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Document Title: Schedule of technical requirements for infrastructural, manufacturing & testing facilities and quality control for Wire and Flux for Submerged Arc welding as per IRS:M-39			

**STR No. MC/STR/W/03 –Rev-2**

भारत सरकार  
**Government of India**  
रेल मंत्रालय  
**Ministry of Railways**



*Schedule of Technical Requirements for Infrastructural,  
Manufacturing & Testing Facilities and Quality Control for  
Wire and Flux for Submerged Arc Welding as per IRS: M-39/2020*

**Issued by**

धातु व रसायन निदेशालय

**Metallurgical & Chemical Directorate**

अनुसंधान अभिकल्प एवं मानक संगठन, मानक नगर, लखनऊ - 226 011

**Research Designs & Standards Organisation**

**Manak Nagar, Lucknow – 226011**

**Schedule of Technical Requirements for Infrastructural, Manufacturing & Testing Facilities and Quality Control for Wire and Flux for Submerged Arc Welding as per IRS: M-39/2020**

**1.0 SCOPE**

This schedule covers the technical requirements for manufacture of Wire and Flux for Submerged Arc Welding (SAW) as per IRS–M–39-20.

**1.1** The welding consumables for submerged arc welding have been grouped as below on the basis of infrastructure facilities, manufacturing process, quality control and application at users end.

<b>Group VIII A</b>	SAW Wire, Class W-1, W-2, W-3, W-4, W-5
<b>Group VIII B</b>	SAW Flux, Class F-1, F-2, F-3, F-4, F-5

**1.2 Fresh Approval:** The firms can apply any nos. of class in a group mentioned in STR in single application. Firm has to apply separately for each group. Testing charges shall be levied separately according to number of classes applied in each group

**1.3** The firm should have the experience of at least Two (2) years of manufacturing and supplying/ exporting the applied welding consumables to the industries manufacturing earth moving equipments, marine industries and thermal power plants (Enclose documentary evidences).

**1.4** The firm should have annual turnover of minimum one (1) crore

**1.5** The details of Manufacturing & testing facilities shall be submitted in format of Annexure to STR as per Annex-I.

**1.6** The details about applied items and its test results as per Annex-III, IV & V.

**2.0 REQUIREMENTS FOR SAW WIRE (For Group VIIIA, Class W-1, W-2, W-3, W-4, W-5)**

**2.1 GENERAL**

**2.1.1** The firm should have well illuminated and ventilated covered shed with sufficient height and space for performing various manufacturing activities like Decoiling, Wire

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drawing, wet wire drawing, Pickling, Washing, Copper Coating, Finished drawing, Spooling, Packing etc.

**2.1.2** Separate identified area for storage of raw materials and finished product and scraps.

**2.1.3** Separate quality control laboratory for physical and chemical testing.

**2.1.4** Humidity chamber for storage stability & corrosion test.

## **2.2 MINIMUM PRODUCTION FACILITIES**

The firm should have the following facilities:

**2.2.1** Wire drawing and Copper coating facilities consisting of Decoiler, Wire drawing set, Pickling bath, Washing bath, Coppering bath, Rinsing bath, Finish drawing and Coiling arrangement

**2.2.2** Butt welding machine of suitable capacity for joining wires.

**2.2.3** Automatic Spooling machine for winding of wire.

**2.2.4** Weighing facilities.

**2.2.5** Packing facilities as per clause 4.4 of IRS-M-39-[20](#).

## **2.3 TESTING FACILITIES**

### **2.3.1 GENERAL**

**2.3.1.1** The firm should have duly calibrated micrometer with least count 0.01mm for measurement of diameter of wire.

**2.3.1.2** The firm should have arrangement for measurement of copper coating thickness of wire by colorimeter/wet analysis method.

**2.3.1.3** The firm should have SAW (Submerged Arc Welding) machine of capacity minimum 500 Ampere and nozzle of various sizes for carrying out performance test of wire.

### **2.3.2 CHEMICAL TESTING**

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**2.3.2.1** The firm should have chemical testing laboratory consisting of Carbon-Sulphur determination apparatus, Chemical balance, Hot plate, Muffle furnace (800°C), Electric oven, Barometer, Hygrometer, Platinum crucible, Glass-wares and Chemicals.

