



FABRICATION DIVISION
Welding Development & Technology
BHEL, BHOPAL

Technical Specification No: FBM/WD&T/TS16 Rev 01

Technical Specification of carbon steel electrodes (solid) for submerged arc welding

P.I No.

S. No	Description	Requirement**		Offered/ Deviations	Remarks
1	Scope	This specification prescribes requirements for carbon steel electrodes (solid) for submerged arc welding.	Vendor to note		
2	General Requirements	1. The solid electrode shall be suitable for radiographic quality welding of low and medium carbon steel material like SA-516 Gr-70 using submerged arc welding. 2. The electrode shall be in annealed condition.	Vendor to Confirm		
2.1	Classification of electrode	EM12K as per SFA 5.17 of ASME Sec II C.	Vendor to Confirm		
2.2	Tensile strength of electrode (solid)	500-575 MPa	OCM to provide Test Certificate		
2.3	Microhardness of electrode (solid)	215 HV _(0.5) (max.)	OCM to provide Test Certificate		
2.4	Chemical composition of electrode (solid)	As per EM12K of Table 1 of SFA 5.17 of ASME Sec II C.	OCM to provide Test Certificate		
2.5	Size of electrode	3.2 ± 0.06 mm	Vendor to Confirm		
2.6	Spool type	Coils with support	Vendor to Confirm		
2.7	Weight of Spool	25 kgs (approx.)	Vendor to Confirm		
2.8	Spool inside diameter (in mm)	ID : 300, +15, - 0	Vendor to Confirm		
2.9	Finish and Uniformity	As per clause 16.2 of SFA 5.17 of ASME Sec II C.	Vendor to Confirm		
2.10	Standard package forms	As per clause 16.3 of SFA 5.17 of ASME Sec II C.	Vendor to Confirm		
2.11	Winding Requirement	As per clause 16.4 of SFA 5.17 of ASME Sec II C. Also, wire (electrode) shall be in layer winding & not random winding.	Vendor to Confirm		
2.12	Electrode Identification	As per clause 16.5 of SFA 5.17 of ASME Sec II C.	Vendor to Confirm		
2.13	Packaging	As per clause 16.6 of SFA 5.17 of ASME Sec II C.	Vendor to Confirm		
2.14	Marking of Packages	As per clause 16.7 of SFA 5.17 of ASME Sec II C.	Vendor to Confirm		



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3	Tests Required for electrode (solid) quoted				
3.1	The following tests to be confirmed by OCM and may be re-tested at BHEL Bhopal:				
3.1.1	Chemical Analysis of electrode (solid)	As per clause 10 of SFA 5.17 of ASME Sec II C.	OCM to provide Test Certificate		
3.1.2	Radiographic test	As per clause 11 of SFA 5.17 of ASME Sec II C.	OCM to Confirm		
3.1.3	Tensile test	As per clause 12 of SFA 5.17 of ASME Sec II C.	OCM to Confirm		
3.1.4	Impact test (Charpy): 5 Samples at -20 °F on 2 mm V-notch	As per clause 13 of SFA 5.17 of ASME Sec II C. Acceptance shall be as per following: Average of three samples (Discarding Highest and lowest values): 27 J min. Two of the values used for computing average shall $\geq$ 27 J Single Value (Min): 20 J	OCM to Confirm		
3.2	Welding parameters for test	The parameters for welding will be as follows: Current: 350-500 A Voltage: 30 - 36 V Electrode extension: 25 ± 6 mm Travel speed: 250 - 450 mm/min	OCM to Confirm		
3.3	Post Weld Heat Treatment (PWHT)	As per clause 9.4 of SFA 5.17 of ASME Sec IIC.	OCM to Confirm		
3.4	The test mentioned at clause 3.1.2 to 3.1.4 of this specification will be done as per following conditions: 1) Quoted EM12K electrode and TPD 80 flux of M/s Tapadia make or any other neutral fused flux available with BHEL Bhopal in <u>as-welded condition</u> . 2) Quoted EM12K electrode and OK 10.71 of M/s ESAB make or any other agglomerated, basic flux available with BHEL Bhopal in <u>PWHT condition</u> (For PWHT deatails refer clause no 3.3).		OCM to Confirm		



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3.5	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.		Vendor to Confirm		
4	1. BHEL reserves the right to call free sample spool of minimum 25 kgs for further technical evaluation and testing. Vendor to submit samples within 7 days after intimation by BHEL. 2. The test results (for clause 2.2 to 2.4 and 3.1.1 to 3.1.4 of this specification) of BHEL will be final.		Standard Catalogue and Test Certificate to be provided		

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

Legends :

1. OCM- Original Consumable Manufacturer