

Document No. :
BHEL/NPCL/30599 / FBM/
WD&T/NU10

FABRICATION DIVISION
Welding Development & Technology
BHEL, BHOPAL



Technical Purchase Specification of E7018-1 SMAW coated electrode

Revision 01 Date:30-09-2019

P.I.No.	Description	Requirement*
S. No		
1	Scope:	This standard covers low hydrogen type carbon steel arc welding electrodes of class E7018-1 to SFA 5.1 of ASME Sec II Part-C. The welding consumable required in this specification shall be as per NPCL approved brand list.
2	Requirements	These electrodes are used for radiographic quality welding of low and medium carbon steel pressure vessel components like SA 516 Gr-70, attachments to pressure parts and pipe material of radiographic quality.
2.1	Classification	The electrode shall meet the requirements of ASME Sec II - Part C, SFA 5.1 — E7018-1 classification and alongwith that modified requirements specified in this specification shall also be adhered to.
2.2	Chemical Composition	The chemical composition of the undiluted weld metal deposited using the electrode shall be as per E7018 of Table 7 of SFA 5.1 of ASME Sec II C. Also, the Cobalt content in the weld metal shall be limited to 0.02%.
2.3	Mechanical and Impact Properties	1. The mechanical properties of weld metal deposited using the electrode shall meet the requirements of E7018 of Table 2 in both as-welded and after P.WHT (as per Sr. No. 6 of this specification). 2. The impact properties of weld metal deposited using the electrode shall meet the requirements of E7018-1 of Table 3 of SFA 5.1 of ASME Sec II Part C and also NB 2431.1 (D) of ASME Sec III NB (as required in S. No. 4.5) in both as-welded and after P.WHT (as per Sr. No. 6 of this specification).
2.4	Standard size and length	Electrodes shall be supplied in diameters and lengths as specified in the Purchase order. The standard sizes and length shall meet the requirement of Clause 20 of SFA 5.1 of ASME Sec II C.
2.5	Core Wire and Covering	As per clause 21 of SFA 5.1 of ASME Sec II C
2.6	Exposed Core	As per clause 22 of SFA 5.1 of ASME Sec II C
2.7	Electrode Identification	As per clause 23 of SFA 5.1 of ASME Sec II C
2.8	Packaging	As per clause 24 of SFA 5.1 of ASME Sec II C
2.9	Marking of Packages	As per clause 25 of SFA 5.1 of ASME Sec II C. Also, BHEL PO with date shall be mentioned.

* All ASME standards referred in this specification shall be of Ed 2017

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3	Batch Testing			
3.1	Acceptance	The batch shall be deemed to be accepted only if it meets the testing requirements as mentioned in Sr. No. 4 of this specification.		
3.2	Lot	The complete quantity of electrodes of a given size ordered shall be from a single heat/lot/batch(not more than 45 MT).		
3.3	Lot Class	Lot class shall be C3 as per ASME SEC II C, SFA 5.01		
3.4	Facilities for Batch testing	The manufacturer /supplier shall have all facilities to conduct batch testing as per Sr. No. 4 of this specification. If the manufacturer/supplier is not having facility for conducting any particular test(s) then manufacturer/supplier shall provide list of relevant testing facilities. The testing for such cases shall be done at NPCL approved lab or NABL accredited lab.		
4	Testing	1. All tests mentioned in Sr. No. 4.1 to 4.8 shall be duly witnessed by BHEL and NPCL. 2. The tests mentioned at Sr. No. 4.2, 4.3, 4.5 and 4.6 shall be done in both as-welded condition as well as after PWHT as per Sr. No. 6. 3. The tests mentioned at Sr. No. 4.4 and 4.7 shall be done in as-welded condition only.		
4.1	Tests required	All relevant tests to be carried out as per Table 4 of SFA 5.1 of ASME Sec II C. Some additional tests as mentioned in Sr. No. 4.2 to 4.8 of this specification shall also be done.		
4.2	All weld metal tension test	All weld metal tension test to be done in accordance with and shall meet the requirements of clause 12 of SFA 5.1 of ASME Sec II C (even if it is not required as per Table 4 of SFA 5.1 of ASME Sec II C)		
4.3	Radiographic Analysis	Radiographic Analysis to be done in accordance with and shall meet the requirements of clause 11 of SFA 5.1 of ASME Sec II C (even if it is not required as per Table 4 of SFA 5.1 of ASME Sec II C)		
4.4	Chemical Analysis	1) To be done in accordance with and shall meet the requirements of clause 10 of SFA 5.1 of ASME Sec II C. 2) The result of chemical analysis shall be reported as per NB 2432 of ASME Sec III NB 3) The Cobalt content in weld metal shall be limited to 0.02%		
4.5	Impact testing (CV)	The impact test shall be done for two sets of specimen at two different temperatures as mentioned below : 1. To be done in accordance with and shall meet the requirements of clause 14 of SFA 5.1 of ASME Sec II C (it should meet the requirement of atleast 27J at -45°C). 2. To be done in accordance with and shall meet the requirements of NB 2431.1 (D) of ASME Sec III NB (it should meet the requirement of atleast 68J at +18°C and atleast 0.89 mm lateral expansion).		
4.6	Drop weight test	As per clause NB-2320 of ASME Sec III NB. The T _{NP} temperature shall not be higher than -15°C.		

Page 4 of 5

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4.7	Fillet Weld Test	Fillet Weld Test to be done in accordance with and shall meet the requirements of clause 15 of SFA 5.1 of ASME Sec II C (if it is required as per Table 4 of SFA 5.1 of ASME Sec II C).		
4.8	Moisture Test	Moisture Test to be done in accordance with and shall meet the requirements of clause 16 of SFA 5.1 of ASME Sec II C (if it is required as per Table 4 of SFA 5.1 of ASME Sec II C)		
5	Weld test Assemblies	Two sets of weld test assemblies shall be prepared as per clause 9 of SFA 5.1 of ASME Sec IIC . One should be used for carrying out tests in as-welded condition while the other shall be used for carrying out tests after PWHT as per Sr. No. 6 of this specification. 1. Base material shall be SA 516 Gr 70. 2. For all tests (except for tests mentioned at Sr. No 4.4, 4.7 and 4.8) , the test assembly required by SFA-5.1 shall be used for test coupon preparation, except that it shall be increased in size to obtain the number of impact specimens and the drop weight test specimens required by Sr. No. 4.5 and 4.6 of this specification. 3. Weld test assembly for Sr. No. 4.7 shall be as per Figure 3 of SFA 5.1 of ASME Sec II C .		
6	PWHT	The PWHT shall be done as per ASME Sec IIINB. The soaking temperature shall be 595-610°C. The soaking time shall be as per Table NB-4622.1-1 of ASME Sec IIINB. The rate of heating and cooling above 300°C shall be 30°C/hr.		
7	Level of Testing	As per schedule 6 or K of SFA 5.01 of ASME Sec IIC		
8	Quality Considerations			
8.1	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 and also instructions such as baking & shelf life etc.		
8.2	Deviations	The bidder shall clearly state, if there are any deviations to the requirements of this specification.		
8.3	Reports / Certificates	1. Signed and sealed test certificates of all the tests shall be submitted in 6 original copies (with scanned PDF version on CD/USB drive) to BHEL. 2. An additional copy shall accompany the welding consumables in their package for shipment.		
8.4	Calibration Report	All equipments used for conducting above mentioned tests must be calibrated and the calibration report shall be submitted to BHEL.		

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