



ISOTHERMIC CUM EXOTHERMIC SLEEVES AND FLEXIBLE BOARDS FOR USE IN FOUNDRIES

1 GENERAL

This specification governs the requirement of riser lining material in the form of cylindrical / oval sleeves, and rectangular or square flexible boards, flexible bands.

2 APPLICATION

The material shall be used for riser lining in order to enhance riser efficiency in making castings.

3 COMPLIANCE WITH NATIONAL STANDARD

There is no national standard in compliance with above standard.

4 PROPERTIES

- 4.1 Shape and Size: The shape and size of the sleeves shall be as mentioned in the purchase order.
4.2 The material shall be Isothermic cum Exothermic in nature. Minimum aluminium content shall be 12%.
4.3 The sleeves / boards shall be homogeneously bonded and shall have smooth and well finished surface, free from cracks, blow holes, cavity, and patches. Edges and corners should be sharp and intact.
4.4 Strength: The sleeve shall have strength to withstand the compressive pressure of rammed moulding sand and should not develop crack, significant dilation (±2% max.) or collapse. The compressive strength shall be 10-12 kg/cm².
4.5 When unpacked and taken out from the wrapper, moisture content should not exceed 1% in sleeve material. The sleeve should not pickup moisture from the atmosphere or show wetness while in use.
4.6 The bulk density shall be in the range of 0.9 gm/cc to 1.2 gm/cc.
4.7 Permeability shall be in the range of 120-150.
4.8 The minimum Modulus Extension Factor (MEF) shall be as given below but material with higher MEFs shall be preferred.

Table with 2 columns: Sleeve f (mm) and Minimum MEF. Rows include: up to 150 mm (1.55), 180 - 225 mm (1.45), 250 - 300 mm (1.4), 325 and above (1.3)

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Revisions: As per 21st MOM of MRC-FN

APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE - MRC(FN)

Table with 6 columns: Rev No.02, Amd No., Reaffirmed, Prepared CFFP, Haridwar, Issued Corp.R&D, Dt. of 1st Issue February, 1994



**4.9** When the material is in cylindrical form the thickness shall be 10% of the internal diameter. In case of oval shaped sleeves, thickness shall be 12.5% of minor axis length rounded off to nearest 5 mm or as agreed between supplier and BHEL. Height shall be as agreed between supplier and BHEL. In case of boards – flexible, square or rectangle thickness shall be as per agreement. The tolerance on thickness shall be  $\pm 10\%$  or  $\pm 2$  mm whichever is less.

**4.10** While the riser lining material is used, the covering powder and its quantity for the lined riser shall be as agreed between customer and supplier, for which purpose a table is to be provided by the supplier.

## **5 TESTING AND ACCEPTANCE**

Random samples shall be taken from each batch of the consignment for checking the properties as per clause No. 4 (Except clause 4.8). For checking of properties at 4.2, 4.4, 4.5, 4.6 and 4.7, 4 samples of solid cylinder shape of  $\phi 50 \times 50$  mm height made of the same material as that of sleeves shall be supplied with each consignment.

The recommended MEF, volumetric efficiency and extent of gas evolution and entrapment shall be verified by BHEL on surveillance basis (based on cube test).

The method of verification of MEF, volumetric efficiency and gas evolution and entrapment shall be as given in the ANNEXURE – I.

For new vendors, cube test shall be essential for acceptance of the supply.

## **6 TEST CERTIFICATES**

**6.1** Unless otherwise specified, one original and three copies of original manufacturer's test certificates shall be supplied with each consignment bearing the following information. In order to facilitate quick clearance of material, the supplier shall ensure to send a copy of test certificate along with despatch document.

- BHEL Specification No.
- BHEL order No
- Supplier reference / trade mark
- Identification No/batch no.
- Properties as per Clause No.4
- Any other specific information which the supplier would like to convey.

**6.2** Suppliers other than the original manufacturer shall ensure providing original manufacturer's test certificates with linkage to supplier's invoice stating the batch No., lot No., etc. of the supply.

