Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

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

Date: May 5, 2008

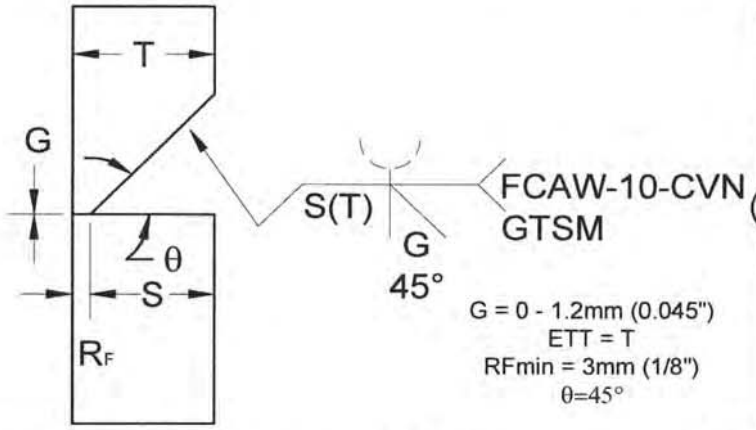
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

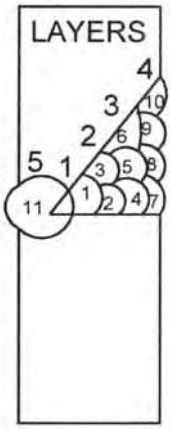
Position:	Horizontal	Welding Process:	FCAW	Consumable:	E491T-12MJ-H4	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Globular Transfer	Shielding Gas:	75% Ar 25% CO2	
		Process Mode:	Semi-Automatic	Gas Flow:	45	ft3/h
		Tungsten Type:		Tungsten Dia.:		in

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

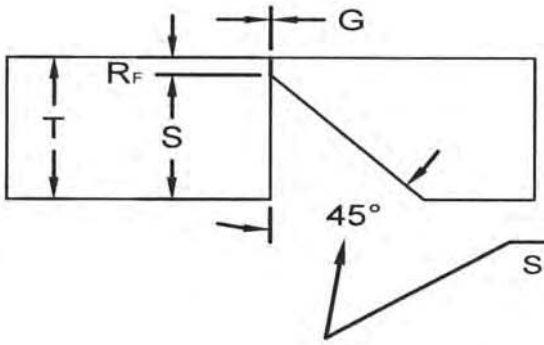
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

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

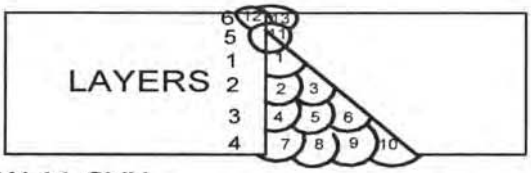
Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	15°C or 59 °F
		PWHT Temp:	NA °F

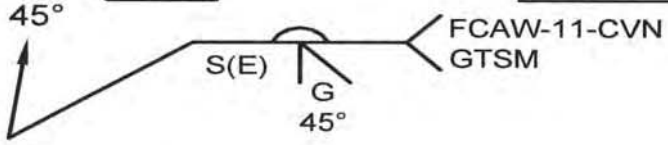
Typical Joint Details:



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

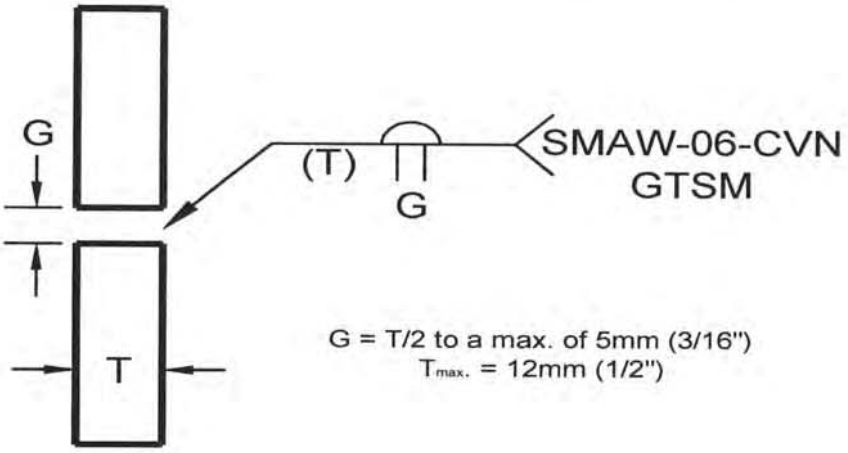
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

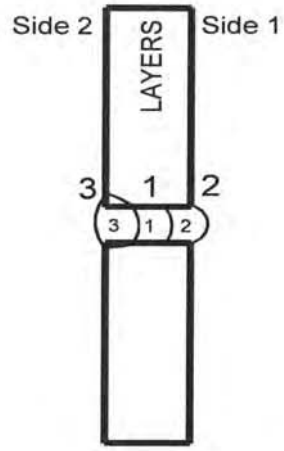
Position:	Horizontal	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 — DATE 07/22/2008 — 7801 — PROVINCE OF NOVA SCOTIA

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

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **SMAW-07-CVN**

Date: May 5, 2008

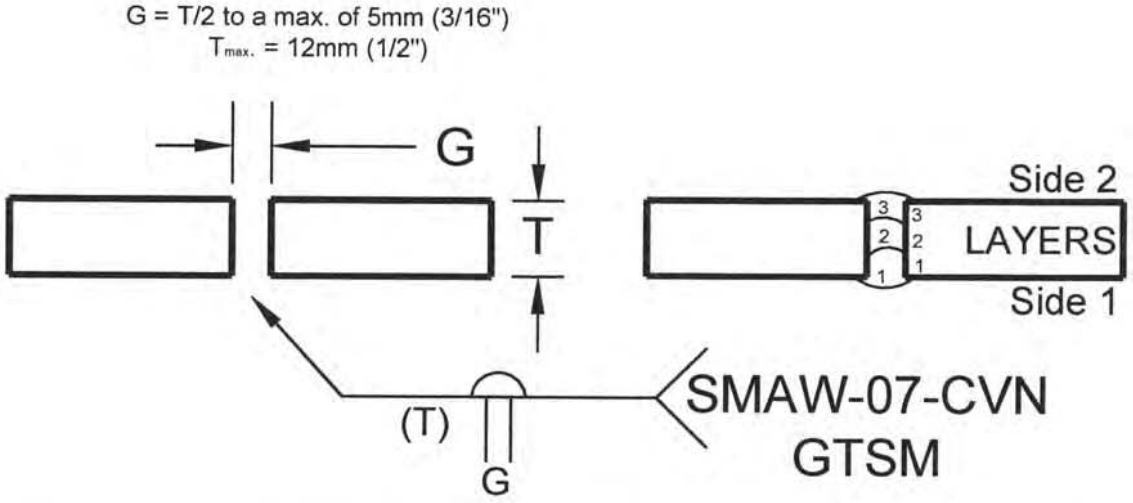
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

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 * PROVINCE OF NOVA SCOTIA * DATE 07/22/2008 7681

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

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

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

Date: May 5, 2008

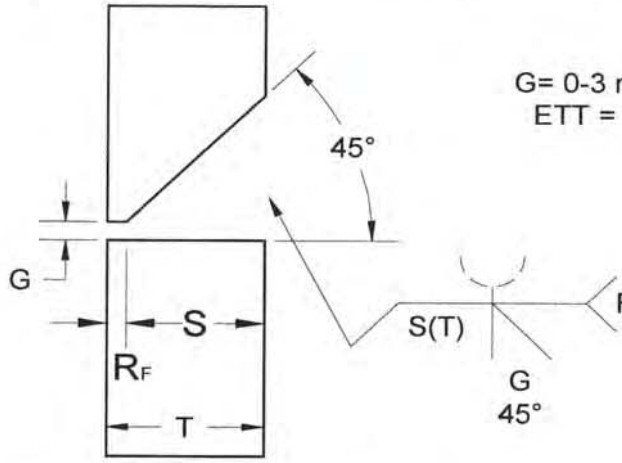
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

