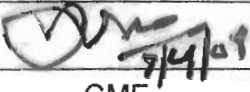
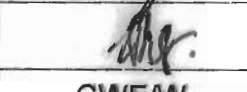
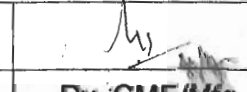
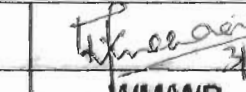


**GOVERNMENT OF INDIA  
(Ministry of Railways)**

**SPECIFICATION FOR  
HIGH ALUMINA ROOF SET FOR  
GEC ARC FURNACE**

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

Issued by  
**SSE/D**

 9/4/08			 3/4/08
CME	CWE/W	Dy. CME/Mfg	WM/WP
APPROVED	REVIEWED	VERIFIED	PROPOSED

JOB No. 5121

## SPECIFICATION FOR HIGH ALUMINA ROOF SET FOR HIGH POWER ELECTRIC ARC FURNACE

### 1.0 SCOPE

The specification covers the design and supply of High Alumina 70% Roof set for GEC Model "13" High Power Electric Arc Furnace, 20 tons capacity, available at Rail Wheel Factory, Yelahanka, Bangalore - 560 064, Karnataka State, India.

### 2.0 GENERAL DESCRIPTION

High Alumina 70% Refractory roof set (including Delta Zone) along with High Alumina 80% Mortar in the gaps around Electrode rings. The size of the brick should be 300 mm long for roof set and 400 mm long for electrode holes as shown in the drawing WAP/SK/MW-123 Alt. 'c'.

### 3.0 JOB REQUIREMENT

High Alumina Roof Set is required for the roof of Direct Electric Arc Furnaces (GEC Model No.13). The expected life of roof set is around 110 heats with one delta set change after around 70 heats.

### 4.0 TECHNICAL DATA

#### 4.1 HIGH ALUMINA ROOF

##### 4.1.1 CHEMICAL COMPOSITION

- 1) Al<sub>2</sub>O<sub>3</sub> : 70% Min.
- 2) Fe<sub>2</sub>O<sub>3</sub> : 3.5% Max.
- 3) Alkalis : 1.5% Max.

##### 4.1.2 PHYSICAL PROPERTIES

- i) Pyrometric Cone Equivalent (PCE) : +36  
(as per ASTM Std. Pyrometric cone.)
- ii) Cold Crushing Strength (CCS) : 350 kg/cm<sup>2</sup> (Min.)

<i>[Signature]</i> CME	<i>[Signature]</i> CWE/W	<i>[Signature]</i> Dy. CME/Mfg	<i>[Signature]</i> WM/WP
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- iii) Apparent porosity (AP) : 22% (Max.)
- iv) Permanent Linear Change (PLC) : +3.5% (Max.)  
(at 1450 °C for 4 hrs.)
- v) Size tolerance : ±1.5% or ± 2mm, whichever is greater
- vi) Refractoriness Under Load (RUL) : 1400°C (min)
- vii) Bulk Density (BD) : 2.6 gm/cm<sup>3</sup> (min.)

**4.1.3 REFRACTORY PARTICLE SIZE**

Bricks should be compact having close grains. When bricks are cut either for sampling or for lining purpose, they should not show any signs of lamination or refractory particle loosening due to larger grains or inadequate bonding. The raw material should not have more than 3 mm size refractory particles. The bricks shall be free from corner/edge damage.

**4.1.4 INSPECTION NORM**

**4.1.4.1 SAMPLING NORM**

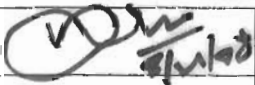

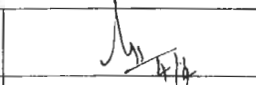
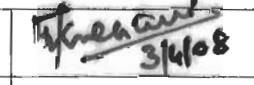
IS1528 Pt. VII: 1974 (Physical & Chemical)

**4.1.4.2 ACCEPTANCE CRITERIA**

IS1528 Pt. VII: 1974 (Physical & Chemical). The manufacturer should ensure that on assembling on the former, there is no gap and the bricks fit snugly.

**4.2 HIGH ALUMINA MORTAR**

- Al<sub>2</sub>O<sub>3</sub> : 80% Min.
- Fe<sub>2</sub>O<sub>3</sub> : 2% Max.
- Pyrometric Cone Equivalent (PCE) : +39  
(as per ASTM Std. Pyrometric cone.)
- Water Content for optimum workability : 25 to 30%

			
CME	CWE/W	Dy. CME/Mfg	WM/WP
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**4.3 TEST FACILITIES**

The firm should have complete testing facilities to check the material as per the specification given above.

