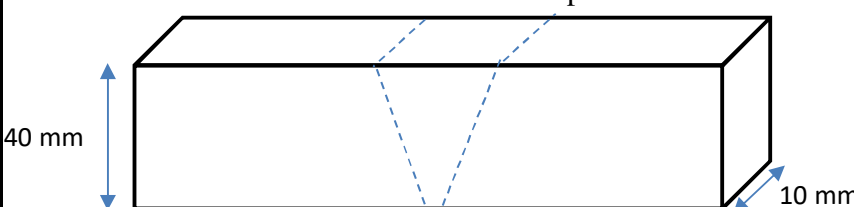


**FABRICATION DIVISION**  
**Welding Development & Technology**

**P.I No.** \_\_\_\_\_ **Date: 10 Aug, 2020**

**Technical Specification No: FBM/WD&T/TS02 Rev 06**

**Technical Specification for E 410NiMo T1-1/4 Flux Cored Arc Welding**

| S. No | Description                           | Requirement                                                                                                                                                                                                                                                             | Vendor to Furnish/confirm                                                                                                                  | Offered | Deviation | Remark |
|-------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|--------|
| 1.1   | E 410NiMo T1-1/4                      | As per SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                                 | Vendor/OCM to confirm                                                                                                                      |         |           |        |
| 1.2   | Diameter of Wire                      | 1.6 mm                                                                                                                                                                                                                                                                  |                                                                                                                                            |         |           |        |
| 1.3   | Weight of Spool                       | 12.5 kgs to 15 Kgs                                                                                                                                                                                                                                                      |                                                                                                                                            |         |           |        |
| 1.4   | Dimensions of Spool                   | ID : 50 mm, OD : 300 mm                                                                                                                                                                                                                                                 |                                                                                                                                            |         |           |        |
| 1.5   | Finish and                            | As per clause 18 of SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                    |                                                                                                                                            |         |           |        |
| 1.6   | Standard package forms                | As per clause 19 of SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                    |                                                                                                                                            |         |           |        |
| 1.7   | Winding Requirement                   | As per clause 20 of SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                    |                                                                                                                                            |         |           |        |
| 1.8   | Packaging                             | As per clause 22 of SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                    |                                                                                                                                            |         |           |        |
| 1.9   | Marking of Pacakges                   | As per clause 23 of SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                    |                                                                                                                                            |         |           |        |
| 2     | <b>Tests Required for wire quoted</b> |                                                                                                                                                                                                                                                                         |                                                                                                                                            |         |           |        |
| 2.1   | Chemical Analysis                     | As per SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                                 | Vendor to confirm the properties and provide Test Certificate from OCM/ Test reports of wire supplied and tested at any of the BHEL Units. |         |           |        |
| 2.2   | Radiographic test                     | As per SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                                 |                                                                                                                                            |         |           |        |
| 2.3   | *Tensile test                         | As per SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                                                                                                                                                 |                                                                                                                                            |         |           |        |
| 2.4   | *Bend Test<br>(Transverse Side bend)  | <p>180° at 4T (40 mm) mandrel dia for atleast 4 samples. Test specimen shall be as given below with bend thickness 10 mm.</p> <p style="text-align: center;">Weld Joint Sample</p>  |                                                                                                                                            |         |           |        |

