Inukshuk Construction Limited
Industrial Contracting Project Management

PO Box 654
Rankin Inlet, NU X0C 0G0
T 867.645.4030 F 867.645.4064

ICL Project #: 313 Location: Amaruk Mine, NU Client Project #: 6115-C-260-001

Field Erected Fuel Storage Tank

Handover Package

Welder Qualification

Contents

1. Individual Welder Qualifications / Welder Log

WPS : MEL-WP-002 Inspector :

Fused only : n/a Auto joint : n/a

NOVA SCOTIA
Labour and Advanced Education

Boiler and Pressure Equipment Regulations
Tested in accordance with ASME Section IX
Pressure Welder Licence

NSID : U0250 **Expires :** 16 Apr 2021
Name : Justin Drege
Certified by : Mosher Engineering Limited

Purge	Backing	Process	F-No.	Qual. thk.
NR	NR	SMAW	1 - 3	0.25"
NR	R	SMAW	1 - 4	0.438"

WPS : MEL-WP-002 **Inspector :**

Base metal (s)

P/S-No.	Max. thk.	Min. thk.	Min. dia.
P1 - 11	0.688"		1"

Position (s) 1: All up
2:

Electrode (s) 1: F1-3 per QW-432/433
2: F1-4 per QW-432/433
3:

Other

GMAW mode : n/a
Con. inert : n/a
Fused only : n/a

Machine controls

Visual : n/a
Auto volt : n/a
Auto joint : n/a

NOVA SCOTIA
Labour and Advanced Education

Boiler and Pressure Equipment Regulations
Tested in accordance with ASME Section IX

Pressure Welder Licence

NSID : W0186 **Expires :** 28 Mar 2021
Name : Zachary G. King
Certified by : Mosher Engineering Limited

Purge	Backing	Process	F-No.	Qual. thk.
NR	NR	SMAW	1 - 3	0.25"
NR	R	SMAW	1 - 4	0.438"

WPS : MEL-WP-002 **Inspector :**

Base metal (s)

P/S-No.	Max. thk.	Min. thk.	Min. dia.
P1 - 11	0.688"		1"

Position (s) 1: All up
2:

Electrode (s) 1: F1-3 per QW-432/433
2: F1-4 per QW-432/433
3:

Other

GMAW mode : n/a
Con. inert : n/a
Fused only : n/a

Machine controls

Visual : n/a
Auto volt : n/a
Auto joint : n/a

NOVA SCOTIA
Labour and Advanced Education

Boiler and Pressure Equipment Regulations
Tested in accordance with ASME Section IX
Pressure Welder Licence

NSID : V0089
Name : Wilbert Dean Goodyear
Certified by : Mosher Engineering Limited

Expires : 25 Apr 2020

WPS : MEL-WP-002

Inspector :

NSBPE NS 34

Purge	Backing	Process	F-No.	Qual. thk.
NR	NR	SMAW	1 - 3	0.25"
NR	R	SMAW	1 - 4	0.438"

Base metal (s)
P/S-No. P1 - 11
Position (s) 1: All
2:

Max. thk. 0.688"

Min. thk. up

Min. dia. 1"

Electrode (s)
1: F1-3 per QW-432/433
2: F1-4 per QW-432/433
3:

Other

GMAW mode	: n/a
Con. inert	: n/a
Fused only	: n/a

Machine controls

Visual	: n/a
Auto volt	: n/a
Auto joint	: n/a

NSBPE NS 34

NOVA SCOTIA
Labour and Advanced Education

Boiler and Pressure Equipment Regulations
Tested in accordance with ASME Section IX
Pressure Welder Licence

NSBPE NS 34

NSID : V0086 **Expires :** 4 Apr 2020
Name : Tyler Kean
Certified by : Mosher Engineering Limited

Purge	Backing	Process	F-No.	Qual. thk.
NR	NR	SMAW	1 - 3	0.25"
NR	R	SMAW	1 - 4	0.438"

WPS : MEL-WP-002 **Inspector :**

Base metal (s) P/S-No.	Max. thk.	Min. thk.	Min. dia.
P1 - 11	0.688"	up	1"

Position (s)
1: All
2:

Electrode (s)
1: EXX per F 1-3
2: EXX per F4
3:

Other

GMAW mode	: n/a
Con. inert	: n/a
Fused only	: n/a

Machine controls

Visual	: n/a
Auto volt	: n/a
Auto joint	: n/a

NSBPE NS 34

NOVA SCOTIA
Labour and Advanced Education

Boiler and Pressure Equipment Regulations
Tested in accordance with ASME Section IX
Pressure Welder Licence

NSID : V0084 **Expires :** 4 Apr 2020
Name : Michael Goodyear
Certified by : Mosher Engineering Limited

Purge	Backing	Process	F-No.	Qual. thk.
NR	NR	SMAW	1 - 3	0.25"
NR	R	SMAW	1 - 4	0.438"

WPS : MEL-WP-002 **Inspector :**

Base metal (s) P/S-No.	Max. thk.	Min. thk.	Min. dia.
P1 - 11	0.688"		1"
Position (s)	1: All	up	
	2:		
Electrode (s)	1: EXX per F 1-3		
	2: EXX per F4		
	3:		

Other

		Machine controls	
GMAW mode	: n/a	Visual	: n/a
Con. inert	: n/a	Auto volt	: n/a
Fused only	: n/a	Auto joint	: n/a

File No. 601

WELDING PERFORMANCE QUALIFICATION

Wayne P. Knox **Is qualified**

As a B CLASS **Welder - Operator**

Subject to the limitations and for a period mentioned at the back of this card.

Chief Boiler and Gas Inspector (Muhammad Wani)

30/05/2019
Date of Issue

PERFORMANCE QUALIFICATION

(In accordance with section IX, A.S.M.E code)

Renewal of performance qualification is required when the welding operator named hereon has not used the specified process and materials, etc., for a period of six months or more.

Process	SMAW
Material	Carbon Steel
Thickness	3mm & above
Filler Metal	F3/F6
Positions	All

30/05/2020
Expiry date dd/mm/yyyy

Inukshuk Construction Limited
Industrial Contracting Project Management

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ICL Project #: 313 Location: Amaruk Mine, NU Client Project #: 6115-C-260-001

Field Erected Fuel Storage Tank

Handover Package

Inspector Qualification

Contents

1. In House & 3rd Party Inspector Qualifications

TEAM® Industrial Services
Inspection Services Canada

CERTIFICATIONS FOR COREY RANDELL

Natural Resources Canada / Ressources naturelles Canada

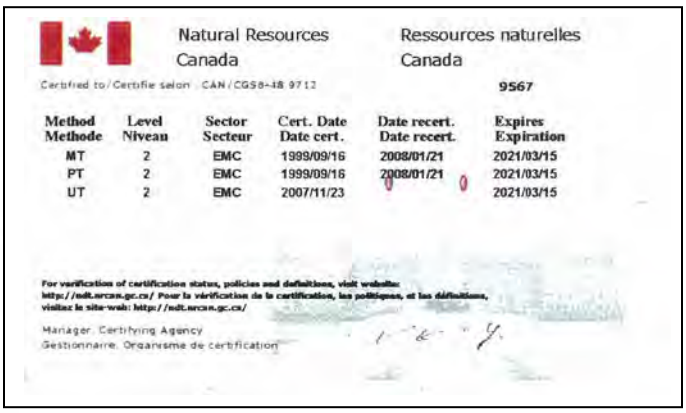
Name/ Nom: Corey Lee Randell
Reg. No. / No. matricule: 9567
Issue Date/ Date d'emission: 2016/11/26

This card does not identify the stated individual to be an employee or representative of Natural Resources Canada, Government of Canada.
Cette carte n'identifie pas l'individu comme étant un employé ou un représentant de Ressources naturelles Canada, Gouvernement du Canada

Corrective lenses for [ ] near [ ] far vision.
Verres correctifs pour la vision de [ ] près [ ] distance.

Signature :

C.G.S.B. CERTIFICATION



Natural Resources Canada / Ressources naturelles Canada

Certified to / Certifié selon : CAN/CGSB-48.9712

9567

Method / Methode	Level / Niveau	Sector / Secteur	Cert. Date / Date cert.	Date recert. / Date recert.	Expires / Expiration
MT	2	EMC	1999/09/16	2008/01/21	2021/03/15
PT	2	EMC	1999/09/16	2008/01/21	2021/03/15
UT	2	EMC	2007/11/23		2021/03/15

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

Manager, Certifying Agency
Gestionnaire, Organisme de certification

C.G.S.B. QUALIFICATIONS

Certified Welding Inspector

COREY LEE RANDELL REG # 8589

is a certified **Level 1** welding inspector in accordance with the requirements of CSA W178.2 "Certification of Welding Inspectors".

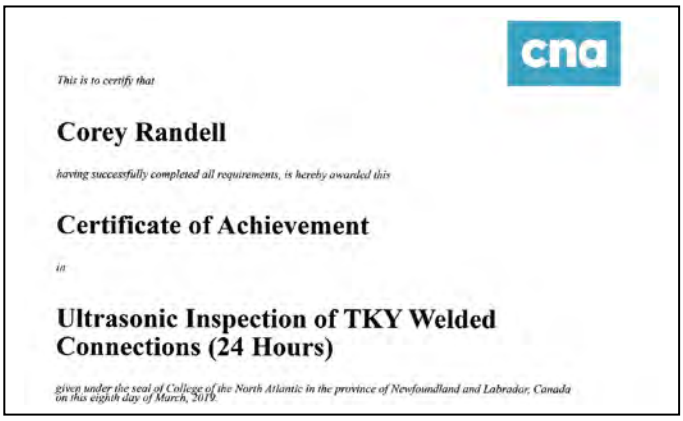
Valid until **January 31, 2022**

This certification includes endorsements for the following code(s) and standard(s):

ASME B31.3-2010

Six-year Re-certification Expiry **January 31, 2022**

CWB CERTIFICATION



cna

This is to certify that

Corey Randell

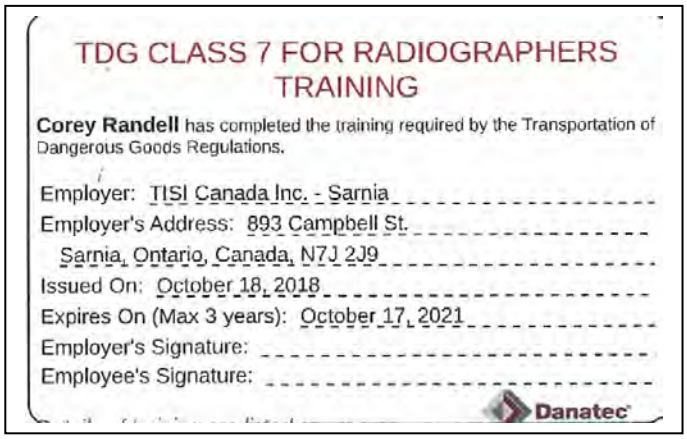
having successfully completed all requirements, is hereby awarded this

Certificate of Achievement

in

Ultrasonic Inspection of TKY Welded Connections (24 Hours)

given under the seal of College of the North Atlantic in the province of Newfoundland and Labrador, Canada on this eighth day of March, 2019.



TDG CLASS 7 FOR RADIOGRAPHERS TRAINING

Corey Randell has completed the training required by the Transportation of Dangerous Goods Regulations.

Employer: TISI Canada Inc. - Sarnia
Employer's Address: 893 Campbell St.
Sarnia, Ontario, Canada, N7J 2J9
Issued On: October 18, 2018
Expires On (Max 3 years): October 17, 2021
Employer's Signature:
Employee's Signature:

Danatec

Corey Lee Randell
9567
Registration Number
Numéro de matricule

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

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

2019/05/10
Issue Date
Date d'émission

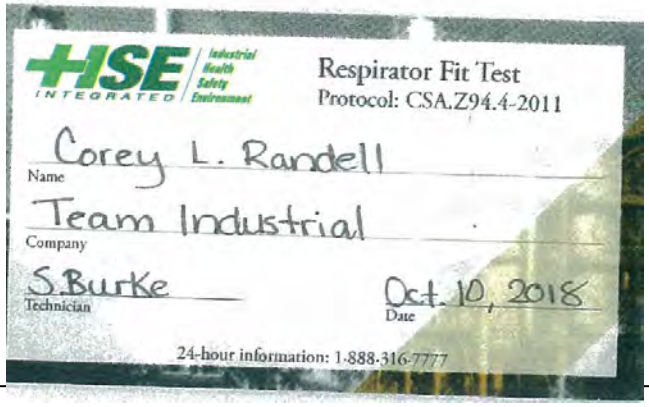
2024/05/10
Expiry Date
Date d'expiration

Designated Officer
Fonctionnaire désigné

Canadian Nuclear Safety Commission / Commission canadienne de sûreté nucléaire

Canada

CERTIFICATIONS FOR COREY RANDELL



CWB Form 455E/2018-1

cwbgroup

Welding Inspector Visual Acuity Record

SECTION 1: **IDENTIFICATION OF APPLICANT (Please print):**

Applicant's Name: Corey Lee RANDELL Registration #: 8589

☐ Application for Certification ☑ Renewal of Certification

SECTION 2: **VISION REQUIREMENTS:**

Evidence of satisfactory vision, as determined by a medical professional, must be provided by all new applicants and certified inspectors who are renewing their certification. The vision examination must have been performed no more than 12 months from the date of receipt of this form by the CWB.

Near vision acuity shall permit reading a minimum of Jaeger number 1 or Times Roman N 4.5 or equivalent letters (having a height of 1.6 mm) at not less than 30 cm with one or both eyes, either corrected or uncorrected.

Submission of a prescription for corrective lenses in lieu of this form is not acceptable.

SECTION 3: **DECLARATION OF EXAMINER:**

This is to certify that I, Dr E Chan OD (Examiner's Name (please print)) administered a test of visual acuity to Corey RANDELL (Applicant's Name (please print)) on 12/05/2018 (Examination Date (MM / DD / YYYY))

I also certify that the applicant: (check applicable box)

Meets the vision requirements in Section 2 without correction ☑

Meets the vision requirements in Section 2 with correction ☐

Does not meet the vision requirements in Section 2 ☐

Check one of the following:

☑ Optometrist ☐ Ophthalmologist ☐ Medical Doctor

☐ Registered Nurse ☐ Other (Specify) _____

Address: 644 Portland St. Dartmouth, NS B2W 2M3

Signature of Examiner: [signature] O.D. #50185 Tel. #: 902 446 3951

FOR CWB USE ONLY:

Reviewed by: _____ Date: _____

PLEASE ATTACH COMPLETED RECORD TO YOUR APPLICATION AND SEND TO THE CWB.
RETAIN A COPY FOR YOUR FILE.

Inukshuk Construction Limited
Industrial Contracting Project Management

PO Box 654
Rankin Inlet, NU X0C 0G0
T 867.645.4030 F 867.645.4064

ICL Project #: 313 Location: Amaruk Mine, NU Client Project #: 6115-C-260-001

Field Erected Fuel Storage Tank

Handover Package

Weld Procedures

Contents

1. Approved Weld Procedures

SUBMERGED ARC-WELDING MANUAL

TABLE OF CONTENT

Mosher ENGINEERING

1007 Cobequid Road, Windsor Junction, Nova Scotia B2T 1K1

WELDING PROCEDURE SPECIFICATION NUMBER SAW-1
Submerged Arc Welding

1 SCOPE

This Welding Procedure Specification covers welding and related operations of steel structures that are fabricated in accordance with the terms outlined in CSA Standard W47.1 and W59, latest revisions. The attached Data Sheets for an essential part of this specification.

A change in any of the essential variables contained in the succeeding paragraphs or detailed on applicable Welding Procedure Data Sheets shall require a new Welding Procedure Specification and/or new Welding Procedure Data Sheets.

2 WELDING PROCEDURE

The welding shall be done automatically or semi-automatically using the SAW (Submerged Arc Welding) process.

Joints shall be made following the procedural stipulations indicated in CSA Standard W59 and may consist of single or multiple passes, in accordance with the approved welding procedure data sheets to which this specification refers.

3 BASE MATERIAL

The base metal shall conform to the specifications for the steel groups 1, 2, and 3 per Table 11.1 or Table 12.1 of CSA W59. Other groups may be welded providing the Canadian Welding Bureau accepts the Welding Procedure Data Sheets (WPDS).

4 BASE METAL THICKNESS

Base metal thickness from over 3.2 mm (⅛") to an unlimited thickness (inclusive) may be welded under this specification providing the respective welding procedure data sheets have been supplied and approved for an appropriate weld size.

5 FILLER METAL

The filler metal shall conform to specification for CSA Standard W48 and shall be compatible with the base metal, as specified in Table 11.1 and 12.1 of CSA Standard W59. The classification of electrode to be used is shown on the appropriate Welding Procedure Data Sheet.

5.1 Storage and Conditioning of Electrodes and Fluxes

Electrodes (wire) shall be stored in a clean, dry environment in original containers until ready for use. All wire contaminated by surface rust or foreign material shall be discarded.

Flux used for SAW shall be dry and free from contamination of dirt, mill scale or other foreign material. All flux shall be purchased in packages capable of being stored under normal conditions for at least six (6) months without such storage affecting its welding characteristics or weld metal properties. Flux from damaged packages that have been exposed to free moisture shall be discarded or shall be dried before use in shallow layers (2 in. / 50 mm maximum) at a minimum temperature of 500°F (260°C) for at least one (1) hour or at time and temperature conditions as recommended by the flux manufacturer. Any flux that has been fused during welding shall not be reused

6 POSITION

The welding shall be done in the flat position or horizontal positions provided approved Welding Procedure Data Sheets referring to those positions and this procedure specification are followed.

7 PREHEAT

The minimum preheat before welding will comply with Table 5-3 shown in the CSA Standard W59. Welding will be done at sufficient speed to ensure that the minimum preheat is maintained or exceeded.

If welding is interrupted for some time so that the temperature of the base metal falls below the minimum preheat temperature, then arrangements will be made to preheat again prior to recommencing welding.

The weldment shall be allowed to cool to the ambient temperature, without an external quench media being supplied. In other words, cooling water or placement in frigid conditions that cause a quick temperature change shall not be used.

