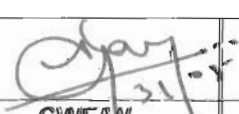

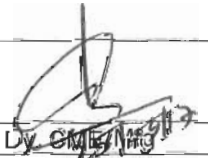
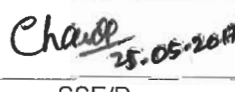


**GOVERNMENT OF INDIA  
(Ministry of Railways)**

**SPECIFICATION FOR  
GRAPHITE ELECTRODE  
WITH PRESET NIPPLE  
PL No.76980017**

Issued by

**MECHANICAL DRAWING OFFICE  
RAIL WHEEL FACTORY  
YELAHANKA, BANGALORE-560 064  
INDIA**

			
CWEAW APPROVED	ABD/M&C REVIEWED	Dy. CME VERIFIED	SSE/D PREPARED

**SPECIFICATION FOR GRAPHITE ELECTRODE WITH PRESET NIPPLE****1.0 SCOPE**

The Specification covers supply of Graphite Electrodes with preset Nipples for GEC Model 13, Electric Arc Furnace installed at Rail Wheel Factory, Yelahanka, Bangalore - 560 064, Karnataka State, India.

Supplier/manufacturer shall be an ISO 9001 certified company. Supplier/manufacturer shall have proven technical capability and experience of having supplied the Graphite Electrodes for similar applications. Evidences shall be furnished by the supplier along with the offer to corroborate the performance.

**2.0 GENERAL DESCRIPTION**

Graphite electrodes 400 mm dia with preset nipples.

**3.0 JOB REQUIREMENTS**

Graphite electrodes 400 mm dia with preset nipples are required for high powered electric Arc Furnaces (GEC Model 13) with 12.1/13.5 MVA Transformer rating and with a melting capacity of 20-22 MT molten steel of medium carbon grade. Steel is tapped at a temperature about 1700°C. Power on to meltdown time varies from 65 minutes to 90 minutes depending on extent of auto oxy lancing in the furnace. During the process of melt down working current of 27KA is used. Electrode should have capacity to take minimum 10% extra current over this working current.

Heavy scrap is used in the Arc Furnace, which tends to generate heavy vibrations while arcing. There are also instances when scrap collapses inside the furnace during melt down resulting in electrode breakage at the nipple joint. Hence, the electrodes and nipples would have to be of requisite strength to withstand these severe operating conditions.. Automatic oxygen lancing using pyrojet burner is operated for steel melting. Power on to tap time is about 2 hrs.

**4.0 RAW MATERIAL AND PROCESS CONTROL**

Low ash containing Calcined Petroleum Coke of appropriate grain size and distribution shall be used with binder and anti-puffing agents for the manufacture of electrodes. Baked electrodes shall be adequately pitch impregnated to achieve the specified properties. Increase in bulk density at each impregnation shall be recorded and the same may be provided to RWF's

<i>Chand</i> 25.05.2017
SSE/D
PREPARED

authorised inspection agency upon demand for verification. The manufacturer shall have the in process testing facilities of raw material and finished product inspection spelt out.

## 5.0 TECHNICAL DATA

### 5.1 GRAPHITE ELECTRODES

Test coupons shall be drawn from the core of the electrode for the preparation of test samples for the properties listed in the clause 5.1 (b) to (f) and 5.2.3. (a) to (d)

- a) Nominal dia : 400 mm.
- b) Bulk density : 1.67 gm/cc min (ASTM C 559-77)
- c) Nominal length : 1800 mm  
(Short length pieces upto 15% of ordered quantity permitted in accordance with IS Specification IS 9050 :1979)
- d) Flexural strength : 95 kg/cm<sup>2</sup> min. (ASTM- C 651-1991)  
(Longitudinal) (Room Temperature)
- e) Ash content : 0.5% max. (loss on ignition)
- f) Electrical resistivity : 675 Micro-Ohm cm (max.)  
(Longitudinal)

### 5.2 NIPPLES

5.2.1 Nipples will be of 4TPI and dimensions of nipple shall match these of electrode.

Nipples shall be present with electrode, tested for electrical resistivity and protected suitably to avoid transit and handling damages.