## **7 INSPECTION, DEVIATION AND REPLACEMENT**

BHEL reserves the right to inspect material at site before despatch. The supplier shall intimate in advance enclosing a copy of test certificate of the material offered for inspection. However inspection at BHEL shall be final. The supplier shall offer BHEL representative all reasonable facilities without charge to satisfy the latter that the material is being furnished in accordance with this specification. The supplier shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his works, the supplier shall make necessary arrangements for carrying out the prescribed tests elsewhere.

If the material received at BHEL is not found in accordance with the requirements, it shall be rejected and the supplier will have to replace it free of cost at the earliest.

For any deviation from the specification demanded by the supplier, prior approval of BHEL must be obtained in writing.



## CORPORATE PURCHASING SPECIFICATION

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### 8 PACKING AND MARKING

The material shall be suitably packed to avoid damage, breakage and moisture pickup during transit and storage. Packing should be that of the original manufacturer. Each consignment is to be legibly marked or labelled with the following information:

- BHEL order No.
- Specification No. and item description.
- Manufacturer's/Supplier's name and trade mark, if any.
- Batch No.
- Size and quantity supplied.
- Date of manufacture

Any material found broken, damaged, soiled due to improper packing or mishandling during transportation or otherwise shall be rejected and has to be replaced in equal quantity by the supplier within 15 days of intimation.

### 9 LIST OF REFERRED STANDARDS (Latest publications including amendments):

- 1) DIN 1690 Part 2



## ANNEXURE – I

**Verification of Module Extension Factor (MEF) as recommended by supplier.**

Testing shall be done on a cube casting provided with a circular lined riser,

- 1) Minimum feed safety margin to be considered as 20% of lined riser filling height, which shall be an indicator of volumetric feed efficiency.
- 2) The contact surface of riser base to casting top shall be considered non-cooling.
- 3) After covering the riser top with recommended covering powder, the cooling coefficient of riser top shall be treated equal to side surfaces of lined riser.
- 4) The cooling coefficient of cube top which is not in contact of riser base shall have the value equal to other sides ( $a^2 - (p/4) \cdot d^2$ ) for cube of side 'a' and riser diameter 'd'
- 5) Riser shall be parted off from casting by sawing – not by gas cutting. The riser then shall be split vertically to physically observe shrinkage pattern and measurement of feed safety margin.
- 6) The cube casting shall be subjected to UT as per **DIN1690 Part II Quality level 1**.
- 7) The UT shall be done to check shrinkage only and not for any other defect e.g., inclusion, segregation, crack, etc.
- 8) If felt necessary, the cube casting can be parted off in pieces by sawing and verifying for shrinkage defects.
- 9) Liquid metal shall be plain C steel (economic consideration) at  $1565 \pm 10^\circ\text{C}$ . Moulding sand shall be either sodium silicate bonded sand or phenol resin bonded sand. Non-pressurised gating system shall be at the ratio of 1:2-3: 4-5 (from sprue to ingate). The riser top shall have provision to accommodate the recommended quantity of covering powder. Addition of covering powder shall be done immediately after pouring.
- 10) Boiling tendency of liquid metal, if any, in the sleeve riser shall be noted. If boiling continues for more than 2 minutes, gas evolution in sleeve shall be considered excessive and liable for rejection.

**Example:**

When recommended MEF for f 250 sleeve is 1.4, for a sleeve riser of H=D.

Modulus =  $(250/5) \times 1.4 = 70$  mm.

If f 250 lined riser is placed on a cube of 320 mm side, all 5 surfaces of cube shall have cooling coefficient of 1 and the top surface under riser shall have cooling coefficient equivalent to

$$(320 \times 320 - 0.785 \times 250 \times 250) / (320 \times 320) = 0.5208$$

$$\text{Hence casting modulus} = 320 / (5 + (0.52/1)) = 57.97 \text{ mm}$$

$$\text{Hence, riser modulus/casting modulus} = 1.2075$$

Hence f 250 HT250 mm sleeve, with MEF 1.4, shall be sufficient to feed a cube of 320 mm.