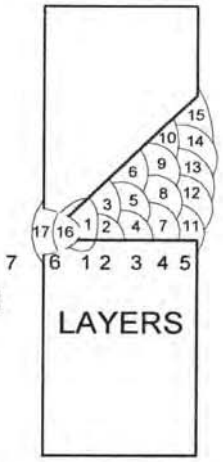
Position:	Horizontal	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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 DATE 07/22/2008 7603 PROVINCE OF NOVA SCOTIA

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

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

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

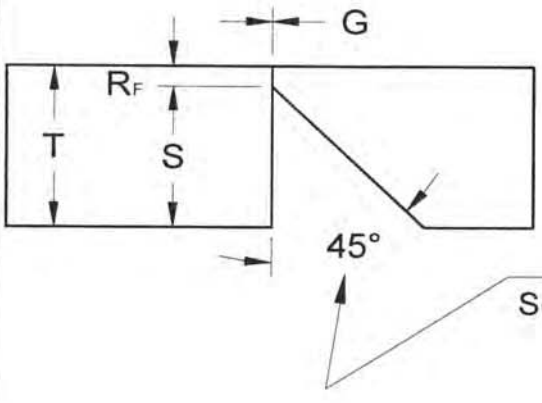
Date: May 5, 2008

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:

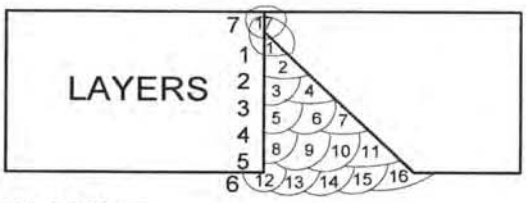
Position:	Vertical Up	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in
Cleaning:	Wire brush and remove slag in between passes	PHT Temp: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

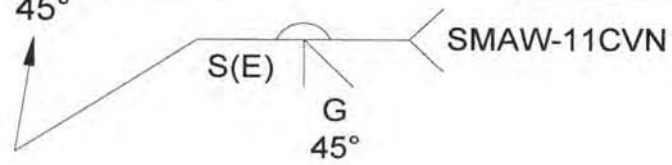
Typical Joint Details:



ETT = T
G = 0 - 1/8"

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:

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA
DATE 07/22/2008
7084

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

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

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

Date: June 11, 2008

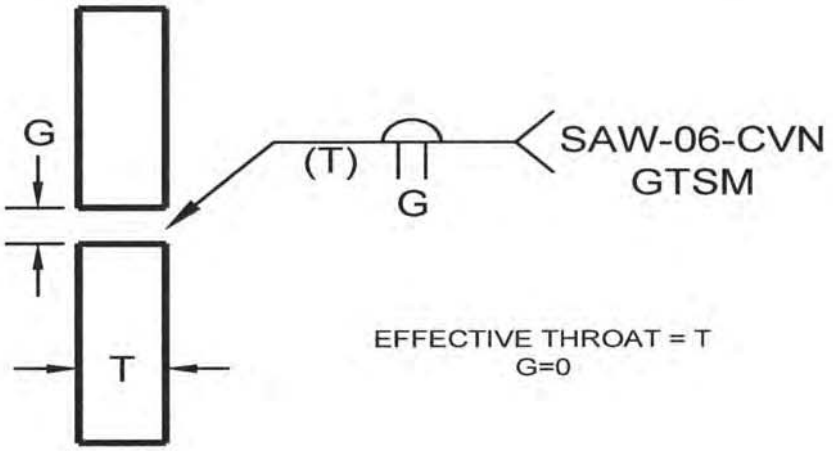
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

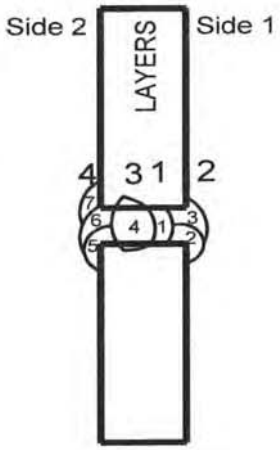
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A
		Process Mode:	Automatic	Gas Flow:	NA ft3/h
		Tungsten Type:		Tungsten Dia.:	NA in

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

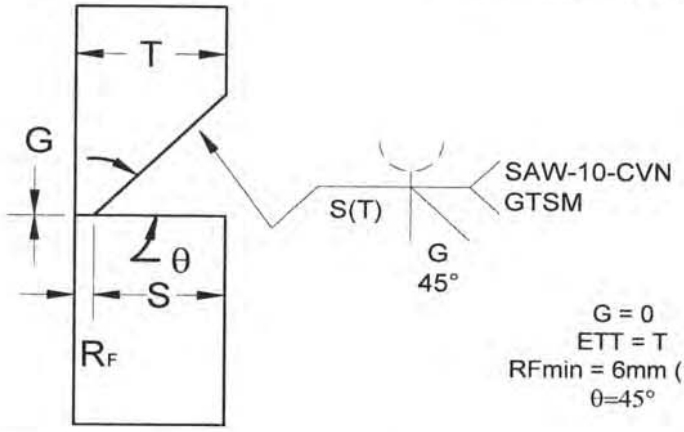
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

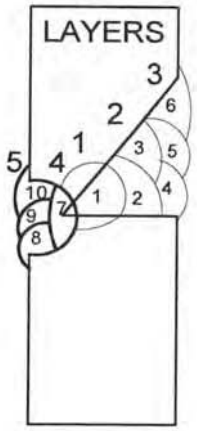
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A
		Process Mode:	Automatic	Gas Flow:	NA ft3/h
		Tungsten Type:		Tungsten Dia.:	NA in

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.

REGISTERED PROFESSIONAL ENGINEER DATE 07/22/2008 7681 PROVINCE OF NOVA SCOTIA

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

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

No.: **FCAW-1**

Date: July 22, 2008

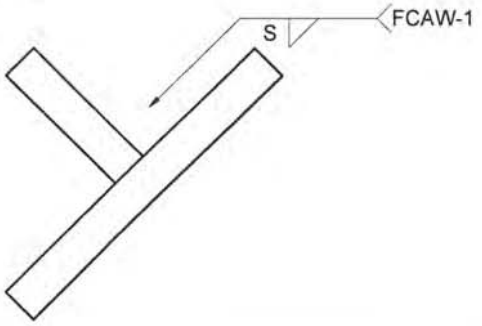
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

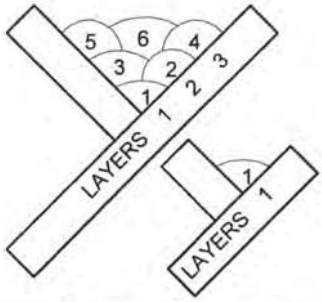
Position:	Flat	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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

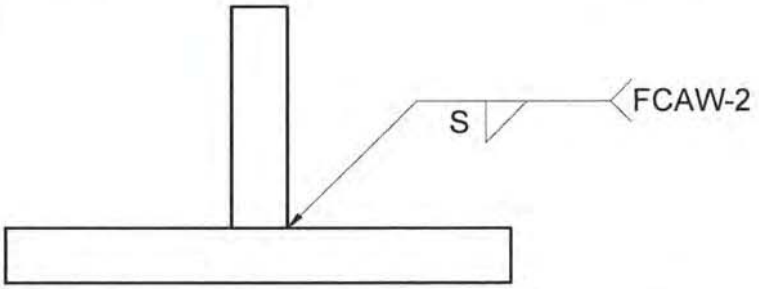
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

