

# XI. Best Practices

DENC and DESC Welding Manual - Version 2019.1 May 1, 2019

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### **A. Number of Welders**

To maintain a uniformity among the welding procedures, the following guidelines have been established into the procedures for determining the number of welders:

1. The number of welders required is determined by the carrier pipe's outer diameter.
2. For all weld types  $< 2 \frac{3}{8}$ " O.D. carrier pipe – one welder maximum
3. For circumferential welds on  $\leq 6 \frac{5}{8}$ " O.D. carrier pipe – one welder maximum to minimize heat stress on carrier pipe.
4. For all weld types  $\geq 2 \frac{3}{8}$ " through  $12 \frac{3}{4}$ " O.D. carrier pipe - One or two welders as needed; Root and hot pass welders shall be equal in number; Only one welder is required for roll welding or fabrication
5. For all welds  $> 12 \frac{3}{4}$ " O.D. carrier pipe - Minimum two welders required for sizes 14" O.D. through 26" O.D. to minimize crawling or jumping around pipe; three or four welders for sizes over 26" O.D.; Root and hot pass welders shall be equal in number; Only one welder is required for roll welding or fabrication
6. In addition, for maintenance welds only on  $\geq 2 \frac{3}{8}$ " O.D. carrier pipe - Two welders simultaneously welding a circumferential weld must weld in opposite quadrants thru the hot (second) pass.

### **B. Heat Treatment**

As to maximize fusion capability of the higher yield strength base materials, it is considered best practice and required to preheat the base pipe when the pipe is wet, the temperature of the pipe is below 40°F, the material grade is greater than 52,000psi, the carbon equivalency is greater than 0.40%, and/or the wall thickness is greater than 0.500in. There may be instances due to weather or high flow related conditions where post weld heat treatment would prove beneficial. However, no post weld heat treatment is required.

### **C. In-service welding on $\leq 2 \frac{3}{8}$ " O.D. carrier pipe**

For any in-service welding procedure specification on  $\leq 2 \frac{3}{8}$ " O.D. carrier pipe, it is up to the welder's discretion to utilize either cellulose or low hydrogen filler material with following the proper associated welding procedure.

**D. Time Lapse Between Passes**

A five (5) minute time allotment is to be provided between the stringer root pass and the following hot pass as a standard across all Company welding procedure specifications. There is no limitation to a complete weld out time due to consideration of non-typical conditions, long weekends and holidays, except where designated on special project "SP" procedures.

**E. Typical Electrode Amperage/Voltage Ranges**

Cellulose Coated Electrodes (E6010, E7010, E8010, E9010)		
Diameter (in)	Amperage	Voltage
3/32	50 - 90	22 - 25
1/8	90 - 130	22 - 27
5/32	130 - 170	25 - 30
3/16	160 - 200	25 - 30
Low Hydrogen Electrodes (E7018, E8018, E9018)		
3/32	80 - 100	20 - 23
1/8	115 - 135	20 - 23
5/32	10 - 190	20 - 23

(UNCONTROLLED IF PRINTED)