOP STANDARDS A SHOP STANDARDS SHOP STANDARDS

- 4.c Preparation of Material (From CSA W59-M1989 Clause 5.3)
  - 1. Surfaces and edges to be welded shall be smooth, uniform and free from fins, cracks and other defects that would adversely affect the quality or strength of the weld. Surfaces to be welded shall also be free, within 50 mm (2") of any weld locations, from loose or thick scale (except for tightly adhering small islands of scale), slag, loose rust, paint, grease, moisture and other foreign material that will prevent welding to meet acceptance levels of this standard or produce objectionable fumes.
  - 2. Preparation of edges for welding shall be smooth and regular and shall be left free of slag. The edges resulting from cutting shall be smoothed when necessary to provide a surface equivalent to that specified in Clause 5.3 (CSA W59) (Pre-ceding paragraph). All re-entrant corners shall be shaped, notch-free, to a radius of at least 15mm. All cutting shall follow closely the lines prescribed. Oxygen gouging not to be used on quenched and tempered steels.
  - For reference to occassional notches and their repair see Clause 5.3.2 CSA W59-M1989 and for planar edge discontinuities refer to Clause 5.3.3 CSA W59-M1989

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WELDING STANDARDS to CSA W47.1

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4 SHOP STANDARDS

R. T. ROSE WEED STEINATURE POPULATION OF RISHASSO

## 4.d Assembly Practices

1. The parts to be joined by fillet welds shall be brought into as close contact as practicable, (see Clause 54.1 of CSA W59-M1989) and in no event shall be separated by more than 5mm (3/16"). If the separation is 1mm (1/32") or greater, the size of the fillet weld shall be increased by the amount of the separation. The separation between faying surfaces of lap joints and of butt joints landing on a backing shall not exceed 2mm (1/16"). Where irregularities in rolled shapes or plates after straightening, do not permit contact within the above limits, the procedure necessary to bring the material within these limits shall be subject to the approval of the Engineer. The use of fillers is prohibited except as specified on the drawings or as specially approved by the Engineer, and made in accordance with Clause 4.5 CSA W59-M1989.

Abutting parts to be joined by groove welds shall be carefully aligned. Where the parts are effectively restrained against bending due to eccentricity in alignment, an offset not exceeding 10% of the thickness of the thinner part joined, but in no case more than 3mm (1/8"), may be permitted as a departure from the theoretical alignment. In correcting misalignment in such cases, the parts shall not be drawn into a greater slope than 1 in 25. Measurement of offset shall be based upon midplane of parts unless otherwise shown on the drawings.

Members to be welded shall be brought into correct alignment and held safely in position until welding has been completed. Suitable allowances shall be made for warpage and shrinkage.

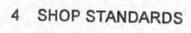
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## WELDING STANDARDS to CSA W47.1

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4.e Allowable Workmanship Tolerances from Detailed Drawings

Dimensions of the cross-section of groove welded joints which vary from those on the detail drawings by more than the following workmanship tolerances shall be corrected as per Appendix C, Clause C1.1 (f) (CSA W59), or referred to the Engineer for approval.

|    |   | Root Not Gouged               | Root Gouged                   |
|----|---|-------------------------------|-------------------------------|
| a) | Root Face of Joint  | +/- 2mm (1/16")               | Not limited                   |
| b) | Root Opening of Joints without steel backing  | +/- 2mm (1/16")               | + 2mm (1/16")<br>- 3mm (1/8") |
|    | Root Opening of Joints with steel backing   | + 6mm (1/4")<br>- 2mm (1/16") | Not applicable Not applicable |
|    | Root openings wider than permitted<br>by the above tolerances but not<br>greater than twice the thickness of<br>the thinner part of 20mm maximum<br>be built up be welding to acceptable<br>dimensions prior to the joining if the<br>parts by welding. |                               |                               |
| c) | Groove angle of Joint   | +10 Degrees - 5 degrees       | +10 Degrees - 5 degrees       |

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- 4.f Control of Distortion and Shrinkage Stresses
  - Insofar as practicable, all welds shall be deposited in a sequence that will balance the applied heat of welding while the welding progresses.

Before the start of welding on a member or structure in which shrinkage stresses or distortion is likely to effect the adequacy of the structure, the program for welding sequence and distortion control shall be developed by the Contractor and submitted to the Engineer for approval.

