

TERMS OF REFERENCE FOR THE R&D PROJECT

Title: Study of the requirements for Solid resins for preparation of resin coated sand (RCS) by hot coating technique for use in foundries

1. Background:

1.1 The resin is synthetic in nature produced by catalytic reaction of phenol and formaldehyde. The resin is supplied in the form of flakes. The catalyst is manufactured by pulverizing hexamine powder. Lubricant which consists of wax and additive may be added separately into the sand mix during the coating operation.

1.2 There is an Indian standard IS 11266: 1985 “Flake resins for use in shell process in foundries –Specification”. This standard specified the requirements of flake resin of various grades like melting point, Flow property, Flake Size, coated sand properties, Sand mixture composition and mixing procedure, test method for determination of melting point of flake resin. In the existing standard lubricated resin (i.e. flake resin and lubricant) is used in preparation of sand mixture, capillary test method is used for determination of melting point of flake resin.

1.3 Recommendation received from a number of resin manufacturer and user that the existing standard on flake resin is required to be revised as nowadays Lubricated resins used for preparing RCS have largely been replaced by non-lubricated/ virgin resins. In turn, lubricant is added separately in prepared sand mixer before discharge. This will improve coating efficiency and reduction in resin demand for achieving equivalent strength. Benefits include lower gas evolution at curing and pouring stages with improvement in work place environment and casting quality. Also, used sand containing lesser binder, demands lesser thermal energy for reclamation. Most of the resin manufacturer is manufacturing uniform resin with higher melting point and the melting points are checked by Ball and Ring Test Method for quick result.

1.4 A need was thus felt to initiate a R&D project to Study of the requirements for flake/uniform shaped resin, catalyst and lubricant in combination, for use in production of shell cores or moulds in a foundry using hot sand coating process, and this will in turn help in revision of IS 11266: 1985.

This standard can be accessed from <https://standardsbis.bsbedge.com/>

2. Objective:

To collect relevant data and information from primary and secondary sources of requirements for Solid resins for preparation of resin coated sand (RCS) by hot coating technique for use in foundries.

3. Scope:

- 3.1 Study the available literature like national and international standard such as ASTM, JIS, EN, ISO etc available on the subject, research papers, any study conducted by other organisations, companies' brochure. Identify the grades, their chemical and physical properties, methods used for determining melting point of solid resin and any other requirements which can be included in the standard.
- 3.2 Collect data of the manufacturing base of the product.
- 3.3 Visit the manufacturers of the product and get the information on the following:
 - 3.3.1 Types of Raw material used
 - 3.3.2 Varieties/grades manufactured
 - 3.3.3 Quality parameters (chemical and physical properties) of different grades
 - 3.3.4 Manufacturing process,
 - 3.3.5 In process quality checks - Melting point, Flow property, flake size, sand mixture, sand mixture procedure and coated sand properties.
 - 3.3.6 Test facilities and test methods used
 - 3.3.7 Marking and labelling being done
 - 3.3.8 Packaging requirement
 - 3.3.9 Tests being undertaken
 - 3.3.10 Testing facilities in the plant
 - 3.3.11 Waste recycling
- 3.4 Identification and visit to the laboratories
- 3.5 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. Observe the main properties required by them in the product like- melting point, flow property, flake size, sand mixture, sand mixture procedure and coated sand properties.
- 3.6 Prepare a 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 – Melting point, Flow property, flake size, sand mixture, sand mixture procedure and coated sand properties.
 - c. conduct focussed group discussion with quality personnel
 - d. collect the data as mentioned in the scope through a questionnaire.
 - e. draw samples of the grades and get it tested in In-house laboratory/ NABL accredited laboratory/ BIS approved laboratories
- 4.3 Visit laboratories and make report on

- f. test equipment required
- g. test method being used
- h. testing charges
- i. testing time required.

4.4 Visit the users of the product and observe the sand mixture, sand mixture procedure and coated sand properties. Collect the information as mentioned in the scope through a questionnaire.

4.5 Analyse the data and test reports from diverse sources and include the same in the project report.

5. Sampling plan:

5.1 Two manufacturers, one from large/medium and one from small/micro scale shall be visited.

5.2 Three samples for each grade shall be tested.

5.3 Two users of the product shall be visited.

5.4 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 soft copy, covering all aspects mentioned in the scope.

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

7. Timeline:

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:

Sr 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 month

3	Preparation and submission of first draft report BIS	2.5 month
4	Submission of final project report	3 month

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 14-Foundry and Steel Castings Sectional Committee

Nodal officer:

- Mr Kunal Kumar, Scientist D/ Joint Director – Member Secretary MTD 14,
- Email: mtd14@bis.gov.in