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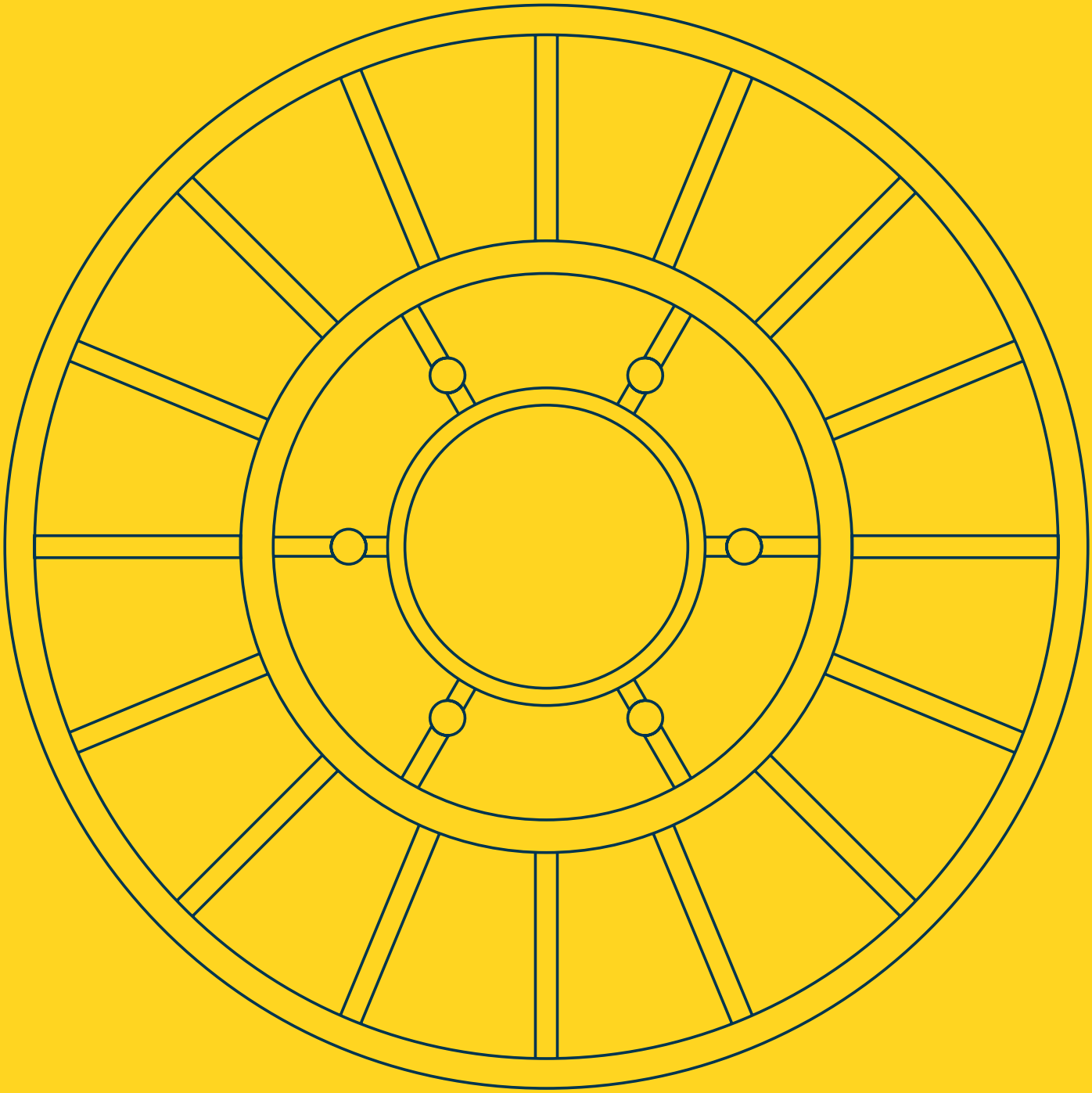
FLUX CORED ARC WELDING TECHNICAL REPORT

FOR MILD STEEL AND 490 N/MM² CLASS HIGH TENSILE STRENGTH STEEL



WELD WITH THE BEST.

WIA Miller HOBART

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FLUX CORED ARC WELDING TECHNICAL REPORT

APPLICATIONS

Butt, fillet welding of mild steel & 490N/mm² high tensile strength steels of structure such as bridges, buildings, storage tanks, ships and industrial machinery.

