



# PLANT PURCHASE SPECIFICATION

(CFFP - HARDWAR)

FF 05066 Rev 5

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## HEAVY DUTY RESIN BONDED MAGNESIA CARBON BRICKS (RBMC SPL) BRICKS FOR EAF & VAD,VOD & LRF LADLES

### 1.0 GENERAL:

This specification governs the quality requirements of RBMC-Special bricks for EAF, VAD, VOD & LRF ladles.

### 2.0 APPLICATION:

- \* **Metal and slag zone of Electric Arc Furnaces.** Oxygen lancing is done in EAF for melting and reducing Phosphorous to 0.004%.
- \* **Bottom, metal and slag zone of ladles.** Oxygen lancing in ladles during VOD operation.
- \* Degassing under vacuum at  $\leq 1$  Tor for 30 minute at Temp. 1720°C (max) to reduce gas contents and achieve Sulphur  $\approx 0.002\%$ .
- \* Typical final slag composition after secondary refining is as follows: Cao 40-45%, SiO<sub>2</sub> 13- 17%, MgO 10-12%, Al<sub>2</sub>O<sub>3</sub> 20-25%, Fe<sub>2</sub>O<sub>3</sub> 1.5-3%, Cr<sub>2</sub>O<sub>3</sub>+MnO <1.2%

### 3.0 CONDITION OF DELIVERY

The different types of bricks shall be supplied as per sizes and drawings indicated at page number 5 and 6 of this specification.

- \* Used to brick slag and metal zone of

6.1: EAF of capacity of 10T and 30T

6.2.1: VAD, VOD and LRF ladles

6.2.2: Bottom bricks of VAD, VOD & LRF

6.3: EAF of 70T

6.4: Tap hole refractory for EBT of 70T EAF

### 4.0 COMPLIANCE WITH NATIONAL STANDARDS

There is no Indian standard of resin bonded Magnesia Carbon bricks.

### 5.0 PROPERTIES:

When tested in accordance with the relevant clauses of **IS-1528 or any other International Standard/ Validated instrumental analysis traceable to international standards**, the test samples shall show the following values.

#### 5.1: PHYSICAL PROPERTIES:

|                                                  |        |       |
|--------------------------------------------------|--------|-------|
| Bulk Density (gm /cc)                            | 3      | (Min) |
| Apparent Porosity                                | 5%     | (Max) |
| C.C.S (N/mm <sup>2</sup> )                       | 35     | (Min) |
| Refractoriness Under Load                        | 1600°C | (Min) |
| Thermal expansion up to 1400°C                   | 2%     | (Max) |
| HMOR, (Kg/Cm <sup>2</sup> ) AT 1400°C*30 minutes | 125    | (Min) |

|                  |             |  |                                      |                             |                  |
|------------------|-------------|--|--------------------------------------|-----------------------------|------------------|
| RVI              | S.N GHOSH   |  | WORKED BY                            | M K SAHU                    |                  |
| MPIC             | A K KUSWAHA |  | CHECKED BY                           | SUNIL KUMAR                 |                  |
| CHAIRMAN<br>CPSI | V K AGARWAL |  | SUPERVISED BY                        | P.K.ROY                     |                  |
|                  |             |  | APPROVED : PLANT STANDARDS COMMITTEE |                             |                  |
|                  |             |  | PREPARED : SMS TECH                  | ISSUED : Steel Melting Shop | DATE<br>27-04-16 |



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## 5.2 CHEMICAL COMPOSITION:

| SL NO. | ELEMENTS                               | CONTENT |        |
|--------|----------------------------------------|---------|--------|
|        |                                        | %(Min)  | %(Max) |
| a)     | MgO (in fused magnesia used)           | 97      |        |
| b)     | MgO (in finished product)              | 82      |        |
| c)     | Residual carbon (British cocking test) | 8       | 12     |
| d)     | Al <sub>2</sub> O <sub>3</sub>         |         | 2.0    |
| e)     | CaO                                    |         | 2.0    |
| f)     | SiO <sub>2</sub>                       |         | 1.5    |
| g)     | Fe <sub>2</sub> O <sub>3</sub>         |         | 0.5    |

## 6.0: TYPES OF BRICK.

|       | DESCRIPTION                           | SIZE          | a<br>mm | b<br>mm | h<br>mm | l<br>mm | r<br>mm | α<br>deg |
|-------|---------------------------------------|---------------|---------|---------|---------|---------|---------|----------|
| 6.1   | Bricks for Lining of 30t and 10T EAF  | 30/20         | 160     | 140     | 300     | 100     | 2100    |          |
|       |                                       | 30/40         | 170     | 130     | 300     | 100     | -       |          |
| 6.2.1 | Bricks for side wall lining of ladles | SU 745        | 210     | 185.2   | 100     | 177.8   | -       | 8        |
| 6.2.2 | Bricks for bottom lining of ladles    | Bottom Bricks | 225     | 250     | 100     | -       | -       |          |

Drawing of bricks are given in page no 4

## 6.3: Bricks for lining of 70TEAF:

Quantity indicated below is for one set of lining

| Sl no | Bricks size       | Quantity (Numbers) |
|-------|-------------------|--------------------|
| 1     | 400x190/110x100mm | 150                |
| 2     | 400x170/130x100mm | 500                |
| 3     | 400x160/140x100mm | 360                |
| 4     | 350x170/130x100mm | 100                |
| 5     | 350x160/140x100mm | 342                |
| 6     | 400x150/100mm     | 402                |
| 7     | 350x150/100mm     | 128                |

(Dimensional tolerances: ±1.5% or 2mm which is greater)

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## 6.4. TAP HOLE REFRACTORIES FOR 70T EAF:

Size and set as per drawing given at page no 5 of 7.