**5.0 STORAGE**

The supplier should have arrangement to store the subject item under covered accommodation to protect them from water. Utmost care should be taken during the transportation of these bricks by adequately covering them with tarpaulin etc., to avoid getting exposed to rain.

**6.0 TRANSPORTATION & HANDLING**

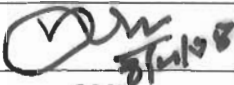
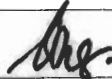
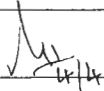
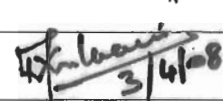
The bricks should be transported to RWF stores by road directly from the firm's premises to avoid any damages to the bricks. Special care should be taken by the supplier to ensure that the edges do not get chipped off during manufacturing and subsequent handling. The bricks which are chipped off are liable to be rejected and will have to be replaced by the firm at the firm's expense.

**7.0 DESIGN GUIDELINE**

New supplier should study the roof former available at RWF for the above mentioned Arc Furnace to incorporate this aspect in the design of the bricks. The steel making process can be studied to arrive at expected service life at Clause 3.0.

**8.0 PACKING**

The material shall be packed in a disposable wooden base pallet of  $\leq 1.5t$  capacity, capable of being handled by 3t forklift. The edges of the brick shall be protected with cardboard paper and strapped on to the base pallet, taking special care to avoid corner damage.

 CME APPROVED	 CWE/W REVIEWED	 Dy. CME/Mfg VERIFIED	 WM/WP PROPOSED
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A.T	DESCRIPTION	JOB No	APPROVED
(C)	DRAWING REDRAWN & NOTE No.1 WAS 'BILL OF MAT'L FOR GUIDANCE ONLY'	4705	Jub 25/5

NOTE:-  
 © 1. THIS DRAWING IS FOR GUIDANCE OF ROOF DIAMETER AND CENTRE RAISE. MANUFACTURER IS FREE TO SELECT HIS OWN BILL OF MATERIAL TO SUIT THE OVERALL FURNACE ROOF DIMENSIONS.