### **3.0 REQUIREMENTS FOR SUBMERGED ARC WELDING FLUX (For Group VIII B, Class F-1, F-2, F-3, F-4 & F-5)**

#### **3.1 GENERAL**

**3.1.1** The firm manufacturing agglomerated flux should have well illuminated and ventilated covered shed with sufficient height and space for various manufacturing activities consisting of weighing of flux ingredients, Dry mixing, Wet mixing, Agglomerating, Sieving of final product, Weighing of final flux product and Packing.

**3.1.2** The firm should have separate identified area for storage of raw material, finished product and scrap.

**3.1.3** The firm should have separate welding room for performance test and test weld preparations.

**3.1.4** The firm should have separate laboratory for physical and chemical testing of raw material and weld metal.

**3.1.5** The firm should have mechanical testing laboratory for carrying out mechanical test of weld metal.

**3.1.6** Machining facilities preferably at same location for preparation of test pieces from weld assembly.

- i)** Lathe Machine for preparation of All Weld tensile test pieces.
- ii)** Shaping Machine – for shaping of test pieces, edge preparations on plates & back gouging of welds.
- iii)** V-notch cutter with gauge for cutting of V notch on impact test pieces.
- iv)** Power Hacksaw

#### **3.2 MINIMUM MANUFACTURING FACILITIES**

##### **3.2.1 Requirement for Agglomerated Flux**

The firm should have following machines/equipment:

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- 3.2.1.1 Sieve (B.S. Mesh size 10 or equivalent) for coarse screening of raw material.
- 3.2.1.2 Dry mixer, capacity 100 Kg. minimum, (generally electrically operated).
- 3.2.1.3 Wet mixer, capacity 100 Kg. minimum, (generally electrically operated).
- 3.2.1.4 Drying Oven, 200°C, electrically operated of suitable capacity.
- 3.2.1.5 Agglomerating Furnace, 600°C of suitable capacity with automatic temperature control.
- 3.2.1.6 Sieving set of B.S. mesh size 10, 40, 100 mesh or equivalent for sieving of finished product.
- 3.2.1.7 Packing arrangement as per clause 5.6.2 or alternatively as per Clause 5.6.3 to IRS- M-39 –[20](#).

### 3.3 TESTING FACILITIES

#### 3.3.1 GENERAL

- 3.3.1.1 The firm should have facilities for determination of grain size distribution of flux, measurement of tap density and moisture content of flux.
- 3.3.1.2 The firm should have facilities for determination of Basicity Index of flux by XRF method or by Chemical Analysis method.
- 3.3.1.3 The firm should have SAW machine of capacity 1000 Amp. for performance test and welding of test weld samples.
- 3.3.1.4 Radiographic (X–Rays or Gama Rays) test [from in-house/outsourced agency](#) (Applicable for firms applying for radiographic Quality welding consumables)

#### 3.3.2 MECHANICAL TESTING

- 3.3.2.1 The firm should have Universal Testing Machine of capacity 20MT min. with necessary attachment for measuring Yield Load and Breaking Load and carrying out Bend Test. The machine should be calibrated by a recognized agency and the firm should have valid calibration certificate.

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**3.3.2.2** The firm should have duly calibrated Impact Testing Machine capacity 30 kgfm (Charpy 'V' notch type test piece) with testing facilities at room temperature, 0°C, -20°C and -46°C depending upon the requirement of the product offered.

### **3.3.3 CHEMICAL TESTING**

**3.3.3.1** The firm should have chemical testing laboratory for chemical analysis of raw materials and weld metal.

**3.3.3.2** The chemical laboratory should consist of Carbon-Sulphur determination apparatus, chemical balance, hot plate, muffle furnace (800°C), electric oven, barometer, hygrometer, platinum crucible, glass wares and chemicals.

**Note:** Use of Spectrometer or any other modern facilities for determination of element present is permissible.

## **4.0 QUALITY CONTROL REQUIREMENTS**

**4.1** There should exist a system to ensure traceability of the product from raw material stage to finished product stage.

### **4.2 QUALITY ASSURANCE PLAN (QAP):**

The Firm shall have an “internal quality assurance system” with proper documentation to sustain quality of products being manufactured. Firm will also prepare quality assurance plan as per RDSO ISO document no-QM-RF-8.1-3 (latest version) - Guidelines for preparing QAP during registration. This document is available on RDSO website under vendor interface.

