

WPS 3-01 – Application of Welding Procedure Specifications

Rev. 1, 10/27/06

Attachment 6: AWS Prequalified Welding Procedure

AWS PREQUALIFIED WELDING PROCEDURE

WPS: 3503-D1.1-1 Revision No.: 0 Date: 11/24/2025 Welding Process: FCAW-G
 BASE MATERIALS: Spec: ASTM A500 Grade: C to Spec: ASTM A572 Grade: 50
 Qualified Thickness Range 1/8" - Unlimited, except square groove is limited as specified in AWS D1.1 Figure 5.1 & 5.2
 FILLER METALS: Spec: A/SFA 5.20 & N/A Class: E71T-1M & N/A
147 ultracore SR12H Lincoln

WELD JOINT:

Joints welded with this procedure shall conform with details as specified by joint designation in GWS 1-06, Weld Joint Design:

Acceptable Joint Designation Any AWS D1.1 Figure 5.1, 5.2, 5.3, 5.4 & 5.5 Positions: See Additional Variables

Root Treatment: Gouge, Chip, Wire Brush or Grind as required Backing: Any Group 1, 2 or weld metal

Progression: Vertical Up PWHT: N/A Preparation: Wire Brush or Grind

SHIELDING Gas: AWS A5.32, Argon / CO2 PREHEAT: Minimum Temp ° F 50F BM 1/8" - 1-1/2",
 Composition: 75 % 25 % N/A % N/A % 150F BM 1-1/2" - 2-1/2", 225F BM > 2-1/2"
 Flow Rate: CFH 28 to 38 INTERPASS: Maximum Temp ° F 500F

WELDING CHARACTERISTICS: Current and Polarity: DC and EP

Transfer Mode: SPRAY Pulsing Cycle: N/A to N/A

WELDING TECHNIQUE: Stringer (S) or Weave (W) Bead: Either Oscillation: N/A

Single or Multi Pass: Multi Pass Single or Multiple Arc: Single

Forehand (F) or Backhand(B) for GMAW: F GMAW Gun Angle °: 5 to 15

WELDING PARAMETERS			
Filler Size	Amp Range	Volt Range	Travel Speed
0.045"	125 - 245	22 - 28	22 - 28 ipm

NOTE: This WPS has been prepared in accordance with AWS D1.1 2020 Clause 5. Prequalification of WPS's.

Signature on file at ES-FE

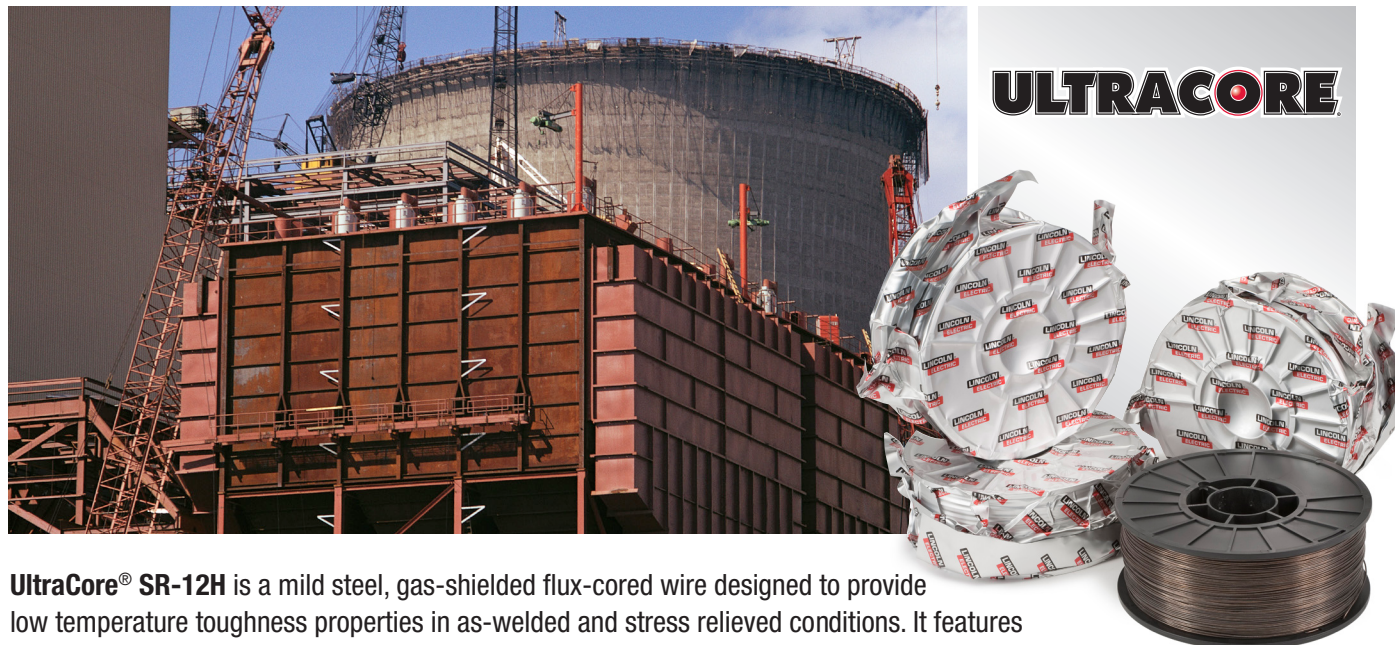
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DATE

Additional Variables: 5/16" Max Root Pass Thickness, 1/4" Max Fill Pass Thickness, 5/16" Max Single Pass Fillet Weld Size, Weave limited to 5/8" wide except vertical position which is limited to 1". Position is as specified by joint designation in AWS D1.1 Figures 5.1, 5.2, 5.3, 5.4 & 5.5, Any Base Metal From Group 1 or 2 is allowed, Wire Feed Speed 175 - 475 in/min, Only CV (Constant Voltage) Power Supply is allowed. For PJP groove welds follow AWS D1.1 Table 5.5. Recommended to use Lincoln Electric UltraCore SR-12H weld filler metal.