CLASSIFICATIONS

AS/NZS ISO 17632:	-B T49 3 T1-1 C A-U-H5
	-B T49 3 T1-1 M A-U-H10
AWS A5.36:	E491T1-C1[M21}A0-CS1-H8
AWS A5.36M:	E491T1-C1[M21]A2-CS1-H8
AWS A5.20:	E71T-1C/1M, 9C/9M

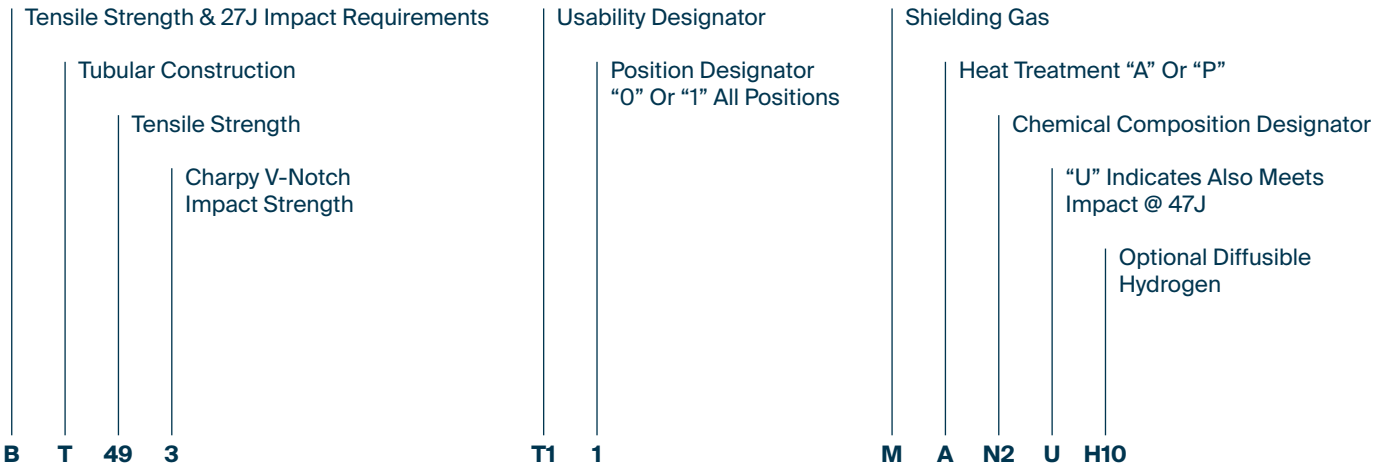
CHARACTERISTICS ON USAGES

1) Austfil Excel is a rutile type flux cored wire designed for all-position welding by single pass & multi pass with 100%CO_2 and 75~80%Ar+20~25% CO_2 shielding gas.
2) It provides excellent usability with stable arc, low spatter, good bead appearance, easy slag removal, and low welding fume.

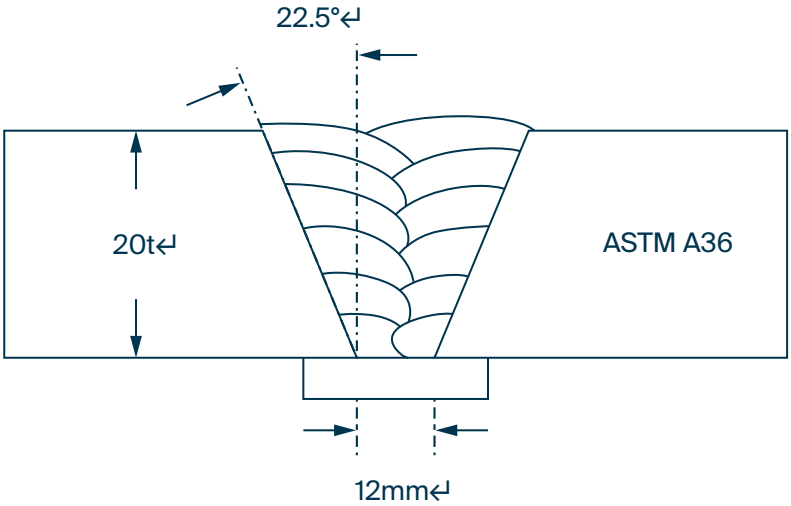
NOTES ON USAGES

1) It is suitable to use shielding gas of 20~25 ℓ/min.
2) The distance between the contact tip & base metal (CTWD) is to be 20-25mm.
3) Protect the weld with a screen to prevent blowholes caused by wind where the wind velocity is 2m/sec.
4) Thick heavy plate should be welded under proper preheating & interpass-temperature.