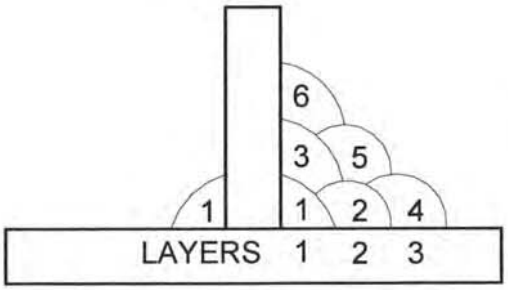
Position:	Horizontal	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9-CH	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2	
		Process Mode:	Semi-Automatic	Gas Flow:	35	ft3/h
		Tungsten Type:		Tungsten Dia.:		in

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 — 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-3**

Date: July 22, 2008

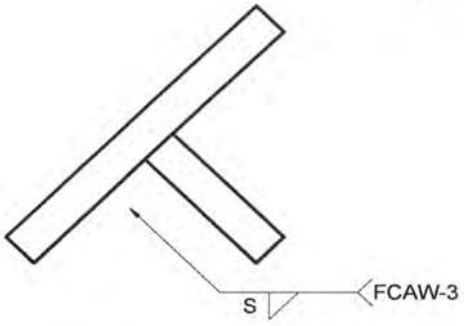
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

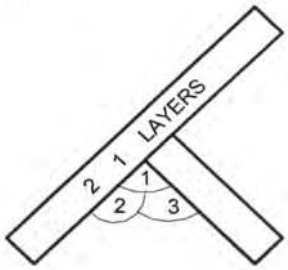
Position:	Vertical Up	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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**

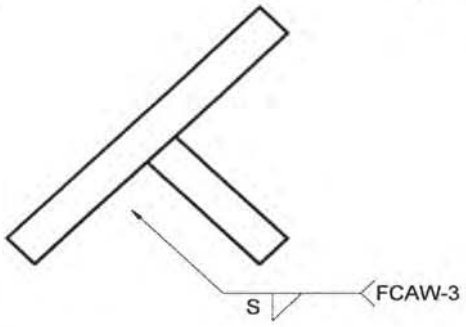
Date: July 22, 2008

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

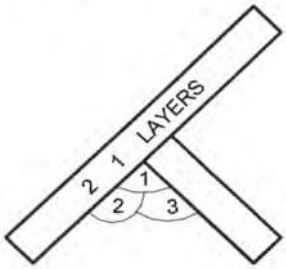
Material Information:

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

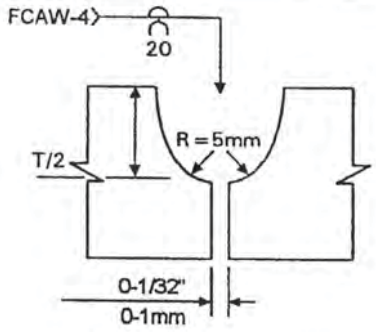
Company's Approval:

REGISTERED PROFESSIONAL ENGINEER
DATE 07/22/2008
7661
PROVINCE OF NOVA SCOTIA

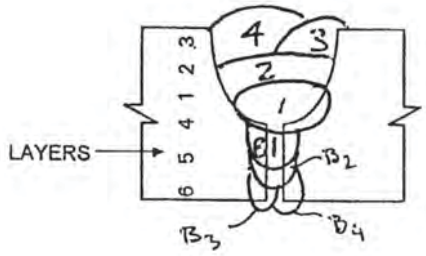
Prepared by: FORGERON ENGINEERING LIMITED **Tel:** (902) 835-7225

RTR FORM S-101, 1992 to CSA W47.1	**RTR ENGINEERING WELDING PROCEDURE DATA SHEET**	No. FCAW-4-IN1	Date MARCH 28, 2002

Company Name and Complete Address	**MOSHER ENGINEERING LIMITED** **2089 Upper Water Street** **Halifax, Nova Scotia, B3J 2R7**	WPS No.	RTR-4(A)
		Applicable Standard(s)	CSA W47.1, W59 & W48.
		Electrode Classification	E49XT9M-H16 X=1 or 2
Welding Process & Mode	☐ SMAW ☐ SAW ☐ GTAW (Tungsten) Type: ☒ FCAW ☐ GMAW ☐ ESW ☐ SW Size: ☐ Manual ☒ Semi-Automatic ☐ Machine ☐ Automatic	☒ 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	Engineer's Stamp

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

CWB Accepted

CWB

Sep 16, 2008

Valid only if welding consumables are certified by the CWB

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

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

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

Date: June 11, 2008

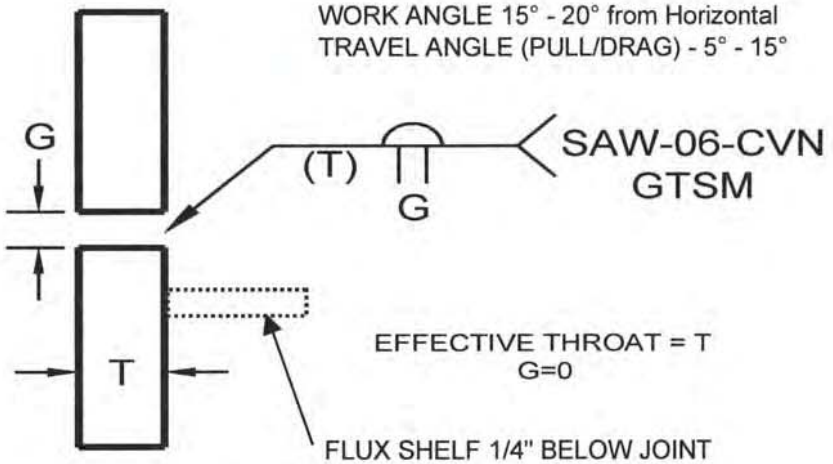
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

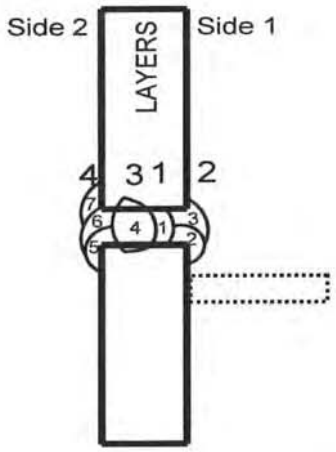
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8	
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A	
		Process Mode:	Automatic	Gas Flow:	NA	ft3/h
		Tungsten Type:		Tungsten Dia.:	NA	in

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	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

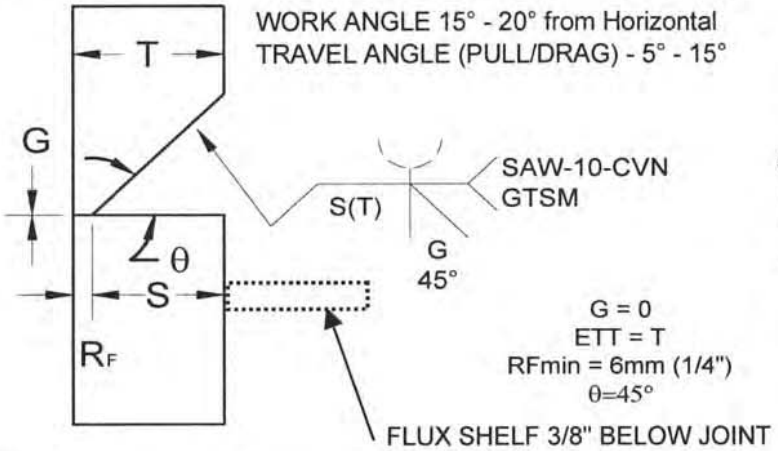
Company Name:	Mosher Engineering	Wldg. Specification No:	SAW-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

