Los Alamos NATIONAL LABORATORY

WELDING PROCEDURE SPECIFICATION

WPS: 3503-xxxx-1/11B **REV. NO.:** 1 **DATE:** 1/30/2006 ****APPLICABILITY****
WELDING PROCESS: FCAW **and** FCAW **CODE:** ASME IX **OTHER:**
SUPPORTING PQR: P-FC-4-1G

JOINT: **This WPS shall be used in conjunction with the General Welding Standards (GWS) and Welding Fabrication Procedure (WFP) sections and criteria for joint details, repairs, NDE, inspection, etc.**

Weld Joint Type: Groove/fillet **Class:** Full & Partial Penetration & Fillets
See GWS 1-06 and WFP's for joint details. **Preparation:** Mechanical/thermal
Root Opening: 3/32 - 1/4 **Backing:** CS strap/ring when used
Backgrind Root: Double sided joints **Backing Mat.:** CS when uused
Bkgrd Method: Arc gouge/grind/chip **GTAW Flux:** N/A **Backing Retainer:** N/A

FILLER METALS: **Class:** E7xT-x-x **and** E7xT-x
A No: 1 **SFA Class:** 5.20 **and** 5.2 **F No:** 6 **and** N/A **Size:** .045 .045 .062 .062
Insert: N/A **Insert Type:** N/A **Weld Metal Thickness Ranges:**
Flux: **Type:** N/A **Size:** N/A **AWS Root Pass:**
Filler Material Note: Wire types limited to E71T-1 and E71T-5 .045" and .062 dia. Wires **AWS Balance:**
ASME Root Pass: 0.187 **thru** 0.49
ASME Balance: 0.187 **thru** 3

BASE MATERIAL:

	P No: 1	**Gr No.:** All	**to P No.:** 11B	**Gr No.:** All
Spec.: A-36 CS- Plate, bars & shapes	**Grade:** All	**to Spec.:** HSLA-80 AS- Plate		**Grade:** All
Qualified Pipe Dia. Range: >=	**AWS:** 0	**ASME:** 0.25		
Qualified Thickness Range:	**AWS:**	**ASME:** 0.187 **thru** 3		

QUALIFIED POSITIONS: **AWS:** 1G, 1F, 2F **ASME:** All **Vert. Prog.:** V/UP

Preheat Min. Temp.:	70	**GAS: Shielding:** Argon	**or**	N/A
Interpass Max. Temp.:	500 **°F**	**Gas Composition:** 75 / 25 / 0 %		0 / 0 / %
Preheat Maintenance:	70 **°F**	**Gas Flow Rate cfh:** 25 **to** 40		25 **to** 45
PWHT: Time @ °F Temp.:	N/A	**Backing Gas/Comp:** N/A		0 **%**
Temperature Range:	N/A **°F to** N/A **°F**	**Backing Gas Flow cfh:** 0 **to** 0		
		Trailing Gas/Comp: N/A		0 **%**

WELDING CHARACTERISTICS:

Current: DCEP **and** N/A	**Tungsten Type:** N/A	**Transfer Mode:** Spray	
Ranges: **Amps:** 180 **to** 300	**Tungsten Dia.:**	**Pulsing Cycle:** N/A **to** N/A	
Volts: 24 **to** 32		**Background Current:** N/A	
Fuel Gas: N/A	**Flame:** N/A	**Braze Temp °F:** N/A **to** N/A	

WELDING TECHNIQUE: **For fabrication specific requirements such as fitup, cleaning, grinding, PWHT and inspection criteria, refer to Volume 2, Welding Fabrication Procedures.**

Technique:	Semi-auto. Man.	**Cleaning Method:** Chip/wire brush/file		
Single or Multi Pass:	M	**Stringer or Weave Bead (S/W):** S	**Oscillation:** N/A	
GMAW Gun Angle:	5 ° **to** 15 °	**Forehand or Backhand for GMAW:** FH/BH		
No Pass > 1/2":	True	**GMAW/FCAW Tube to Work Distance (in):** 5/8"-3/4"		
Maximum K/J Heat Input:	** **KJ/in**	**Travel Speed:** Varies	**Gas Cup Size:** 1/2 - 3/4	

PROCEDURE QUALIFIED FOR:
Charpy "V" Notch: N/A **Nil-Ductile Transition Temperature:** N/A **Dynamic Tear:** N/A

Comments: 1)*Material thickness = 3/4" = 225° F min. 2) **Joule heat imput = 50K inch. 2) Use tempering bead technique (bead on bead) 3) Pipe position limitd to 1G rolled position with backing ring only.

Weld Layer	Manual Process	Filler Metals	Size	Amp Range	Volt Range	Travel/ipm	Nozzle Angle	Other
1	FCAW	E7xT-x-x	.045	180 **to** 225	24 **to** 28	4 **to** 9	5 **to** 15	
2	FCAW	E7xT-x	.045	180 **to** 225	24 **to** 28	4 **to** 9		
3	FCAW	E7xT-x	.062	250 **to** 300	26 **to** 32	4 **to** 9		
4	FCAW	E7xT-x	.062	250 **to** 300	26 **to** 32	4 **to** 9		

REM. * Weld layers are representative only - actual number pf passes and layer sequence may vary.

ML-1/2 projects or jobs must determine if the supporting documentation for this WPS complies with quality requirements of the project/job.

Use of LANL Welding Procedures and Welder Qualifications for non-LANL work shall be at the sole risk and responsibility of the Subcontractor, and the Subcontractor shall indemnify and save LANL and the Government harmless from any and all claims, demands, actions or causes of action, and for any expense or loss by the reason of Subcontractor's and their employees posession and use of LANL procedures and qualifications.

APPROVAL: Signatures on file at ES-FE **DATE:** 1/30/2006