

## TERMS OF REFERENCE FOR THE R&D PROJECTS

**Title of the Project:** Study and Identification of critical parameters for classification of refractory insulating bricks/shaped insulating products.

### 1. Background:

- 1.1 Refractory insulating bricks are shaped refractories having a true porosity of not less than 45% by volume and are characterized by low thermal conductivity and low heat capacity. They act as insulators and are used in various furnaces such as BOF, electric etc. The existing BIS product standards related to refractory insulating bricks viz. IS 2042: 2006 Insulating Bricks - Specification and; IS 12951: 2006 Mica Insulating bricks for high temperature applications, contains only 3 grades of refractory insulating bricks. However, many more grades of insulating bricks are manufactured and used in India. The current Indian Standards mentioned above are rarely used since in these standards limited numbers of grades are mentioned and further the requirements of these refractory insulating bricks depend upon the final application and the type of material being smelted/refined.
- 1.2 The international standards such as ISO 2245 focus on classification rather than detailed product specifications. However, in ISO classification has been done based on one parameter only and thus has a limited use in context of the Indian Industry where classification based on more than one critical parameter such as Cold Crushing Strength (CCS), Thermal conductivity, PLC, bulk density is desired.
- 1.3 A need was thus felt to study critical parameters which are relevant and essential within the Indian refractory industry and prepare a classification framework based on the study. This framework will form the basis for development of a new Classification standard on refractory insulating bricks.

Indian standards can be accessed from <https://standardsbis.bsbedge.com/>

### 2. Objective:

To collect relevant data and information, from primary and secondary sources, for critical parameters influencing the quality and performance of refractory insulating bricks and develop a comprehensive framework for the classification of refractory insulating bricks based on identified parameters.

### 3. Scope:

- 3.1 Conduct a thorough literature review of various national and international standards such as ASTM, JIS, EN, ISO etc available on the subject, research papers, any study conducted by other organizations, company brochure, Indian industry standards/data etc. and to identify existing parameters such as PLC, Bulk density, Thermal conductivity, CCS etc. used in the classification of refractory insulating bricks. The following international standard(s) are accessible on the subject. Nevertheless, the literature review should not be confined solely to these standards. Additional international standards related to the subject may be available and must be identified and examined.

- C155-97(2022) Standard Classification of Insulating Firebrick

- JIS R 2611: 2001 Insulating fire bricks
- ISO 2245:2006 Shaped insulating refractory products – Classification

**3.2** Identify the manufacturing base of the product.

**3.3** Visit the manufacturers of the product and get the information on the following:

- i. Varieties/grades manufactured
- ii. Manufacturing processes.
- iii. Quality parameters (chemical, physical properties) of different grades
- iv. Identification of critical parameters for classification of the product
- v. Whether the product standards are still relevant to the industry or a classification standard will suffice.
- vi. Safety requirements
- vii. In process quality checks
- viii. Testing facilities and test methods undertaken.
- ix. Marking and labelling being done
- x. Packaging requirement
- xi. Steps taken to address sustainability and 3 R (reduce, reuse and recycle).

**3.1** Identify the testing laboratories and visit these laboratories.

**3.2** Check the quantity of the product imported and exported and countries with which the trade for this product is occurring. Also check if any technical regulations exist for this product in these countries. Take data of the foreign specification as per which the product is being imported or exported.

**3.3** Identify the users of the product and take data of the quantity being used by them, specification used, check for the test certificates received by them and study the chemical and physical properties mentioned in the TC. Also understand from the user the main properties/critical parameters used for classification of the product. Also collect the data on whether the product standards are still relevant to the refractory industry or a classification standard will suffice.

**3.4** Prepare comprehensive project report incorporating the points mentioned above.

## **4. Methodology**

**4.1** Study the literature and analyse the findings.

**4.2** Visit the manufacturing unit and

- a. observe the manufacturing process,
- b. examine in-process control measures,
- c. conduct focused group discussion with quality personnel
- d. collect the data as mentioned in the scope through a questionnaire.
- e. test samples as per proposed classification and draw samples for independent testing.

**4.3** Test the samples drawn in NABL accredited laboratory

**4.4** Visit the identified importers/exporters/traders/suppliers and collect data as mentioned in the scope through a questionnaire.

**4.5** Visit the users of the product and collect data as mentioned in the scope through a questionnaire.

**4.6** Visit laboratories and make report on

- a. test equipment required for testing the product for critical parameters.

- b. test method being used, and Standards being followed by labs for testing the product.
- c. testing charges
- d. testing time required for each test.
- e. Witness the tests being conducted on the samples drawn

4.7 Analyze the findings and prepare a classification framework.

## 5 Sampling plan:

5.1 Two manufacturers from each large, small and micro scale shall be visited.

5.2 Three samples for each classification proposed shall be tested.

5.3 Samples may be drawn from manufacturer, user, importer or market.

5.4 Two users of the product shall be visited.

5.5 Two laboratories, preferably one in government sector and one in private sector shall be visited.

## 6 Deliverables:

6.1 Final project report, in hard copy format as well as in editable soft copy, covering all aspects mentioned in the scope.

6.2 Questionnaire, discussion, visit reports, test reports, international standards to be appended with the final project report.

## 7 Timeline and Method of Progress Review:

The duration of the project is 3 months from the date of award of the project. The proposed indicative timeline stage-wise is given below:

Sl No.	Stage	Time from date of award of project (cumulative)
1	Literature review and identification of manufacturing base, testing laboratories, user/user industry, and discussion with BIS for the finalization of sampling plan	1 month
2	Visit to manufacturers, testing laboratories, users and importers and exporters and data collection	2 months
3	Preparation and submission of first draft report to BIS	2.5 month
4	Submission of final project report	3 months

Note: The proposer may submit the draft report to BIS without waiting for test report from independent laboratories if the test is of long duration test .

**8. Support BIS will provide:**

BIS will provide access to latest available editions of Indian standards and/ or international standards relevant to the project, on request.

**9.Relevant sectional committee and Nodal officer from BIS**

**Sectional committee:** MTD 15 (Refractories Sectional Committee)

**Nodal officer:** Mr Saaqib Raahi, Scientist B/ Assistant Director –Member Secretary MTD 15  
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