

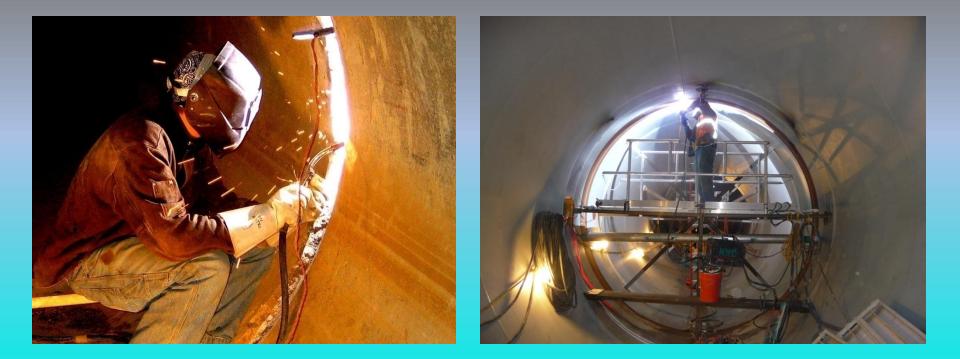
Second Edition



ASCE Manuals and Reports on Engineering Practice No. 79 ASCE

ASCE MOP 79, Chapter 11 – Welding, Overview Nash Williams-National Welding Corp.





"Welding of steel penstocks is critical to the success of hydroelectric projects."





- Welding requirements previously spread throughout 6 chapters
 - Committee task was to compile into a single welding Chapter
 - Consolidated by removing redundancies and conflicts
 - Welding design still based on ASME Section VIII, Division 1



Variety of Penstock configurations Overview





Welding Procedures and Practices Utilize both ASME Sect. VIII or AWS D1.1



NATIONAL WELDING CORPORATION PROCEDURE QUALIFICATION RECORD (POR) Revision 0

6/21/2005 SEMI-AUTOMATIC 6G Uphill
6G
Uphill
NA
(Root Only), FCAW Spray
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Weave
Single
Multiple Electrode
Sector Street and Street Stree
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ngle NA
.750"
No
Mechanical-Power Brush
60X29.1X262/11.5=39.8 KJ/in
NA
no.
50 Deg. F 500 Deg. F
SUU Deg. P
VOLTS TRAVEL SPEEL
VOLTS TRAVEL SPEED
19 6.6 IPM
29.1 11.5 IPM
IP 2

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2 0. Specimen No. 3 4		Width Thickness Area		PSI	Location
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3 4					
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6 SIDE BEND		PASSED			
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1 3	s	13	Laboratory Test	NO. N/	
THER TESTS					
Welders Name	Troy Wittusen				

Welding Procedures comprised of 3 key documents

- Procedure Qualification Record (PQR)
- Welding Procedure Specification (WPS)
- Welder Performance Qualification (WPQ)



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VELDING PROCEDURE SPECIFICATION M		X07 (Butt w/Backup)	DATE	198301 191	6/21/2005
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	10	TI		L.	
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ASE METALS (QW-403) *					
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POSITIONS (QW	/-409}								
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	s of Fillet		ALL	Птека	inge			NA.	_
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	rature Minimum		50 DEG F		Percent Gas(es)		nt Composition s) Mixture Flow Rate		
	rature Minimum erature Maximum	-	500 DEG F	Shieldin		s(es) /CO2	75/25		8 CFH
Preheat Mainte		_	50 DEG F	Trailing			13/23	304	ourn
rieneat manite	endince	-	500201	Backing					
ELECTRICAL CH	ARACHTERSITICS (C	2W-409)		1	10 W				
Current (AC or I		DC		Polarity				EP	
Amps Range FC	AW	236-28	8	Volts Ra	ange FCAW	-	27.1-31.1		
	Tungsten Electrode	e Size and T	vpe	NA					
	Mode of Metal Tra	insfer	Mas.	NA NA					
	Mode of Metal Tra Electrode Wire Fee	insfer	Mas.				FCAW	450-5	550
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Welding Procedure Specification

Provides parameter ranges



NATIONAL WELDING CORPORATION

WELDER OR WELDING OPERATOR QUALIFICATION RECORD (WQR)