5.2.2 The manufacturer shall use good quality of needle coke (finer grain size than the electrode) for nipple manufacturing. Nipples shall be subjected to adequate cycles of Pitch impregnation and meet the requirements specified in Clause 5.2.3. Evidence of pitch impregnation shall be produced for RWF's verification during inspection.

The inspector shall be free to verify documentary evidence for confirming pitch impregnation.

<i>Chand</i> 25.05.2017
SSE/D
PREPARED

## 5.2.3 Nipples shall meet the following properties

- a) Bulk density : 1.75 gm/cc min. (ASTM C 559-77)
- b) Flexural strength : 220 kg/cm<sup>2</sup> min (ASTM- C 651-1991)  
(Longitudinal) (at 20°C)
- c) Electrical resistivity : 550 Micro-Ohm cm (max.)  
(Longitudinal)
- d) Ash Content : ≤ 0.3% (loss on ignition)

5.3 Machined dimensions of electrodes and nipples should be in accordance with IS 9050:1979.

## 6.0 OTHER INFORMATION TO BE FURNISHED BY TENDERER IN THEIR OFFER

6.1 Recommended torque for tightening the electrode should be furnished in the offer.

## 7.0 PACKING CONDITIONS

7.1 The electrode shall be suitably packed in a wooden pallet of ≤1.5 tonne capacity, capable of being handled by 3T forklifts, so as to avoid transit damage.

7.2 The ends of the electrodes shall be packed with thick cardboard caps to avoid any damage to ends/nipple during transit and handling.

**“Use eco friendly bio-degradable packing material.”**

## 8.0 TEST REPORTS AND INSPECTION NORMS

8.1 The manufacturer should submit Test Reports and standards for methods followed to ensure compliance with the requirements of the specification, described in clause 5.1 and 5.2.1 & 5.2.3.

### DIMENSIONAL CHECK

Sampling norm : GIL II – IS 2500:Part 1:2000

Acceptance criteria : AQL.0.65 IS 2500:Part 1:2000

Single Sampling, Normal Inspection.

<i>Chade</i> 25.05.2017
SSE/D
PREPARED

SAMPLING NORM FOR DESTRUCTIVE TEST

The firm will follow its own sampling norm and test certificate shall cover values for the parameters under clauses 5.1 and 5.2 for electrodes and nipples.

**9.0 QUALITY ASSURANCE PLAN (QAP)**

The manufacturer shall submit their Quality Assurance Plan (QAP) along with their bid for approval by RWF, which will be followed in the manufacturing of Graphite Electrode with Preset Nipple to satisfy the technical requirement as required under this specification. Manufacturer shall get their QAP approved from RWF in advance, unless a waiver is given to this effect.

**10.0 TRIAL OF THE SUPPLY**

The material for trial shall necessarily meet all the requirements mentioned elsewhere in this specification prior to shop floor trial. Only after this, the material will be taken up for shop floor trial by RWF as per Trial Scheme at Annexure-1 and the corresponding Trial Report shall be prepared as per Annexure-2.

<i>Chadd</i> <i>25.05.2017</i>
SSE/D
PREPARED

**TRIAL SCHEME OF GRAPHITE ELECTRODE WITH PRE SET NIPPLE**

1	Trial scheme No.	RWF/M/SPECN-1/040/1991 alt .../ Trial Scheme PL NO.....
2	Objective of Trial	To establish the suitability of Graphite electrode with preset nipple as per Specn No. RWF/M/SPECN-1/040/1991 alt ...
3	Description of Material PO Number & PO date PO Qty. Supplier	GRAPHITE ELECTRODE WITH PRESET NIPPLE ..... ..... .....
4	IDN Number & Date IDN Qty.	..... .....
5	Authority for conducting Trial	Dy. CME/ Mfg
6	Earlier trial details	Fist Time Supply/ Second time/ Third time ...../...../.....
7	Trial Parameters	As mentioned in Trial Scheme
8	Specification	RWF/M/SPECN-1/040/1991 alt ...
9	Pre-trial Testing details	Met. Lab Report & MTC
10	Trial qty	Full IDN Qty/ 5% of the tendered quantity
11	Equipment / Station process	EAF –A,B,C

( ..... to be filled by Team Members)

**Trial Parameters:**

1. Total quantity Graphite electrode with preset nipple to be drawn and trial conducted on the entire quantity under the purchase order/5% of the tendered quantity, whichever is less.
2. Inspection & testing by shop and whenever required by laboratory completely in line (not in part) with the specification. Sampling for inspection as per RWF specification.
3. Examination of MTC (Manufacturer's Test Certificate) and comments on its suitability.