8 HEAT TREATMENT AND STRESS RELIEVING

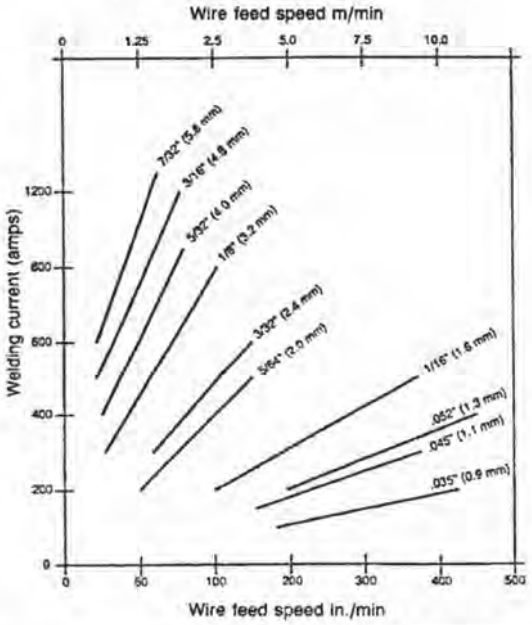
This will not be applicable to structures welded under this specification unless a specification showing all the parameters is submitted to the Canadian Welding Bureau and approval is obtained.

9 ELECTRICAL CHARACTERISTICS WELDING TECHNIQUE

The Welding Procedure Data Sheets show details of the electrical characteristics to be used. The current used shall be direct current (DC) or alternating current (AC) as indicated on the welding procedure data sheets. However, unless otherwise noted on the data sheets or recommended by the consumable supplier, current and voltage ranges and electrode stick outs shall be as shown below:

Wire Diameter, in.	Current Range DC(+), amp	Arc Voltage Range	Stick out (standard), in
1/16	150 – 400	19 – 37	5/8" - 1 ¼"
5/64	200 – 600	20 – 37	5/8" - 1 ¼"
3/32	350 – 700	22 – 37	5/8" - 1 ¼"
1/8	300 – 900	23 – 37	5/8" - 1 ¼"
5/32	400 – 1000	25 – 37	5/8" - 1 ¼"
3/16	500 - 1100	27 – 37	5/8" - 1 ¼"
7/32	600 – 1200	30 – 37	5/8" - 1 ¼"
1/4	700 - 1600	30 – 38	5/8" - 1 ¼"

CURRENT (AMPS) VS. WIRE FEED SPEED
DC(+) Polarity, Single Arc, **Normal Stickout**



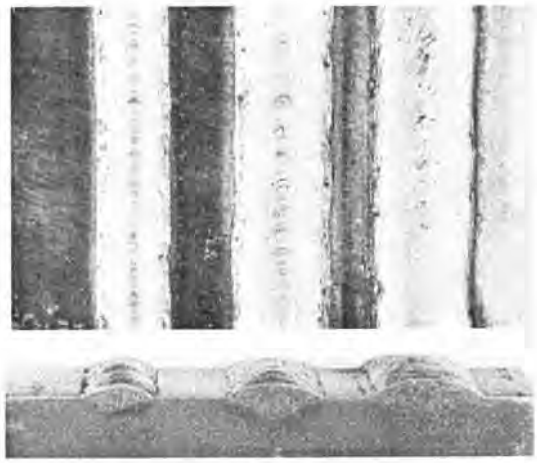
9.1 Effect of Parameters

9.1.1 Amperage

Increasing the amperage results in an increased deposition rate and penetration

Amperage too high
- Unstable arc
- Undercutting
- High narrow bead
- Burn through

Amperage to Low
- Unstable Arc
- Poor Penetration



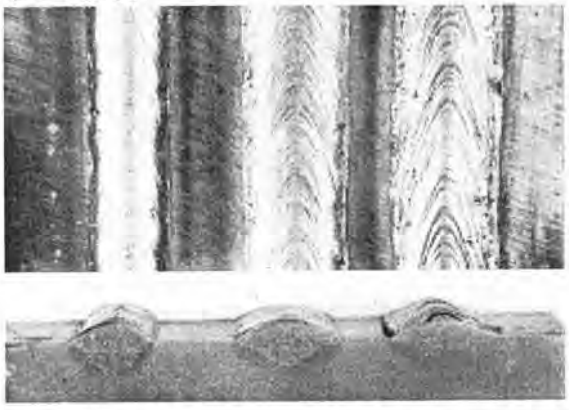
Weak Medium Strong

9.1.2 Voltage

An increased in voltage will increase the arc length, create a flatter and wider bead, increases flux consumption, improves slag removal; reduce penetration; increases resistance to porosity caused by rust or scale; increase alloy pick-up from the flux and will reduces flattening (root gap).

Voltage too high
- Produces a "hat-shaped" bead (cracking)
- Poor slag removal
- Concave fillet weld - crack-sensitive
- Increases transfer of alloying elements
- Undercuts at weld connection

Voltage too low
- Produces a high, narrow bead



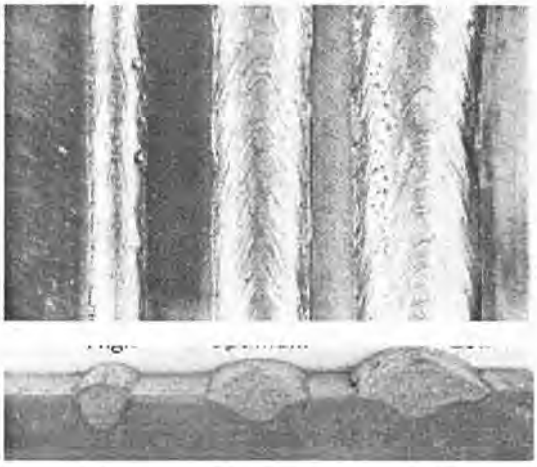
Low Medium High

Poor slag removal

9.1.3 Welding (Travel) Speed

Welding speed greatly affects penetration and bead shape. An increase in speed will reduce penetration, increases tendency to undercut, increase possibility of arc blow, increases porosity, can cause an irregular bead and may result in bad degassing.

If your welding speed too low it may result in bead profile subject to cracking, arc visibility, large difficult to control molten pool, rough looking bead, slag inclusions, make it difficult to remove slag and causes a risk of burn through



Low Medium High

10 PREPARATION OF BASE MATERIAL

The edges or surfaces of parts to be joined by welding shall be prepared by suitable means (e.g. Oxy-acetylene, plasma, etc.). Where hand cutting is involved the edge will be ground to a smooth surface. All surfaces and edges shall be free from fins, tears, cracks or any other defects that could adversely affect the quality of the weld.

All loose or thick scale, rust, moisture or other foreign material that would prevent proper welding or produce objectionable fumes shall be removed.

Typical joint preparations can be found in the appendix of this WPS.

11 TREATMENT OF UNDERSIDE OF WELDING GROOVE{tc \l2 "12.0 TREATMENT OF UNDERSIDE OF WELDING GROOVE}

Prior to depositing weld metal on the underside of a welding groove, the root shall be back gouged to sound metal, unless otherwise specified on the applicable data sheet.

Machining, air carbon arc or oxygen gouging, chipping or grinding may be used for back gouging.

12 QUALITY

Cracks or blowholes that appear on the surface of any pass shall be removed before depositing the next covering pass. The procedure and technique shall be such that undercutting of base metal or adjacent passes is minimized. Fillet and butt welds shall be meet the desirable or acceptable fillet weld profiles shown in Figure 5.4 of CSA Standard W59. The reinforcement in groove welds shall not exceed 3 mm (1/8") and shall have a gradual transition to the plane of the base metal surface. In general, the weld quality will be such as to meet the requirements of Clause 11.5.4 or 12.5.4 (as applicable) of CSA W59.

13 WELD METAL CLEANING

Glass remaining after a pass shall be removed before applying the next covering pass. Prior to painting, all glass shall be removed and the parts shall be free of loose scale, oil and dirt.

14 DATA SHEETS

Welding Procedure Data Sheets are specifications setting broad guidelines for the shop and field welding practice of the fabricator for each anticipated combination of essential variables. From the practical point of view, it is essential to include all variables that would make the weld easier or more difficult to make. The practical men will find that this will cover suitable tolerances for the geometry of joint and the other parameters involved.

The attached data sheets form part of this specification.

15 TROUBLE SHOOTING

The solutions below should only be used where they do not conflict with the Welding Procedure Data Sheets. Contact welding engineer for problems that cannot be corrected without conflict

Problem	Causes
Porosity	- Moist flux - Rust, carbon deposit or paint on plate surface - Oxidized electrode wire - Base metal chemistry - Contaminants - Excessive or insufficient flux thickness
Lack of Penetration	- Excessive root face - Insufficient amperage or wire speed - Travel speed too high - Voltage too high - Bad positioning of electrode wire - Excessive final length
Lack of Fusion	- Amperage too low - Travel speed too high - Bad positioning of electrode wire - Presence of carbon deposits or other foreign matters
Undercutting	- Travel speed too high - Excessive amperage - Excessive voltage - Bad positioning of electrode wire (angle, distance)
Hot Cracking	- Bad width/depth radio - Base metal chemistry (presence of sulphur, carbon or phosphor) - Presence of contaminants - Concave fillet weld - Stress

Cold Cracking	- Presence of hydrogen - Inappropriate pre-heat - Base metal chemistry - Tack welds too small
Unstable arc	- Check wire feed system

16 APPROVALS

CWB APPROVAL

CWB Accepted

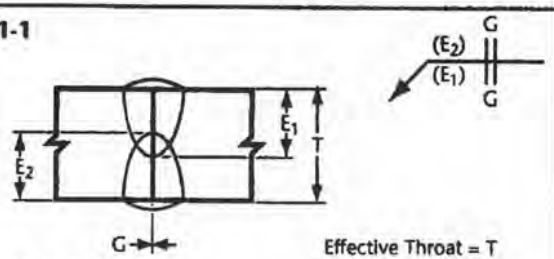
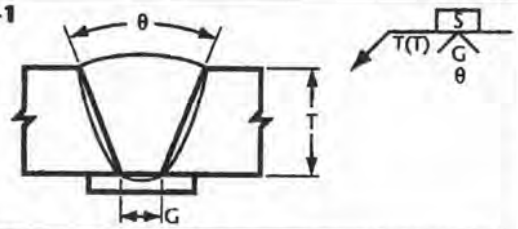
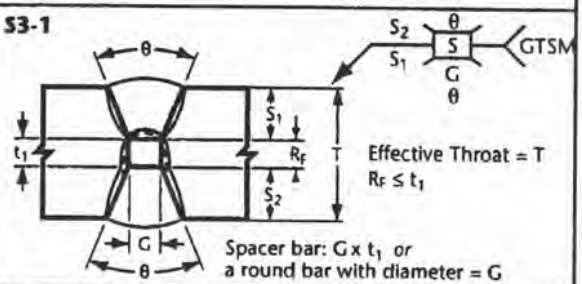
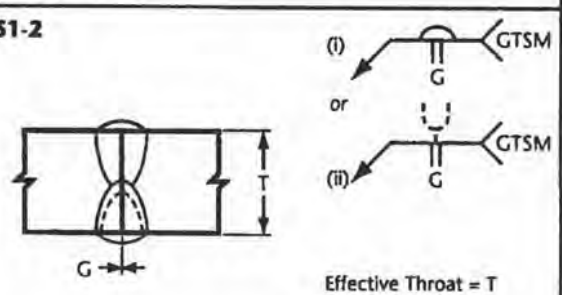
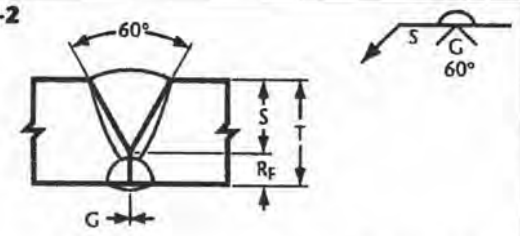
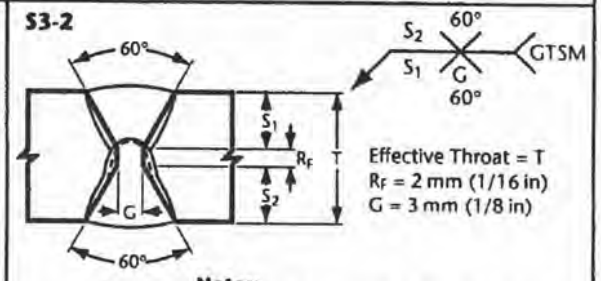
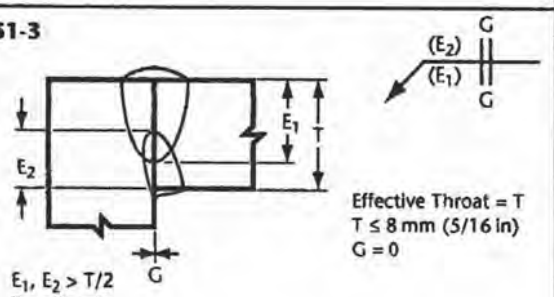
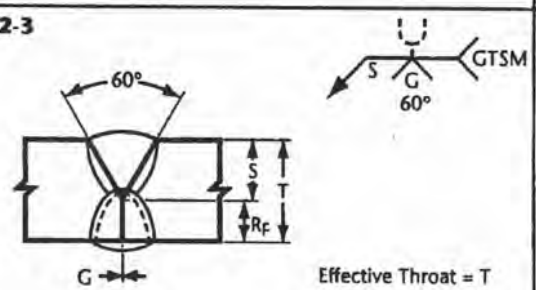
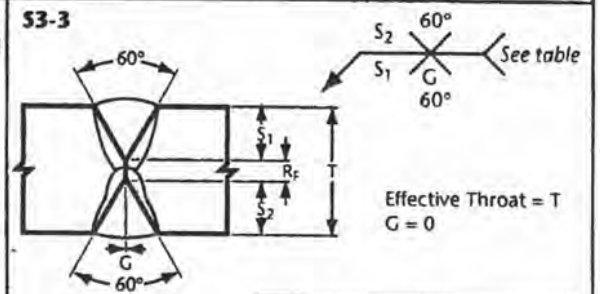
CWB

Jul 28, 2008

Valid only if welding consumables are certified by the CWB

COMPANY'S APPROVAL

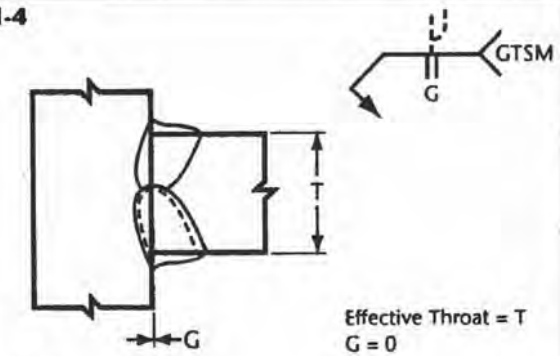
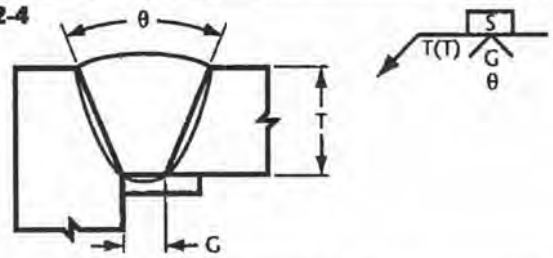
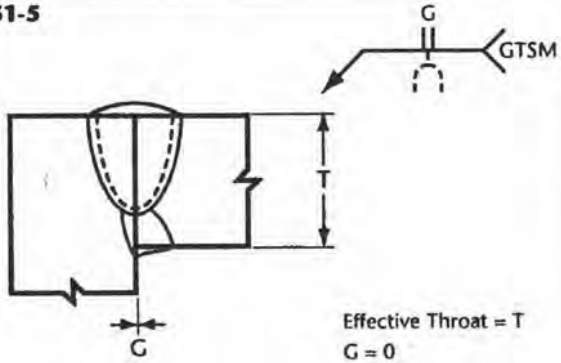
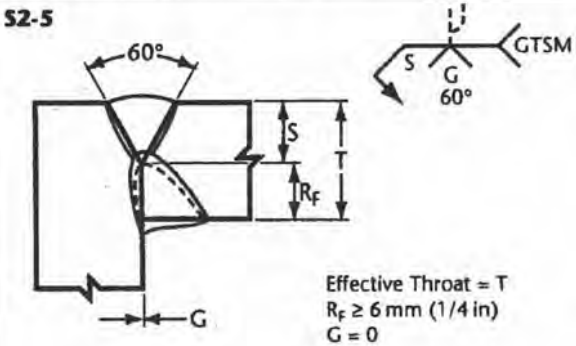
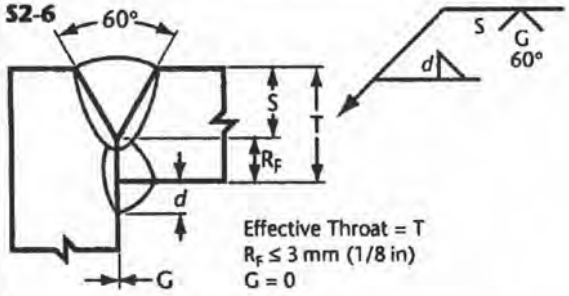
REGISTERED PROFESSIONAL ENGINEER
DATE 07/22/2008
S. KEAY
7601
PROVINCE OF NOVA SCOTIA