The direction of the general progression in welding on a member shall be from points where the parts are relatively fixed in position with respect to each other toward points where they have a greater relative freedom of movement.

Joints expected to have large shrinkage shall normally be welded before joints expected to have lesser shrinkage and with as little restraint as possible.

All shop splices in each component of a coverplated or built-up member shall be made before such component part is welded to other component parts of the member. With the approval of the Engineer, long girders or girder section may be made by shop splicing sub-sections, each made in accordance with this Clause (Clause 5.4, CSA W59 - M1989).

For conditions of severe external shrinkage restraint refer to clause 5.1.7 (CSA W59-M1989).

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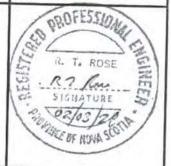
MARCH 28, 2002

## WELDING STANDARDS to CSA W47.1

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- 4.g Quality of Welds
  - 1. Welds shall have no cracks
  - 2. Welds shall be free from overlap
  - Undercut shall not exceed the permissable valves as given in Clauses 11.5.4 and 12.5.4 of CSA W59-M1989 for statically and Dynamically Loaded structures respectively.
  - The minimum acceptable quality of welds, including visual examination, shall confirm to clause 11.5.4 for Statically Loaded Structures, and Clause 12.5.4 for Dynamically Loaded Structures.

## Item 6 – Welding Consumable

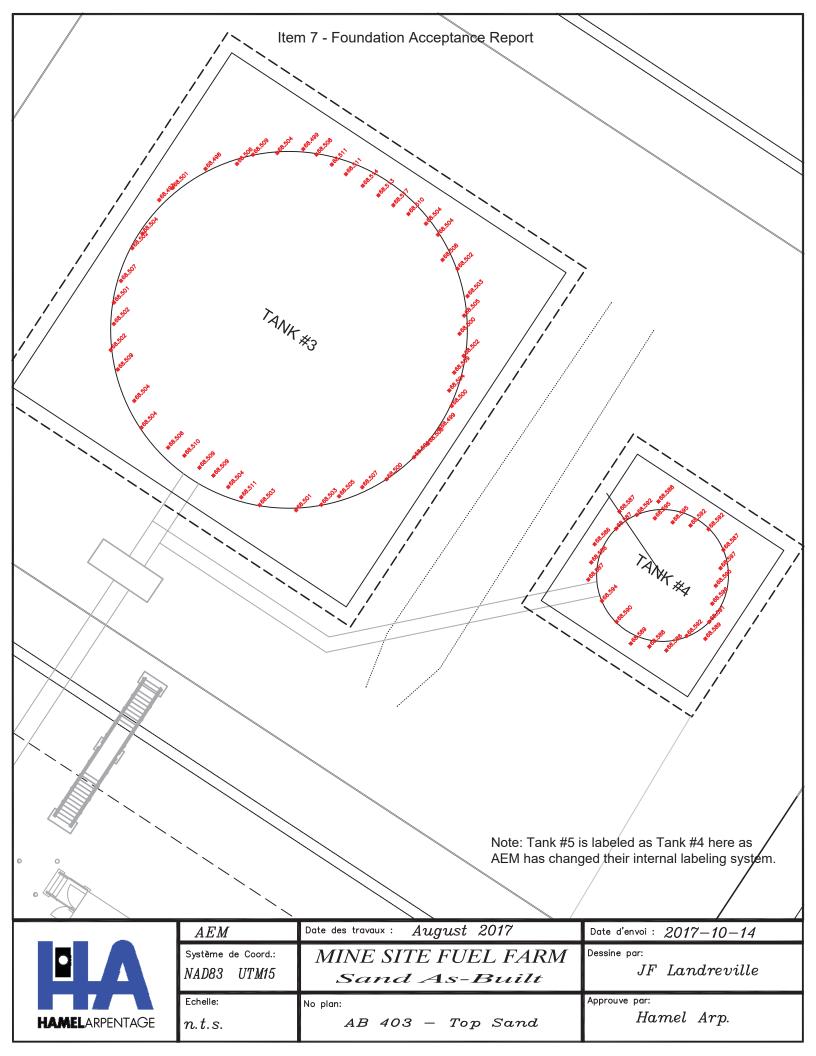
## Contents

1. N/A

## Item 7 – Foundation

## Contents

1. Foundation Acceptance Report



## Item 8 – Floor

## Contents

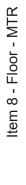
- 1. MTR
- 2. Weld Map / Visual Report
- 3. Vacuum Box Test Report
- 4. Floor Leveling Report