AS/NZS ISO COMPULSORY CLASSIFICATION DESIGNATORS



MECHANICAL PROPERTIES & CHEMICAL COMPOSITIONS OF ALL WELD METAL TEST



(Joint Preparation & Layer Details)

Wire Diameter	1.6 mm
Current/Polarity	DCEP
Amperage / Voltage	280 A / 26~28 V
Shielding Gas	CO_2, 20 l/min.
CTWD	20~25 mm
Inter-pass temp.	150 ± 15°C
Welding Position	1 G
Welding Speed	250 ~ 300 mm/min.

Chemical Compositions (wt.%)

	C	Mn	Si	S	P	Ni	Cr	Mo	V
AWS A5.20	0.12	1.75	0.90	0.03	0.03	0.50	0.20	0.30	0.08
100% CO_2	0.04	1.35	0.47	0.01	0.01	0.01	0.03	0.01	0.01
75%Ar-25%CO_2	0.04	1.45	0.53	0.01	0.01	0.01	0.03	0.01	0.01

Mechanical Properties

	Tensile Properties			CVN-IE
	YP(MPa)	TS(MPa)	El.(%)	@-30°C
AWS A5.20	≥ 400	490-660	≥ 22	≥ 27J
100% CO_2	480	550	32.8	65
75%Ar-25%CO_2	530	610	30.5	80

FLUX CORED ARC WELDING TECHNICAL REPORT

DIFFUSIBLE HYDROGEN CONTENT

Welding Condition				
Specification	AWS A4.3 / GC method			
Wire Diameter	1.6 mm			
Polarity	DCEP			
Amperage	280 A			
Voltage	28 A			
CTWD	20 mm			
Welding Speed	280~320 mm/min.			

Result				
	X1	X2	X3	X4
100% CO_2	3.4	3.6	3.8	3.4
75%Ar-25%CO_2	5.2	4.8	5.0	5.3

Average Hydrogen Content	100% CO_2	3.5 ml/100g
	75%Ar-25%CO_2	5.0ml/100g

RECOMMENDED SETTINGS / DEPOSITION RATE / EFFICIENCY / SIZE AVAILABLE

Recommended Polarity (DCEP)

		1.2mm	1.6mm
Flat Horizontal Fillet	A	160~300	180~400
	V	22~30	26~35
Vertical Up	A	160~240	180~280
	V	22~26	23~27
Overhead	A	160~240	180~280
	V	23~26	23~27

Deposition Rate/Efficiency

	Amp.	Volt.	Depo. Rate (kg/hr.)	Depo. Efficiency (%)
1.2mm CO_2 gas	160	26	2.54	88.9
	200	28	3.48	88.2
1.6mm Co2 gas	240	30	4.40	89.8
	280	32	5.70	88.6
	320	34	7.14	89.4

Size Available

Wire Diameter (mm)	Pack size and Type	Pallet Size (kg)	Part No.
1.2	15kg spool	1080	AE71CM12
1.6	15kg spool	1080	AE71CM16

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FLUX CORED ARC WELDING TECHNICAL REPORT