Welds / Joints	1 – Square Groove	2 – Single V-Groove	3 – Double V-Groove
Butt (B)	**S1-1**  E_1, E_2 > T/2 $E_1 + E_2$ > T Effective Throat = T T ≤ 12 mm (1/2 in) G = 0 **Note:** *Welds shall be centred on the joint.* **B-L1-S**	**S2-1**  θ: 20°, G: ≥ 16 mm (5/8 in), Notes: *Split pass mandatory in root layer* θ: 30°, G: ≥ 6 mm (1/4 in), Notes: — θ: 45°, G: ≥ 3 mm (1/8 in), Notes: — **B-U2a-S**	**S3-1**  Effective Throat = T $R_F \le t_1$ Spacer bar: G x t_1 *or* a round bar with diameter = G θ: 20°, G: ≥16 mm (5/8 in), t_1: ≥6 mm (1/4 in), GTSM: Mandatory, Notes: *Split pass mandatory in root layer* θ: 30°, G: ≥6 mm (1/4 in), t_1: ≥6 mm (1/4 in), GTSM: Mandatory, Notes: — **B-U3a-S**
Butt (B)	**S1-2**  Effective Throat = T G = 0 **B-U1-S**	**S2-2**  Effective Throat = T R_F = 6 mm (1/4 in) G = 0 **B-U2b-S**	**S3-2**  Effective Throat = T R_F = 2 mm (1/16 in) G = 3 mm (1/8 in) **Notes:** **(1)** *Deposit a SMAW or FCAW root weld 10 mm (3/8 in) thick minimum.* **(2)** *GTSM prior to welding from other side.* **B-U3b-S**
Butt (B) or Corner (C)	**S1-3**  E_1, E_2 > T/2 $E_1 + E_2$ > T Effective Throat = T T ≤ 8 mm (5/16 in) G = 0 **Note:** *Outside weld shall be centred on the joint.* **C-L1-S**	**S2-3**  Effective Throat = T R_F > 6 mm (1/4 in) G = 0 **B-U2c-S**	**S3-3**  Effective Throat = T G = 0 R_F: ≤ 6 mm (1/4 in), GTSM: Not mandatory R_F: > 6 mm (1/4 in), GTSM: Mandatory **B-U3c-S**

*See **NOTES** at bottom left of following page*

(Continued)

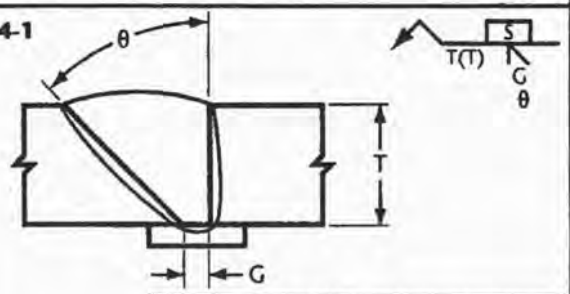
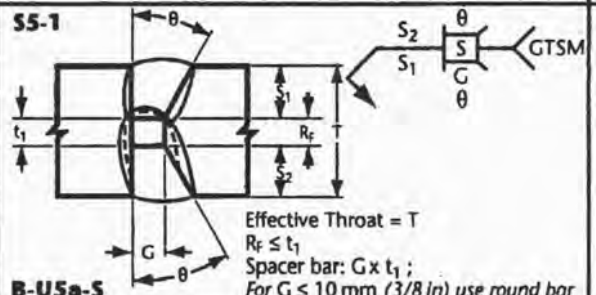
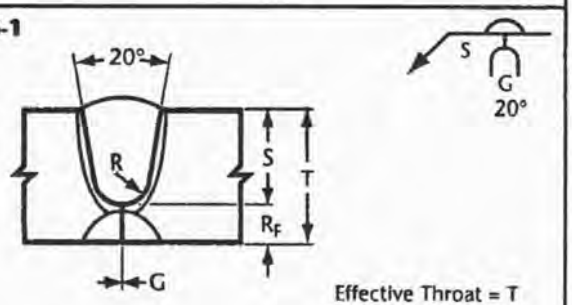
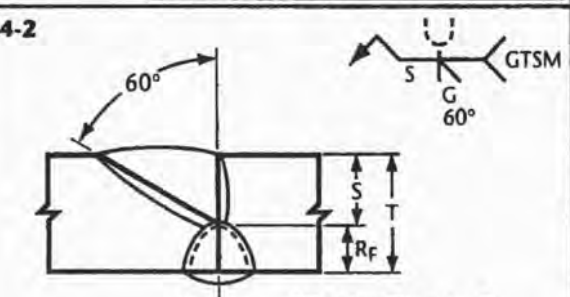
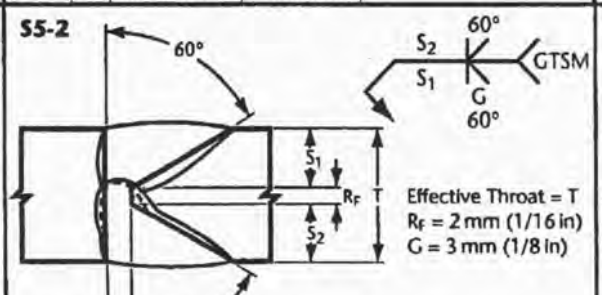
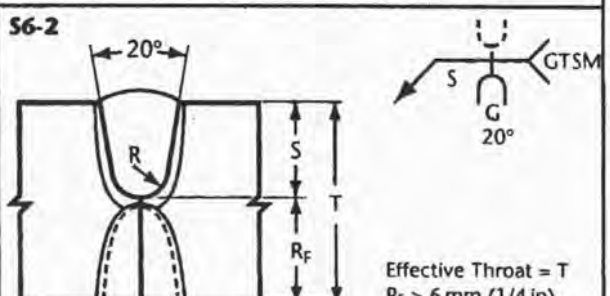
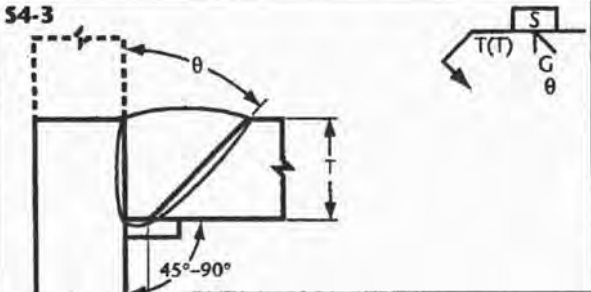
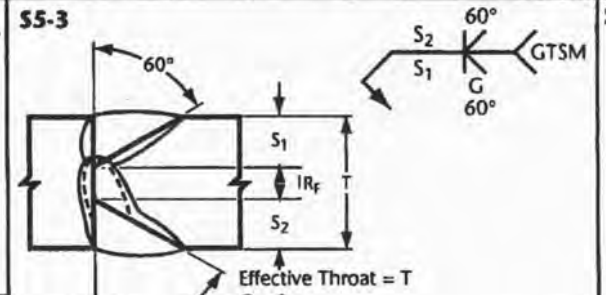
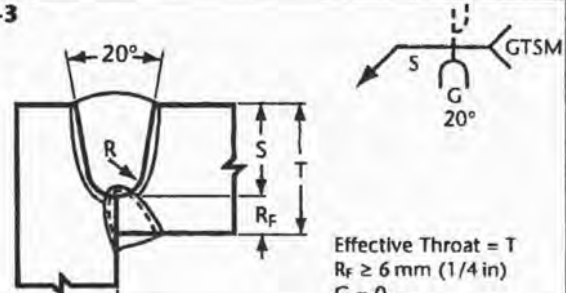
Figure 10.3
Prequalified Complete Joint Penetration Groove Welds for the Submerged Arc Welding Process (SAW)
(See Clauses 10.1.1 and 10.3.1.)

Welds / Joints	1 – Square Groove (cont'd)	2 – Single V-Groove (cont'd)	
Tee (T) Corner (C)	**S1-4**  Effective Throat = T G = 0 **T-U1-S**	**S2-4**  **C-U2a-S**	
Corner (C)	**S1-5**  Effective Throat = T G = 0 **C-U1-S**	**S2-5**  Effective Throat = T $R_F \geq 6$ mm (1/4 in) G = 0 **C-U2b-S**	
Corner (C)	**Notes:** **(1)** *For all joints that show the GTSM reference on the welding symbol, gouging to sound metal prior to welding from the other side is mandatory. See Clause 5.1.4 for definition.* **(2)** *The groove in a joint may be reversed where more practical or necessary.* **(3)** *See Clause 10.3.1.* **(4)** *For all joints with backing bars or spacers, the "S" in the welding symbol shall mean steel material in accordance with Clause 5.5.1.1.* **(5)** *For corner joints, see preferred preparation as shown in Figure 4.1.*	**S2-6**  Effective Throat = T $R_F \leq 3$ mm (1/8 in) G = 0 **Note:** *Weld back side first with SMAW or FCAW minimum* 6 mm (1/4 in) *fillet.* **C-U2c-S**	

θ	G	Notes
20°	≥ 16 mm (5/8 in)	*Split pass mandatory in root layer*
30°	≥ 6 mm (1/4 in)	—
45°	≥ 3 mm (1/8 in)	—

(Continued)

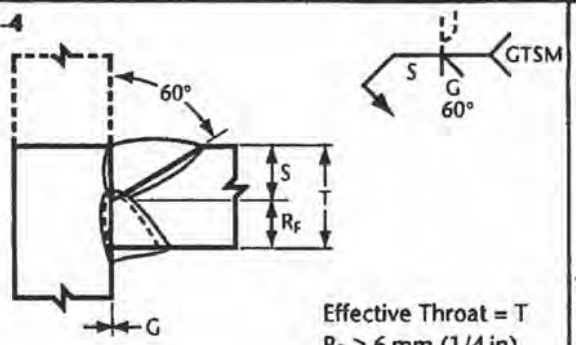
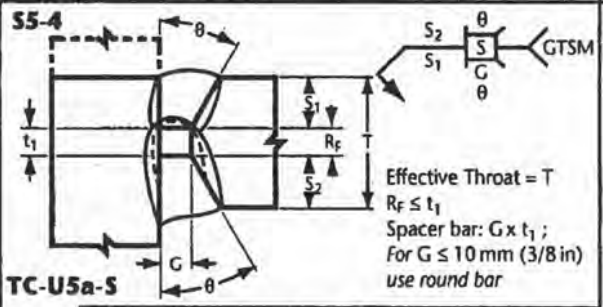
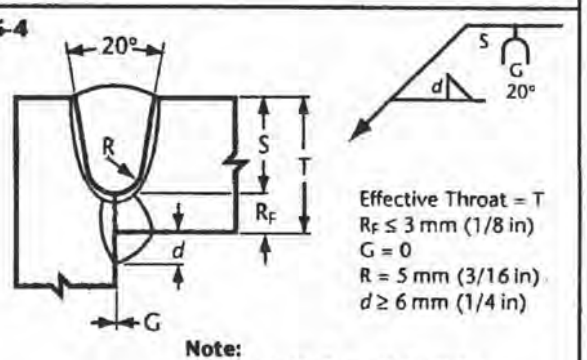
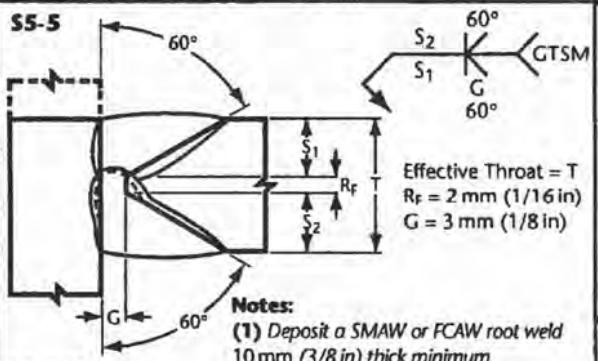
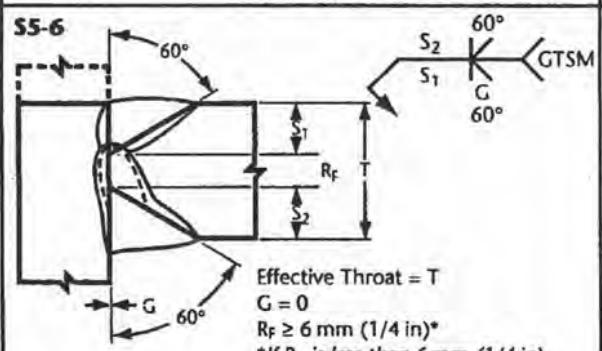
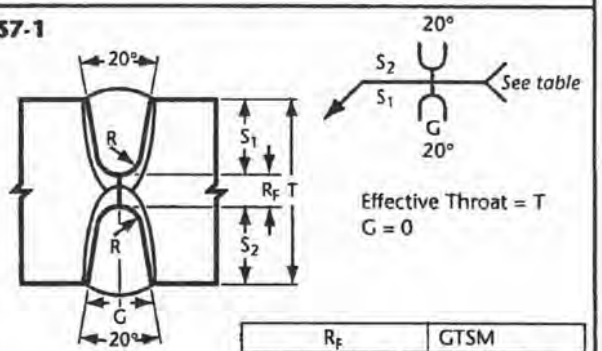
Figure 10.3 (Continued)
Prequalified Complete Joint Penetration Groove Welds for the Submerged Arc Welding Process (SAW)

Welds / Joints	4 – Single Bevel Groove	5 – Double Bevel Groove	6 – Single U-Groove
Butt (B)	S4-1  B-U4a-S θ ≥16 mm (5/8 in) Split pass mandatory in root layer 20° ≥16 mm (5/8 in) Split pass mandatory in root layer 30° ≥10 mm (3/8 in) — 45° ≥6 mm (1/4 in) —	S5-1  B-U5a-S Effective Throat = T $R_F \le t_1$ Spacer bar: G x t_1 ; *For G ≤ 10 mm (3/8 in) use round bar* θ ≥16 mm (5/8 in) ≥6 mm (1/4 in) Split pass mandatory in root layer 20° ≥16 mm (5/8 in) ≥6 mm (1/4 in) Split pass mandatory in root layer 30° ≥10 mm (3/8 in) ≥6 mm (1/4 in) — 45° ≥6 mm (1/4 in) ≥6 mm (1/4 in) —	S6-1  B-U6a-S Effective Throat = T R_F = 6 mm (1/4 in) G = 0 R = 5 mm (3/16 in)
Butt (B)	S4-2  B-U4b-S Effective Throat = T R_F > 6 mm (1/4 in) G = 0	S5-2  B-U5b-S Effective Throat = T R_F = 2 mm (1/16 in) G = 3 mm (1/8 in) **Note:** *Deposit a SMAW or FCAW root weld 10 mm (3/8 in) thick minimum.*	S6-2  B-U6b-S Effective Throat = T R_F > 6 mm (1/4 in) G = 0 R = 5 mm (3/16 in)
Butt (B) Tee (T) Corner (C)	S4-3  TC-U4a-S θ ≥16 mm (5/8 in) Split pass mandatory in root layer 20° ≥16 mm (5/8 in) Split pass mandatory in root layer 30° ≥10 mm (3/8 in) — 45° ≥6 mm (1/4 in) —	S5-3  B-U5c-S Effective Throat = T G = 0 $R_F \ge$ 6 mm (1/4 in)* **If R_F is less than 6 mm (1/4 in) deposit a SMAW or FCAW weld from other side.*	S6-3  C-U6a-S Effective Throat = T $R_F \ge$ 6 mm (1/4 in) G = 0 R = 5 mm (3/16 in)

*See **NOTES** at bottom left of following page*

(Continued)

Figure 10.3 (Continued)
Prequalified Complete Joint Penetration Groove Welds for the Submerged Arc Welding Process (SAW)

Welds / Joints	4 – Single Bevel Groove (cont'd)	5 – Double Bevel Groove (cont'd)	6 – Single U-Groove (cont'd)
Tee (T) Corner (C)	**S4-4**  Effective Throat = T $R_F \geq 6$ mm (1/4 in) G = 0 **TC-U4b-S**	**S5-4**  Effective Throat = T $R_F \leq t_1$ Spacer bar: G x t_1 ; *For G ≤ 10 mm (3/8 in) use round bar* **TC-U5a-S** | θ	G	t_1	Notes
20°	≥16 mm (5/8 in)	≥6 mm (1/4 in)	*Split pass mandatory in root layer*
30°	≥10 mm (3/8 in)	≥6 mm (1/4 in)	—
45°	≥6 mm (1/4 in)	≥6 mm (1/4 in)	—		**S6-4**  Effective Throat = T $R_F \leq 3$ mm (1/8 in) G = 0 R = 5 mm (3/16 in) $d \geq 6$ mm (1/4 in) **Note:** *Weld back side first with SMAW or FCAW minimum 6 mm (1/4 in) fillet.* **C-U6b-S**
Tee (T) Corner (C)		**S5-5**  Effective Throat = T R_F = 2 mm (1/16 in) G = 3 mm (1/8 in) **Notes:** **(1)** *Deposit a SMAW or FCAW root weld 10 mm (3/8 in) thick minimum.* **(2)** *GTSM prior to welding from other side.* **TC-U5b-S**	**7 – Double U-Groove**
Butt (B) Tee (T) Corner (C)	**Notes:** **(1)** *For all joints that show the GTSM reference on the welding symbol, gouging to sound metal prior to welding from the other side is mandatory. See Clause 5.1.4 for definition.* **(2)** *The groove in a joint may be reversed where more practical or necessary.* **(3)** *Types of grooves designated by (x) shall be preferably limited to base metal thickness of 16 mm (5/8 in) or greater.* **(4)** *See Clause 10.3.1.* **(5)** *For all joints with backing bars or spacers, the "S" in the welding symbol shall mean steel material in accordance with Clause 5.5.1.1.* **(6)** *For corner joints, see preferred preparation as shown in Figure 4.1.*	**S5-6**  Effective Throat = T G = 0 $R_F \geq 6$ mm (1/4 in)* **If R_F is less than 6 mm (1/4 in) deposit a SMAW or FCAW weld from other side.* **TC-U5c-S**	**S7-1**  Effective Throat = T G = 0 	R_F	GTSM
---	---
≤ 6 mm (1/4 in)	Not mandatory
> 6 mm (1/4 in)	Mandatory	 **B-U7-S**

(Continued)

Figure 10.3 (Continued)
Prequalified Complete Joint Penetration Groove Welds for the Submerged Arc Welding Process (SAW)