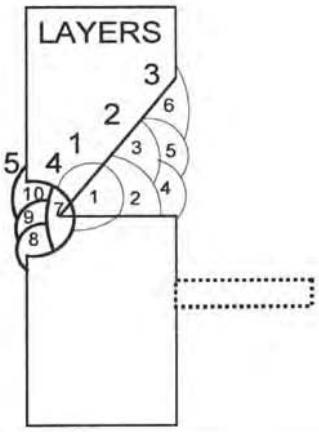
Position:	Horizontal	Welding Process:	SAW	Consumable:	F7A4-EM12K-H8
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	N/A
		Process Mode:	Automatic	Gas Flow:	NA ft3/h
		Tungsten Type:		Tungsten Dia.:	NA in

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 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-1-CVN**

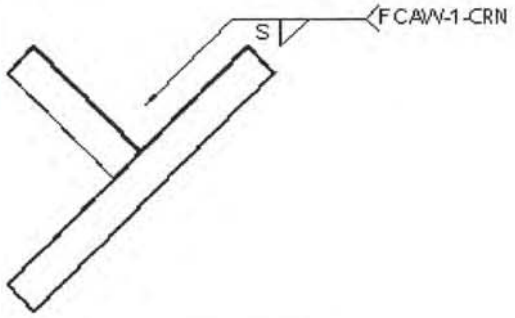
Date: July 22, 2008

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

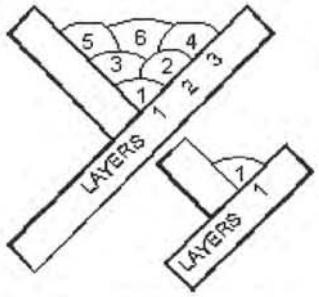
Material Information:

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 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. 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
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-2-CVN**

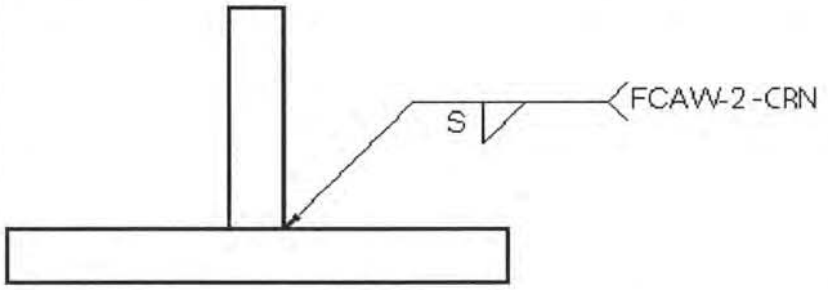
Date: July 22, 2008

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

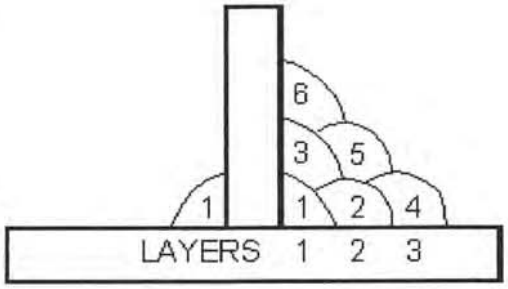
Material Information:

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**

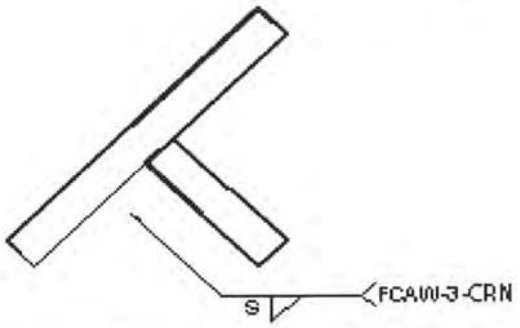
Date: July 22, 2008

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

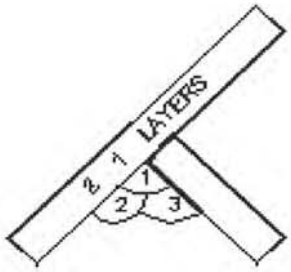
Material Information:

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 09/10/09 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

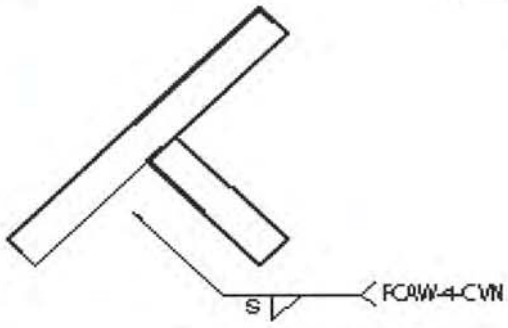
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

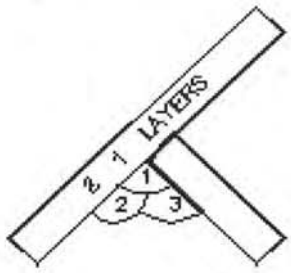
Position:	Overhead	Welding Process:	FCAW	Consumable:	E491T-9MJ-H16/E4801T-9CH
Base Mat'l:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	Spray Transfer	Shielding Gas:	75% Ar 25% CO2
		Process Mode:	Semi-Automatic	Gas Flow:	35 ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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

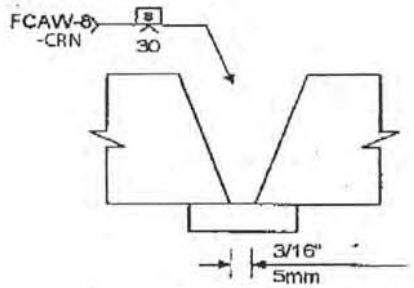
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

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

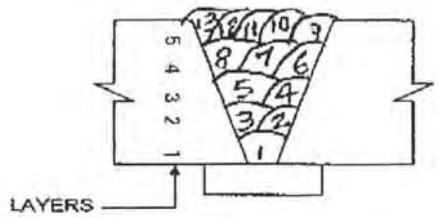
Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	15°C or 59	°F
		PWHT Temp:	N/A	°F

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:

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

Mosher ENGINEERING

WELDING PROCEDURE DATA SHEET

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

Date: December 1, 2008

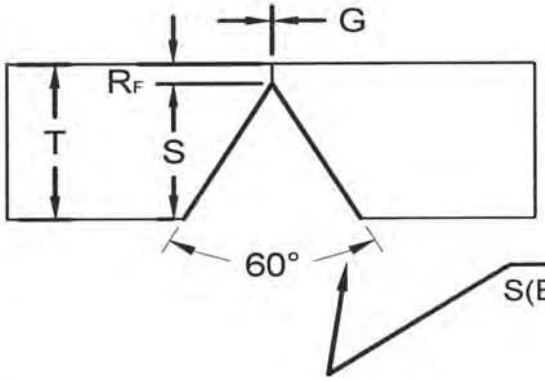
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-4
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & AWS D1.1

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

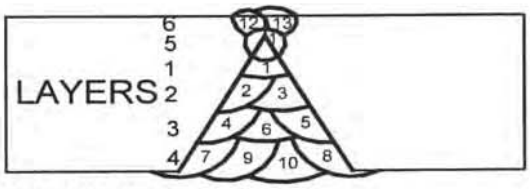
Cleaning:	Wire brush and remove slag in between passes	PHT Temp:	15°C or 59 °F
		PWHT Temp:	NA °F

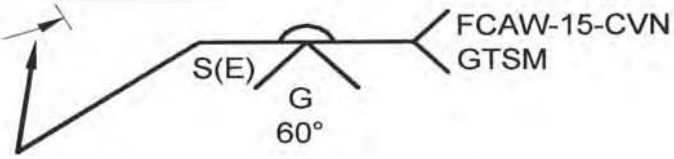
Typical Joint Details:



ETT = T
G = 0
RF = 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:

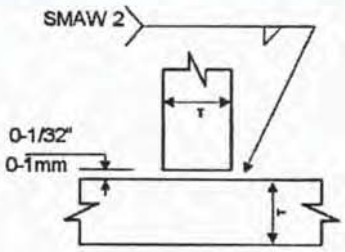
REGISTERED PROFESSIONAL ENGINEER
DATE 12/1/08
T. E. FORGERON
2913
PROVINCE OF NOVA SCOTIA

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

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

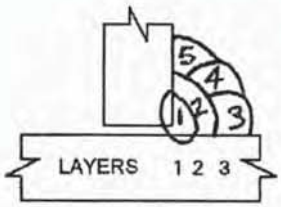
RTR FORM S-101, 1992 to CSA W47.1	**RTR ENGINEERING WELDING PROCEDURE DATA SHEET**	No. SMAW-2	Date MARCH 28, 2002

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

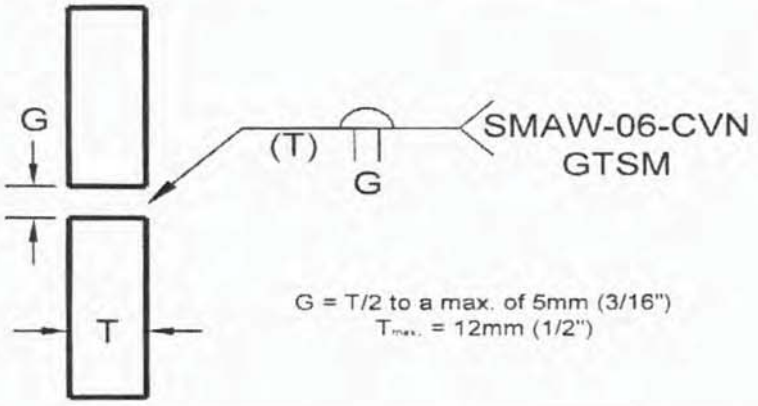
Company Name:	Mosher Engineering	Wldg. Specification No:	RTR-1
Address:	1358 Queen Street	Reference WPQR:	
	Halifax Nova Scotia B3J 2H5	Ref. Standards:	CSA W47.1, W59 & W48

Material Information:

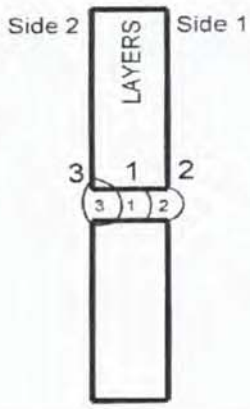
Position:	Horizontal	Welding Process:	SMAW	Consumable:	E4918/E48018/E7018
Base Matl:	CAN G40.21 350WT Cat. 5 (27J @-40°C)	Mode of Transfer:	N/A	Shielding Gas:	N/A
		Process Mode:	Manual	Gas Flow:	ft3/h
		Tungsten Type:		Tungsten Dia.:	in

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	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:

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

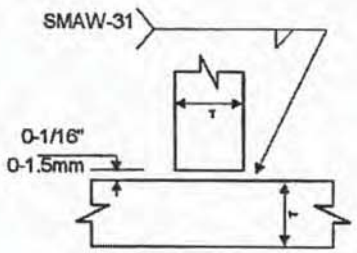
RTR FORM S-101, 1992 to CSA W47.1

RTR ENGINEERING
WELDING PROCEDURE DATA SHEET

No.	Date
SMAW-31	MARCH 28, 2002

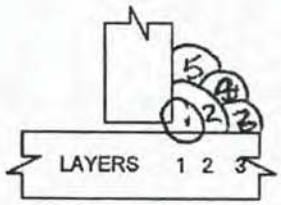
Company Name and Complete Address	MOSHER ENGINEERING LIMITED 2089 Upper Water Street Halifax, Nova Scotia, B3J 2R7
Welding Process & Mode	[X] SMAW [ ] SAW [ ] GTAW (Tungsten) Type: [ ] FCAW [ ] GMAW [ ] ESW [ ] SW Size: [X] Manual [ ] Semi-Automatic [ ] Machine [ ] Automatic
Material Designation	Steel 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: Lew Feltham | Test Plate Number: 202

Signature of Comp. Rep.: Les Hoss

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

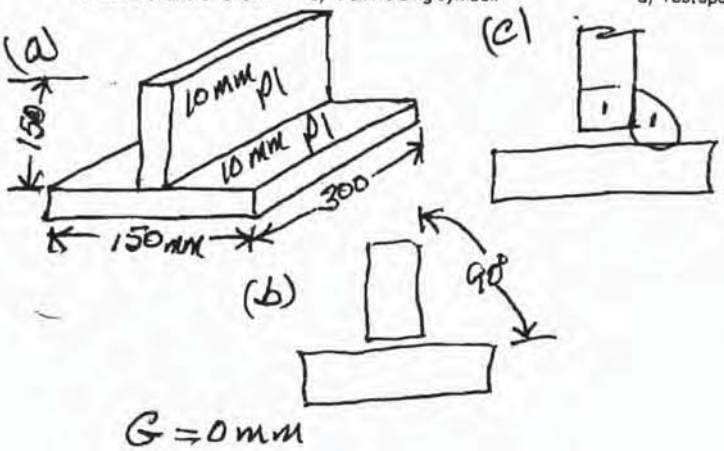
Certified Electrode Used? ☑ Yes ☐ No | Current Type and Polarity: ACHF | Electrode Extension: ✓

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	[illegible]	Indalco
Filler Metal B			
Flux			

Tungsten Type: EWP | Tungsten Diameter: 4.0 mm

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

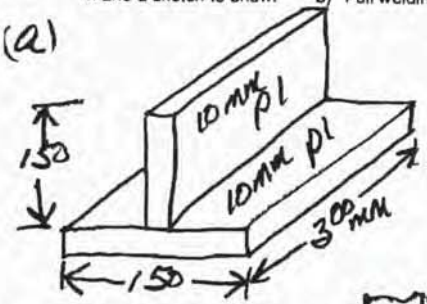
Certified Electrode Used? ☑ Yes ☐ No | Current Type and Polarity: AC HF | Electrode Extension: /

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

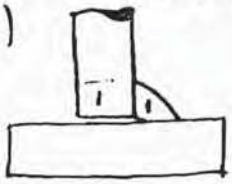
Welding Sequence			Filler Metal		Arc Parameters		
Side	Layer	Pass	Size	W. Feed Speed	Amperes	Volts	Arc Travel Speed
UNITS			( )	( )	A	V	( )

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)



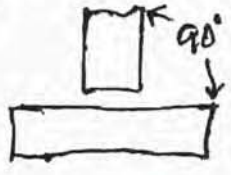
(c)



(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:

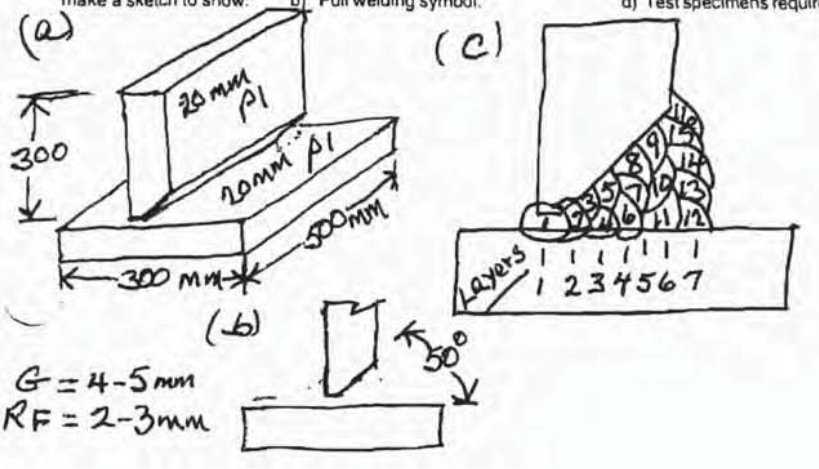
Shielding Gas: 75% Ar 25% CO2 Flow Rate: 22 L/min Nozzle Size: 16 mm

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

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.