WIRE FEEDABILITY EVALUATION

Wire Feedability Valuation Model

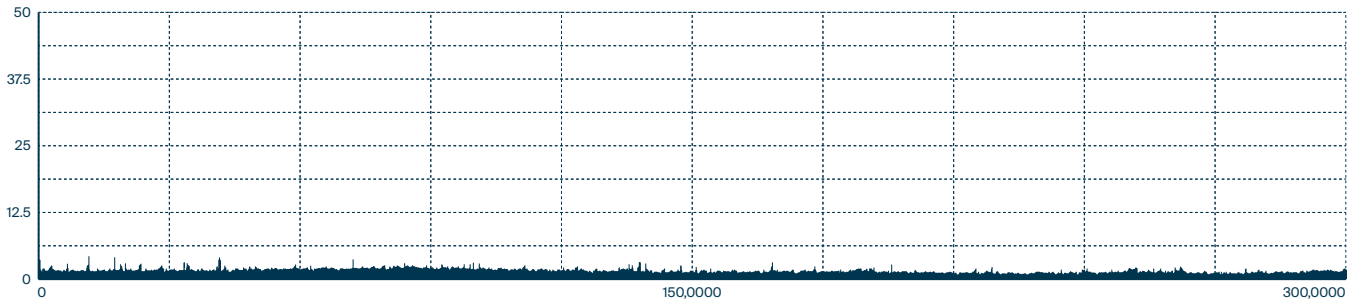
Cable Type	Cable Length	Welding Condition	Welding Time	Welding Equipment	CTWD
1 turn/2 turn	6 m	300~320A/ 32~34V	300 sec. 3 times	Arc monitoring system	25mm

Wire feedability evaluation (Feeding resistance value)

Very good	Good	Normal	Bad	Very bad
~0.4	0.41~0.60	0.61~0.80	0.81~1.00	1.1~

Evaluation Result

Feeding resistance : 0.38



AWS D 1.8 / SEISMIC WELDING TEST

Welding Conditions

	Wire Dia.(mm)	Heat input (KJ/mm)	Shied gas	Remark
#1	1.2	1.11	100% CO_2	Low Heat input
#2	1.6	3.45		High Heat input
#3	1.2	1.05	75%Ar+ 25%CO_2	Low Heat input
#4	1.6	3.22		High Heat input

Test Results

Spec.	Y.P (MPa)	T.S (MPa)	El. (%)	CVN-IE (J)
	≥400	≥480	≥22	≥54 @+20°C
#1	519	587	27.5	106
#2	425	487	36.5	225
#3	604	652	25.9	130
#4	451	529	36.2	188

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New & Improved for Optimum Positional Welding

SUMMARY

- Rutile type flux-cored wire designed for all positional welding
- Formulated for 100% CO_2 and 75-80% Ar + 25-20% CO_2 shielding gases
- Excellent operator appeal and usability with stable arc, low spatter, smooth bead appearance and easy slag removal

CLASSIFICATION

- AS/NZS ISO 17632-B: T493T1-1 M A-U-H10, T493T1-1 C A-U-H5
- AWS A5.20: E71T-1M, E71T-1C
- E71T-9M, E71T-9C

DESCRIPTION AND APPLICATION

An all positional rutile micro alloyed type flux-cored welding wire specifically formulated for optimum performance using both CO_2 and Ar/CO_2 shielding gas mixtures.

The exceptionally smooth arc performance produces a superb weld for single or multipass welding with low spatter losses in all positions and applications (except vertical down). Austfil Excel is recommended for the welding of mild, carbon and carbon-manganese steels where good impact properties are required.

This high deposition flux-cored wire has been specially formulated to operate in a wider, more forgiving parameter range. It is suitable for general & heavy fabrication, structural steel fabrication, truck bodies, shipbuilding, earth moving equipment, storage tanks & bridge construction.

OPERATIONAL DATA

Wire size (MM)	Welding Current Range (A)	Arc Voltage Range *(V)
1.2	160 - 300	22 - 30
1.6	180 - 400	23 - 35

Recommended electrical stick out is 15-25mm.
Welding Current DC +
*Voltage is determined by arc current and wire arc length. Welding currents and voltage shown are operational guides only

SHIPPING APPROVAL

LR 100% CO2 3YS H5, 80/20 3YS H10

TYPICAL ALL WELD METAL CHEMICAL ANALYSIS

100% CO_2

C	Mn	Si	S	P	Ni
0.04	1.35	0.45	0.01	0.01	0.01

75%Ar+25%CO_2

C	Mn	Si	S	P	Ni
0.04	1.45	0.50	0.01	0.01	0.01

TYPICAL ALL WELD METAL MECHANICAL ANALYSIS

Gas Type	Ar+25% CO_2	100% CO_2
Yield Strength	530 MPa	580 MPa
Tensile Strength	610 MPa	550 MPa
Elongation	30.5%	32.8%
CVN Impact Values	80J @ -30°C	65J @ -30°C

PACKAGING DATA

Wire size (MM)	Pack size and type	Pallet size (KG)	Part No.
1.2	15kg spool	1080	AE71CM12
1.6	15kg spool	1080	AE71CM16

