Weld Procedure and Welder Qualifications

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1. Determine the governing standard the fabrication is being carried out in accordance with.





- Typical National Standards applicable to stainless steel fabrications
 - BS EN ISO 15614-1
 - PD5500
 - ASME IX
 - AWS D1.6
 - National standards are based on procedures meeting the mechanical requirements of the base materials.



- Other standards or codes that might be applicable on a project basis include but are not limited to:
 - DNV Rules
 - Lloyds Rules
 - Norsok standards
 - EEMUA 194



These codes are specified as they contain additional supplementary tests for metallurgical and corrosion requirements.

Impact tests Intergranular corrosion tests for austenitics Ferrite counts for Duplexes Pitting corrosion test for Dupexes



- Having determined the relevant governing standards
- 2. From the project drawings determine the materials specifications and grades.
 - Allocate the applicable material groups
 - To BS EN ISO 15614-1
 - Austenitic stainless steels are group 8
 - Ferritic stainless steels are group 7.1
 - Martensitic stainless steels are group 7.2
 - Duplex stainless steels are group 10



- Applicable material groups
 - To ASME IX
 - Austenitic stainless steels are P No 8
 - Ferritic stainless steels are P No 6
 - Martensitic stainless steels are P No 7
 - Duplex stainless steels are P No 10
 - To AWS D1.6
 - Austenitic stainless steels are A or B
 - Others are grouped C-E
 - The material group is necessary to determine the range of qualification for a procedure.



- 3. Determine the type of weld joints, butt, partial penetration, fillet etc.
 - Most standards accept a butt weld to qualify many other configurations





- A single sided butt weld will qualify, single sided and double sided. But a double sided will not qualify a single sided.
- A butt weld will qualify a fillet weld.
- BS EN ISO 15614-1, states a fillet weld should be qualified, if production is predominately fillet welds.



- 4. Determine the minimum and maximum material thicknesses for each group and joint type.
 - Most standards accept a the thickness qualified as covering a range of thicknesses, BS EN ISO 15614-1 normally states 1/2t – 2t, but there are variations, ie minimum limits.





- 5. Determine the welding processes to be used in production.
 - Each process is qualified separately for all standards,
 - although some allow qualification of multi process joints, ie TIG root + MMA Fill by individual process qualification.



- 6. Chose welding consumables.
 - For each process,
 - To match the material grades and supplementary requirements.



• 7. Determine which welding positions are to be used in production.





- Standards vary on the range of positions qualified by a procedure and reference to the governing standard will be necessary.
- For example
 - A vertical up butt weld procedure to:
 - BS EN ISO 15614-1 covers butts and fillets in any position, unless impact or hardness tests are required, then only that position.
 - AWS D1.6 and ASME IX, this would cover butts in F& V and fillets in F,H & V.



- 8. Having now determined what is being welded and how.
 - Check existing weld procedure qualifications for compliance with the governing standards.
 - For simple standard applications you may be able to use 'prequalifed procedures', to AWS D1.6 or BS EN ISO 15610
 - Otherwise prepare pWPS's for welds not covered and run procedure qualifications.



TWI software Weldspec

- TWI software Weldspec
 - Can collate all your existing weld procedures by standards.
 - Prepare pWPS's and WPQ's with applicable ranges.
 - Print certificates.





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I IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	pWPS re	cord number 101	Revision 0	WPS record number	101	Revision 0				
⊡	Date	30/04/2015		Company name	/ XYZ Fabs					
⊞	PACE ME									
ASME IX records		Product form	Specification (type or grade)	Grp-po	Size mm Sch Thick	mm Dia mm				
AWS D1.1 records		Pipe	EN 10217-1 (P235TR1)	1.1	50.80 40 3.91	60.33				
	Welded to:	Pipe	EN 10217-1 (P235TR1)	1.1	50.80 40 3.91	60.33				
	and tested:	v Without PWHT	☐ With impacts	Vith hardne	ss 🔽 Supplementa	ry tests only				
		With PWHT Fillet-weld test Other tests Heat input control								
	Notes	L Tube expansion prior to								
	IONTS									
	JOINTS		laint danian	laint design Walking sequence						
	Joint des	ign Butt-pipe ss nb								
	Backing	nb: without backing				∽∥				
	Retainers	None								
	Groove a	ngle deg. 74		4						
	Root ope	ning mm 2·4								
	Root face	e mm 0-2		←						
	WELDING	PROCESSES								
	Welding	process	141: TIG	141: TIG						
	Туре		Manual	Manual						
	FILLER M	ETALS	·	-						
							-			
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- Advice for running weld procedures:
 - Involve third party witness, Lloyds DNV, before welding
 - Qualify the largest ranges possible
 - Qualify the highest material group possible for consumables chosen
 - Add supplementary tests, impacts, ferrite counts, G48 if possible. More expense to do supplementary tests at a later date.







