



FABRICATION DIVISION
Welding Development & Technology
BHEL, BHOPAL

Document No. :
FBM/WD&T/TS11 Rev 06

Technical Specification for Carbon Steel Flux Cored Arc Welding Electrode

P.I No.		Date:18-09-2020				
S. No	Description	Requirement*	Vendor to Confirm	Offered	Deviation	Remarks
1	Scope	This specification prescribes requirements for the classification of low and medium carbon steel electrodes for flux cored arc welding (FCAW) process.				
2	Application	The wire will be used for radiographic quality welding of low and medium carbon steel pressure vessel components.				
2.1	Classification	The electrode shall meet all the requirements of ASME Sec II - Part C, SFA 5.36 — E71T1-C1A0-CS1-H8 and E71T1-C1P0-CS1-H8 classification and alongwith that modified requirements specified in this specification shall also be adhered to.	OCM to Confirm			
2.2	Standard sizes	As per Table 17 of SFA 5.36 of ASME Sec II C.				
2.3	Finish and Uniformity	As per clause 18 of SFA 5.36 of ASME Sec II C.				
2.4	Standard Package Forms	As per clause 19 of SFA 5.36 of ASME Sec II C.				
2.5	Winding Requirements	As per clause 20 of SFA 5.36 of ASME Sec II C.				
2.6	Filler Metal Identification	As per clause 21 of SFA 5.36 of ASME Sec II C.				
2.7	Packaging	As per clause 22 of SFA 5.36 of ASME Sec II C.				
2.8	Marking of Packages	As per clause 23 of SFA 5.36 of ASME Sec II C.				
4	Tests Required	The wire shall meet the requirements of relevant tests as per Table 6 of SFA 5.36 of ASME Sec II C and additional tests mentioned in this specification. The wire shall meet the requirements of all the tests (mentioned in S. No. 4.1 to 4.6) in as-welded condition. Also, the wire shall meet the requirements of the tests mentioned in S. No. 4.2 to 4.4 after PWHT (refer S. No. 5 for PWHT details).	Refer Note 2** of this specification			
4.1	Chemical Analysis	As per clause 10 of SFA 5.36 of ASME Sec II C.				
4.2	Radiographic Test	As per clause 11 of SFA 5.36 of ASME Sec II C.				
4.3	Tension Test	As per clause 12 of SFA 5.36 of ASME Sec II C.				
4.4	Impact Test	As per clause 14 of SFA 5.36 of ASME Sec II C. [Temperature for Impact Test: -20°C and Impact energy 27 J (minimum).]				
4.5	Diffusible Hydrogen Test	Diffusible Hydrogen content to be tested according to one of the methods given in AWS A4.3 and shall not exceed 8 mL/100g of deposited weld metal.	OCM to Specify			
4.6	Fillet Weld Test	As per clause 14 of SFA 5.29 of ASME Sec II C.	OCM to Confirm			
5	PWHT	PWHT Temperature shall be as per Table 8 of SFA 5.36 of ASME Sec II C for the classification of electrode required by this specification. (refer clause 9.2.1.2 of SFA 5.36 of ASME Sec II C for other details related to PWHT).	Refer Note 2** of this specification			
6	Test Assembly	The Test Assembly for tests mentioned in S. No. 4.1 to 4.4 shall be as per clause 9 of SFA 5.36 of ASME Sec II C. The test assembly for Fillet Weld Test (mentioned at S. No. 4.6 of this specification) shall be as per clause 9.4.2 of SFA 5.29 of ASME Sec II C.	OCM to Confirm			
7	Quality Considerations					
7.1	Information to be supplied in the bid	At the time of bidding the welding consumable supplier shall furnish all the relevant technical information regarding his product which shall include the recommended welding parameters.	OCM to Confirm			
7.2	Deviations	The bidder shall clearly state, if there are any deviations to the requirements of this specification.	OCM to Confirm			