## 7.0 INSPECTION AT SUPPLIER'S WORKS:

- CFFP reserves the right to witness the testing of the material at supplier works and therefore the supplier shall notify the readiness of the material in advance.
- CFFP may, at its discretion, test the material after receipt and acceptance of the material will be based on the CFFP's test results. *In case of any dispute in chemical analysis referee method shall be IS.*
- For result of analysis and properties of material the decision of CFFP shall be final and binding on the supplier.

## 8.0 TEST CERTIFICATES:

One Original and three copies of Test Certificate from the **Manufacturer** containing the following information **along with test result of all properties given in clause no 5 should be provided. The T.C should contain the packing details of material.**

Manufacturer's Name

Name of the material

Batch/Lot No.

Quantity.

**The TC should also contain the BHEL's P.O. No. and Challan No. and packing detail of the material.**

## 9.0 PACKING AND MARKING:

Packing should be such as to prevent loss / deterioration in quality during handling, transport and storage. It should be in the **Manufacturer's packing**. Each package should be marked with the following details.

Name of the material

Manufacturer's Name / Trade mark

Batch/Lot No.

Net weight.

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |      | <b>PLANT PURCHASE SPECIFICATION</b><br>(CFFP - HARDWAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>FF 05066 Rev 5</b><br><br><b>Page 4 of</b> |            |                                                                                       |                   |            |             |                                                                                       |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------|---------------------------------------------------------------------------------------|-------------------|------------|-------------|---------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------|---------|-----|----------------------------------------|------------------|--------------------|--------|--------------------------------------------------------------------------------|-------------------------------------------------------------------|
| <p><b>10.0 PERFORMANCE OF MATERIAL:</b></p> <p>Guaranteed heat in working lining(<b>Slag zone +Metal zone</b>) of EAF and VAD/VOD/LRF under working conditions mentioned below against types of bricks.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 20%;">Equipment.</th> <th style="width: 15%;">Bricks</th> <th style="width: 30%;">Working condition</th> <th style="width: 35%;">LIFE</th> </tr> </thead> <tbody> <tr> <td>30T&amp;10T EAF</td> <td>30/20 &amp;30/40</td> <td>Oxygen lancing, removal of P to 0.004%</td> <td>80 heats minimum with intermediate repair near tap hole area and arch cooler area.</td> </tr> <tr> <td>70T EAF</td> <td>SET</td> <td>Oxygen lancing, removal of P to 0.004%</td> <td>25 Heats minimum</td> </tr> <tr> <td>VAD/VOD/LRF Ladles</td> <td>SU 745</td> <td>Temp achieved-1720°C Max<br/>Degassing at Vacuum level ≤1 torr for ≈ 30 minutes</td> <td><b>Minimum 5000</b> minutes of purging with one slag line repair.</td> </tr> </tbody> </table> <p><b>Record of Life:</b></p> <p style="margin-left: 40px;">Furnace life → Record from <b>Heat Process Sheet/Furnace Log Book.</b></p> <p style="margin-left: 40px;">Ladle life → Record from <b>Heat Process Sheet/Ladle Life Record Book</b> in pit side</p> <p><b>11.0 ACCEPTANCE OF MATERIAL:</b></p> <p>Acceptance of material will be based on conditions defined in clause number 5 and 6 and drawings mentioned in page 5 and 6 of the specification.</p> |              |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                               | Equipment. | Bricks                                                                                | Working condition | LIFE       | 30T&10T EAF | 30/20 &30/40                                                                          | Oxygen lancing, removal of P to 0.004% | 80 heats minimum with intermediate repair near tap hole area and arch cooler area. | 70T EAF | SET | Oxygen lancing, removal of P to 0.004% | 25 Heats minimum | VAD/VOD/LRF Ladles | SU 745 | Temp achieved-1720°C Max<br>Degassing at Vacuum level ≤1 torr for ≈ 30 minutes | <b>Minimum 5000</b> minutes of purging with one slag line repair. |
| Equipment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Bricks       | Working condition                                                                     | LIFE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                               |            |                                                                                       |                   |            |             |                                                                                       |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |
| 30T&10T EAF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 30/20 &30/40 | Oxygen lancing, removal of P to 0.004%                                                | 80 heats minimum with intermediate repair near tap hole area and arch cooler area.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                               |            |                                                                                       |                   |            |             |                                                                                       |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |
| 70T EAF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SET          | Oxygen lancing, removal of P to 0.004%                                                | 25 Heats minimum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                               |            |                                                                                       |                   |            |             |                                                                                       |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |
| VAD/VOD/LRF Ladles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SU 745       | Temp achieved-1720°C Max<br>Degassing at Vacuum level ≤1 torr for ≈ 30 minutes        | <b>Minimum 5000</b> minutes of purging with one slag line repair.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                               |            |                                                                                       |                   |            |             |                                                                                       |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |                                                                                       | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">WORKED BY</td> <td style="width: 25%;">M K SAHU</td> <td style="width: 20%; text-align: center;">  </td> <td style="width: 40%;"></td> </tr> <tr> <td>CHECKED BY</td> <td>SUNIL KR.</td> <td style="text-align: center;">  </td> <td></td> </tr> </table> | WORKED BY                                     | M K SAHU   |  |                   | CHECKED BY | SUNIL KR.   |  |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |
| WORKED BY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M K SAHU     |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                               |            |                                                                                       |                   |            |             |                                                                                       |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |
| CHECKED BY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SUNIL KR.    |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                               |            |                                                                                       |                   |            |             |                                                                                       |                                        |                                                                                    |         |     |                                        |                  |                    |        |                                                                                |                                                                   |