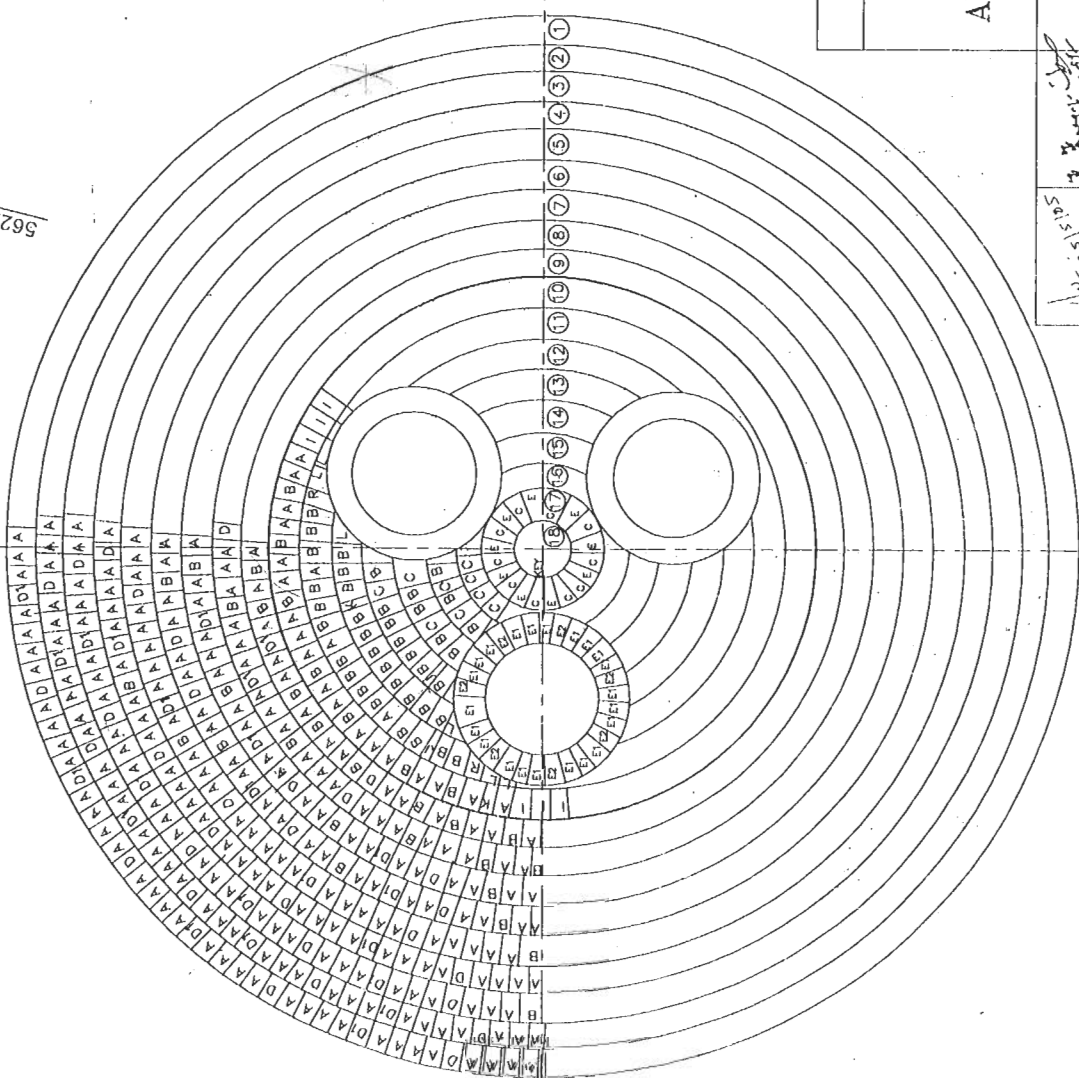
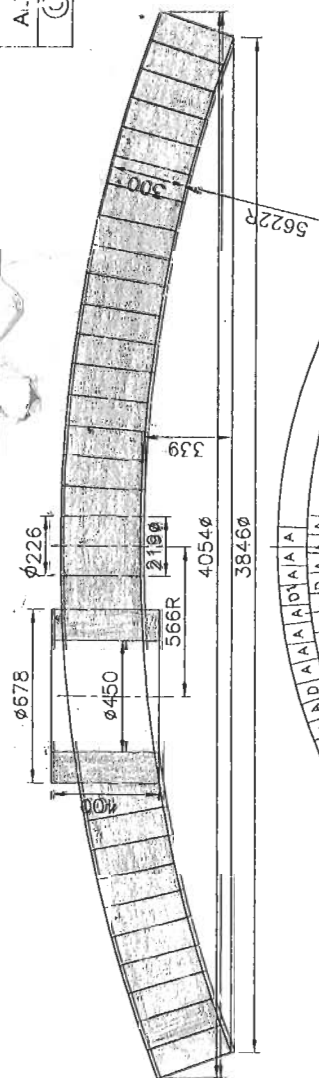
REF. FOR ROOF RING : DRG No. 721 2001 10670

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18											66	21	
17			10			9							1
16			12										
15		9	6										
14		12	6										
13		21	3			3							
12		33						3	6				
11	9	42						3	12	6			
10	35	21				1		9	1	1			
9	53	32				5	5						
8	69	22				6	6						
7	77	17				9	9						
6	84	17				12	9						
5	103	7				11	10						
4	110	3				15	12						
3	111	3				19	16						
2	121	1				19	17						
1	136					16	16						

BRICKS MARK

BILL OF MATERIAL

INDIAN RAILWAYS		REF DRG.	
MODEL '13' ELECTRIC		SCALE	AME/D
ARC FURNACE ROOF LINING			SSE/D
			CHD
		PROJECTION	DRN
		ALT	
RAIL WHEEL FACTORY		DRG.No. RWF/SK/MW-123	
BANGALORE		JOB No. 1001 SHEET 1 OF 1	



APPROVED  
 DT: 25/5/05  
 W.M.M.

ALL DIMENSIONS ARE IN MILLIMETRES.  
 UNLESS OTHERWISE SPECIFIED, TOLERANCES SHALL BE AS PER IS:202 CLASS 'T'.  
 DIMENSIONS IN PARENTHESIS ARE FOR UNTOLENCED DIMENSIONS AS PER IS:202 CLASS 'T'.  
 UNLESS OTHERWISE SPECIFIED, TOLERANCES SHALL BE AS PER IS:202 CLASS 'T'.  
 DIMENSIONS IN PARENTHESIS ARE FOR UNTOLENCED DIMENSIONS AS PER IS:202 CLASS 'T'.

