

APPENDIX B Filler Metal Comparison Chart ABS-AWS

The AWS Filler metals listed on the following pages are those which it is felt, based on a review of past experience, are acceptable and meet the minimum Bureau requirements for the indicated grade. Comparisons have been made separately for manual electrodes, wire-flux, and wire-gas combinations.

Manual Electrodes

ABS Filler Metal Grade	Acceptable AWS Classification	Suitable for ABS Hull Structural Steel Grade
Ordinary Strength		
1	AWS A5.1-04 E6010, E6011, E6027 E7015, E7016, E7018, E7027, E7028, E7048 E7016-1, E7018-1	A to 12.5mm (0.5 in.) Inclusive
2	AWS A5.1-04 E6010, E6011, E6027 E7015, E7016, E7018, E7027, E7028, E7048 E7016-1, E7018-1	A, B, D
3	AWS A5.1-04 E6010, E6011, E6027 E7015, E7016, E7018, E7027, E7048 E7016-1, E7018-1	A, B, D, E
Higher Strength		
2Y	AWS A5.1-04 E7015, E7016, E7018, E7028, E7048 E7016-1, E7018-1 AWS A5.5-06 E8016-C3, E8018-C3	AH, DH
3Y	AWS A5.1-04 E7016-1, E7018-1 AWS A5.5-06 E8016-C3, E8018-C3	AH, DH, EH

Notes:

1. Electrode Classifications E6012, E6013, and E7014 may be used for Grade 1 Single pass fillet applications for the attachment of stiffening members in non-structural applications.
2. Electrode Classification E7024 may be used for Grade 1 single pass fillet applications in the flat and horizontal welding positions for attachment of stiffening members. In the case of barges for river, bay, and sound service the E7024 electrode may also be used for single pass lap joints. Acceptability of E7024 electrode in both cases is contingent on procedure tests being conducted in the shipyard for the particular brand of electrode to demonstrate that adequate penetration and elongation are achieved. Macro etch and longitudinal fillet weld guided bend tests are to be included for each size electrode to be used in production. Welding current should be controlled and periodic production tests should be carried out to insure that adequate weld quality is maintained.
3. Electrode Classification E6020 may be used for Grade 1 fillet applications without supplementary testing.
4. For ABS H40 higher strength hull structural steel having 390N/mm² (40kgf/mm², 57,000 psi) yield strength, above filler metal grades may be used provided each fabricator carries out a procedure test to ensure that required strength and toughness will be obtained in production.

**Wire-Flux
Combinations**

	ABS Filler Metal Grade	Acceptable AWS Classification		Suitable for ABS Hull Structural Steel Grade
		AWS A5.17-97	AWS A5.23-07	
Ordinary Strength				
1		F6A0X, F6A2X, F6A4X F6A6X, F7A0X, F7A2X F7A4X, F7A6X		A to 12.5mm (0.5 in.) inclusive
2		F6A0X, F6A2X, F6A4X F6A6X, F7A0X, F7A2X F7A4X, F7A6X		A, B, D
3		F6A2X, F6A4X, F6A6X F7A2X, F7A4X, F7A6X		A, B, D, E
Higher Strength				
1Y		F7A0X, F7A2X, F7A4X F7A6X	F7A0X, F7A2X, F7A4X F8A0X, F8A2X, F8A4X	AH to 12.5mm (0.5 in.) inclusive
2Y		F7A0X, F7A2X, F7A4X F7A6X	F7A0X, F7A2X, F7A4X F8A0X, F8A2X, F8A4X	AH, DH
3Y		F7A2X, F7A4X F7A6X	F7A2X, F7A4X, F8A2X, F8A4X	AH, DH, EH

Notes:

1. The letter X represents the various electrode chemistry designations such as EL8, EM15K, etc.
2. Wire-flux classification F6AZX may be used for Grade 1 applications, and F7AZX and F8AZX may be used for grade 1Y applications provided that the average Charpy V-Notch impact value of the weld metal meets Bureau requirement for the pertinent grade as indicated in the ABS Rules for Steel Vessels Part 2 Appendix 2 Tables 1 and 2.
3. Electrodes approved to AWS grades not requiring impact testing may be used for Grade 1 fillet application for the attachment of stiffening members in non-structural applications. They may be specially approved for welding of stiffening members on structural applications. Such approval is contingent on procedure tests being conducted at the shipyard. These tests should be equivalent to those specified for E7024 electrodes as in Note 2 of Appendix B—Manual Electrodes.
4. For ABS H40 higher strength hull structural steel having 390N/mm² (40kgf/mm², 57,000 psi) yield strength, above filler metal grades may be used provided each fabricator carries out a procedure test to ensure that the required strength and toughness will be obtained in production.

Wire-Gas Combinations

ABS Filler Metal Grade	Acceptable AWS Classification		Suitable for ABS Hull Structural Steel Grade
	AWS A5.18-05	AWS A.5.20-05 (See Note 1)	
Ordinary Strength			
1	ER70S-2, ER70S-3 ER70S-6, ER70S-7	E6XT-1, E6XT-5 E6XT-6, E6XT-8	A to 12.5mm (0.5 in.) inclusive
2	ER70S-2, ER70S-3 ER70S-6, ER70S-7	E6XT-1, E6XT-5 E6XT-6, E6XT-8	A, B, D
3	ER70S-2, ER70S-6 ER70S-7	E6XT-6 E6XT-8, E7XT-5 E7XT-6, E7XT-8	A, B, D, E
Higher Strength			
1YA	ER70S-2, ER70S-3 ER70S-6, ER70S-7	E7XT-1, E7XTG-6 E7XT-5, E7XT-8	AH to 12.5mm (0.5 in.) inclusive
2Y	ER70S-2, ER70S-3 ER70S-6, ER70S-7	E7XT-1, E7XT-6 E7XT-5, E7XT-8, E7XT-9, E7XT-12	AH, DH
3Y	--	E7XT-1J, E7XT-9J, E7XT-12J	AH, DH, EH

Notes:

1. Electrode classifications of AWS A5.20-05 that meet the minimum Bureau requirements for grades 1YA, 2Y, and 3Y are also acceptable for Bureau grades 1, 2, and 3 respectively.
2. Electrode classifications ER70S-4, ER70S-5, ER70S-G, E7XT-4, E7XT-7, E7XT-11, and E7XT-G which do not require impact testing may be used for welding ordinary and higher strength steels provided that the average Charpy V-Notch impact value of the weld-metal meets the Bureau requirement for the pertinent grade as indicated in the ABS Rules for Steel Vessels Part 2 Appendix 2 Tables 1 and 2.
3. Electrode classifications E6XT-4, E6XT-7, E6XT-11, and E6XT-G may be used for welding ordinary strength steel provided that the average Charpy V-Notch impact value of the weld metal meets the Bureau requirement for the pertinent grade as indicated in the ABS Rules for Steel Vessels Part 2 Appendix 2 Tables 1 and 2.
4. Electrode classifications E7XT-2, E7XT-3, E7XT-10, and E7XT-GS that do not specify all weld metal tensile requirements may be specially approved for fillet weld applications.
5. Electrodes approved to AWS grades not requiring impact testing may be used for Grade 1 fillet application for the attachment of stiffening members in non-structural applications. They may be specially approved for welding of stiffening members on structural applications. Such approval is contingent on procedure tests being conducted at the shipyard and should be equivalent to those specified for E7024 electrodes as in Note 2 of Appendix B—Manual Electrodes.
6. For ABS H40 higher strength hull structural steel having 390N/mm² (40kgf/mm², 57,000 psi) yield strength, above filler metal grades may be used provided each fabricator carries out a procedure test to ensure that the required strength and toughness will be obtained in production.