## **Test Certificate** Item 8 - Floor - MTR

Form TC1: Revision 2: Date 23 Apr 2014

| Customer:  |  |   |  |   | Cus  | tomer                                    | P.O.No.:C  | 41965 8                       | Customer P.O.No.:C41965 & 41-490195  |                                 | Will Orde   | r No. 41                      | Mill Order No. 41-491117-01                    |                                | hipping   | Manifest  | Shipping Manifest: AR240135             |
|--|--|---|--|---|--|--|--|-------------------------------|--|---------------------------------|---|-------------------------------|--|--------------------------------|---|---|---|
| SAMUEL, SON & CO. LTD<br>1250 APPLEBY LINE   | N & CO.<br>3Y LINE                           | LTD   |  |   | Proc   | duct Des                                 | cription: C  | SA G40.                       | Product Description: CSA G40.21(2013) 38WT/260WT - CAT<br>5;LCVN 15FT.LBS,TCVN13FT.LBS@-45F/A673-P                                     | /T/260WT<br>N13FT.LE            | S@-45F/   | \673-P                        | Ship   | Ship Date: 21<br>Cert Date: 21 | 21 Feb 17<br>21 Feb 17  | <b>Cert No:</b> 0 (Page 1 of                            | <b>Cert No:</b> 081597458 (Page 1 of 2) |
| BURLINGTON   | Z  |   |  |   |  |  | ζZ   | ALLOTS AP16:<br>NORMALIZED    | ZED  | EU) IABL                        | Б. 1-4-1<br>Б. 1-4-1                                | <u> </u>                      |  |                                |   |   |   |
| ON L7L5G6  |  |   |  |   | Size   | Size: 0.250 X                            | X 120.0 X  | X 480.                        | 480.0 (IN)   |                                 |   |                               |  |                                |   |   |   |
|  | Tested                                       | Tested Pieces:                                      |  |   |  | Tensiles:                                | }S:  |                               |  |                                 |   | Cha                           | Charpy Impact Tests                            | t Tests                        |   |   |   |
| Heat<br>Id   | Piece<br>Id                                  | Tested<br>Thickness                                 | Tst  | t YS  | UTS<br>(KSI)   | %RA                                      | Elong %<br>2in 8in                                 | % Tst<br>Dir                  | Hardness   | Abs.                            | Energy(FTLB)  | 7LB) 1                        | % Shear<br>2 3 /                               | ۸۷g                            | Tst Tst<br>Tmp Dir  | st Tst  | BDWTT<br>Tmp %Shr                       |
| E7B101 E   | E01  | 0.256 (DISCRT)<br>0.256 (DISCRT)                    |  | C 53  | 75   |  | 25   | <u> </u>                      |  |                                 |   |                               |  | بې                             | 50F L   | 5.0   |   |
| E7B101 E   | E03  | 0.256 (DISCRT)                                      |  | 0 0 0<br>45                                   | 75   |  | 27   | <b>⊢</b>                      |  |                                 |   |                               |  | ပ် ပေ                          |   | 5.0   |   |
| E7B101 E   | E04  | 0.256 (DISCRT)                                      |  | <u>, , , , , , , , , , , , , , , , , , , </u> |  |  |  |                               |  |                                 |   |                               |  | ůψ                             |   | 0.00  |   |
| E7B101 E   | E05  | 0.256 (DISCRT)                                      |  | <u> </u>                                      |  |  |  |                               |  | 61 49<br>82 41                  | 48 4 <i>2</i><br>61 57<br>32 35                     |                               |  | טיטי <u>ל</u>                  | -50F<br>-50F<br>  | 0.0 0   |   |
| W7B598 E   | E07<br>E08                                   | 0.256 (DISCRT)<br>0.256 (DISCRT)                    |  | C 52<br>C 51                                  | 72   |  | 25   | <u>⊢</u> ⊢                    |  |                                 |   |                               |  | <u>,</u> 4                     |   | 2.0   |   |