| S. No | Description                                                                                                                                                                                                                                                 | Requirement                                                                                                                                        | Vendor to Furnish/confirm                                                                                                                   | Offered | Deviation | Remark |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|--------|
| 2.5   | *Impact test at weld (Charpy): 5 Samples at RT(Room Temperature) on 2 mm V-notch                                                                                                                                                                            | Average of three samples (Discarding Highest and lowest values): 50 J (minimum).<br>Two of the values used for computing average shall $\geq 50$ J | Vendor to confirm the properties and provide Test Certificate from OCM / Test reports of wire supplied and tested at any of the BHEL Units. |         |           |        |
| 2.6   | Fillet Weld test                                                                                                                                                                                                                                            | As per SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                            |                                                                                                                                             |         |           |        |
| 2.7   | Diffusible Hydrogen                                                                                                                                                                                                                                         | Diffusible Hydrogen content as per AWS A 4.3 (as opened): $\leq 5$ ml/100g                                                                         |                                                                                                                                             |         |           |        |
| 2.8   | * The test mentioned at clause 2.3, 2.4 and 2.5 to be done after carrying out PWHT as mentioned at clause 4.0 and the shielding gas to be used shall be either 80% Ar + 20 % CO <sub>2</sub> or 100 % CO <sub>2</sub> .                                     |                                                                                                                                                    |                                                                                                                                             |         |           |        |
| 2.9   | BHEL reserves the right to call a spool of weight and dimensions as mentioned in clause 1.3 and 1.4 respectively for further technical evaluation. The test results of BHEL will be final. Vendor to submit samples within 7 days after intimation by BHEL. |                                                                                                                                                    |                                                                                                                                             |         |           |        |
|       |                                                                                                                                                                                                                                                             |                                                                                                                                                    |                                                                                                                                             |         |           |        |
| 3     | Test Piece                                                                                                                                                                                                                                                  |                                                                                                                                                    |                                                                                                                                             |         |           |        |
| 3.1   | Size for bend test                                                                                                                                                                                                                                          | 40 mm Thick Plate, length and width suitable to carry test mentioned at clause 2.4 above                                                           | Material TC to be provided                                                                                                                  |         |           |        |
| 3.2   | Material for Bend                                                                                                                                                                                                                                           | ASTM A 487 CA6NM Grade A or SA 240 Type S 41500                                                                                                    |                                                                                                                                             |         |           |        |
| 3.3   | Size for other test                                                                                                                                                                                                                                         | As per SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                            |                                                                                                                                             |         |           |        |
| 3.4   | Material for other test                                                                                                                                                                                                                                     | As per SFA 5.22 of ASME Sec IIC Ed 2019                                                                                                            |                                                                                                                                             |         |           |        |
|       |                                                                                                                                                                                                                                                             |                                                                                                                                                    |                                                                                                                                             |         |           |        |
| 4     | Post Weld Heat Treatment                                                                                                                                                                                                                                    |                                                                                                                                                    |                                                                                                                                             |         |           |        |
| 4.1   | Rate of Heating                                                                                                                                                                                                                                             | $\geq 50$ °C per hour from 200 ° C or more                                                                                                         | S.R graph to be provided                                                                                                                    |         |           |        |
| 4.2   | Soaking Temp                                                                                                                                                                                                                                                | 600 - 620 ° C                                                                                                                                      |                                                                                                                                             |         |           |        |
| 4.3   | Soaking time                                                                                                                                                                                                                                                | $\leq 8$ hrs                                                                                                                                       |                                                                                                                                             |         |           |        |
| 4.4   | Rate of Cooling                                                                                                                                                                                                                                             | $\geq 50^{\circ}\text{C}$ per hour up to 200 ° C or more                                                                                           |                                                                                                                                             |         |           |        |

| S. No | Description                      | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Vendor to Furnish/confirm |  | Offered | Deviation | Remark |
|-------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--|---------|-----------|--------|
| 5     | Authorization and Correspondence | <p>In case of authorized vendor quotes for the tender then the following must be met:</p> <ol style="list-style-type: none"> <li>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.</li> <li>2. All Technical correspondence and confirmation shall be done with their principal supplier (OCM). Contact details of OCM to be provided with the offer.</li> <li>3. All liability shall be of principal in the event of default by the authorized agent/dealer.</li> </ol> | OCM to Confirm            |  |         |           |        |
|       |                                  | <p><b>Legends :</b></p> <ol style="list-style-type: none"> <li>1. OCM- Original Consumable Manufacturer</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |  |         |           |        |