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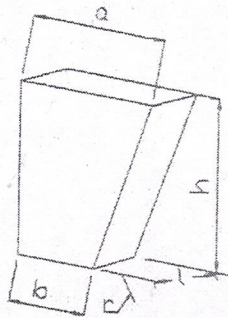
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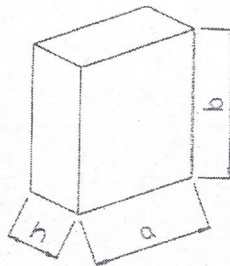
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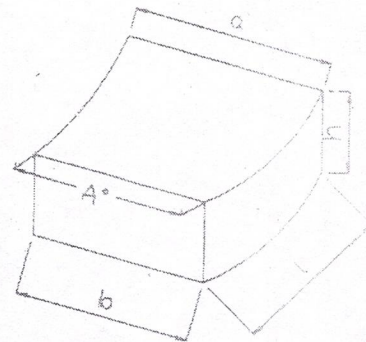
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SIZE: 30/20 & 30/40



BOTTOM BRICK



SIZE: SU 745

WORKED BY

M KSAHU

CHECKED BY

SUNIL KR.

*[Signature]*

*[Signature]*

23



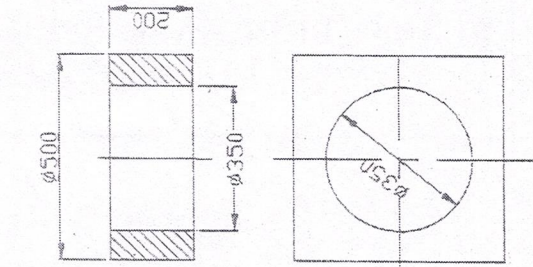
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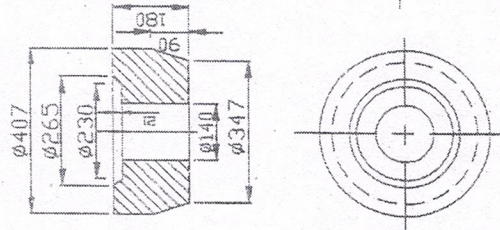
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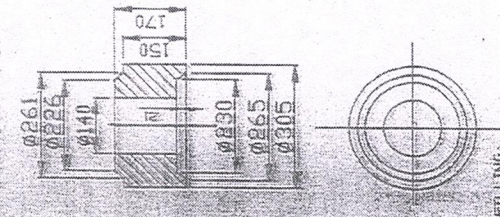
③ TAP BLOCK  
Wt/Piece 92Kgs



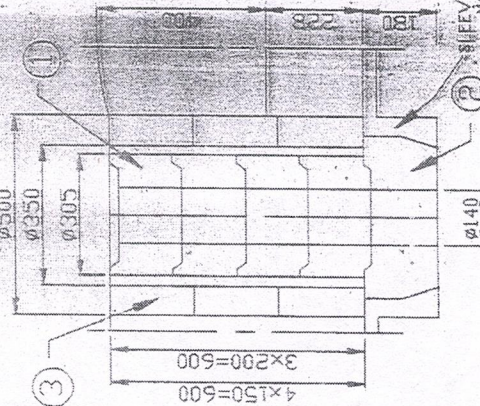
② END BRICK  
Wt/Piece 55Kgs



① TAP TUBE  
Wt/Piece 26Kgs



ASSEMBLY



RIEVE FILLING  
MASS

NOTES:-

- ONE SET CONSISTS OF 4 NOS. OF ITEM 1, 1 NO. OF ITEM 2, 3 NOS. OF ITEM 3

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BY

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23/4/16

23/04/16