|  | E09  | 0.256 (DISCRT)                                      |  | ;<br>, o o                                    | ·<br>·   |  | ·  |                               |  |                                 |   |                               |  | . 4 rò                         | -45F T<br>-50F L  | 5.0   |   |
|  |  |   |  | O   |  |  |  |                               |  | 33 30                           | 31 31   | _                             |  | -5                             | -50F T  | 2.0   |   |
| Heat   | O  | Ā   | o<br>L   | ত   | Tot Al   | Sol Al                                   | Cu Che   | Chemical Analysis<br>Ni Cr Mo |  | ><br>Cp                         | F   | Ф                             | z  |                                |   |   | ORGN                                    |
| E7B101<br>W7B598   | <u>6</u> 7.                                  | 2 8   | 0. 0.  |   |  | 4  | 2. 2.  | .10                           | oʻ oʻ  | 12 .005<br>11 .004              | 9 9   | 2 2                           | 6900.  |                                |   |   | USA                                     |
| LED  | ST S     | 1   | METALLURGICAL COMPONENT  | COMPON  | O<br>F   | THE                                      | STEEL AND  | NO                            | MERCURY WAS  | 1                               | INTENTIONALLY                                       |                               | ADDED DURING                                   |                                | THE MANUFACTURE   | URE   |   |
| KILLED STEEL, PRODI<br>MTR EN 10204:2004<br>CHARPY FULL SIZE E<br>NORMALIZED PLATES.<br>TEST COUPONS TAKEN | STEEL, 1<br>10204:20<br>FULL SI;<br>ZED PLA? | 515   | CED TO A FINE GRAIN P<br>NSPECTION CERTIFICATE<br>JIVALENT = ABSORBED E<br>HEATED AT 1665F FOR | E GRAI<br>RTIFIC<br>3SORBE<br>565F F          | INE GRAIN PRACTIC<br>SETIFICATE 3.1 C<br>ABSORBED ENERGY<br>1665F FOR 14 MI<br>REATED PLATE. | ACTICE 3.1 COMPLIZERGY AVG X 14 MINUTES  | COMPLIANT<br>COMPLIANT<br>7 AVG X 10 /<br>11NUTES. | TEST                          | SIZE IN MM   | ⋝:                              |   |                               |  |                                |   |   |   |
| PRODUCTS   | S SHIPPED:                                   | ED:   |  | 7   |  | 000                                      |  | •                             | 7  |                                 | L   |                               |  |                                |   |   |   |
| E/B101<br>E7B101<br>E7B101<br>W7B598<br>W7B598   | 1 E E C C C C C C C C C C C C C C C C C      | 6705034<br>6705123<br>6705124<br>6705041<br>6705038 | PCES:  | <br>  | LESS:<br>LBS:<br>LBS:<br>LBS:<br>LBS:  | 4084<br>40884<br>40884<br>40884<br>40884 |  |                               | E78101 E02<br>E78101 E05<br>E78101 E05<br>W78598 E08<br>W78598 E08   |                                 | 6705086<br>6705085<br>6705042<br>6705040<br>6705043 | PCES: PCES: PCES: PCES: PCES: | 1, LBS<br>1, LBS<br>1, LBS<br>1, LBS<br>1, LBS |                                | 4 4 0 8 4 4 0 8 8 4 4 0 8 8 4 4 0 8 8 4 4 0 8 8 4 4 0 8 8 4 4 0 8 8 4 4 0 8 8 4 4 0 8 8 4 4 0 8 4 8 4 |   |   |
|  |  |   |  |   |  |  |  |                               |  |                                 |   |                               |  |                                |   |   |   |
| (A)  | Cust   | Cust Part #:  |  |   |  |  | WE HI<br>TESTE<br>REQU                             | EREBY (<br>ED IN AC<br>IREMEN | WE HEREBY CERTIFY THAT THIS MATERIAL WAS<br>TESTED IN ACCORDANCE WITH, AND MEETS THE<br>REQUIREMENTS OF, THE APPROPRIATE SPECIFICATION | T THIS M<br>WITH, AN<br>\PPROPF | ATERIAL<br>ID MEETS<br>SIATE SPE                    | WAS<br>THE<br>:CIFICAT        |  | Justin<br>ENIOR MET,           | Justin Ward +1<br>DR METALLURGIST .   | Justin Ward +1 251 662<br>SENIOR METALLURGIST - PRODUCT | 52 4400<br>cT                           |
|  |  |   |  |   |  |  |  |                               |  |                                 |   |                               |  |                                |   |   |   |