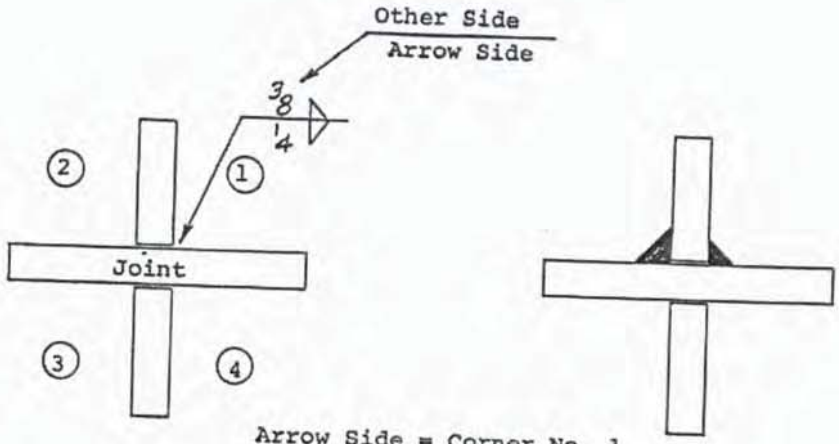
WELDING STANDARDS to CSA W47.1

CWB APPROVAL

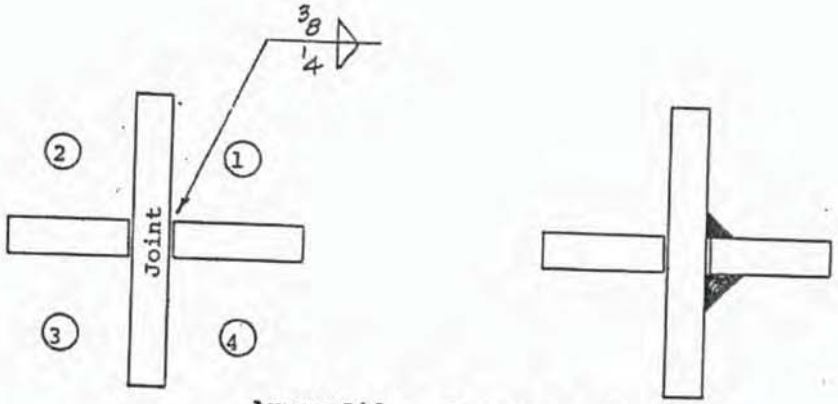
ENGINEERS STAMP

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

2.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

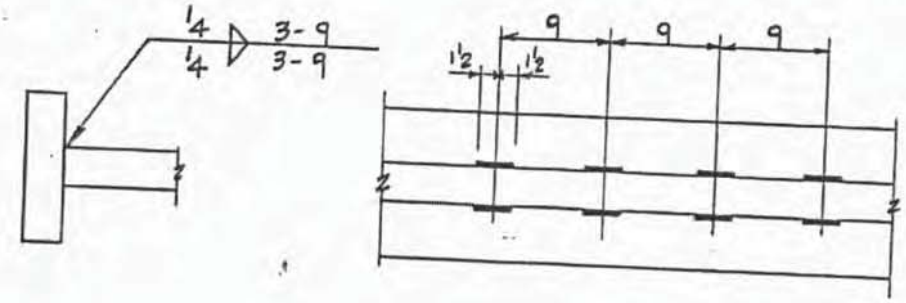
MARCH 28, 2002

WELDING STANDARDS to CSA W47.1

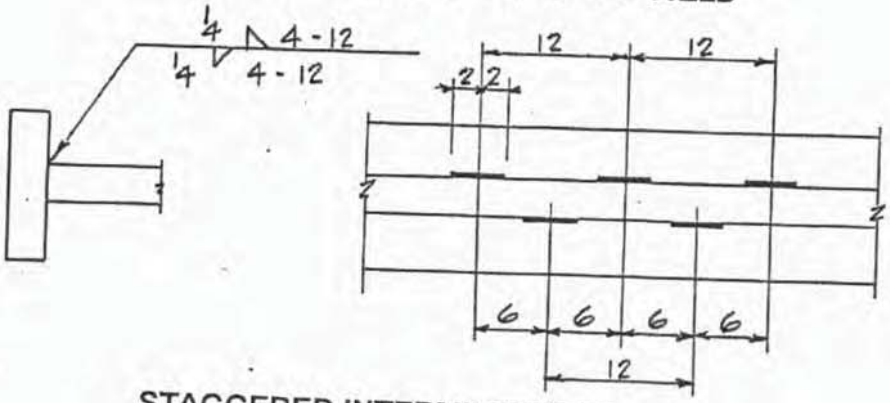
CWB APPROVAL

ENGINEERS STAMP

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.

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

(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.

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

(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.

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

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

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

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.

WELDING STANDARDS to CSA W47.1

CWB APPROVAL

ENGINEERS STAMP

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

3 SUPPLEMENTARY WELD INFORMATION

3.A Fillet Welds

8. Fillet welds shall not terminate at corners of parts of members but shall be returned continously, full size around the corner for a length equal to twice the weld size where such return can be made in the same plane.

9. The minimum fillet size as measured shall be shown in the table below (Table 3-1). Except that the weld size need not exceed the thickness of the thinner part joined unless a larger size is required by calculated stress. For this exception particular care shall be taken to provide sufficient heat input to ensure weld soundness.

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

TABLE 3-1 MINIMUM FILLET SIZE

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

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

3.b Groove Welds

1. A complete penetration groove weld is defined as one made from one side on a backing bar or on both sides combined with back gouging to provide complete penetration and fusion of weld and base metal throughout the depth of the joint.

2. The effective area of a groove weld shall be the effective weld length multiplied by the efective throat thickness.

3. The effective throat thickness of a complete joint penetration groove weld shall be the thickness of the thinner part joined. (No increase is permitted for weld reinforcement.).

4. The minimum groove depth of single partial joint penetration groove welds or on each side of double partial joint penetration groove welds shall be in accordance with the Table 3.2 on page 12.

5. For details of Plug and Slot Welds refer to section 4.4.2 of CSA W59-M1989

6. For details of Flare Grooves and their effective throats refer to Section 4.3.1.6 of CSA W59-M1989

3 SUPPLEMENTARY WELD INFORMATION

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

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

3 SUPPLEMENTARY WELD INFORMATION

3.b Groove Welds

5. The effective throat thickness of a partial joint penetration groove weld for joints with no root openingshall be the depth of camfer less 3mm (1/8") for grooves having an included angle at the root of the groove less than 60 but not less than 45 .

6. The effective throat thickness of a partial joint penetration groove weld shall be the depth of camfer for grooves having an included angle at the root of the groove of 60 or greater.

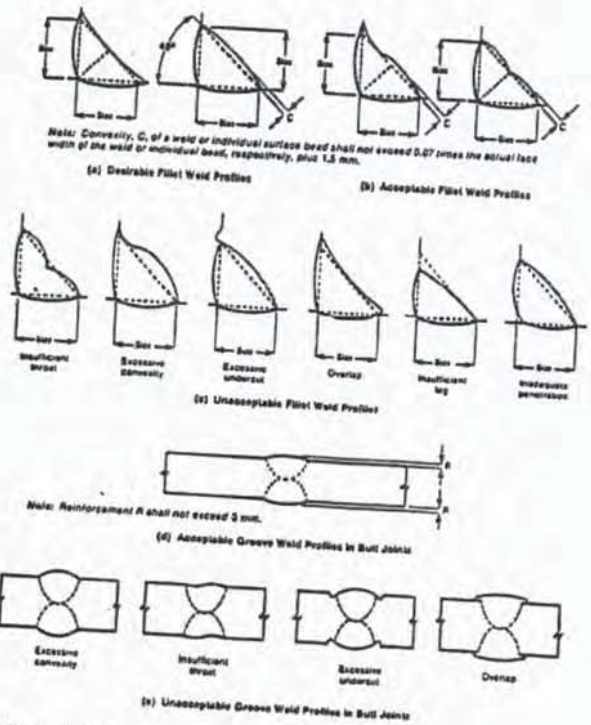
7. The effective throat thickness of a partial joint penetration groove weld reinforced with a fillet weld shall be the shortest distance between the root of the groove and the surface of the fillet less 3mm (1/8") where such reduction is required by Paragraph (5).