**4.3** i) All the technical personnel responsible for supervision and handling of products and quality control activities should have Degree in Mechanical Engineering/ Metallurgical Engineering with a minimum of three (3) years experience and should be working in the firm as regular employees.

ii) Artisan staff like machinist, welder and fitter should have ITI qualification in respective trade and time to time they should have been imparted training from recognized institution in the respective trades (Enclose training documents)

iii) All employees should be on regular role.

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- 4.4 The vendor shall have acquired ISO Certification ISO : 9001 : 2015 in respect of all the products applied for and the same shall be covered in the certification.
- 4.5 The firm should ensure that proper analysis is being done on monthly basis to study the rejection at various internal stages and it is documented.
- 4.6 The firm should ensure that all the relevant specifications, IS standards are available with the firm.
- 4.7 The firm should ensure that proper record of complaints received from users (Railways) is being maintained and corrective action is taken in the format mentioned in RDSO ISO document No. QM-RF-8.1.3 (latest version).
- 4.8 Quality control measuring equipment/instrument like UTM, Impact testing machine, Vernier calipers /Screw gauge, Tong tester, Weight boxes etc. shall be periodically calibrated.
- 4.9 Minimum Qty. specified for up-gradation from RDSO vendors for developmental order to approved vendors status as per Annex –II.

**ANNEXURE TO STR**

S. No.	STR para no.	Requirement of M&P/T&P as per STR		Details of the M&P/T&P available with the firm						
		Name of M&P/T&P	Range / Capacity of M&P/T&P	Name of M&P/T&P	Model	Make	Machine no.	Year of Built	Range/ Capacity	Proof of ownership

**UNDERTAKING OF THE FIRM**

*"I hereby give an undertaking that if at any time after approval is accorded, some machinery is found deficient without intimation to RDSO, and then it will be presumed that machinery was not there since beginning and firm's approval will be withdrawn immediately."*

**Date:**

**Place:**

**Signature**

**Name in capitals & Designation**

**Stamp of the firm**

**Note :**

1. Details of M & P should be furnished by vendor in complete as per format given above and also furnish the details of the ownership.
2. It should be mandatory to inform the RDSO through FAX/[E-mail](#) (followed by confirmation copy through courier/speed post) as soon as any machinery is removed from the firm's premises (even for repair etc.). RDSO should be informed again, when is brought back and made operational.

**Date:**

**Place:**

**Signature**

**Name in capitals & Designation**

**Stamp of the firm**



**Annex- II**

**Minimum essential quantity of SAW Wire & Flux to be supplied to be on RDSO Vendor for developmental order list for consideration for up gradation in Approved Vendor\***

<b>Sr. No.</b>	<b>Group of SAW Wire &amp; Flux</b>	<b>Minimum Quantity to be supplied of each class to Zonal Railways, Production units &amp; wagon Builders only</b>
<b>1</b>	Group-VIIIA	3,000Kg
<b>2</b>	Group-VIIIB	5,000Kg

**\*NOTE:** A Vendor shall be considered eligible for upgradation to “Approved Vendors” status on completing successful supply of a minimum quantity as mentioned above as a ‘list of RDSO vendors for developmental order’ along with the fulfillment of all other conditions as laid down in RDSO Vendor Registration Guidelines (Apex document) with latest amendment (Document No. QO-D-8.1-11). Vendor registration guidelines are on RDSO website [www.rdsso.indianrailways.gov.in](http://www.rdsso.indianrailways.gov.in).

**Annex-III**

**GOVERNMENT OF INDIA – MINISTRY OF RAILWAYS  
RESEARCH DESIGNS & STANDARDS ORGANISATION  
MANAK NAGAR, Lucknow -226 011**

Questionnaire Form in connection with assessment of SAW Wire & Fluxes for Submerged Arc Welding  
for use on Indian Railways  
(Please fill up one form for each brand)