## **Test Certificate**

Form TC1: Revision 2: Date 23 Apr 2014

| Customor   |   |            |             | Cui                                     | stomer                                  | P.O.No.:C               | 41965 &                       | Customer P.O.No.:C41965 & 41-490195  | Mill Ord   | Mill Order No. 41-491117-01  | 91117-01   | Shipping   | Shipping Manifest: AR240135 | AR240135                                |
|--|---|------------|-------------|---|---|-------------------------|-------------------------------|--|--|--|--|--|-----------------------------|---|
| SAMUEL, SON & CO. LTD<br>1250 APPLEBY LINE   | CO. LTD<br>NE   |            |             | Pro                                     | Product Descr                           | iption:                 | SA G40.2<br>LCVN 15           | 21(2013) 38W7<br>FT.LBS,TCVN   | ption: CSA G40.21(2013) 38WT/260WT - CAT<br>5;LCVN 15FT.LBS,TCVN13FT.LBS@-45F/A673-P   | //A673-P   | Ship Date:<br>Cert Date:   | ~ ~ ~  |                             | <b>Cert No:</b> 081597458 (Page 2 of 2) |
| BURLINGTON   |   |            |             |   |   | ζŹ                      | ALLOYS AP16:<br>NORMALIZED    | .Pl65U(121H E<br>ZED   | ALLOYS APISSU(121H ED) IABLE 4-1 GK.IIIA<br>NORMALIZED   | <b>⊄</b><br>≣:<br>Y  |  |  |                             |   |
| ON L7L5G6  |   |            |             | Siz                                     | Size: 0.250 X                           |                         | 120.0 X 480.0 (IN)            | (NI)   |  |  |  |  |                             |   |
|  | <del>-</del>  |            |             |   | ו דיו                                   | es:                     |                               |  |  | Charp  | Charpy Impact Tests  |  |                             |   |
| Heat Piece<br>Id Id  | ce Tested<br>I Thickness  | Tst<br>Loc | YS<br>(KSI) | UTS<br>(KSI)                            | %RA                                     | Elong %<br>2in 8in      | o Tst<br>Dir                  | Hardness   | Abs. Energy(FTLB)<br>1 2 3 Avg   | -  | % Shear<br>2 3 Avg   | Tst<br>Tmp   | Tst Tst Dir Siz             | BDWTT<br>Tmp %Shr                       |
| W7B598 E08<br>W7B598 E08<br>W7B598 E08<br>W7B598 E08<br>W7B598 E08<br>E7B101 E02<br>E7B101 E05<br>E7B101 E05<br>E7B101 E05<br>E7B101 E05<br>W7B598 E08 | 88 6705039<br>8 6705039<br>8 6705045<br>2 6705045<br>2 6705151<br>5 6705151<br>6 705127<br>6 705127<br>6 705127<br>6 705127<br>6 705127<br>6 705127<br>6 705127 |            |             | LBS: LBS: LBS: LBS: LBS: LBS: LBS: LBS: | 4 4 4 4 4 4 4 4 4 4 4 4 8 8 8 8 8 8 8 8 |                         | н о о н ц ц ц ц ц ц           | E7B101 E05<br>W7B598 E08<br>W7B598 E08<br>E7B101 E04<br>E7B101 E05<br>E7B101 E05<br>E7B101 E05<br>E7B101 E05<br>E7B101 E05<br>E7B101 E05 | 6705087<br>6705087<br>6705087<br>6705156<br>67051152<br>67051162<br>67051130<br>67051163   | POCES:  POCES: | 1, LBS: 1, LBS | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4                |                             |   |
|  |   |            |             |   |   |                         |                               |  |  |  |  |  |                             |   |
| (P)  | Cust Part #:  |            |             |   |   | WE HE<br>TESTE<br>REQUI | EREBY C<br>ED IN AC<br>REMENT | ERTIFY THAT<br>CORDANCE V<br>IS OF, THE AI   | WE HEREBY CERTIFY THAT THIS MATERIAL WAS<br>TESTED IN ACCORDANCE WITH, AND MEETS THE<br>REQUIREMENTS OF, THE APPROPRIATE SPECIFICATION | L WAS<br>'S THE<br>'ECIFICATIO   |  | Justin Ward +1 251 662 senior metallurgist - Product | +1 251 662<br>ST - PRODUCT  | 2 4400<br>T                             |
|  |   |            |             |   |   |                         |                               |  |  |  |  |  |                             |   |