8. For hollow structural sections the effective throat thickness of Flare-V and Flare-Bevel Groove welds shall be established by the contractor. Unless otherwise approved by the engineer, this shall be done by means of trial welds for each set of procedural conditions shall then be sectioned and measured to establish welding techniques which will ensure that the design throat thickness is achieved in production.

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

4.a Acceptable and Unacceptable Weld Profiles

TABLE - 1



Notes:

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

(2) *The finishing passes of all groove welds in butt joints shall provide a reinforcement at the centre of weld not exceeding 3 mm. The reinforcement shall be built up uniformly from the surface of the parent metal to a maximum at the centre of the weld. There shall be no valley or groove along the edge or in the centre of the weld. The deposited metal shall be smooth and uniform in cross-section.*

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

4.b Splicing

1. Connections or splices in beams or girders when made by groove welds shall be complete penetration groove welds, unless otherwise approved by the Engineer.

2. Splices of tension members made by groove welds shall be complete joint penetration groove welds unless otherwise approved by the Engineer.

3. All shop splices in each component of a cover-plated or built-up member shall be made before such component part is welded to other component parts of the member.

4. Tension butt joints in plates of different material thickness or widths shall be made in such a manner that the slope through the transistion zone is not steeper thatn 1 in 2 1/2. The transisiton shall be accomplished by chamfering the thicker part, tapering the wider part, slopeing the weld metal, or by any combination of these.

5. Compression butt joints do not require a transistion zone in members of different thickness or width, if approved by the Engineer.

WELDING STANDARDS to CSA W47.1

CWB APPROVAL

ENGINEERS STAMP

4 SHOP STANDARDS

4.c Preparation of Material (From CSA W59-M1989 Clause 5.3)

1. Surfaces and edges to be welded shall be smooth, uniform and free from fins, cracks and other defects that would adversely affect the quality or strength of the weld. Surfaces to be welded shall also be free, within 50 mm (2") of any weld locations, from loose or thick scale (except for tightly adhering small islands of scale), slag, loose rust, paint, grease, moisture and other foreign material that will prevent welding to meet acceptance levels of this standard or produce objectionable fumes.

2. Preparation of edges for welding shall be smooth and regular and shall be left free of slag. The edges resulting from cutting shall be smoothed when necessary to provide a surface equivalent to that specified in Clause 5.3 (CSA W59) (Pre-ceding paragraph). All re-entrant corners shall be shaped, notch-free, to a radius of at least 15mm. All cutting shall follow closely the lines prescribed. Oxygen gouging not to be used on quenched and tempered steels.

3. For reference to occassional notches and their repair see Clause 5.3.2 CSA W59-M1989 and for planar edge discontinuities refer to Clause 5.3.3 CSA W59-M1989

WELDING STANDARDS to CSA W47.1	CWB APPROVAL	ENGINEERS STAMP
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4.d Assembly Practices

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

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

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

WELDING STANDARDS to CSA W47.1

CWB APPROVAL

ENGINEERS STAMP

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

4 SHOP STANDARDS

4.e Allowable Workmanship Tolerances from Detailed Drawings

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

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

4 SHOP STANDARDS

4.f Control of Distortion and Shrinkage Stresses

1. Insofar as practicable, all welds shall be deposited in a sequence that will balance the applied heat of welding while the welding progresses.

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

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

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

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

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

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

4.g Quality of Welds

1. Welds shall have no cracks

2. Welds shall be free from overlap

3. Undercut shall not exceed the permissable valves as given in Clauses 11.5.4 and 12.5.4 of CSA W59-M1989 for statically and Dynamically Loaded structures respectively.

4. The minimum acceptable quality of welds, including visual examination, shall confirm to clause 11.5.4 for Statically Loaded Structures, and Clause 12.5.4 for Dynamically Loaded Structures.

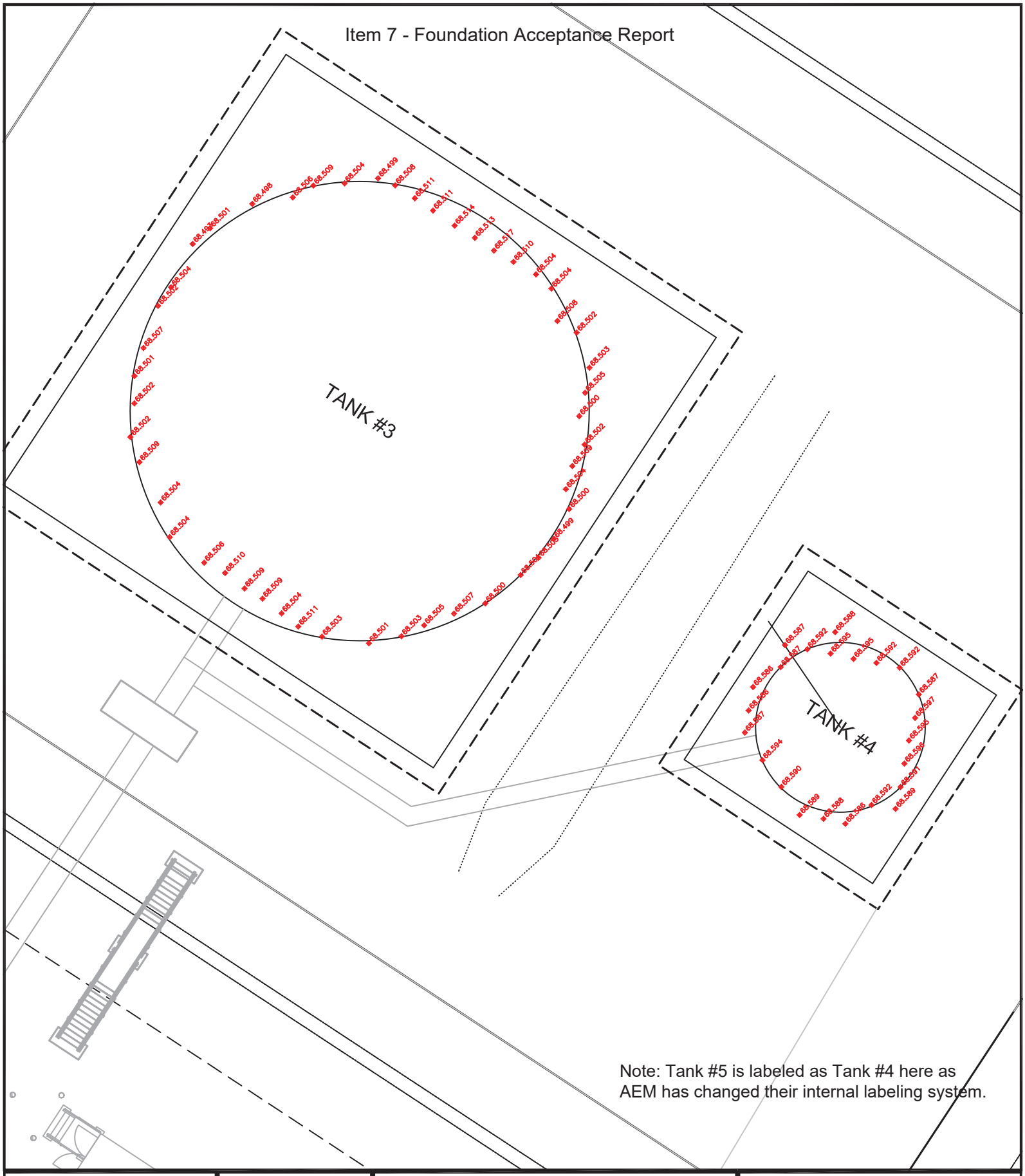
Item 6 – Welding Consumable

Contents

1. N/A

Item 7 – Foundation

Contents



Note: Tank #5 is labeled as Tank #4 here as AEM has changed their internal labeling system.