<b>1.</b>	<b>Name and address of the manufacturer</b>			
	Head Office			
	Works/Factory			
	PHONE/FAX/ <u>E-mail</u>			
<b>2.</b>	<b>Particulars of the brand offered for Assessment (Please enclose technical leaflet):</b>			
<b>2.1</b>	Name of brand			
<b>2.2</b>	Classes/Grades as per IRS M-39/20 for which required to be assessed			
<b>2.3</b>	Code No. as per BIS Specn. No. & Year			
<b>2.4</b>	AWS Specification & Code			
<b>2.5</b>	Current conditions			
	(i) Sizes manufactured, current conditions with corresponding grade of flux			
	(ii) current conditions with corresponding grade of wire			
	Diameter of wire (mm)	Voltage ( <u>Volts</u> )	Current range (Amp)	Travel speed
<b>2.6</b>	Type of wire/Flux			
<b>3.</b>	Whether offered for initial assessment or periodic check			
<b>4.</b>	Whether the offered brand is being checked at periodic intervals for production control. If yes, please indicate test results for minimum two sizes of wire/ properties of flux & weld metal test results made with to sizes of corresponding grade of wire.			

5.	Whether the brand has been approved by NTH/BIS/ LLOYDS Shipping or other approving Agency, If yes, submit a copy of approval Certificate :	
6.	Whether the brand offered is in regular production? If yes, please indicate average annual production :	
7.	Price per Kg (for information only)	Size Rs.....
8.	Special characteristics/ recommendation for the brand, if any :	

**Note :**

All the items are to be filled properly. Please write N.A. if not applicable.

**Encl :**

1. Tech. Leaflet

Signature of competent authority with  
designation and seal

2. BTC in standard format for wire/flux  
(properties of flux & weld deposit in  
combination with respective grade of wire)

**Annex-IV**

**BTC STANDARD FORMAT FOR Test Results For SAW Wire**

Test No.....

Dt : .....

**1. Sample Details:**

Sample Code No./ Brand	IRS Grade of Wire	Batch No.	Date of manufacture	Size (mm)	Packaging as per IRS : M-39-20	Quality of wire & Wire spool ( as per IRS M 39-20)	
						Wire	Wire spool

**2. Chemical Composition of wire:**

Elements%	C	Mn	Si	S	P	Ni	Cr	Mo	Cu	Any other element
Bare Wire										
Specified value as per IRSM - 39/20										

3. Cast & Helix:

4. %Copper in coating (by weight):

5. Storage stability test:

6. Any other test (Pl. specify)

*Note: Please fill up all the boxes. Write N.A. if not applicable*

**Signature of QC Incharge/Chemist**

**Annex-V**

**BTC STANDARD FORMAT FOR Test Results For SAW Flux**

Test No.....

Dt : .....

**1. Sample Details:**

Sample Code No./ Brand	IRS Grade of Flux	Batch No.	Date of manufacture	Type of Flux	Packaging (as per IRS:M-39-20)	Grade, Brand & Size of Wire Used in combination	Weld Parameters*		
							Volta ge	Curre nt	Travel speed

**2. Chemical Composition of weld metal:**

Elements%	C	Mn	Si	S	P	Ni	Cr	Mo	Cu	Any other element
As obtained										
Specified value as per IRSM -39/20										

**3. Mechanical Properties:**

**(a) Multirun All weld:**

Properties	Radiography/Ultrasonic (IIW Blue/ <u>ASTM E390</u> / RDSO procedure No. MC-4)	UTS N/mm <sup>2</sup>	YS N/mm <sup>2</sup>	%age El. on 5d G.L.	%age R.A.	Charpy impact value (Joule)		
						Ind. Values (min.3 values)	Av.	Temp °C
As obtained								
Specified value as per IRSM -39/20								

**(b) Two run weld:**

Properties	Radiography/ Ultrasonic (IIW Blue/ <u>ASTM E390</u> / RDSO procedure No. MC-4)	Transverse Tensile strength N/mm <sup>2</sup>	Bend Test at 90° using 3T mandrel	Charpy impact value (Joule)		
				Ind. Values (min.3 values)	Av.	Temp °C
As obtained						
Specified value as per IRSM -39/20						

- |                                                                                   |                     |
|-----------------------------------------------------------------------------------|---------------------|
| 4. Grain size:                                                                    | 5. Basicity Index:  |
| 6. Tap density:                                                                   | 7. Moisture content |
| 8. <u>Corrosion Resistance Test for Wire-flux combination, W-5 &amp; F-5 only</u> |                     |
| 9. Any other test (Pl. specify)                                                   |                     |

*Note: Please fill up all the boxes. Write N.A. if not applicable.  
\*Please indicate the name of RDSO approved wire used.*

**Signature of QC Incharge/Chemist**