



QW-482 WELDING PROCEDURE SPECIFICATION
(See QW-200.1, Section, IX, ASME Boiler and Pressure Vessel Code)

WPS NO.	102-101-S010308	DATE	16 May 2019	SUPPORTING PQR'S	0401	
REVISION	0	WELDING PROCESS	GTAW + SMAW	JOINT TYPE	Groove/Fillet	
REV. DATE		WELDING TYPE	Manual*Manual			
JOINTS (QW-402)						
GROOVE DESIGN	As per drawing					
BACKING: (YES/NO)	Yes/No *					
BACKING MATERIAL(TYPE)	Base Metal and/or Weld Metal					
OTHERS	*GTAW-Yes/ No, SMAW-Yes; QW 402.10-As per drawing; QW 402.11-NA					
BASE METALS (QW-403)						
	MATERIAL 1			MATERIAL 2		
P.NO	1			1		
GROUP NO.	1,2			1,2		
SPECIFICATION/GRADE	-			-		
THICKNESS RANGE:(MM)						
BASE METAL GROOVE THICKNESS	5-200			DEPOSITED WELD METAL THICKNESS:(MAX, MM)		
BASE METAL FILLET THICKNESS	Any			GTAW: 12		
MAX PASS THICKNESS	6			SMAW: 200		
OTHERS	NA					
FILLER METALS(QW-404)						
WELDING PROCESS	GTAW		SMAW			
SPEC NO.(SFA)	5.18		5.1			
AWS NO.(CLASS)	ER70S-2		E7018-1			
F.NO	6		4			
A.NO	1		1			
SIZE OF FILLER METAL(MM)	2.4		3.2 4.0			
SUPLIMENTAL FILLER METAL	No		NA			
FILLER METAL TRADE NAME	Any		Any			
FILLER METAL PRODUCT FORM	Bare Solid		NA			
ELECTRODE FLUX(CLASS)	NA		NA			
FLUX TYPE	NA		NA			
FLUX TRADE NAME	NA		NA			
CONSUMABLE INSERT	No		NA			
RECRUSHED SLAG	NA		NA			
CHEMICAL COMPOSITION	NA					
OTHER	QW-404.33-NA; QW-404.50-Not Used.		QW-404.33-NA			
POSITIONS(QW-405)						
PROCESS(ES)	GTAW		SMAW		F=FLAT	
POSITION(S) OF GROOVE	All		All		H=HORIZONTAL	
WELDING PROGRESSION	Vertical-Uphill		Vertical-Uphill		V=VERTICAL	
POSITION(S) OF FILLET	All		All		O=OVERHEAD	
OTHER:	NA					
PREHEAT(QW-406)						
THICKNESS RANGE(MM)	<25	25-32	32-75	75-100	=>100	
PREHEAT TEMP.(°C/MIN)	25	50	100	125	150	
INTERPASS TEMP.(°C/MAX)	275					
PREHEAT MAINTENANCE	NA					
OTHER	NA					

PREPARED BY	MAULIK H THAKKAR	APPROVED BY	
	<i>(Signature)</i> 21/5/19		<i>(Signature)</i> 21/5/19