- Welder qualification requirements are defined in the national standards.
 - BS EN ISO 9606 -1
 - ASME IX
 - AWS D1.6
- Other codes tend to refer to the national standards for welder qualification
 - Norsok refers to BS EN ISO 9606 -1

TWI World Centre for Materials Joining Technology

- Differences between National standards
- Joint types
 - ASME IX & AWS D1.6, state a butt weld qualifies fillet welds
 - BS EN ISO 9606 -1, requires a separate qualification for fillet welds.
- Positions
 - Higher position qualifies lower positions



- Much the same process as for weld procedures;
 - Application standards
 - Materials
 - Joint types
 - Thicknesses
 - Welding processes
 - Welding positions



TWI Software Welderspec

- TWI software Welderspec.
 - Can collate all your existing weld qualifications by standards, welder or procedure.
 - Prepare Welder Qualifications with applicable ranges.
 - Print certificates.
 - Monitor validity.
 - Software talks to Weldspec.



🔕 Welderqual - [EN WPQ00001]												<u>_ 8 ×</u>
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	Welder Performance Qualification Additional information											
□□···♥ WPU 市····♥ Geoff Balph	TWI Technology Centre											
SME IX records	EN 287-1 / ISO 9606-1 - Welder Qualification Test Certificate (WPQ) Welderqual											
AWS D1.1 records Welder Maintenance Loss (W/ML)												
E Geoff Ralph	EN DESIGNATION	EN DESIGNATION										
	Designation	Designation EN ISO 9606-1, 141, T, BW, FM1, S, s3.91, t3.91, D60.33, PA, ss gb								1		
		1										
	Welder's name	Joe Bloggs		Welder's picture	Test date	20/04/3	2015	_				
	ID Number				WPQ record nu	mber 101			_			
	Date of birth	09/05/2014			Standard test n	o.			Rev.			
	Stamp number				WPS record nu	mber			Rev.			
	Company name	Nuttals			Qualification co	de EN ISO	9606-1: 2	013				
	Division				Examining body				-			
	Job knowledge	Not tested			Deference no				-			
	Devalidation met	had 9 2(b) Rouplidate	in 2 up pro		Reference no.	21/04/	2017	_				
		Revailation date 21/04/2017										
	BASE METALS		On a sife stin	(h	0	0	0h	Think	Die			
	Produ	uct form	EN 10216-1	(type or grade) (P265TB1)	Gr]	1 50.80	5cn.	3.91	mm Dia. mn 60.33			
	Welded to: Pipe		EN 10216-1	(P265TB1)	1	1 50.80	40	3.91	60.33			
	I ipe				J.	1 130.00	140	10.01	100.00			
	Joint type	Joint type Butt C Fillet Branch Supplementary fillet weld test Combined Fillet/Butt test										
	VARIABLES	VARIABLES ACTUAL VALUES RANGE QUALIFIED										
	Type of weld join	nt P	Pipe - Butt			Butt welds and Branch welds where angle >= 60°						
	Base metal	1	1.1 to 1.1									
								Fillat				
	BASE METAL THICKNESS Butt Fillet Butt Fillet						rindt	a 4				
	Plate thickness	mm 1-			l I	•						
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- Advice on welder qualifications.
 - Qualify the largest ranges
 - BS EN ISO 9606-1
 - 3-<12mm qualifies 3mm-2t
 - 12mm qualifies 3mm and above.
 - Keep minimum number of qualifications
 - Keep volumetric NDT results for updating validity.