WELDING PROCEDURE SPECIFICATION

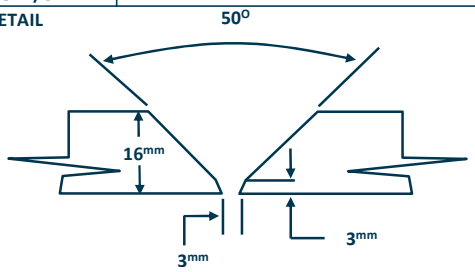
W.P.S. No.	WIA-AE-001A
REVISION.	0
P.Q.R. No.	PQR-AE-001A

FABRICATOR:

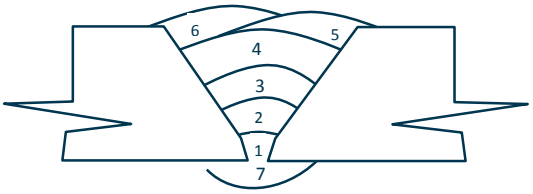
PROJECT: Company Standard Procedure

WELDING CODE	AS/NZS1554.1:2014 SP		
WELDING PROCESS	FCAW		
EDGE PREPERATION	MACHINE/FLAME CUT AND GRIND IN ACCORDANCE WITH WTIA TECH NOTE 5		
JOINT TYPE	PRE-QUALIFIED B-C 2a SINGLE V BUTT WELDED BOTH SIDES	**RANGE QUALIFIED**	B-C 2a & C-C 2a
POSITION	1G (PA) **RANGE QUALIFIED:** 1G (PA)		
WELDING M/C TYPE	MILLER DIMENSION 650		

JOINT DETAIL



PASS SEQUENCE **SIDE 1**



BACK GOUGE/GRIND SIDE 2 TO SOUND METAL BEFORE WELDING

SIDE 2

JOINT TOLERANCE		**MATERIAL SPECIFICATION**				**THERMAL TREATMENT**	
ROOT OPENING mm	1.5-4.5	**MATERIAL GRADE:**	AS3679.1 350	**GROUP NUMBER**	4	**MINIMUM PREHEAT**	25°C See Note 2
ROOT FACE mm	1.5-4.5	**STEEL TYPE:**	4	**RANGE QUALIFIED:**	1, 2 & 4	**MAX. INTERPASS TEMP**	250°C
GROOVE ANGLE °	45-60°	**PQR THICKNESS:**	16mm	**RANGE QUALIFIED:**	8-32mm	**P.W.H.T**	N/A

TECHNIQUE		**CONSUMABLES**	
STRING OR WEAVE	STRING	**CONSUMABLE SPECIFICATION**	
CLEANING: INITIAL	MACHINE/GRIND	**AS/NZS ISO 17632:**	B-T493T1-1MA-U H10
INTERPASS	CHIP, WIRE BRUSH, GRIND	**AWS A5.20:**	E71T-1M H8
BACKGOUGE METHOD	GOUGE/GRIND	**BRAND NAME**	WIA Austfil Excel
ELECTRICAL STICK OUT	16-24mm		
MAX. WEAVE WIDTH	3mm		
TUNGSTEN SIZE & TYPE	N/A		
ELECTRODE ANGLE	75-85°	**GAS TYPE**	75% Argon/25% CO_2
PROGRESSION	BACKHAND 5-10° DRAG	**FLOW RATE**	14-20 L/min

WELD PASS DETAILS			**ELECTRODE DISCRIPTION**			**GAS TYPE**	**WELDING PARAMETERS**			**TRAVEL SPEED**	**MAX**	**HEAT INPUT**
PASS	**SIDE**	**POSITION**	**TYPE**	**SIZE**	**BRAND**	**FLUX TYPE**	**AMPS**	**VOLTS**	**POLARITY**	**mm / min**	**INTERPASS**	**Kj/mm**
1 Root	1	1G	BT493 U	1.6	WIA	75% Ar 25% CO_2	205-250	22-26	DCEP	245-330	250°C	0.81-1.59
2-4 Fill	1	1G	BT493 U	1.6	WIA	75% Ar 25% CO2	220-270	23-27	DCEP	220-375	250°C	0.80-1.98
5-6 Cap	1	1G	BT493 U	1.6	WIA	75% Ar 25% CO2	220-270	23-27	DCEP	265-360	250°C	0.84-1.65
BACK GOUGE/GRIND SIDE 2 TO SOUND METAL BEFORE WELDING												
7	2	1G	BT493 U	1.6	WIA	75% Ar 25% CO2	220-270	23-27	DCEP	265-360	250°C	0.84-1.65