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REVISION

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POSTWELD HEAT TREATMENT (QW-407)											
TYPE OF PWHT		STRESS RELIEVING									
PWHT TEMP. RANGE (°C)		670-690									
PWHT TIME RANGE		4 Hrs. 30 Min.									
Rate Of Cooling (°C/Hr)		As per Drg.									
METHOD OF PWHT		Gas / Electric									
PWHT NOTES		See eqpt. Drg./Spec for restriction within above range if any									
OTHER		NA									
GAS (QW-408)											
				GTAW				SMAW			
		Gas(es)	% Composition	Flowrate(LPM)			Gas(es)	% Composition	Flowrate(LPM)		
SHIELDING GAS		Argon - Welding Grade	99.995	5-15			NA	NA	NA		
BACKING GAS		NA	NA	NA			NA	NA	NA		
TRAILING GAS		NA	NA	NA			NA	NA	NA		
OTHER:		NA									
ELECTRICAL CHARACTERISTICS (QW-409)											
WELD LAYER(S)	PROCESS	FILLER METAL		FLUX TRADE NAME	CURRENT		VOLT RANGE	TRAVEL SPEED RANGE (MM/MIN)	WIRE FEED SPEED RANGE (MM/MIN)	MAX HEAT Input (KJ/MM)	BEAD LENGTH per electrode for SMAW (MM)
		AWS CLASS	SIZE (mm)		TYPE & POLARITY	AMP RANGE					
AS REQ-2MI	GTAW	ER70S-2	2.4	NA	DC-EN	100-140	15-22	65 MIN	NA	NA	NA
AS REQ-2MI	SMAW	E7018-1	3.2	NA	DC-EP	100-140	22-28	NA	NA	NA	75
AS REQ-2MI	SMAW	E7018-1	4.0	NA	DC-EP	140-180	22-28	NA	NA	NA	125
TUNGSTEN				EWTh-2/EWCe-2			TUNGSTEN SIZE(mm)		2.4/3.2		
MODE OF METAL TRANSFER(GMAW/FCAW)				NA			PULSING		No		
TECHNIQUE (QW-410)											
WELDING PROCESS		GTAW				SMAW					
MULTIPLE/SINGLE ELECTRODE		Single				NA					
MULTIPLE/SINGLE PASS(PER SIDE)		Multiple				Multiple					
STRING/WEAVE		String/Weave				String/Weave					
CONTACT TUBE#WORK DISTANCE(MM)		NA				NA					
ELECTRODE SPACING(MM)		NA				NA					
GAS CUP OR NOZZLE SIZE(MM)		6.3-19				NA					
OSCILLATION		No				NA					
OSCILLATION WIDTH(MM)		NA				NA					
OSCILLATION FRE(CPM)		NA				NA					
PEENING		No									
SUPPLEMENTAL DEVICE		NA									
INITIAL/INTERPASS CLEANING		Wire Brush or Grind; Flame cut or Arc Ground Surfaces to be ground or machined.									
METHOD OF BACKGOUGING		-									
NOTES											
1. Weaving shall be <3 times electrode core diameter (For SMAW).											
2. GTAW shall be equipped with HF start unit.											
3. QW-404 14-Deletion of filler-Not Allowed.											
4. QW-410.11, .54 - NA.											
5. NA-Not Applicable.											

PREPARED BY	APPROVED BY
MAULIK H THAKKAR <i>(Signature)</i> 24/11/19	<i>(Signature)</i> S. G. S. S. S.



LARSEN & TOUBRO LIMITED, HED - HMC
QW - 483 PROCEDURE QUALIFICATION RECORD
 (See QW - 200.2, Section IX, ASME Boiler and Pressure Vessel Code)

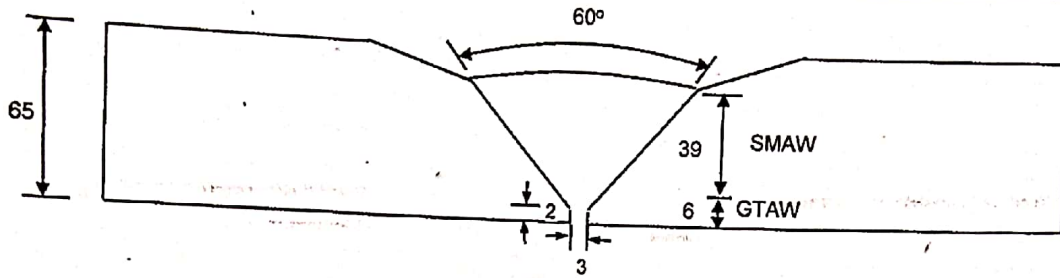
Procedure Qualification Record No : 6461

WPS No. : 102-171

Welding Process(es) : GTAW + SMAW

Type (Manual, Machine, Automatic, Semi-Auto) : MANUAL + MANUAL

JOINTS (QW-402)



ALL DIMENSIONS ARE IN 'mm'

BASE METALS (QW-403)

Spec. / Grade : SA 516M GR. 485 # SA 516M GR. 485
 P No. & Gr. No. : 1 & 2 # 1 & 2
 Thickness : 45 mm
 Diameter : NA
 H/T Condition : NORMALISED
 Groove Prep. By : MACHINING
 Others : 1 pass < 7 mm

POST WELD HEAT TREATMENT (QW-407)

PWHT Type : STRESS RELIEVING
 Temperature : 677-705 °C
 Time : 4 HRS 5 MIN
 Heating Rate : 39 °C/HR
 Cooling Rate : 36 °C/HR

GAS (QW-408)

Type of Gas	Shielding	Purging	Trailing
ARGON	NA	NA	NA
Comp. of Gas	99.995%	NA	NA
Flow Rate (LPM)	5 - 7.5	NA	NA
Other	NA	NA	NA

FILLER METAL (QW-404)

Process	GTAW	SMAW
WM Analysis A No.	: 1	1
Size	: 2.4	3,2,4,0
Filler Metal F No.	: 8	4
SFA Specification	: 5.18	5.1
AWS Classification	: ER70S-2	E7018-1
Flux for SAW	: NA	NA
BRAND NAME	: TIGFIL-70S-2	ULTIMATE-18 (SPL)
Deposited weld thk	: 6 mm	39 mm
Others	: ADOR MAKE	HONAVAR MAKE