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	SSED BY		BRYAN HA	NSEN CWI		DATE	5/13/2010	
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					MI-AUTOMATIC	FEATU	SEMI-AUTOMATIC	
PROCESS/TY				FLAW/SE	DCEP	FCAW,	DCEP	
CURRENT/PI					JP AND 4G	A	GROOVE & FILLET	
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BACKING (YE					NO TO	-	NO	
	PECIFICATION			A516	GRADE 70	A	516 GRADE 70	
BASE METAL	ASE METAL:				10000			
	THICKNESS: PLATE				.375"		.125"-750"	
		PIPE/TUBE			NA		.125"-750"	
	DIAMETER:	PIPE/TUBE			NA	2	4" AND OVER	
FILLER META	AL:							
	SPECIFIICATIO	ON NUMBER			A 5.20		4 5.20, A5.29	
	CLASSIFICATI	ON			E71T1	1 1	71T1, E81T1	
	F-NUMBER				6		6	
GAS/FLUX TI	(PE			75% AR	SON, 25% CO2	75%.	ARGON, 25% CO2	
OTHER								
FILLET TEST RESULTS: APPEARANCE								
ILLET TEST	RESULTS:	APPEARAN		NA	FILLET SIZE		NA	
RACTURE T	RESULTS: EST ROOT PENET	APPEARAN	CE	NA NA	MACROETCH		NA	
RACTURE T	RESULTS: EST ROOT PENET	APPEARAN	CE	NA NA		<u>N</u>		
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FILLET TEST I FRACTURE T DESCRIBE TH GUIDED BEN	RESULTS: EST ROOT PENET IE LOCATION, NA	APPEARAN RATION ATURE AND SI	CE	NA NA CK OR TEARING C	MACROETCH OF THE SPECIMEN	_	NA	
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NATIONAL WELDING CORP.

Welders Continuity Log

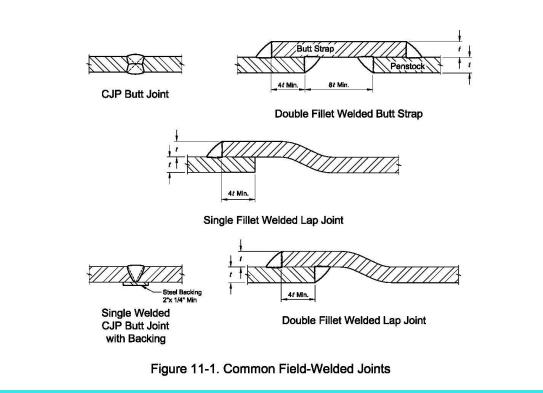
Welder Name	Hardy Brow	n Stamp	Number.	HB
Foreman:	No	Identif	ication No.	123456789
Welder Active	Yes	Acti	ve Date	5/16/2010
PROCESS	ORIGINAL	MOST RECENT DATE WELDED	PROJECT	EXPIRATION DATE
FCAW-Semi-Auto	5/16/2010	10/25/2010	Palo Verde Nuclear Phoenix, AZ	4/25/2011
FCAW-Semi-Auto	5/16/2010	6/15/2011	Blue Ridge Penstock B Ridge, GA	lue 12/15/2011
			· · · · · · · · · · · · · · · · · · ·	
tes: Hardy tional Welding Corpora		tinuously for National W	elding since hiring on Date	5/16/2010

7025 S. Commerce Park Dr., Midvale, UT 84047 * PH (801) 255-5959 * FAX (801) 255-5919

Welder Performance Qualification

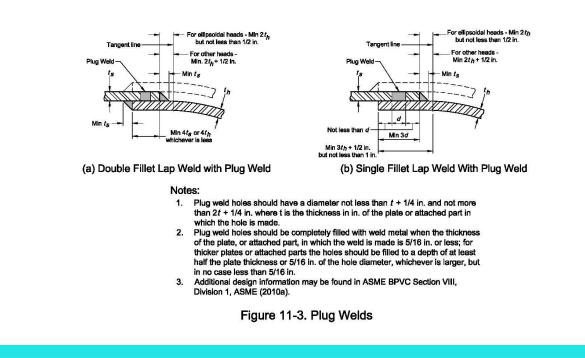
Documents a welders ability to deposit sound welds





Longitudinal joints are generally full penetration butt joints (CJP) Circumferential joints can be a butt weld or fillet weld (designer discretion)





Plug Welds have been added to this manual

Less common joint type but often found beneficial to designers intending to increase joint strength





Flux Cored Arc Welding Gas Metal Arc Welding



Welding Processes

Shielded Metal Arc Welding

Stick-Manual

- FCAW (Flux Cored Arc Welding)
- GMAW (Gas Metal Arc Welding)
- SMAW (Shielded Metal Arc Welding)
 - SAW (Submerged Arc Welding)

Submerged Arc Welding

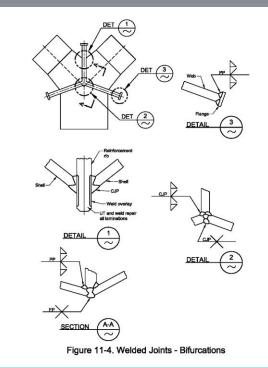


Assembly and Thermal Affects









Bifurcations and Joint Designs





Importance of Inspection

See Chapter 14

Question & Answer

CARSON

NIIGAZ