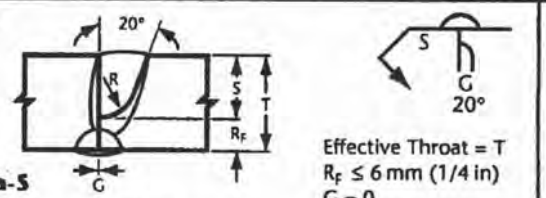
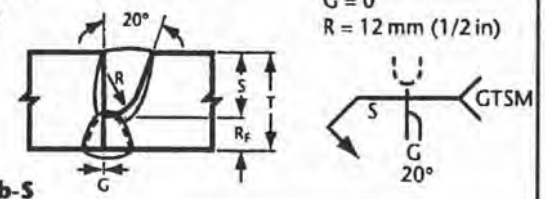
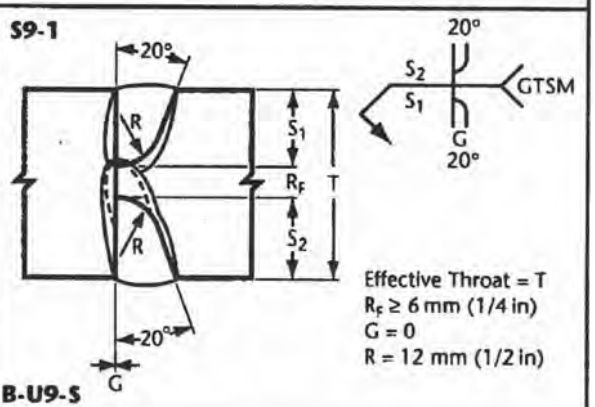
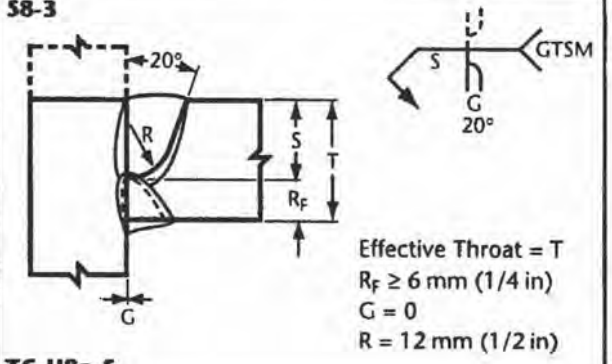
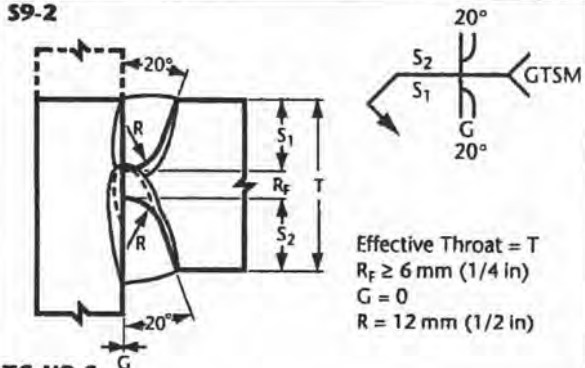
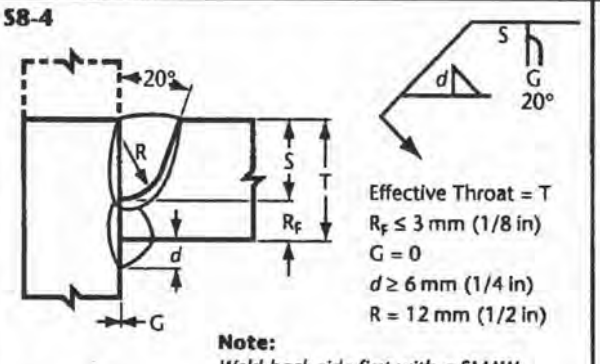
Welds / Joints	8 – Single J-Groove	9 – Double J-Groove
Butt (B)	**S8-1**  **B-U8a-S** Effective Throat = T $R_F \leq 6$ mm (1/4 in) G = 0 R = 12 mm (1/2 in) **S8-2**  **B-U8b-S**	**S9-1**  **B-U9-S** Effective Throat = T $R_F \geq 6$ mm (1/4 in) G = 0 R = 12 mm (1/2 in)
Tee (T) Corner (C)	**S8-3**  **TC-U8a-S** Effective Throat = T $R_F \geq 6$ mm (1/4 in) G = 0 R = 12 mm (1/2 in)	**S9-2**  **TC-U9-S** Effective Throat = T $R_F \geq 6$ mm (1/4 in) G = 0 R = 12 mm (1/2 in)
Tee (T) Corner (C)	**S8-4**  **TC-U8b-S** Effective Throat = T $R_F \leq 3$ mm (1/8 in) G = 0 $d \geq 6$ mm (1/4 in) R = 12 mm (1/2 in) **Note:** *Weld back side first with a SMAW or FCAW min.* 10 mm (3/8 in) *fillet.*	**Notes:** **(1)** *For all joints that show the GTSM reference on the welding symbol, gouging to sound metal prior to welding from the other side is mandatory. See Clause 5.1.4 for definition.* **(2)** *The groove in a joint may be reversed where more practical or necessary.* **(3)** *See Clause 10.3.1.* **(4)** *For corner joints, see preferred preparation as shown in Figure 4.1.*

Figure 10.3 (Concluded)
Prequalified Complete Joint Penetration Groove Welds for the Submerged Arc Welding Process (SAW)

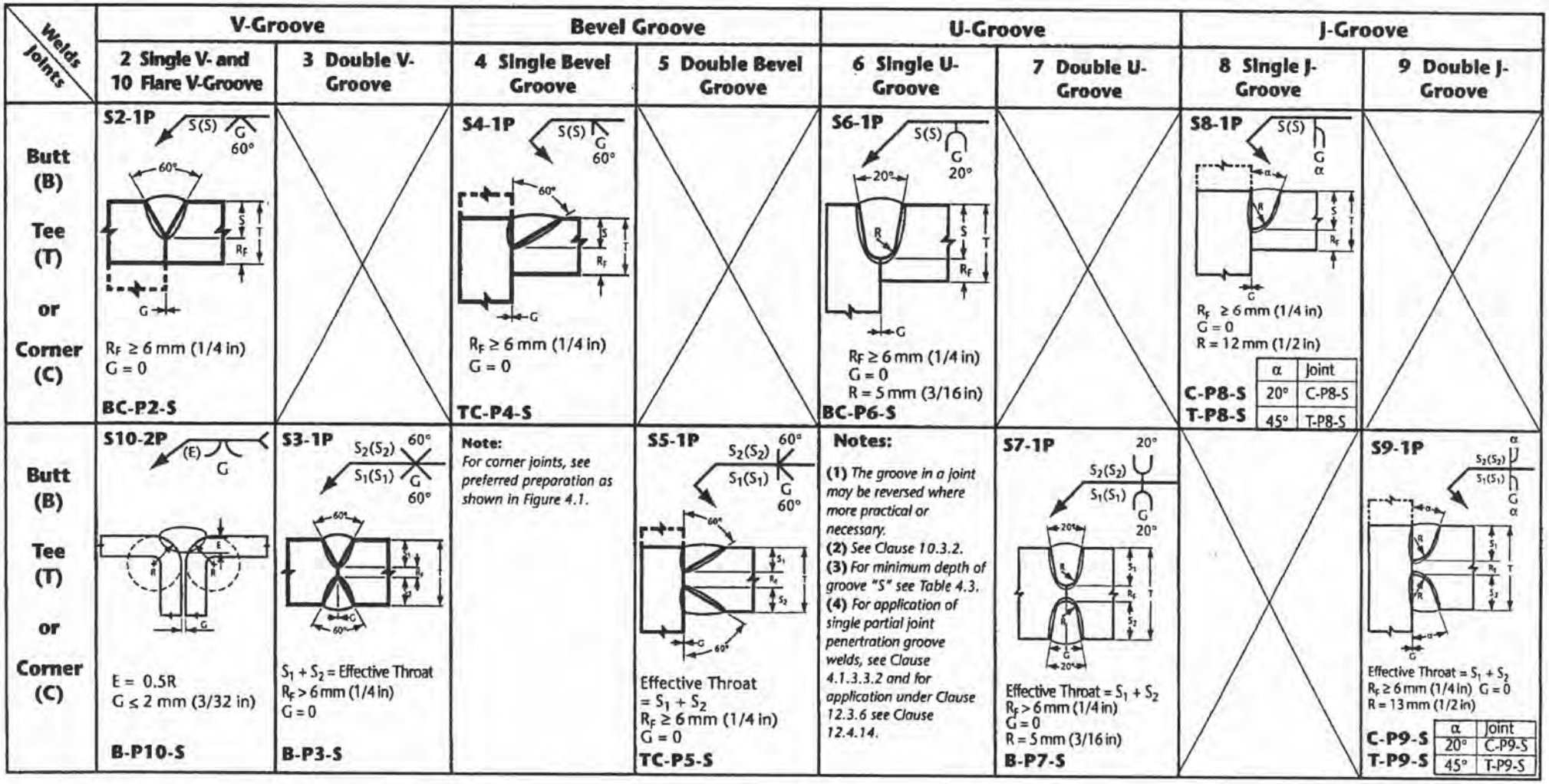


Figure 10.4
Prequalified Partial Joint Penetration Groove Welds for the Submerged Arc Welding Process (SAW)
(See Clause 10.3.2.)

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-06-CVN**

Date: May 5, 2008

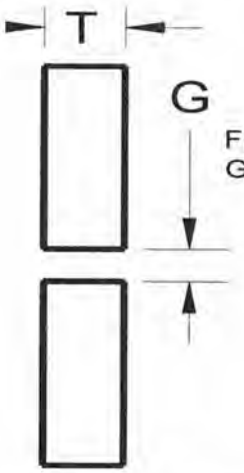
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

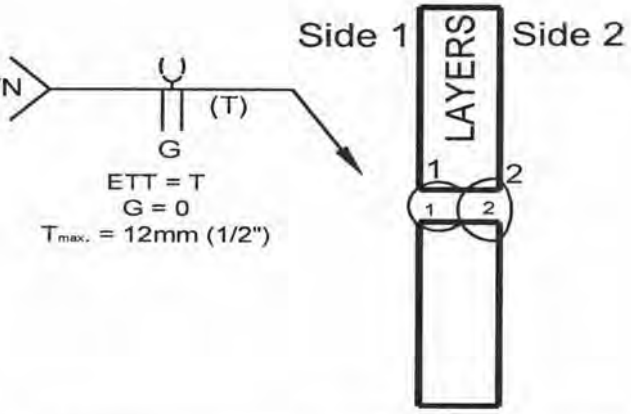
Position:	Horizontal	Welding Process:	FCAW	Consumable:	E491T-12MJ-H4	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Globular Transfer	Shielding Gas:	75% Ar 25% CO2	
		Process Mode:	Semi-Automatic	Gas Flow:	45	ft3/h
		Tungsten Type:		Tungsten Dia.:		in

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 Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt, Tee, Corner	G = 0.045	Θ (°) = 0	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F = 0		Nozzle Diameter:	1/2	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	7.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
1/4	6.4	1/4	1	1	1	1	1	0.045	1.2	200	240	300	400	27	29	31.4	42.5	10.0
			2		2	2	2	0.045	1.2	200	240	300	400	27	29	21.0	28.4	15.0
5/16	7.9	5/16	1	1	1	1	1	0.045	1.2	200	240	300	400	27	29	25.1	34.0	12.5
			2		2	2	2	0.045	1.2	200	240	300	400	27	29	21.0	28.4	15.0
3/8	9.5	3/8	1	1	1	1	1	0.045	1.2	200	240	300	400	27	29	21.0	28.4	15.0
			2		2	2	2	0.045	1.2	200	240	300	400	27	29	21.0	28.4	15.0

Revision Status:

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

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA DATE: 07/22/2008 7607

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-07-CVN**

Date: May 5, 2008

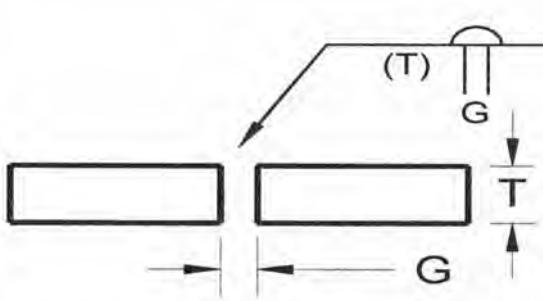
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

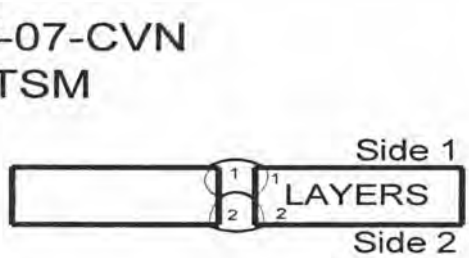
Position:	Vertical Up	Welding Process:	FCAW	Consumable:	E491T-12MJ-H4	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Globular Transfer	Shielding Gas:	75% Ar 25% CO2	
		Process Mode:	Semi-Automatic	Gas Flow:	38	ft3/h
		Tungsten Type:		Tungsten Dia.:		in

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 Details:**		**Technique & Process Information:**		
Joint Type:	Butt, Tee, Corner	G = 0.045	⊖ (°) = 0	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F = 0		Nozzle Diameter:	1/2	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	4.7	lbs/h

Welding Parameters:

Weld Size		Depth of Prep'n	Side No.	Layer No.			Pass No.			Electrode Size		Current (Amps) DCRP			Wire Feed Speed (in/min)			Arc Volts (Volts)			Travel Speed (in/min)			Average Heat Input
in.	mm	in		Min		Max	Min		Max	in.	mm	Min		Max	Min		Max	Min		Max	Min		Max	(kJ/in)
1/4	6.4	1/4	1	1	-	1	1	-	1	0.045	1.2	150	-	170	175	-	225	21	-	25	6.9	-	7.4	30.9
			2			2			2	0.045	1.2	150	-	170	175	-	225	21	-	25	6.9	-	7.4	30.9
5/16	7.9	5/16	1	1	-	1	1	-	1	0.045	1.2	150	-	170	175	-	225	21	-	25	6.9	-	7.4	30.9
			2			2			2	0.045	1.2	150	-	170	175	-	225	21	-	25	6.9	-	7.4	30.9
3/8	9.5	3/8	1	1	-	1	1	-	1	0.045	1.2	150	-	170	175	-	225	21	-	25	6.9	-	7.4	30.9
			2			2			2	0.045	1.2	150	-	170	175	-	225	21	-	25	6.9	-	7.4	30.9

Revision Status:

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

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER * PROVINCE OF NOVA SCOTIA * DATE 07/22/2008 7401

Prepared by: FORGERON ENGINEERING LIMITED Tel: (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-10-CVN**

Date: May 5, 2008

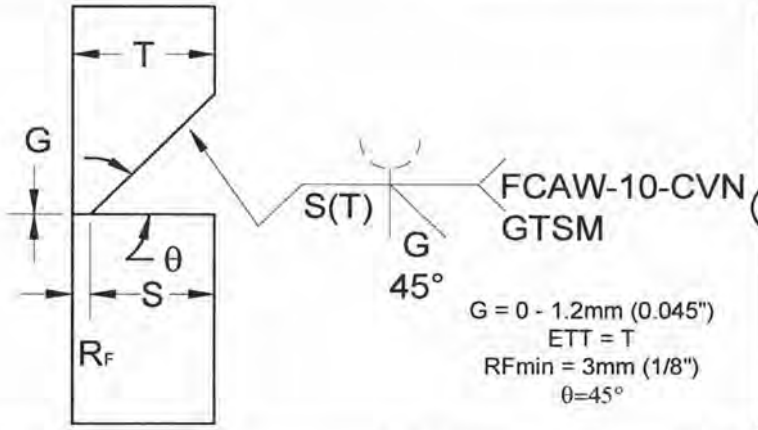
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

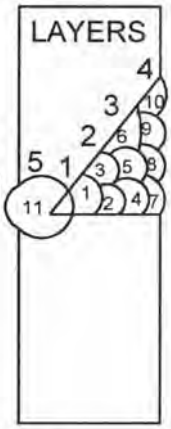
Position:	Horizontal	Welding Process:	FCAW	Consumable:	E491T-12MJ-H4	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Globular Transfer	Shielding Gas:	75% Ar 25% CO2	
		Process Mode:	Semi-Automatic	Gas Flow:	45	ft3/h
		Tungsten Type:		Tungsten Dia.:		in

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 Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt, Tee, Corner	G = 0	Θ (°) = 45	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F = 1/8		Nozzle Diameter:	1/2	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	7.0	lbs/h

Welding Parameters:

Weld Size		Depth of Prep'n	Side No.	Layer No.			Pass No.			Electrode Size		Current (Amps) DCRP			Wire Feed Speed (in/min)			Arc Volts (Volts)			Travel Speed (in/min)			Average 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	1/4	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:

Date:	Explanation:
22/07/2008	P5744

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in
4. Tack weld parameters to be per main weld parameters
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER DATE 07/22/2008 7601 PROVINCE OF NOVA SCOTIA

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-11-CVN**

Date: May 5, 2008

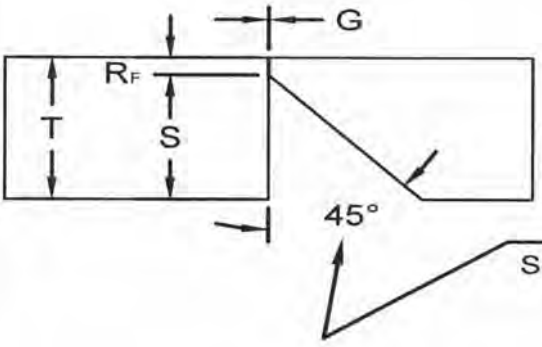
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

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

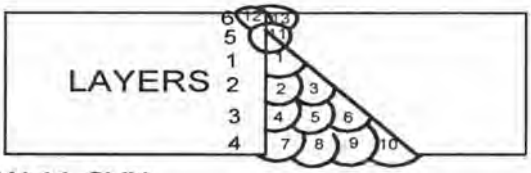
Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	15°C or 59 °F
		PWHT Temp:	NA °F

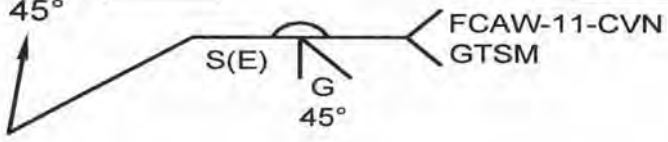
Typical Joint Details:



ETT = T
G = 0 - 1/8"
R_F > 1/8"

Typical Pass & Layer Sequence:





Joint Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt, Tee, Corner	G = 0	Θ (°) = 45	Electrical Stickout:	5/8 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F = 1/8		Nozzle Diameter:	5/8	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	6.5	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/8	9.5	1/4	1	1	2	1	3	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	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	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
3/4	19	5/8	1	1	4	1	10	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