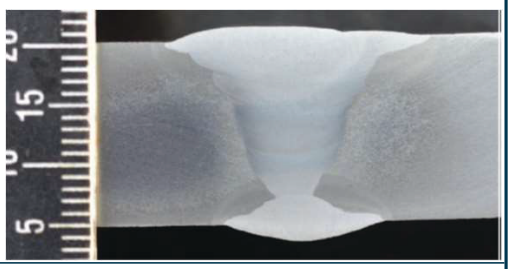
PREPARED BY	WIA	**APPROVED FOR TEST**	Rodney Higgins	**WELDERS NAME / No.**	Mathew Hefferan
DATE	20/04/2021	**DATE**	23/04/2021		20/04/2021

APPROVED FOR CONSTRUCTION

CONTRACTOR		**CLIENT**		**CERTIFYING AUTHORITY**	
NAME	Rodney Higgins IWT (AU/IWT/00032)	**NAME**		**NAME**	
SIGN		**SIGN**		**SIGN**	
DATE	23/04/2021	**DATE**		**DATE**	

COMMENTS.

1. REMOVE EXTRANEOUS MATERIAL FROM JOINT PRIOR TO ASSEMBLY AND WELDING
2. PREHEAT TO BE DETERMINED FOR LARGER COMBINED THICKNESSES AS PER AS/NZS 1554.1 SECT 5.3
3. PREHEAT TO BE MEASURED WITH TEMPIL STICK OR DIGITAL THERMOMETER
4. ELECTRODES TO BE PRE-CONDITIONED AND STORED FOR USE AS RECOMMENDED BY THE MANUFACTURER
5. VISUAL INSPECTION OF WELDS AS PER AS/NZS 1554.1 TABLE 6.2.2
6. NDT AS PER CLIENTS SPECIFICATION
7. SEE PQR-AE 001 A FOR EVIDENCE OF QUALIFICATION
8. MACRO REQUIRED IN ACCORDANCE WITH AS/NZS 1554.1 SP TO QUALIFY WPS
9. WPS ALSO QUALIFIES 1.2 DIAMETER WIRE



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WELDING PROCEDURE SPECIFICATION

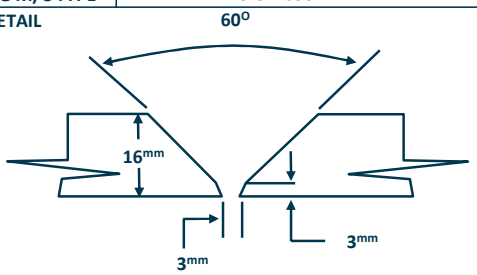
W.P.S. No.	WIA-AE-002 A
REVISION.	0
P.Q.R. No.	PQR-AE-002 A

FABRICATOR:

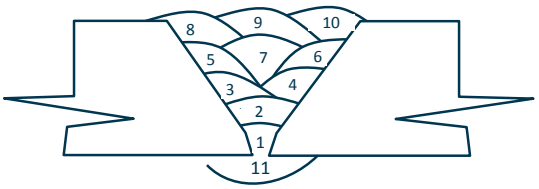
PROJECT: Company Standard Procedure

WELDING CODE	AS/NZS1554.1:2014 SP		
WELDING PROCESS	FCAW		
EDGE PREPERATION	MACHINE/FLAME CUT AND GRIND IN ACCORDANCE WITH WTIA TECH NOTE 5		
JOINT TYPE	PRE-QUALIFIED B-C 2a SINGLE V BUTT WELDED BOTH SIDES	**RANGE QUALIFIED**	B-C 2a & C-C 2a
POSITION	3G (PF) V/UP	**RANGE QUALIFIED:**	3G (PF) V/UP
WELDING M/C TYPE	MILLER DIMENSION 650		