ELECTRICAL CHARACTERISTIC (QW-409)

Process	GTAW	SMAW
Current (AC/DC)	: DC	DC
Polarity	: EN	EP
Amperes (Range)	: 100-140	110-140 (φ 3.2)#
Voltage (Range)	: 15-22	22-28
Tungsten Electrode Type & Size	: EWTh-2 (φ2.4)	NA
Mode of Metal Transfer	: NA	NA
Other	: # 140-180 A (φ 4.0)	

POSITION (QW-405)

Position of Groove : 3G
 Weld Progression : VERTICAL UPHILL
 Others : NA

TECHNIQUE (QW-410)

Process	GTAW	SMAW
Travel Speed (mm/min) Min.	: 65 Min.	70 (φ 3.2), 90 (φ 4.0)
Min. Bead Length (mm)	: NA	75 (φ 3.2), 125 (φ 4.0)#
Max. Heat Input (kJ/mm)	: 2.84	3.36
String/Weave Bead	: ---STRING/WEAVE---	
Oscillation	: NO	NO
Single/Multi Pass/Layer (per side)	: MULTIPLE	MULTIPLE
Single/Multiple Electrodes	: SINGLE	SINGLE
Height of Each Layer (for O/L)	: NA	NA
Bead Overlap (for O/L)	: NA	NA
Magnetic Steering Device	: NA	NA
Contact Tube to Work Dist	: NA	NA
Other	: # 400 mm burnt out of 450 mm	

PREHEAT (QW-406)

Preheat Temp. : 75 °C
 Interpass Temp. : 275 °C
 DHT/ISR : NA
 Others : NA

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Surat Office
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 12/10/14

12/10/14 (CPBP)

TENSILE TEST (QW-150)									
Specimen No.	Thickness (mm)	Width (mm)	Area (mm ²)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm ²)	Character of Failure & Location			Others
8291 T1	43.35	19.15	830.15	445384	537	DUCTILE & WELD			NA
8291 T2	43.39	19.1	828.79	448050	541	DUCTILE & WELD			NA

Specimen No.	GAUGE DIA. (mm)	GAUGE LENGTH (mm)	Area (mm ²)	Yield Load (N)	Yield Stress (N/mm ²)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm ²)	% Elong.	% RA	Others (Type of failure)

GUIDED BEND TEST (QW-160)	
Type & Figure No.	Result
SB1, SB2	SATISFACTORY
SB3, SB4	SATISFACTORY

TOUGHNESS TEST* (QW-170)									
Spec. Size: 10 x 10 x 55 MM		Notch Type: CHARPY 'V' - 2 mm /				Other			
Specimen No	Notch Location	Test Temp. (°C)	Impact Values - Joules				LE (mm)	PS (%)	
			1	2	3	Avg.			
AW1-3 (1.5 mm From Bottom.)	WELD (GTAW + SMAW)	-30	71	37	33	47	0.65, 0.25, 0.21	30, 10, 10	
BW1-3 (3/4T From Bottom.)	WELD (SMAW)	-30	46	125	54	75	0.32, 1.12, 0.45	20, 50, 20	
AH1-3 (1.5 mm From Bottom.)	HAZ (GTAW + SMAW)	-30	71	123	106	100	0.63, 1.10, 1.02	30, 40, 40	
BH1-3 (3/4T From Bottom.)	HAZ (SMAW)	-30	125	104	51	93	1.14, 0.99, 0.45	40, 40, 30	

OTHER TEST*

TYPE OF TEST

Macro Examination : SATISFACTORY

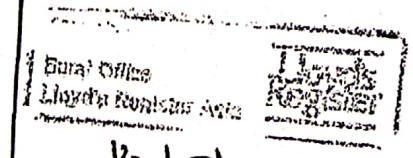
HARDNESS SURVEY*			
LOCATION	WELD	HAZ	BASE METAL
HARDNESS SCALE:		INDENTOR:	
		LOAD: Kgs.	
REFER ANNEXURE - I			

WELDER'S NAME: PIYUSH PATEL P.S. NO.: - Stamp No.: HYK

Tests conducted by: Welding Engineering Department, Hazira Works. Laboratory Test No. PQR/5291/1

We certify that the statements made in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX, Edition 2010.

* Testing in addition to Section IX.



Date: - 12/10/2011

For LARSEN & TOUBRO LIMITED

By - PRATIK PATEL
12/10/11

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