Revision Status:

Date:	Explanation:
22/07/2008	P5744

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in
4. Tack weld parameters to be per main weld parameters
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA DATE 07/22/2008 7601

Prepared by: FORGERON ENGINEERING LIMITED **Tel: (902) 835-7225**

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SMAW-06-CVN**

Date: May 5, 2008

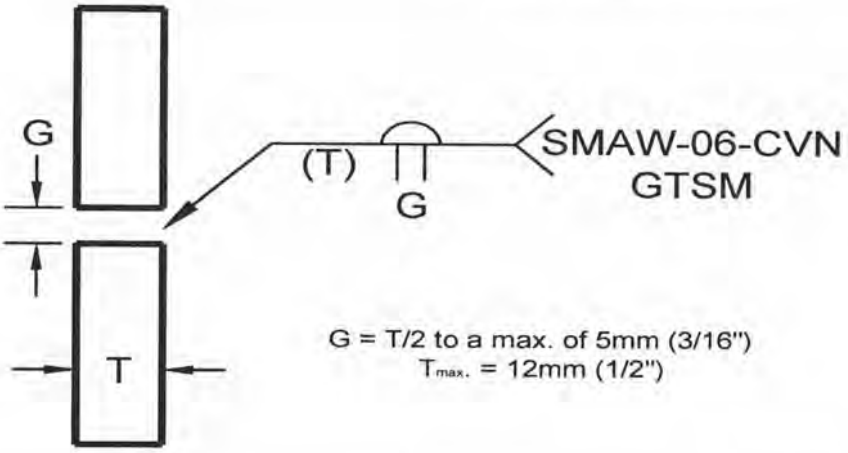
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

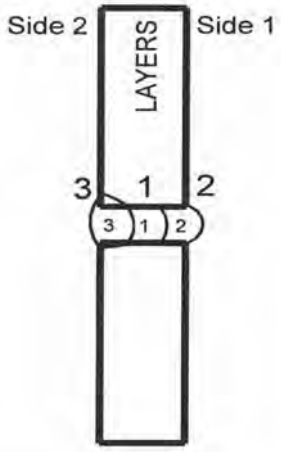
Position:	Horizontal	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 Details:**		**Technique & Process Information:**		
Joint Type:	Butt, Tee, Corner	G = T/2	Θ (°) = 0	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F = 0		Nozzle Diameter:	1/2	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	2.6	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
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		2	3/32	2.4	75	95			20	22	5.7	7.7	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	3.8	5.1	16.0
			2		3	3	3	3/32	2.4	75	95			20	22	5.7	7.7	16.0

Revision Status:

Date:	Explanation:
22/07/2008	Per PQR P65JR78

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NOVA SCOTIA — DATE 07/22/2008 — 7801

Prepared by: FORGERON ENGINEERING LIMITED **Tel: (902) 835-7225**

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SMAW-07-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

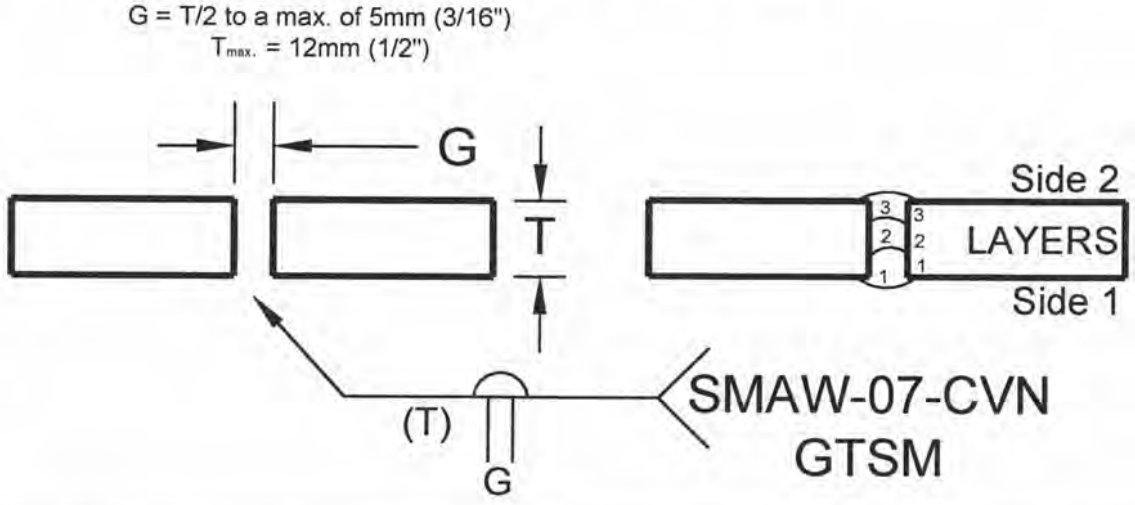
Material Information:

Position:	Vertical Up	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in

Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	175°C or 347	°F
		PWHT Temp:	NA	°F

Typical Joint Details:

Typical Pass & Layer Sequence:



Joint Configuration:		Joint Details:		Technique & Process Information:		
Joint Type:	Butt, Tee, Corner	G = T/2	Θ (°) = 0	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F = 0		Nozzle Diameter:	1/2	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	2.5	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
1/4	6.4	1/4	1		1		1	3/32	2.4	75	95			20	22	2.8	3.2	35.7
			2		2		2	3/32	2.4	75	95			20	22	2.8	3.2	35.7
5/16	7.9	5/16	1	1	2	1	2	3/32	2.4	75	95			20	22	2.8	3.2	35.7
			2		3	3	3	3/32	2.4	75	95			20	22	2.8	3.2	35.7
3/8	9.5	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

Revision Status:

Date:	Explanation:
22/07/2008	Per PQR P65JR78

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER * DATE 07/22/2008 * PROVINCE OF NOVA SCOTIA *

Prepared by: FORGERON ENGINEERING LIMITED **Tel: (902) 835-7225**

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SMAW-10-CVN**

Date: May 5, 2008

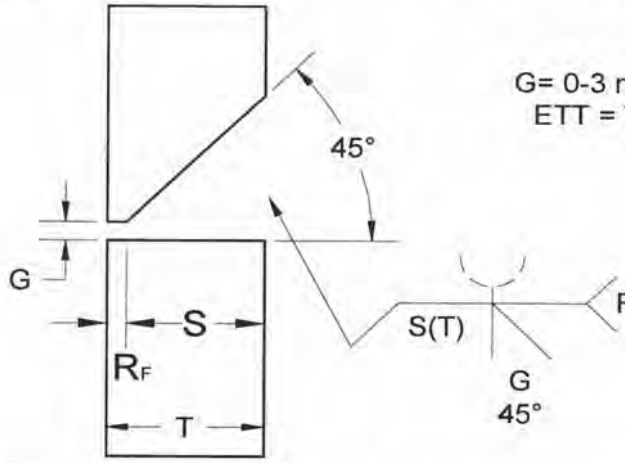
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

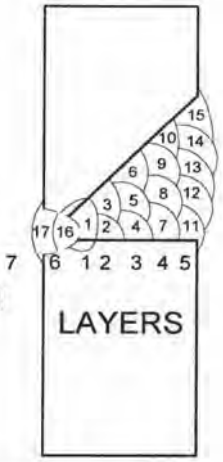
Position:	Horizontal	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 Details:**		**Technique & Process Information:**		
Joint Type:	Butt, Tee, Corner	G = 1/8	Θ (°) = 45	Electrical Stickout:		in
Weld Type:	Complete Joint Penetration	R_F = 1/8		Nozzle Diameter:		in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	3.5	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/8	9.5	1/4	1	1	3	1	6	1/8	3.2	115	127			22	25	3.4	8.6	28.4
			2		7	16	17	1/8	3.2	115	127			22	25	3.4	8.6	28.4
1/2	13	3/8	1	1	4	1	10	1/8	3.2	115	127			22	25	3.4	8.6	28.4
			2		7	16	17	1/8	3.2	115	127			22	25	3.4	8.6	28.4
5/8	16	1/2	1	1	5	1	10	1/8	3.2	115	127			22	25	3.4	8.6	28.4
			2		7	16	17	1/8	3.2	115	127			22	25	3.4	8.6	28.4
3/4	19	5/8	1	1	6	1	15	1/8	3.2	115	127			22	25	3.4	8.6	28.4
			2		7	16	17	1/8	3.2	115	127			22	25	3.4	8.6	28.4

Revision Status:

Date:	Explanation:
22/07/2008	P036388

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA DATE 07/22/2008 7601

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SMAW-11-CVN**

Date: May 5, 2008

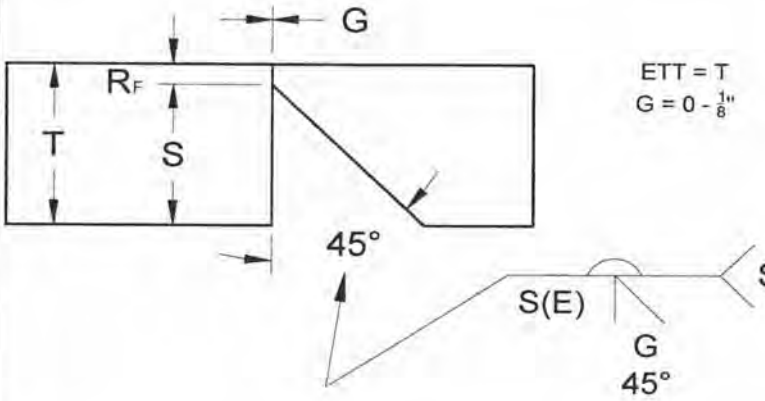
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

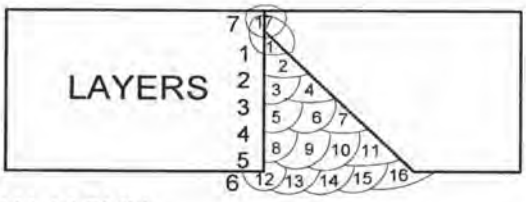
Position:	Vertical Up	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in

Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	175°C or 347 °F
		PWHT Temp:	NA °F

Typical Joint Details:



Typical Pass & Layer Sequence:



Joint Configuration:		**Joint Details:**		**Technique & Process Information:**	
Joint Type:	Butt, Tee, Corner	G = 0	Θ (°) = 45	Electrical Stickout:	in
Weld Type:	Complete Joint Penetration	R_F = 1/16		Nozzle Diameter:	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate: 2.5	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/8	9.5	5/16	1	1	3	1	7	1/8	3.2	115	127			22	25	3.4	8.6	28.4
			2		7		17	1/8	3.2	115	127			22	25	3.4	8.6	28.4
1/2	13	7/16	1	1	4	1	10	1/8	3.2	115	127			22	25	3.4	8.6	28.4
			2		7		17	1/8	3.2	115	127			22	25	3.4	8.6	28.4
5/8	16	9/16	1	1	5	1	11	1/8	3.2	115	127			22	25	3.4	8.6	28.4
			2		7		17	1/8	3.2	115	127			22	25	3.4	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		7		17	1/8	3.2	115	127			22	25	3.4	8.6	28.4

Revision Status:

Date:	Explanation:
22/07/2008	P036388

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

Prepared by: FORGERON ENGINEERING LIMITED Tel: (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SAW-06-CVN**

Date: June 11, 2008

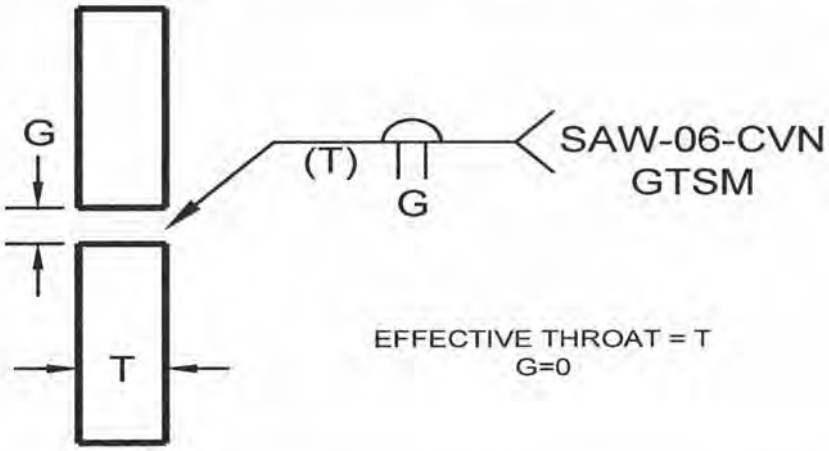
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

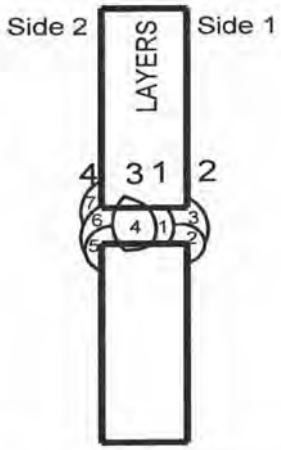
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A
		Process Mode:	Automatic	Gas Flow:	NA ft3/h
		Tungsten Type:		Tungsten Dia.:	NA in

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

Typical Joint Details:



Typical Pass & Layer Sequence:



Joint Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt	G = 3/32	Θ (°) = 0	Electrical Stickout:	1 1/2 ± 1/4	in
Weld Type:	Complete Joint Penetration	R_F = 0		Nozzle Diameter:	3/4	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	11.1	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/8	9.5		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
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	6	1/8	3.3	350	450	415	505	25	29	19.1	25.3	30.3

Revision Status:

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

CWB Approval:

Company's Approval:

NOTES:

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
5. Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED **Tel: (902) 835-7225**

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SAW-10-CVN**

Date: June 11, 2008

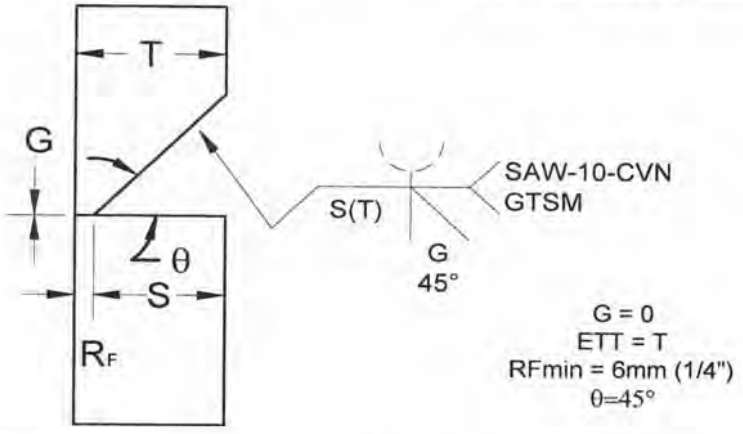
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

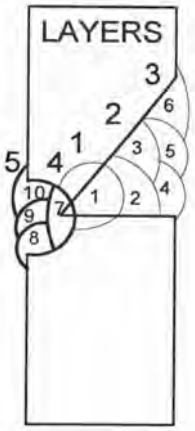
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A	
		Process Mode:	Automatic	Gas Flow:	NA	ft3/h
		Tungsten Type:		Tungsten Dia.:	NA	in

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

Typical Joint Details:



Typical Pass & Layer Sequence:



Joint Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt	G = 0	Θ (°) = 45	Electrical Stickout:	1 1/4 ± 1/4	in
Weld Type:	Complete Joint Penetration	R_F = 1/4		Nozzle Diameter:	3/4	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	11.1	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
7/16	11	3/16	1	1	2	1	2	1/8	3.3	450	550	415	510	25	29	15.4	23.6	41.5
			2	4	5	7	10	1/8	3.3	450	550	415	510	25	29	15.4	23.6	41.5
1/2	13	1/4	1	1	2	1	2	1/8	3.3	450	550	415	510	25	29	15.4	23.6	41.5
			2	4	5	7	10	1/8	3.3	450	550	415	510	25	29	15.4	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	23.6	41.5
			2	4	5	7	10	1/8	3.3	450	550	415	510	25	29	15.4	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	23.6	41.5
			2	4	5	7	10	1/8	3.3	450	550	415	510	25	29	15.4	23.6	41.5

Revision Status:		**CWB Approval:**	**Company's Approval:**
Date:	Explanation:		
22/07/2008	P5710		

NOTES:

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
5. Backgouge as necessary to repair side 2.