*All ASME standards referred in this specification shall be of Ed 2019

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S. No	Description	Requirement	Vendor to Confirm	Offered	Deviation	Remarks
8	Authorization and Correspondence	In case of authorized vendor quotes for the tender then the following must be met: 1. Vendor to provide authorized dealer certificate valid for atleast 1 year, and the OCM to take guarantee of the product quoted, failing this the offer will be rejected. 2. All Technical correspondence and confirmation shall be done with their principal supplier (OCM). Contact details of OCM to be provided with the offer. 3. All liability shall be of principal in the event of default by the authorized agent/dealer. 4. All correspondence and documents including test certificate shall be in english language. 5. If any document provided by vendor is in language other than english, it must be supported with valid english translation.	OCM to Confirm			
9.1	Technical Evaluation Parameters	The interested vendor who quotes for the wire required by this specification should meet all of the following conditions: (1) To submit test result/datasheet from OCM as per SFA 5.36 of ASME Sec-II C and with specific mention of all properties as required in S. No. 4. TC/Datasheet can be a standard TC/Datasheet and not specific to the batch being dispatched to BHEL. (2) To Submit Test results from WRI Trichy atleast as per Annexure 1 of this specification along with offer. (Please note that Sample of Brand testing at WRI (Welding Research Institute) Trichy has to be done independently by vendor/OCM in direct correspondence with WRI Trichy. Sample testing is done on chargeable basis by WRI Trichy). (3) To submit free sample of atleast one spool of 12.5-15.0 kg as per this specification for shop trial at BHEL Bhopal. BHEL Bhopal will do running characterstic tests to check for Slag removal, Arc Striking/Stability, Appearance of Weld, Visible Defect, Restart Defect, Spattering, Porosity and Undercuts followed by DPT and MPI and can also randomly do any of the test mentioned in this specifications. (4) The test results of BHEL will be final.	Vendor to Confirm			
9.2		The S. No. 9.1 is not applicable for below mentioned make and brands which have already been tried and tested at BHEL: (1) DW-100 OF KOBE STEEL LTD, JAPAN (2)TWE-71 1 OF TIEN TAI ELECTRODES CO LTD, TAIWAN (3) LW-71TM OF LINCOLN ELECTRIC,SHANGHAI 201907, CHINA (4) SUPER CORED 71H OF HYUNDAI WELDING CO LTD, SEOUL, KOREA (5) K-71T OF KISWEL LTD, KOREA (6) OK TUBROD15.14 A OF ESAB LTD, KOREA				
10	Note :	1. BHEL reserves the right to call free sample spool (of size as required in PO) of minimum 12 kgs for further technical evaluation and testing at recommended parameters. The test results of BHEL will be final. Vendor to submit samples within 7 days after intimation by BHEL. 2**. OCM to confirm and provide TC/Datasheet along with offer. TC/Datasheet must have specific mention of all properties as required in S. No. 4. TC/Datasheet can be a standard TC/Datasheet not specific to the batch being dispatched to BHEL. 3. OCM to provide recommended welding parameters.	OCM to Confirm			

Legends :

1. OCM- Original Consumable Manufacturer

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**Annexure 1 to
Document No. :FBM/WD&T/TS11 Rev 06**

Table 1

S. No.	Description	Requirement	Heat Treatment Condition
1	Test Required	The wire shall meet the requirements of tests mentioned in S. No. 1.1 to 1.6 :	
1.1	Chemical Analysis	As per clause 10 of SFA 5.36 of ASME Sec II C.	As-welded
1.2	Radiographic Test	As per clause 11 of SFA 5.36 of ASME Sec II C.	PWHT ^a
1.3	Tension Test	As per clause 12 of SFA 5.36 of ASME Sec II C.	PWHT ^a
1.4	Impact Test	As per clause 14 of SFA 5.36 of ASME Sec II C. [Temperature for Impact Test: -20°C and Impact energy 27 J (minimum).]	PWHT ^a
1.5	Diffusible Hydrogen Test	Diffusible Hydrogen content to be tested according to one of the methods given in AWS A4.3 and shall not exceed 8 mL/100g of deposited weld metal.	As-welded
1.6	Fillet Weld Test	As per clause 14 of SFA 5.29 of ASME Sec II C.	As-welded
2	Test Assembly	The Test Assembly for tests mentioned in S. No. 1.1 to 1.4 (of Table 1) shall be as per clause 9 of SFA 5.36 of ASME Sec II C. The test assembly for Fillet Weld Test (mentioned at S. No. 1.6 of Table 1) shall be as per clause 9.4.2 of SFA 5.29 of ASME Sec II C.	

^a The PWHT shall be as per S. No. 5 of the specification (FBM/WD&T/TS11 Rev 06)