**Specific Requirements:**

1. Compare the consumption per metric tonnes of steel and brakages with matching number of other makes by ensuring same process parameter during use and in the same period (or just preceding/succeeding period).

<i>Chadi</i> 25.05.2017
SSE/D
PREPARED

**TRIAL REPORT OF GRAPHITE ELECTRODE WITH PRE SET NIPPLE**

1	Trial No.	RWF/M/SPECN-1/040/1991 alt .../ Trial Scheme PL NO.....
2	Objective of Trial	To establish the suitability of Graphite electrode with preset nipple as per Specn No. RWF/M/SPECN-1/040/1991 alt ...
3	Description of Material PO Number & PO date PO Qty. Supplier	GRAPHITE ELECTRODE WITH PRESET NIPPLE ..... ..... .....
4	IDN Number & Date IDN Qty.	..... .....
5	Authority for conducting Trial	Dy. CME/ Mfg
6	Earlier trial details	Fist Time Supply/ Second time/ Third time ...../...../.....
7	Trial Parameters	As mentioned in Trial Scheme
8	Specification	RWF/M/SPECN-1/040/1991 alt ...
9	Pre-trial Testing details	Met. Lab Report & MTC
10	Trial qty	Full IDN Qty/ 5% of the tendered quantity
11	Equipment / Station process	EAF -A,B,C
12	Nominated Officers	ACMT/W & AWM/MR

( ..... to be filled by Team Members)

**Application Test:** Shop Floor test conducted from date \_\_\_\_ to date \_\_\_\_ & H. No. \_\_\_\_\_Trial Parameters:

- 1 Total quantity of Graphite electrode with preset nipple to be drawn and trial conducted on the entire quantity under the purchase order/5% of the tendered quantity, whichever is less.

Comments:

- 2 Inspection & testing by shop and whenever required by laboratory completely in line (not in part) with the specification. Sampling for inspection as per RWF specification.

Enclosure Details:

- 3 Examination of M Lab report & MTC (Manufacturer's Test Certificate) and comments on its suitability

Comments with documents:

<i>Chad</i> 25.05.2017
SSE/D
PREPARED

**Specific Requirements:**

1. Compare the consumption per metric tonnes of steel and brakages with matching number of other makes by ensuring same process parameter during use and in the same period (or just preceding/succeeding period).

**Observations:**

--

AWM/WM

ACMT/W

SSE/MR

WM/W

Remarks of Dy CME/Mfg.

Remarks of AED/M&C

CWE/W

<i>Chav</i> 25.05.2017
SSE/D
PREPARED



## AMENDMENT SHEET FOR RECORD

Alt 'k' Cl. No.	Alt 'L' Cl. No	Description	Job No	Sign
--	9.0	<p><b>QUALITY ASSURANCE PLAN (QAP)</b></p> <p>The manufacturer shall submit their Quality Assurance Plan (QAP) along with their bid for approval by RWF, which will be followed in the manufacturing of Graphite Electrode with Preset Nipple to satisfy the technical requirement as required under this specification. Manufacturer shall get their QAP approved from RWF in advance, unless a waiver is given to this effect.</p>	6976	<i>Chacko</i>
--	10.0	<p><b>TRIAL OF THE SUPPLY</b></p> <p>The material for trial shall necessarily meet all the requirements mentioned elsewhere in this specification prior to shop floor trial. Only after this, the material will be taken up for shop floor trial by RWF as per Trial Scheme at Annexure-1 and the corresponding Trial Report shall be prepared as per Annexure-2.</p>		
--	Annexure -1	<p>Added Annexure -1</p> <p><b>TRIAL SCHEME OF GRAPHITE ELECTRODE WITH PRE SET NIPPLE</b></p>		
--	Annexure -2	<p>Added Annexure -2</p> <p><b>TRIAL REPORT OF GRAPHITE ELECTRODE WITH PRE SET NIPPLE</b></p>		

<i>Chacko</i> 25.05.2017
SSE/D
PREPARED