Prepared by: FORGERON ENGINEERING LIMITED **Tel: (902) 835-7225**

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-1**

Date: July 22, 2008

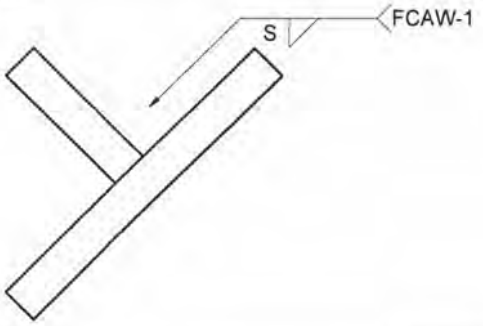
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

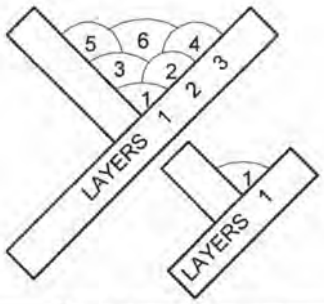
Position:	Flat	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	8.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
1/4	6.4		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
5/16	7.9		1		1		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	16.8	30.8

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB Sep 09, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER DATE 07/22/2008 7601 PROVINCE OF NOVA SCOTIA

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-2**

Date: July 22, 2008

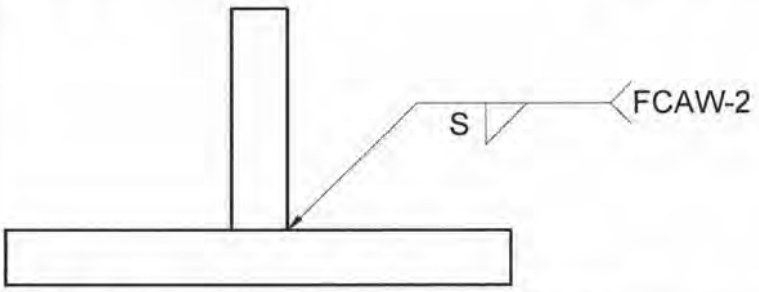
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

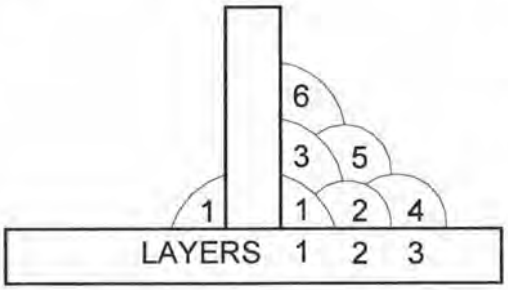
Position:	Horizontal	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9-CH	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2	
		Process Mode:	Semi-Automatic	Gas Flow:	35	ft3/h
		Tungsten Type:		Tungsten Dia.:		in

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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	8.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
1/4	6.4		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
5/16	7.9		1		1		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	16.8	30.8

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB Sep 09, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA DATE 07/22/2008 7693

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No. **FCAW-3**

Date: July 22, 2008

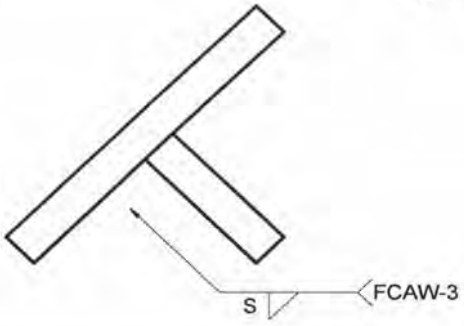
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

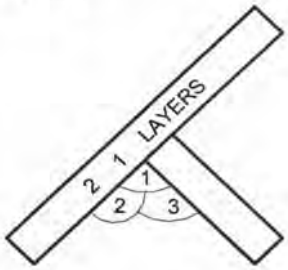
Position:	Vertical Up	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	5.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	150	250	200	300	26	29	28.8	38.9	9.7
1/4	6.4		1		1		1	0.045	1.2	150	250	200	300	26	29	16.2	21.9	17.3
5/16	7.9		1		1		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	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

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

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB

Sep 09, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA
DATE 07/22/2008
7601

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-4**

Date: July 22, 2008

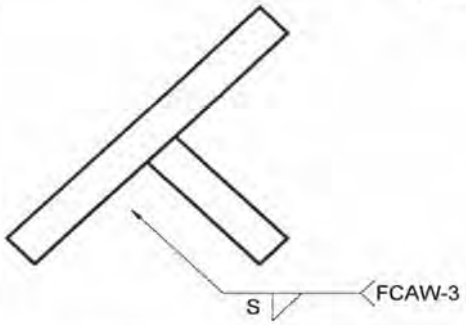
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

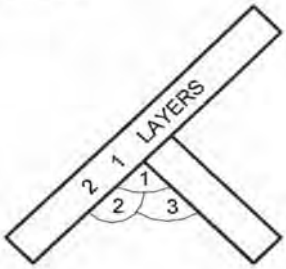
Position:	Overhead	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	5.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	150	250	200	300	26	29	28.8	38.9	9.7
1/4	6.4		1		1		1	0.045	1.2	150	250	200	300	26	29	16.2	21.9	17.3
5/16	7.9		1		1		1	0.045	1.2	150	250	200	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	300	26	29	6.1	8.2	46.2

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

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB

Sep 09, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

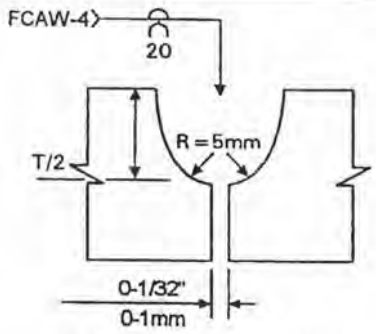
Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

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

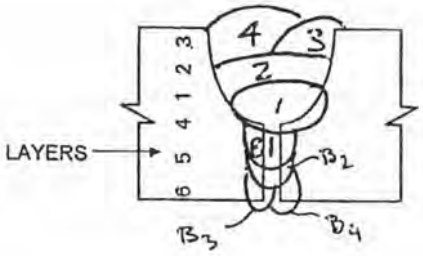
RTR ENGINEERING
WELDING PROCEDURE DATA SHEET

No.	Date
FCAW-4-IN1	MARCH 28, 2002

Company Name and Complete Address	MOSHER ENGINEERING LIMITED 2089 Upper Water Street Halifax, Nova Scotia, B3J 2R7
Welding Process & Mode	☐ SMAW ☐ SAW ☐ GTAW (Tungsten) Type: ☒ FCAW ☐ GMAW ☐ ESW ☐ SW Size: ☐ Manual ☒ Semi-Automatic ☐ Machine ☐ Automatic
WPS No.	RTR-4(A)
Applicable Standard(s)	CSA W47.1, W59 & W48.
Electrode Classification	E49XT9M-H16 X=1 or 2
	☒ Preheat Minimum as per CSA W59 ☐ Other
Material Designation	Steel groups 1,2 & 3 of Table 11-1 W59 for type A (without color matching), for type T (without regard to impact values)
Welding Position	FLAT
Interpass Temperature	Minimum as above Maximum 500 deg. F



Sketch Of Typical Joint Preperation



Typical Pass and Layer Sequence

Groove Weld Complete Joint Penetration	Groove Weld Partial Joint Penetration	Joint Type as per CSA W59	Automatic or Semi-Automatic
☒ Back-gouged to sound metal ☐ Welded onto steel backing ☐ Other	☐ Minimum as per CSA W59 ☐ Others Fillet Weld ☐ Minimum as per CSA W59	☒ Butt ☐ Tee ☐ Lap ☐ Edge ☐ Corner	Electrical Stickout: 3/4" +/- 3/16" Shielding Gas: 75Ar/25CO2 cu.ft /hr. 30-45 Flux

Material Thickness	ETT, or Fillet Size	Side No.	Layer Number	Pass Number	Electrode (in) Size (mm)	Current Polarity	Amperes +/-8%	Wire Feed Speed (in/min)	Volts +/-8%	Arc Travel Speed (in/min)
1/4" 6mm		1	1	1	.045 1.2	DCRP	180	250-325	23	11 +/- 3
		2	6	B1*	.045 1.2	DCRP	180	250-325	23	12 +/- 4
5/16" 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
3/8" 10mm		1	1-2	1-2	.045 1.2	DCRP	190	265-340	23	11 +/- 3
		2	5-6	B1-B3*	.045 1.2	DCRP	190	265-340	23	12 +/- 4
1/2" 12mm		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
5/8" 16mm		1	1-3	1-4	1/16 1.6	DCRP	275	230-300	27	11 +/- 3
		2	4-6	B1-B4*	1/16 1.6	DCRP	275	230-300	27	12 +/- 4

Revision Date	Explanation

CWB Approval

CWB Accepted

CWB

Sep 16, 2008

Valid only if welding consumables are certified by the CWB

Engineer's Stamp

REGISTERED PROFESSIONAL ENGINEER
DATE 11/9/02
S. KEAY
7601
PROVINCE OF NOVA SCOTIA

NOTES: *NUMBER OF PASSES MAY BE INCREASED TO FILL BACK-GOUGING

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SAW-06-CVN**

Date: June 11, 2008

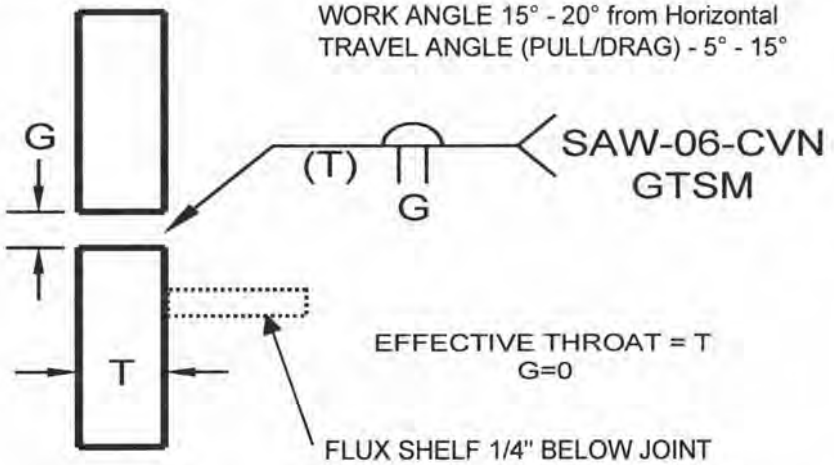
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

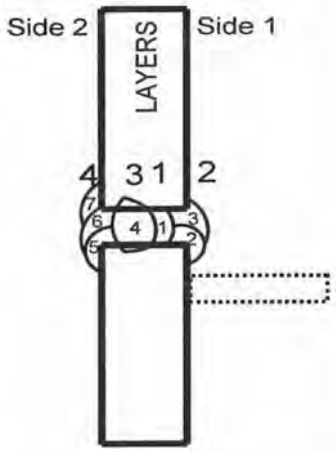
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A
		Process Mode:	Automatic	Gas Flow:	NA ft3/h
		Tungsten Type:		Tungsten Dia.:	NA in

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

Typical Joint Details:



Typical Pass & Layer Sequence:



Joint Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt	G = 3/32	⊖ (°) = 0	Electrical Stickout:	1 1/2 ± 1/4	in
Weld Type:	Complete Joint Penetration	R_F = 0		Nozzle Diameter:	3/4	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	11.1	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/8	9.5		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	450	41	51	25	29	19.1	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	450	41	51	25	29	19.1	25.3	30.3
1/2	13		1	1	2	1	2	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	450	41	51	25	29	19.1	25.3	30.3

Revision Status:

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

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 28, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER * PROVINCE OF NOVA SCOTIA * DATE 07/22/2008

Prepared by: FORGERON ENGINEERING LIMITED Tel: (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SAW-10-CVN**

Date: June 11, 2008

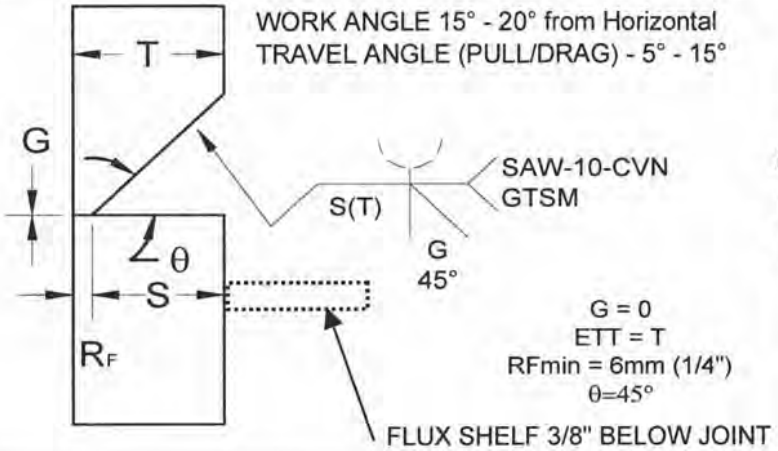
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

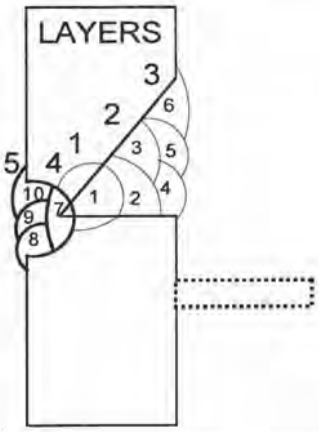
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A
		Process Mode:	Automatic	Gas Flow:	NA ft3/h
		Tungsten Type:		Tungsten Dia.:	NA in

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

Typical Joint Details:



Typical Pass & Layer Sequence:



Joint Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt	G = 0	Θ (°) = 45	Electrical Stickout:	1 1/4 ± 1/4	in
Weld Type:	Complete Joint Penetration	R_F = 1/4		Nozzle Diameter:	3/4	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	11.1	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
7/16	11	3/16	1	1	2	1	2	1/8	3.3	450	550	42	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
1/2	13	1/4	1	1	2	1	2	1/8	3.3	450	550	42	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
			2	4	5	7	10	1/8	3.3	450	550	42	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	10	1/8	3.3	450	550	42	51	25	29	15.4	23.6	41.5

Revision Status:

Date:	Explanation:
22/07/2008	P5710

NOTES:

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
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Jul 28, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER * PROVINCE OF NOVA SCOTIA * DATE 07/22/2008 7601

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-1-CVN**

Date: July 22, 2008

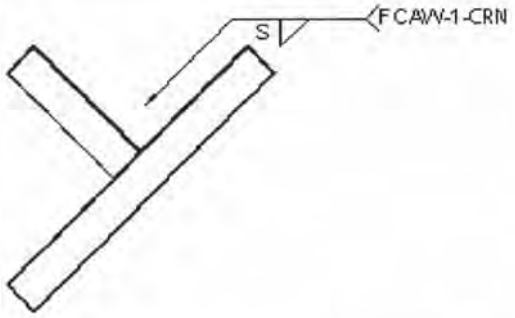
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

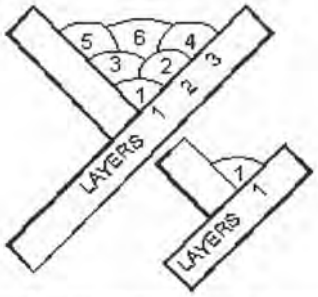
Position:	Flat	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 fl3/h
		Tungsten Type:		Tungsten Dia.:	in

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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	8.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
1/4	6.4		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
5/16	7.9		1		1		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	16.8	30.8

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB

Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER · PROVINCE OF NOVA SCOTIA ·

DATE 2/10/09

T. E. FORGERON

2913

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-2-CVN**

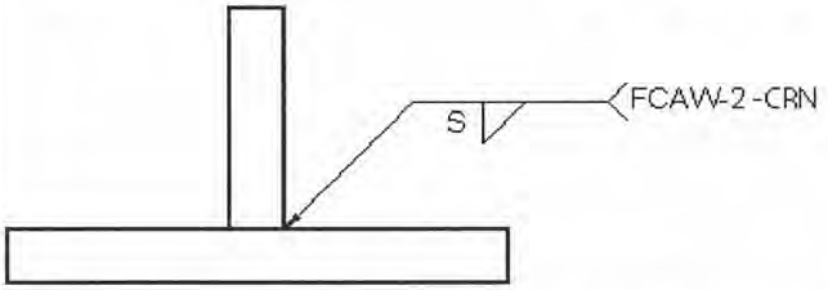
Date: July 22, 2008

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

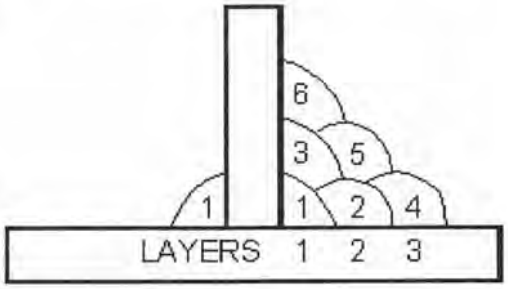
Material Information:

Position:	Horizontal	Welding Process:	FCAW	Consumable:	E491T-9-H16/E4801T-9-CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	8.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
1/4	6.4		1		1		1	0.045	1.2	225	275	380	460	29	31	20.0	24.0	20.5
5/16	7.9		1		1		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	16.8	30.8

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB

Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER
DATE: 2/10/09
T. E. FORGERON
2913
PROVINCE OF NOVA SCOTIA

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No. **FCAW-3-CVN**

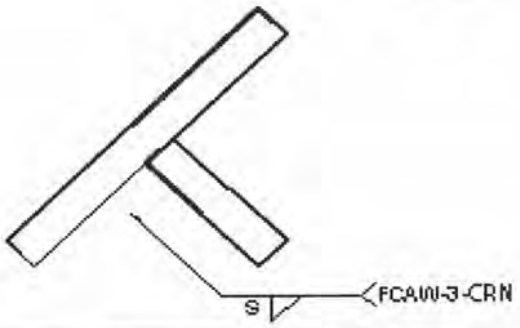
Date: July 22, 2008

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

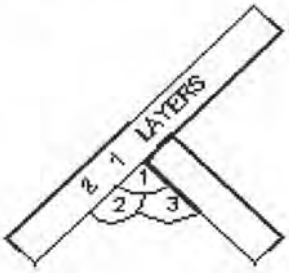
Material Information:

Position:	Vertical Up	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2	
		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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	5.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	150	250	200	300	26	29	28.8	38.9	9.7
1/4	6.4		1		1		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	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

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

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER · PROVINCE OF NOVA SCOTIA · DATE 9/10/09 · T. E. FORGERON 2913

Prepared by: FORGERON ENGINEERING LIMITED Tel: (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-4-CVN**

Date: July 22, 2008

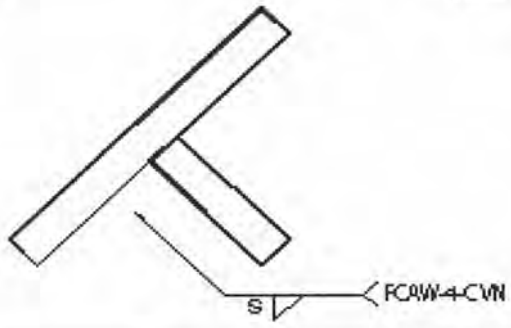
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

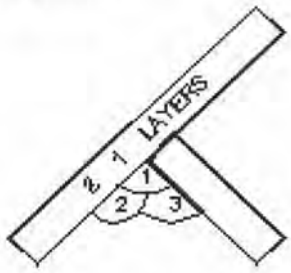
Position:	Overhead	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 Information:**		
Joint Type:	Tee, Corner, Lap	G = 0-1/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Fillet Weld	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	5.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/16	4.8		1		1		1	0.045	1.2	150	250	200	300	26	29	28.8	38.9	9.7
1/4	6.4		1		1		1	0.045	1.2	150	250	200	300	26	29	16.2	21.9	17.3
5/16	7.9		1		1		1	0.045	1.2	150	250	200	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	300	26	29	6.1	8.2	46.2

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

Revision Status:

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

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB

Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER
DATE: 2/10/09
T. E. FORGERON
2913
PROVINCE OF NOVA SCOTIA

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-8-CVN**

Date: Febuary 10, 2009

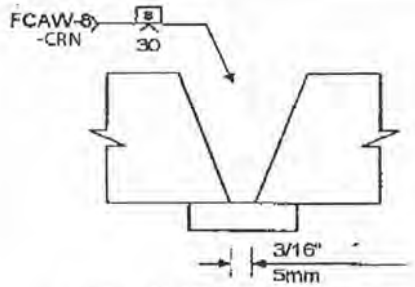
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

Position:	Flat	Welding Process:	FCAW	Consumable:	E491T-12MJ-H4	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Globular Transfer	Shielding Gas:	75% Ar 25% CO2	
		Process Mode:	Semi-Automatic	Gas Flow:	45	ft3/h
		Tungsten Type:		Tungsten Dia.:		in

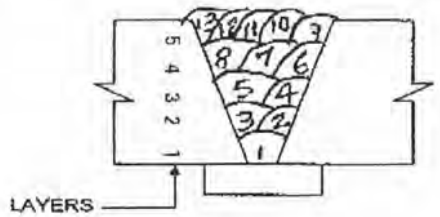
Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	15°C or 59	°F
		PWHT Temp:	N/A	°F

Typical Joint Details:



Sketch Of Typical Joint Preperation

Typical Pass & Layer Sequence:



Typical Pass and Layer Sequence

Joint Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt	G = 3/16"	Q (°) =	Electrical Stickout:	3/4 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F =		Nozzle Diameter:	1/2	in
Backgouging:	N/A			Average Deposition Rate:	7.0	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/8	10	3/8	1	1	2	1	3	0.045	1.2	200	240	300	400	27	29	17.0	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	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

Revision Status:

Date:	Explanation:
7/22/2008	Per PQR P5744

NOTES:

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 calc'd average. Max. Heat Input to 46.7 kJ/in

CWB Approval:

CWB Accepted

CWB

Mar 03, 2009

Valid only if welding consumables are certified by the CWB

Company's Approval:

REGISTERED PROFESSIONAL ENGINEER
DATE 2/10/09
T. E. FORGERON
2913
PROVINCE OF NOVA SCOTIA

Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-15-CVN**

Date: December 1, 2008

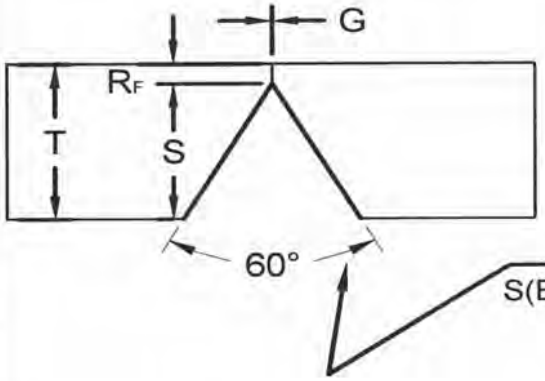
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & AWS D1.1

Material Information:

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

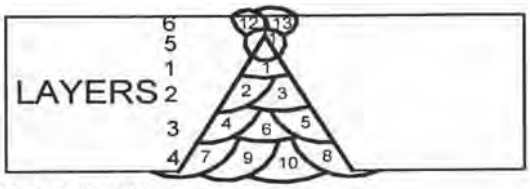
Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	15°C or 59 °F
		PWHT Temp:	NA °F

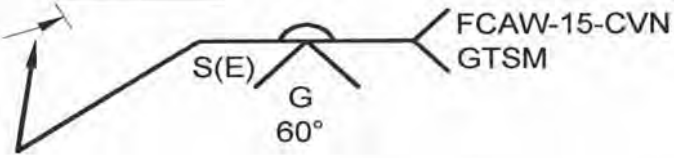
Typical Joint Details:



ETT = T
G = 0
R_F = 1/8"

Typical Pass & Layer Sequence:





Joint Configuration:		**Joint Details:**		**Technique & Process Information:**		
Joint Type:	Butt	G = 0	Q (°) = 60	Electrical Stickout:	5/8 ± 1/8	in
Weld Type:	Complete Joint Penetration	R_F = 1/8		Nozzle Diameter:	5/8	in
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	6.5	lbs/h

Welding Parameters:

Weld Size in.	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
3/8	9.5	1/4	1	1	2	1	3	0.045	1.2	155	175	175	225	24	27	21.0	28.0	15.4
			2	5	6	11	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:

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 calc'd average. Max. Heat Input to 46.7 kJ/in
4. Tack weld parameters to be per main weld parameters
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB

Dec 04, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

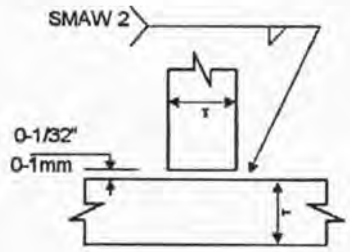
REGISTERED PROFESSIONAL ENGINEER
DATE 12/1/08
T. E. FORGERON
2913
PROVINCE OF NOVA SCOTIA

Prepared by: FORGERON ENGINEERING LIMITED Tel: (902) 835-7225

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

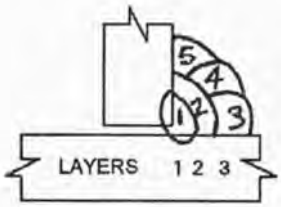
RTR FORM S-101, 1992 to CSA W47.1	**RTR ENGINEERING WELDING PROCEDURE DATA SHEET**	No. SMAW-2	Date MARCH 28, 2002

Company Name and Complete Address	**MOSHER ENGINEERING LIMITED** **2089 Upper Water Street** **Halifax, Nova Scotia, B3J 2R7**	WPS No.	**RTR-1(A)**
		Applicable Standard(s)	**CSA W47.1, W59 & W48.1**
		Electrode Classification	**E48018**
Welding Process & Mode	[x] SMAW [ ] SAW [ ] GTAW (Tungsten) Type: [ ] FCAW [ ] GMAW [ ] ESW [ ] SW Size: [x] Manual [ ] Semi-Automatic [ ] Machine [ ] Automatic	[x] Preheat Minimum as per CSA W59 [ ] Other	
Material Designation	**Steel groups 1,2 & 3 of Table 11-1,W59 for type A (without color matching), for type T (without regard to impact values)**	Welding Position: **HORIZONTAL**	Interpass Temperature: Minimum **As above**; Maximum **450 deg. F**



Sketch Of Typical Joint Preperation

1/8" </= T </= 1 1/4"



Typical Pass and Layer Sequence

Groove Weld Complete Joint Penetration	Groove Weld Partial Joint Penetration	Joint Type as per CSA W59	Automatic or Semi-Automatic
[ ] Back-gouged to sound metal [ ] Welded onto steel backing [ ] Other	[ ] Minimum as per CSA W59 [ ] Others **Fillet Weld** [x] Minimum as per CSA W59	[ ] Butt [x] Tee [x] Lap [ ] Edge [x] Corner	Electrical Stickout Shielding Gas (cu.ft /hr.) Flux

Material Thickness	ETT, or Fillet Size	Side No.	Layer Number	Pass Number	Electrode (in) Size (mm)	Current Polarity	Amperes	Wire Feed Speed (in/min)	Volts	Arc Travel Speed (in/min)
	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			

Revision Date	Explanation

NOTES: *NUMBER OF PASSES MAY VARY BY +/- 1 PASS

3mm fillet can only be applied to 3mm thick sheets.

CWB Approval

Welding Procedure Data Sheet
CWB Approved to CSA W47.1
APR 04 2002
Approval valid only when Welding Consumables certified by C.W.B. (Cl.8.2.2.1, CSA W47.1)

Engineer's Stamp

REGISTERED PROFESSIONAL ENGINEER
R. T. ROSE
SIGNATURE
02/03/28
PROVINCE OF NOVA SCOTIA

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No. SMAW-06-CVN

Date: May 5, 2008

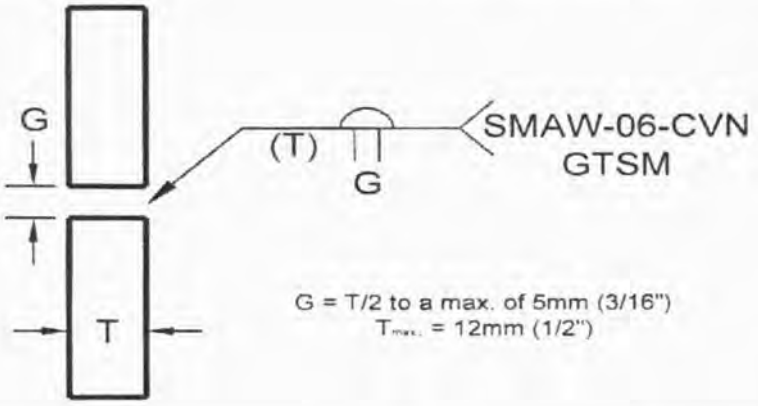
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

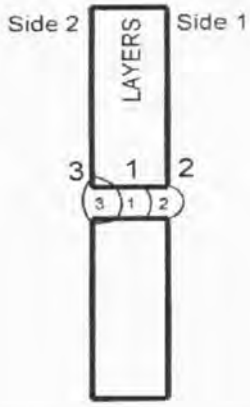
Position:	Horizontal	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Matl:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in.

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 Details:**		**Technique & Process Information:**		
Joint Type:	Butt, Tee, Corner	G = T/2	F (°) = 0	Electrical Stickout:	3/4 ± 1/8	in.
Weld Type:	Complete Joint Penetration	R_F = 0		Nozzle Diameter:	1/2	in.
Backgouging:	Backgouged to Sound Metal			Average Deposition Rate:	2.6	lb/h

Welding Parameters:

Weld Size in	Weld Size mm	Depth of Prep'n in	Side No.	Layer No. Min	Layer No. Max	Pass No. Min	Pass No. Max	Electrode Size in.	Electrode Size mm	Current (Amps) DCRP Min	Current (Amps) DCRP Max	Wire Feed Speed (in/min) Min	Wire Feed Speed (in/min) Max	Arc Volts (Volts) Min	Arc Volts (Volts) Max	Travel Speed (in/min) Min	Travel Speed (in/min) Max	Average Heat Input (kJ/in)
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		2	3/32	2.4	75	95			20	22	5.7	7.7	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	3.8	5.1	16.0
			2		3	3	3	3/32	2.4	75	95			20	22	5.7	7.7	16.0

Revision Status:

Date:	Explanation:
22/07/2008	Per PQR P65JR78

NOTES:

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.
5. Backgouge as necessary to repair side 2.

CWB Approval:

CWB Accepted

CWB Jul 25, 2008

Valid only if welding consumables are certified by the CWB

Company's Approval:

Prepared by: FORGERON ENGINEERING LIMITED Tel: (902) 835-7225

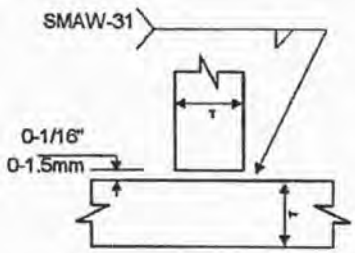
RTR FORM S-101, 1992 to CSA W47.1

RTR ENGINEERING
WELDING PROCEDURE DATA SHEET

No.	Date
SMAW-31	MARCH 28, 2002

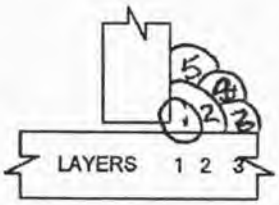
Company Name and Complete Address	MOSHER ENGINEERING LIMITED 2089 Upper Water Street Halifax, Nova Scotia, B3J 2R7
Welding Process & Mode	[X] SMAW [ ] SAW [ ] GTAW (Tungsten) Type: [ ] FCAW [ ] GMAW [ ] ESW [ ] SW Size: [X] Manual [ ] Semi-Automatic [ ] Machine [ ] Automatic
Material Designation	Steel group 2 from Table 5-3 of W59 Excluding 260WT, 300W, 300WT, A570 Gr. 50, A572 Gr. 50 & A607 Gr. 50
Welding Position	HORIZONTAL

WPS No.	RTR-1(A)
Applicable Standard(s)	CSA W47.1, W59 & W48.1
Electrode Classification	E41011
[X] Preheat Minimum as per CSA W59 [ ] Other	
Interpass Temperature	Minimum As above Maximum 450 deg. F



Sketch Of Typical Joint Preperation

3/16" </= T </= 1 1/4"



Typical Pass and Layer Sequence

Groove Weld Complete Joint Penetration	Groove Weld Partial Joint Penetration	Joint Type as per CSA W59	Automatic or Semi-Automatic
[ ] Back-gouged to sound metal [ ] Welded onto steel backing [ ] Other	[ ] Minimum as per CSA W59 [ ] Others Fillet Weld [X] Minimum as per CSA W59	[ ] Butt [X] Tee [X] Lap [ ] Edge [X] Corner	Electrical Stickout Shielding Gas (cu.ft /hr.) Flux

Material Thickness	ETT, or Fillet Size	Side No.	Layer Number	Pass Number	Electrode (in) Size (mm)	Current Polarity	Amperes	Wire Feed Speed (in/min)	Volts	Arc Travel 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 Date	Explanation

NOTES: *NUMBER OF PASSES MAY VARY BY +/-1 PASS

CWB Approval

Welding Procedure Data Sheet
CWB Approved to CSA W47.1
APR 04 2002
Approval valid only when Welding Consumables certified by C.W.B. (Cl.8.2.2.1, CSA W47.1)

Engineer's Stamp

REGISTERED PROFESSIONAL ENGINEER
R. T. ROSE
SIGNATURE
02/03/28
PROVINCE OF NOVA SCOTIA

CWB Form 130E/2003-1

CANADIAN WELDING BUREAU
DIVISION OF CWB GROUP - INDUSTRY SERVICES

WELDING PROCEDURE QUALIFICATION REPORT

P 036339

REPORT ____ OF ____

WPDS No A3332-1H

WPS No. A3300

DATE OF TEST (MONTH / DAY / YEAR)	APPLICABLE STANDARD	Company Code
06 / 24 / 2008	☐ CSA W47.1 ☑ CSA W47.2 ☐ CSA W186 ☐ AWS D1.3 ☐ OTHER	DFBAR2

RETEST ☑ YES ☐ NO | LAB WORK REQUIRED ☐ YES ☑ NO

QUALIFICATION REQUESTED BY: ☑ COMPANY ☐ CWB

Company Name: D. F. Barnes Ltd

Location of Test: Goulds

CWB Witness: Leo Feltham | Test Plate Number: 202

Signature of Comp. Rep.: Les Hoar

Welder's Name: Wade L Hillier | Welders N.T. Card Required ☐ Yes ☐ No

S.I.N.:

Base Materials: 1. Specification ASTM B221-02 Grade 6061-T6511; 2. Specification ASTM B221-02 Grade 6061-T6511

Preheat Temperature: Ambient 25° | Interpass Temperature MIN / MAX: NOT Recorder

Post-Weld Treatment: None

Cleaning Procedures: S.S. Wire Brush, Grinder

Welding Position(s): ☐ FLAT ☑ HORIZ. ☐ VERTICAL UP ☐ VERTICAL DOWN ☐ OVERHEAD ☐ OTHER

INVOICING DATA

Hours on Site	1.5 HRS. @ 80.00 /HR. =	120.00	PR-01
Hours Travelling	0.5 HRS. @ 80.00 /HR. =	40.00	PR-02
Kilometres (kms)	27 KM. @ 0.48 /KM. =	12.96	PR-03
Travel Expenses			PR-08
Lab Charges	HRS. @ /HR. =		PR-04
Specimen Assessment	HRS. @ /HR. =		PR-05
Engineering Charge	HRS. @ /HR. =		PR-09
Outside Lab. Charges			PR-06/7

Welding Process: ☐ SAW ☑ GTAW ☐ SMAW ☐ PAW ☐ FCAW ☐ GMAW ☐ OTHER

Process Mode: ☑ Manual ☐ Semi-Automatic ☐ Machine ☐ Automatic

Method of Backgouging: N/A

Depth of Backgouging:

	Classification	Trade Name	Manufacturer
Filler Metal A	ER5356		Indalco
Filler Metal B			
Flux			

Tungsten Type: EWP | Tungsten Diameter: 4.0 mm

Shielding Gas: Argon | Flow Rate: 10L/min | Nozzle Size: 12 mm

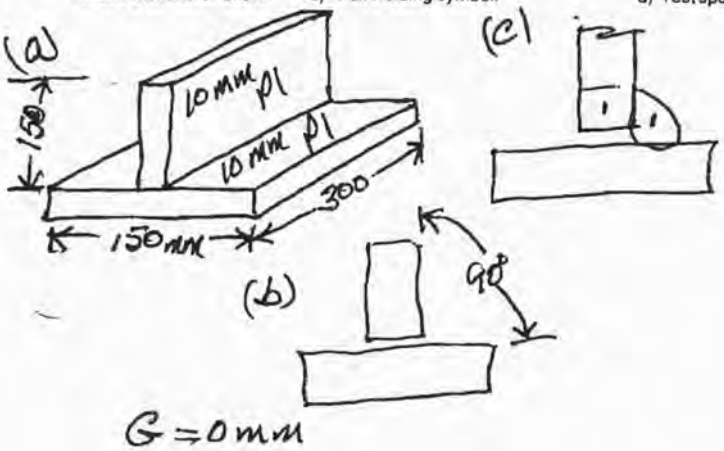
Certified Electrode Used? ☑ Yes ☐ No | Current Type and Polarity: ACHF | Electrode Extension: ✓

Welding Sequence			Filler Metal		Arc Parameters		
Side	Layer	Pass	Size	W. Feed Speed	Amperes	Volts	Arc Travel Speed
UNITS			(mm)	(N/A)	A	V	(mm/min)
1	1	1	3.2		298	19	69

Welding Sequence			Filler Metal		Arc Parameters		
Side	Layer	Pass	Size	W. Feed Speed	Amperes	Volts	Arc Travel Speed
UNITS			( )	( )	A	V	( )

In the space below make a sketch to show: a) Joint geometry. b) Full welding symbol. c) Pass/layer sequence. d) Test specimens required.