HAMELARPENTAGE	AEM	Date des travaux : August 2017	Date d'envoi : 2017-10-14
	Système de Coord.: NAD83 UTM15	MINE SITE FUEL FARM Sand As-Built	Dessine par: JF Landreville
	Echelle: n.t.s.	No plan: AB 403 – Top Sand	Approuve par: Hamel Arp.

Item 8 – Floor

Contents

Item 8 - Floor - MTR

Test Certificate

Form TC1: Revision 2: Date 23 Apr 2014

SSAB

12400 Highway 43 North, Axis, Alabama 36505, US

Customer:
SAMUEL, SON & CO. LTD
1250 APPLEBY LINE

BURLINGTON
ON L7L5G6

Customer P.O.No.: C41965 & 41-490195 | **Mill Order No.** 41-491117-01 | **Shipping Manifest:** AR240135

Product Description: CSA G40.21(2013) 38WT/260WT - CAT 5;LCVN 15FT.LBS,TCVN13FT.LBS@-45F/A673-P ALLOYS API650(12TH ED) TABLE 4-1 GR.IIIA NORMALIZED

Ship Date: 21 Feb 17
Cert Date: 21 Feb 17
Cert No: 081597458

Size: 0.250 X 120.0 X 480.0 (IN)

Tested Pieces:				Tensiles:						Charpy Impact Tests									
Heat Id	Piece Id	Tested Thickness	Tst Loc	YS (KSI)	UTS (KSI)	%RA	Elong % 2in 8in	Tst Dir	Hardness	Abs. Energy(FTLB) 1	2	3	Avg	% Shear 1	2	3	Avg	Tst Tmp	Tst Dir	Tst Siz (mm)	BDWTT Tmp %Shr
E7B101	E01	0.256 (DISCRT)	C	53	75		25	T													
E7B101	E02	0.256 (DISCRT)	C							37	27	59	41					-50F	L	5.0	
			C							24	36	28	29					-50F	T	5.0	
E7B101	E03	0.256 (DISCRT)	C	54	75		27	T		51	62	61	58					-50F	L	5.0	
			C							37	30	27	31					-50F	T	5.0	
E7B101	E04	0.256 (DISCRT)	C							22	33	38	31					-50F	L	5.0	
			C							42	37	48	42					-50F	T	5.0	
E7B101	E05	0.256 (DISCRT)	C							61	49	61	57					-50F	L	5.0	
			C							32	41	32	35					-50F	T	5.0	
W7B598	E07	0.256 (DISCRT)	C	52	72		25	T													
W7B598	E08	0.256 (DISCRT)	C	51	71		25	T		33	31	37	34					-45F	L	5.0	
			C							30	28	31	30					-45F	T	5.0	
W7B598	E09	0.256 (DISCRT)	C							43	31	55	43					-50F	L	5.0	
			C							33	30	31	31					-50F	T	5.0	

Chemical Analysis

Heat Id	C	Mn	P	S	Si	Tot Al	Sol Al	Cu	Ni	Cr	Mo	Cb	V	Ti	B	N	ORGN
E7B101	.19	.92	.010	<.001	.24	.022	.020	.24	.13	.10	.04	.002	.005	.010	.0002	.0069	USA
W7B598	.18	.92	.009	.001	.24	.028	.022	.26	.13	.08	.05	.001	.004	.011	.0002	.0078	USA

KILLED STEEL
MERCURY IS NOT A METALLURGICAL COMPONENT OF THE STEEL AND NO MERCURY WAS INTENTIONALLY ADDED DURING THE MANUFACTURE OF THIS PRODUCT.
KILLED STEEL, PRODUCED TO A FINE GRAIN PRACTICE
MTR EN 10204:2004 INSPECTION CERTIFICATE 3.1 COMPLIANT
CHARPY FULL SIZE EQUIVALENT = ABSORBED ENERGY AVG X 10 / TEST SIZE IN MM
NORMALIZED PLATES. HEATED AT 1665F FOR 14 MINUTES.
TEST COUPONS TAKEN FROM HEAT TREATED PLATE.
PRODUCTS SHIPPED:

E7B101 E05	6705084	PCES:	1,	LBS:	4084	E7B101 E02	6705125	PCES:	1,	LBS:	4084
E7B101 E02	6705123	PCES:	1,	LBS:	4084	E7B101 E05	6705086	PCES:	1,	LBS:	4084
E7B101 E03	6705100	PCES:	1,	LBS:	4084	E7B101 E05	6705085	PCES:	1,	LBS:	4084
E7B101 E02	6705124	PCES:	1,	LBS:	4084	W7B598 E08	6705042	PCES:	1,	LBS:	4084
W7B598 E08	6705041	PCES:	1,	LBS:	4084	W7B598 E08	6705040	PCES:	1,	LBS:	4084
W7B598 E09	6705038	PCES:	1,	LBS:	4084	W7B598 E08	6705043	PCES:	1,	LBS:	4084

(P) Cust Part #:

WE HEREBY CERTIFY THAT THIS MATERIAL WAS TESTED IN ACCORDANCE WITH, AND MEETS THE REQUIREMENTS OF, THE APPROPRIATE SPECIFICATION

Justin Ward +1 251 662 4400
SENIOR METALLURGIST - PRODUCT

Item 8 - Floor - MTR

Test Certificate

Form TC1: Revision 2: Date 23 Apr 2014

SSAB

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W7B598	E08	6705039	PCES: 1, LBS: 4084						E7B101	E05	6705087	PCES: 1, LBS: 4084					
W7B598	E08	6705052	PCES: 1, LBS: 4084						W7B598	E08	6705050	PCES: 1, LBS: 4084					
W7B598	E08	6705049	PCES: 1, LBS: 4084						W7B598	E08	6705044	PCES: 1, LBS: 4084					
W7B598	E08	6705045	PCES: 1, LBS: 4084						E7B101	E04	6705126	PCES: 1, LBS: 4084					
E7B101	E02	6705151	PCES: 1, LBS: 4084						E7B101	E02	6705152	PCES: 1, LBS: 4084					
E7B101	E02	6705150	PCES: 1, LBS: 4084						E7B101	E05	6705162	PCES: 1, LBS: 4084					
E7B101	E05	6705160	PCES: 1, LBS: 4084						E7B101	E05	6705153	PCES: 1, LBS: 4084					
E7B101	E05	6705161	PCES: 1, LBS: 4084						E7B101	E04	6705129	PCES: 1, LBS: 4084					
E7B101	E04	6705127	PCES: 1, LBS: 4084						E7B101	E04	6705130	PCES: 1, LBS: 4084					
E7B101	E04	6705128	PCES: 1, LBS: 4084						E7B101	E05	6705163	PCES: 1, LBS: 4084					
E7B101	E02	6705149	PCES: 1, LBS: 4084						E7B101	E04	6705102	PCES: 1, LBS: 4084					
W7B598	E08	6705046	PCES: 1, LBS: 4084														

(P) Cust Part #:

WE HEREBY CERTIFY THAT THIS MATERIAL WAS TESTED IN ACCORDANCE WITH, AND MEETS THE REQUIREMENTS OF, THE APPROPRIATE SPECIFICATION

Justin Ward +1 251 662 4400
SENIOR METALLURGIST - PRODUCT