JOINT DETAIL



PASS SEQUENCE **SIDE 1**



BACK GOUGE/GRIND SIDE 2 TO SOUND METAL BEFORE WELDING

SIDE 2

JOINT TOLERANCE		MATERIAL SPECIFICATION				THERMAL TREATMENT	
ROOT OPENING mm	1.5-4.5	**MATERIAL GRADE:**	AS3679.1 350	**GROUP NUMBER**	4	**MINIMUM PREHEAT**	25°C See Note 2
ROOT FACE mm	1.5-4.5	**STEEL TYPE:**	4	**RANGE QUALIFIED:**	1, 2 & 4	**MAX. INTERPASS TEMP**	250°C
GROOVE ANGLE °	55-70°	**PQR THICKNESS**	16mm	**RANGE QUALIFIED:**	8-32mm	**P.W.H.T**	N/A

TECHNIQUE		CONSUMABLES	
STRING OR WEAVE	STRING	**CONSUMABLE SPECIFICATION**	
CLEANING: INITIAL	MACHINE/GRIND	**AS/NZS ISO 17632:**	B-T493T1-1MA-U H10
INTERPASS	CHIP, WIRE BRUSH, GRIND	**AWS A5.20:**	E71T-1M H8
BACKGOUGE METHOD	GOUGE/GRIND	**BRAND NAME**	WIA Austfil Excel
ELECTRICAL STICK OUT	16-24mm		
MAX. WEAVE WIDTH	3mm		
TUNGSTEN SIZE & TYPE	N/A		
ELECTRODE ANGLE	75-85°	**GAS TYPE**	75% Argon 25% CO_2
PROGRESSION	VERTICAL UP	**FLOW RATE**	14-20 L/min

WELD PASS DETAILS			ELECTRODE DISCRIPTION			GAS TYPE	WELDING PARAMETERS			TRAVEL SPEED	MAX	HEAT INPUT
PASS	**SIDE**	**POSITION**	**TYPE**	**SIZE**	**BRAND**	**FLUX TYPE**	**AMPS**	**VOLTS**	**POLARITY**	**mm / min**	**INTERPASS**	**Kj/mm**
1 Root	1	3G	BT493 U	1.6	WIA	75% Ar 25% CO_2	195-240	21-25	DCEP	205-280	250°C	0.87-1.75
2-7 Fill	1	3G	BT493 U	1.6	WIA	75% Ar 25% CO2	205-250	22-26	DCEP	285-400	250°C	0.67-1.36
8-10 Cap	1	3G	BT493 U	1.6	WIA	75% Ar 25% CO2	205-250	22-26	DCEP	170-230	250°C	0.91-1.83
BACK GOUGE/GRIND SIDE 2 TO SOUND METAL BEFORE WELDING												
11	2	3G	BT493 U	1.6	WIA	75% Ar 25% CO2	205-250	22-26	DCEP	290-390	250°C	0.69-0.99

PREPARED BY	WIA	**APPROVED FOR TEST**	Rodney Higgins	**WELDERS NAME / No.**	Mathew Hefferan
DATE	20/04/2021	**DATE**	20/04/2021		20/04/2021

APPROVED FOR CONSTRUCTION

CONTRACTOR				CERTIFYING AUTHORITY	
		CLIENT			
NAME	Rodney Higgins IWT (AU/IWT/00032)	**NAME**		**NAME**	
SIGN		**SIGN**		**SIGN**	
DATE	23/04/2021	**DATE**		**DATE**	

COMMENTS.

1. REMOVE EXTRANEOUS MATERIAL FROM JOINT PRIOR TO ASSEMBLY AND WELDING
2. PREHEAT TO BE DETERMINED FOR LARGER COMBINED THICKNESSES AS PER AS/NZS 1554.1 SECT 5.3
3. PREHEAT TO BE MEASURED WITH TEMPIL STICK OR DIGITAL THERMOMETER
4. ELECTRODES TO BE PRE-CONDITIONED AND STORED FOR USE AS RECOMMENDED BY THE MANUFACTURER
5. VISUAL INSPECTION OF WELDS AS PER AS/NZS 1554.1 TABLE 6.2.2
6. NDT AS PER CLIENTS SPECIFICATION
7 SEE PQR-FM 002 A FOR EVIDENCE OF QUALIFICATION
8. MACRO REQUIRED IN ACCORDANCE WITH AS/NZS 1554.1 SP TO QUALIFY WPS
9. WPS ALSO QUALIFIES 1.2 DIAMETER WIRE

NOTES

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