d) Specimen Extracted As per CSA W47.2 Fig 13



Failed due to Lack of penetration in Fracture Specimen

LABORATORY EVALUATION

TEST	NO.	SAT.	UN-SAT.	N/A
Root Bend		☐	☐	☐
Face Bend		☐	☐	☐
Side Bend		☐	☐	☐
Tensile		☐	☐	☐
Macro Etch		☐	☐	☐
Fracture		☐	☑	☐
Other(s)		☐	☐	☐
		☐	☐	☐

NOTES: Failed due to Lack of Root Fusion & Penetration

EVALUATION BY

DATE: 07 / 09 / 2008 (MONTH / DAY / YEAR)

RECEIVED JUL 04 2008

CANADIAN WELDING BUREAU
DIVISION OF CWB GROUP - INDUSTRY SERVICES

WELDING PROCEDURE QUALIFICATION REPORT

CWB Form 130E/99-1

REPORT ____ OF ____

DATE OF TEST: 06 (MONTH) 24 (DAY) 2008 (YEAR)

APPLICABLE STANDARD: ☐ CSA W47.1 ☑ CSA W47.2 ☐ CSA W186 ☐ AWS D1.3 ☐ OTHER ____

Company Code: DFBAR2

P 5694

WPDS No. A3332-1H

WPS No. A3300

QUALIFICATION REQUESTED BY: ☑ COMPANY ☐ CWB

RETEST ☐ YES ☑ NO | LAB WORK REQUIRED ☐ YES ☑ NO

Company Name: D. F. Barnes Ltd

Location of Test: Goulds

CWB Witness: Lew Fettham | Test Plate Number: 202

Signature of Comp. Rep.: [signature]

Welder's Name: Wade L. Hillier | Welders N.T. Card Required ☐ Yes ☐ No

S.I.N.:

Base Materials: 1. Specification ASTM B 221-02 Grade 6061-T6511; 2. Specification ASTM B 221-02 Grade 6061-T6511

Preheat Temperature: Ambient+ | Interpass Temperature MIN: N/A | MAX: N/A

Post-Weld Treatment: None

Cleaning Procedures: Stainless Steel Wire Brush

Welding Position(s): ☐ FLAT ☑ HORIZ. ☐ VERTICAL UP ☐ VERTICAL DOWN ☐ OVERHEAD ☐ OTHER ____

INVOICING DATA

Hours on Site	1.5	HRS. @	80.00	/HR. =	120.00
Hours Travelling	0.5	HRS. @	80.00	/HR. =	40.00
Kilometres (kms)	27	KM. @	0.48	/KM. =	12.96
Travel Expenses					

Welding Process: ☐ SAW ☑ GTAW ☐ SMAW ☐ PAW ☐ FCAW ☐ GMAW ☐ OTHER ____

Process Mode: ☑ Manual ☐ Semi-Automatic ☐ Machine ☐ Automatic

Method of Backgouging: N/A

Depth of Backgouging: N/A

	Classification	Trade Name	Manufacturer
Filler Metal A	ER5356		Indalco
Filler Metal B			
Flux			

Tungsten Type: EWP | Tungsten Diameter: 4.0 mm

Shielding Gas: Argon | Flow Rate: 10L/min | Nozzle Size: 10mm

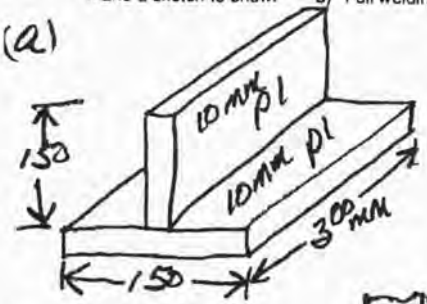
Certified Electrode Used? ☑ Yes ☐ No | Current Type and Polarity: AC HF | Electrode Extension: —

Welding Sequence			Filler Metal		Arc Parameters		
Side	Layer	Pass	Size	W. Feed Speed	Amperes	Volts	Arc Travel Speed
UNITS			(mm)	( )	A	V	(mm/min)
1	1	1	3.2	NA	298	19	59

Welding Sequence			Filler Metal		Arc Parameters		
Side	Layer	Pass	Size	W. Feed Speed	Amperes	Volts	Arc Travel Speed
UNITS			( )	( )	A	V	( )

In the space below make a sketch to show: a) Joint geometry. b) Full welding symbol. c) Pass/layer sequence. d) Test specimens required.

(a)



(c)

(d) Specimen Extracted as per CSA, W47.2 Fig. 13

Failed due to lack of penetration in Fracture specimen

(b)

G = 0mm

LABORATORY EVALUATION

TEST	NO.	SAT.	UN-SAT.	N/A
Root Bend		☐	☐	☐
Face Bend		☐	☐	☐
Side Bend		☐	☐	☐
Tensile		☐	☐	☐
Macro Etch		☐	☑	☐
Fracture		☐	☑	☐
Other(s)		☐	☐	☐
		☐	☐	☐

NOTES: Failed due to LACK of Root Fusion of Penetration

EVALUATION BY: [signature]

DATE: 07 (MONTH) 09 (DAY) 2008 (YEAR)

CWB Form 130E/2003-1

CANADIAN WELDING BUREAU
DIVISION OF CWB GROUP - INDUSTRY SERVICES

WELDING PROCEDURE QUALIFICATION REPORT

P 036341

REPORT ____ OF ____

WPDS No. ____

WPS No. 3100'

DATE OF TEST (MONTH / DAY / YEAR)	APPLICABLE STANDARD	Company Code
06 / 26 / 2008	☑ CSA W47.1 ☐ CSA W47.2 ☐ CSA W186 ☐ AWS D1.3 ☐ OTHER S473	METW01

RETEST ☐ YES ☑ NO LAB WORK REQUIRED ☑ YES ☐ NO

INVOICING DATA

Hours on Site	4 HRS. @ 80.00 /HR. = 320.00		PR-01
Hours Travelling	0.5 HRS. @ 80.00 /HR. = 40.00		PR-02
Kilometres (kms)	20 KM. @ 0.48 /KM. = 960		PR-03
Travel Expenses			PR-08
Lab Charges	HRS. @ /HR. =		PR-04
Specimen Assessment	HRS. @ /HR. =		PR-05
Engineering Charge	HRS. @ /HR. =		PR-09
Outside Lab. Charges			PR-06/7

QUALIFICATION REQUESTED BY: ☑ COMPANY ☐ CWB

Company Name: Metal World

Location of Test: St. John's, NL

CWB Witness: Lew Feltham Test Plate Number: 220

Signature of Comp. Rep.: Doug Hynes

Welder's Name: Joe Fewer Welders N.T. Card Required ☐ Yes ☐ No

S.I.N.:

Base Materials: 1. Specification EN10225 Grade S355 G10; 2. Specification EN10225 Grade S355 G10

Preheat Temperature: 75°C Interpass Temperature MIN 80°C MAX 120°C

Post-Weld Treatment: None

Cleaning Procedures: Chipping Hammer, Wire Brush, Grinder

Welding Position(s): ☐ FLAT ☑ HORIZ. ☐ VERTICAL UP ☐ VERTICAL DOWN ☐ OVERHEAD ☐ OTHER

Welding Process: ☐ SAW ☑ SMAW ☑ FCAW ☐ GTAW ☐ PAW ☐ GMAW ☐ OTHER

Process Mode: ☑ Manual ☑ Semi-Automatic ☐ Machine ☐ Automatic

Method of Backgouging: N/A

Depth of Backgouging:

	Classification	Trade Name	Manufacturer
Filler Metal A	E5518-C1	LA 8018	Air Liquide
Filler Metal B	81T1-N1	SAFDUAL 128	SAF
Flux			

Tungsten Type: Tungsten Diameter:

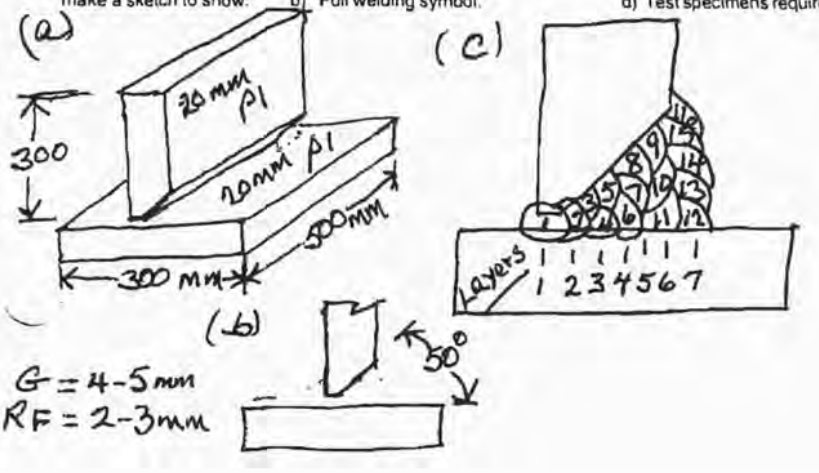
Shielding Gas: 75% Ar 25% CO2 Flow Rate: 22 L/min Nozzle Size: 16 mm

Certified Electrode Used? ☑ Yes ☐ No Current Type and Polarity: DCRP Electrode Extension: 16-20 mm

Welding Sequence			Filler Metal		Arc Parameters		
Side	Layer	Pass	Size	W. Feed Speed	Amperes	Volts	Arc Travel Speed
UNITS			(MM)	(M/min)	A	V	(mm/min)
1	1	1	3.2	N/A	132	21	45
1	2	2	1.6	4.4	240	23	191
1	3	3	1.6	4.4	238	23	291
1	3	4	1.6	5.0	250	23	315
1	4	5	1.6	5.0	265	23	250
1	4	6	1.6	5.0	282	22.5	297
1	5	7	1.6	5.0	270	22.5	370

Welding Sequence			Filler Metal		Arc Parameters		
Side	Layer	Pass	Size	W. Feed Speed	Amperes	Volts	Arc Travel Speed
UNITS			(MM)	(M/min)	A	V	(mm/min)
1	5	8	1.6	5.0	262	22.5	268
1	6	9	1.6	5.0	275	22.5	306
1	6	10	1.6	5.0	265	22.5	341
1	6	11	1.6	5.0	275	22.5	366
1	7	12-16	1.6	5.0	279	22.5	435

In the space below make a sketch to show: a) Joint geometry, b) Full welding symbol, c) Pass/layer sequence, d) Test specimens required. d) Specimen Extracted as per Client's Instructions



Failed Radiography due to Slag Inclusion

LABORATORY EVALUATION

TEST	NO.	SAT.	UN-SAT.	N/A
Root Bend		☐	☐	☐
Face Bend		☐	☐	☐
Side Bend		☐	☐	☐
Tensile		☐	☐	☐
Macro Etch		☐	☐	☐
Fracture		☐	☐	☐
Other(s)		☐	☐	☐
		☐	☐	☐

NOTES: Failed Radiography due to Slag Inclusion

EVALUATION BY

DATE 07 / 09 / 2008 (MONTH / DAY / YEAR)

MOSHER ENGINEERING LIMITED 2089 Upper Water Street Halifax, Nova Scotia, B3J 2R7	TABLE MARCH 28, 2002

WELDING STANDARDS to CSA W47.1	CWB APPROVAL	ENGINEERS STAMP
TABLE OF CONTENTS	Welding Engineering Standards Received by CWB pursuant to CSA W47.1 APR 0 4 2002 Page 1-2	REGISTERED PROFESSIONAL ENGINEER R. T. ROSE SIGNATURE 02/03/28 PROVINCE OF NOVA SCOTIA

MOSHER ENGINEERING LIMITED 2089 Upper Water Street Halifax, Nova Scotia, B3J 2R7	Page 1 MARCH 28, 2002	
WELDING STANDARDS to CSA W47.1	CWB APPROVAL	ENGINEERS STAMP
GENERAL NOTES		REGISTERED PROFESSIONAL ENGINEER R. T. ROSE SIGNATURE 02/03/28 PROVINCE OF NOVA SCOTIA

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.

WELDING STANDARDS to CSA W47.1	CWB APPROVAL	ENGINEERS STAMP
GENERAL NOTES		REGISTERED PROFESSIONAL ENGINEER · R. T. ROSE · SIGNATURE · 02/03/28 · PROVINCE OF NOVA SCOTIA ·

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.

WELDING STANDARDS to CSA W47.1	CWB APPROVAL	ENGINEERS STAMP
2.a WELDING SYMBOLS AND BASIC JOINTS		REGISTERED PROFESSIONAL ENGINEER · R. T. ROSE · SIGNATURE · 02/03/28 · PROVINCE OF NOVA SCOTIA ·

1. 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.

MOSHER ENGINEERING LIMITED
2089 Upper Water Street
Halifax, Nova Scotia, B3J 2R7

MARCH 28, 2002

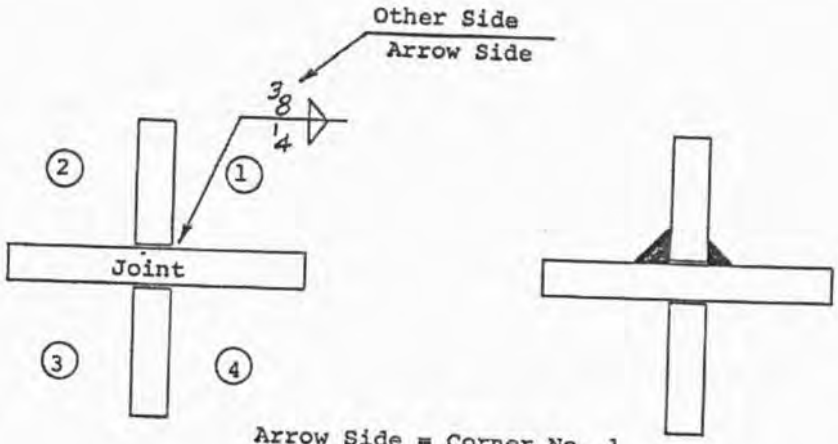
WELDING STANDARDS to CSA W47.1

CWB APPROVAL

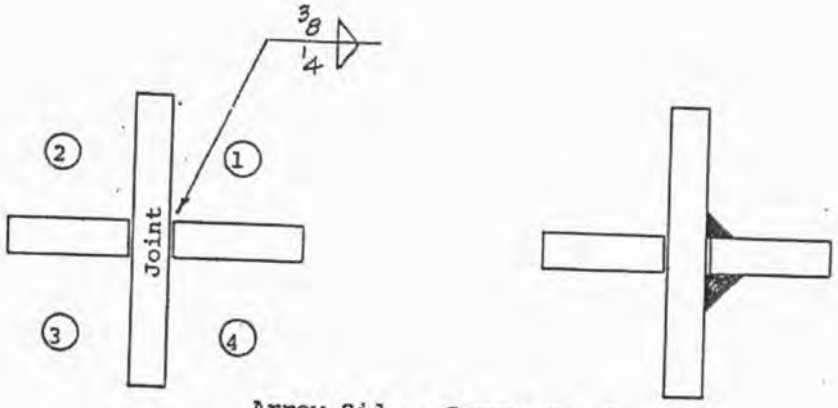
ENGINEERS STAMP

REGISTERED PROFESSIONAL ENGINEER
R. T. ROSE
SIGNATURE
02/05/28
PROVINCE OF NOVA SCOTIA

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



Arrow Side = Corner No. 1
Joint = Contact Area 1 - 2
Other Side = Corner No. 2



Arrow Side = Corner No. 1
Joint = Contract Area 1 - 4
Other Side = Corner No. 4

MOSHER ENGINEERING LIMITED
2089 Upper Water Street
Halifax, Nova Scotia, B3J 2R7

MARCH 28, 2002

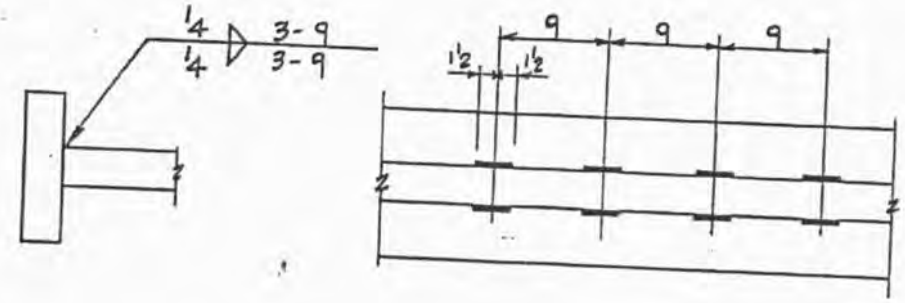
WELDING STANDARDS to CSA W47.1

CWB APPROVAL

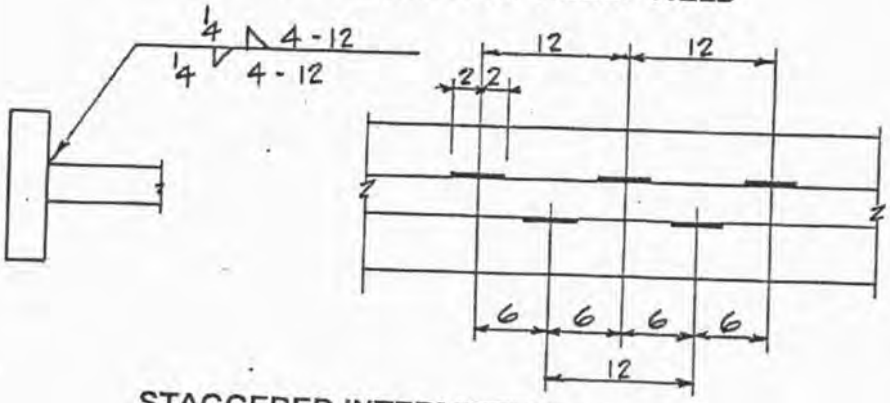
ENGINEERS STAMP

REGISTERED PROFESSIONAL ENGINEER
R. T. ROSE
SIGNATURE
02/03/28
PROVINCE OF NOVA SCOTIA

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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(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 continous.

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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(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

G - Grinding

M - Matching

R - Rolling

H - Hammering

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

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3.a Fillet Welds

1. The effective area of a fillet weld shall be the effective weld length multiplied by the effective throat thickness.

2. 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.

3. 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.

5. 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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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.

5. 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.

6. Fillet welds may be continous or intermittent except for CSA W59-12.4.14. 1.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.