UltraCore® SR-12H

AWS E71T-1M-JH4, E71T-9M-JH4, E71T-12M-JH4



UltraCore® SR-12H is a mild steel, gas-shielded flux-cored wire designed to provide low temperature toughness properties in as-welded and stress relieved conditions. It features (H4) diffusible hydrogen levels and protech packaging for improved moisture resistance. For a mixed gas electrode optimized to meet your post weld heat treatment needs - choose UltraCore® SR-12H.

KEY FEATURES

- ▶ **Impact Toughness** - Capable of producing weld deposits with impact toughness of 70 - 110 ft•lbs @ -40°F (as welded and after 8 hrs. PWHT @ 1150°F).
- ▶ **Diffusible Hydrogen** - Meets H4 diffusible hydrogen levels
- ▶ **Q2 Lot® Controlled and Tested** - Certificate showing actual deposit chemistry and mechanical properties per lot available online
- ▶ **Prior to Using this Material** for ASME Boiler and Pressure Vessel Code Section III applications, please contact the Lincoln Electric Specials Department to receive a Certified Material Test Report (CMTR) which meet all requirements of NCA-3860

WELDING POSITIONS

All

APPLICATIONS

- ▶ Nuclear applications
- ▶ Applications requiring PWHT of mild steel

CONFORMANCES

AWS A5.20/5.20M:	E71T-1M-JH4, E71T-9M-JH4, E71T-12M-JH4
ASME SFA-5.20	E71T-1M-JH4, E71T-9M-JH4, E71T-12M-JH4

SHIELDING GAS75-80% Argon / Balance CO₂**DIAMETERS / PACKAGING**

Diameter in. (mm)	15 lb (7 kg) Plastic Spool 60 lb (28 kg) Carton
0.045 (1.1)	ED034122

MECHANICAL PROPERTIES⁽¹⁾ – As Required per AWS A5.20/5.20M

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lb) @ -40°C (-40°F)
Requirements - AWS E71T-12M-JH4 As-Welded with 75% Ar / 25% CO ₂	400 (58) min.	480 - 620 (70 - 90)	22 min.	27 (20) min.
Test Results⁽³⁾ As-Welded with 75% Ar / 25% CO ₂ Stress-Relieved for 8 hrs. @ 620°C (1150°F)	510 - 550 (74 - 80) 450 (65)	570 - 600 (83 - 87) 540 (78)	25 - 32 30	110 - 200 (80 - 150) 100 - 150 (70 - 110)

DEPOSIT COMPOSITION⁽¹⁾ – As Required per AWS A5.20/5.20M

	%C	%Mn	%Si	%Ni	%S	%P	Diffusible Hydrogen (mL/100g weld deposit)
Requirements - AWS E71T-12M-JH4 As-Welded with 75% Ar / 25% CO ₂	0.12 max.	1.60 max.	0.90 max.	0.50 max.	0.03 max.	0.03 max.	4 max.
Test Results⁽³⁾ As-Welded with 75% Ar / 25% CO ₂	0.03 - 0.06	1.27 - 1.60	0.27 - 0.45	0.34 - 0.41	<0.01	<0.01	1 - 4

TYPICAL OPERATING PROCEDURES

Diameter, Polarity Shielding Gas	CTWD ⁽⁴⁾ mm (in)	Wire Feed Speed m/min (in/min)	Voltage (Volts)	Approx. Current (Amps)	Melt-Off Rate kg/hr (lb/hr)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
0.045 in. (1.1 mm), DC+ 75-80% Ar / balance CO ₂	22 (7/8)	4.4 (175)	22-24	125	1.8 (4.0)	1.5 (3.4)	88
		5.7 (225)	22-24	145	2.3 (5.1)	2.0 (4.4)	
		7.0 (275)	23-25	165	2.9 (6.3)	2.5 (5.5)	
		8.3 (325)	23-25	185	3.4 (7.4)	2.9 (6.4)	
		9.5 (375)	24-26	205	3.9 (8.6)	3.4 (7.5)	
		10.8 (425)	25-27	225	4.4 (9.7)	3.8 (8.4)	
		12.1 (475)	26-28	245	4.9 (10.9)	4.3 (9.5)	

⁽¹⁾ Typical all weld metal. ⁽²⁾ Measured with 0.2% offset. ⁽³⁾ See test results disclaimer below. ⁽⁴⁾ To estimate ESO, subtract 1/4 in. (6.0 mm) from CTWD.

Note: This product contains micro-alloying elements. Additional information available upon request.

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

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