

**CORPORATE PURCHASING SPECIFICATION**

AA 53616

Rev. No. 03

PREFACE SHEET

PHENOL FORMALDEHYDE RESIN AND ACID CURED CATALYST SYSTEM

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

1. INDIAN :

Suggested/Probable Suppliers and Grades:

1. FORACE POLYMER
2. FOSECO
3. Refer Plant vendor directory.

User Plants /References:

1. HEEP, HARDWAR : FF06004
2. BHOPAL :
3. HYDERABAD :

Revisions :As per 24th MOM of MRC-FN**APPROVED :**

INTERPLANT MATERIAL
RATIONALISATION COMMITTEE-MRC (FN)

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PHENOL FORMALDEHYDE RESIN AND ACID CURED CATALYST SYSTEM

1.0 General

This specification governs the technical requirements for Phenol Formaldehyde Resin and acid cured Catalyst used in Foundries.

2.0 Application

2.1 The Resin and acid cured Catalyst shall be used as binder for sand mix for mould and core making in Foundries.

2.2 The resin and acid cured catalyst are to be procured from same source as a system. The supplier shall stand guarantee for the performance of combination and ensure the compatibility of resin and catalyst with sand.

3.0 Appearance

3.1 The Resin and acid cured Catalyst shall be clear liquid, free from dust and other visible impurities.

3.2 During storage, a separate layer at the top and sedimentation at the bottom should not be formed within the stipulated shelf life.

4.0 Properties

4.1 Resin

The Resin shall have the following typical properties.

Appearance	Clear liquid (Brown)
Viscosity at 25° C	150-250 CP/ 50-80 seconds in B4 cup as per IS3944
pH value	4 to 6.5
Density at 25° C	1.2 to 1.25 gms/cm ³
Nitrogen content	0.6 % max
Permission Free Phenol	6% max.
Permission Free Formaldehyde (Formalene)	0.3% max.
Solid Content	71% minimum
Shelf Life	Minimum 8 weeks from date of receipt in BHEL when stored at 20 °C max.

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4.2 Catalyst (Typical)

The catalyst should be super saturated solution of para toluene sulphonic acid (PTSA). The minimum normality of the catalyst shall be 4 N.

4.3 Sand-Mixes

4.3.1 The sand mix prepared as per clause 5.0 shall be tested for compression strength, bench life and following requirement shall be met.

Time after making of AFS standard specimen		Minimum compression strength at ambient temperature of 25-30 ⁰ C
A	2 Hour	16 Kg/cm ² (indicative only)
	4 Hour	18 Kg/cm ²
	24 Hour	32 Kg/cm ²
B	Bench life	i) 15 minutes or more at 30 ⁰ C, with or without dilution
		ii) 10 minutes or more above 30°C with or without dilution

4.3.2 Gas emission during preparation of the mould:

The fumes generated during sand preparation and mould/core making shall not be excessive which inhibit working on the shop floor.

5.0 Sampling and Method for Preparation of Sand Mix

5.1 Sampling

The composite samples of resin and catalyst shall be drawn from each batch of the consignment on random basis.

5.2 Method for preparation of sand mix.

The high silica sand to be used for determining the properties of the sand mix should be absolutely dry with AFS fineness no. between 40 to 50 and clay content not more than 0.20%.

The sand binders shall be mixed in following proportions.

Sand	100 parts by weight
Resin	1.6% of sand
Catalyst	40% of resin



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The catalyst should be added first to the sand and mixed in a sand mixer for 1.5 minutes, then resin to be added and mix for 1.5 min more before using the same for making the samples for determining the properties as per clauses 4.3.

In summer above 30°C catalyst is to be diluted with water as and when suggested by manufacturer.

In winter below 20° C catalyst addition may increase above 40% upto 60% of resin to obtain the required sand strength as suggested by manufacturer.

6.0 Acceptance Test

- 6.1 The supplier shall offer the material, batch wise to BHEL only after evaluating the suitability w.r.t. the properties detailed in clause No. 4.
- 6.2 BHEL shall however reevaluate the properties as per clause 4.3 for each batch of consignment.
- 6.3 To ascertain the properties of sand mix as per Clause 4.3.1, samples shall be prepared as mentioned in Clause 5.2. Following testing procedure is to be carried out for determining acceptance or rejection of the material. The procedure is to be followed, irrespective of any supplier's recommendation of dilution or increase of catalyst % alongwith the supply.
 - 6.3.1 The first tests to be performed should be based on 1.6% resin and 40% catalyst addition. The material shall be accepted, if the properties as mentioned in Clause 4.3.1 are achieved.
 - 6.3.2 If the bench life is found less than 8 minutes, the material is rejected.
 - 6.3.3 If the bench life is found to be less than 15 minutes; i.e., 15 minutes > (Bench Life) ≥ 8 minutes, catalyst to be diluted by adding water 10% (of catalyst) and DCS and bench life is to be ascertained. If the results are as given in 4.3.1, the material is accepted. If the bench life is still less than 15 minutes, further dilution 20%(of catalyst) to be carried out and DCS and bench life is to be checked.
 - 6.3.4 If the DCS at 4 or 24 hours is found to be less than minimum required, catalyst % to be increased to 50% of resin and all tests are to be carried out. If the results are as given in 4.3.1, the material is accepted. If the DCS is still low, catalyst addition can be increased to 60% of resin and retested.
 - 6.3.5 When ambient temperature falls below 20°C and development of strength is found slow, the bench life and strength after 24 hours as mentioned in Clause 4.3.1 shall be considered for acceptance.
 - 6.3.6 For testing under dilution or increasing % catalyst, acceptance shall be on the basis of results of all tests, i.e., DCS after 4 and 24 hours and bench life as per Clause 4.3.1.
- 6.4 The material shall also be judged on shop floor for pungency of fumes as per clause 4.3.2
- 6.5 Within shelf life (i.e. period between the date of manufacturing and the date of expiry), if the binders do not meet the properties requirement as per clause 4.3 of this specification, it shall be rejected irrespective of its previous acceptance. The supplier shall be liable for replacing such materials free of cost.
- 6.6 The properties as per Clause No. 4.1 and 4.2 shall be checked on surveillance basis.

**7.0 Inspection, Deviation and Replacement**

- 7.1 BHEL reserves the right to inspect material at vendor/manufacturers' premises before despatch. The supplier shall intimate in advance about readiness of material 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 test facilities without charge to satisfy the latter that the material being furnished is 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.
- 7.2 If the material received is not found in accordance with these requirements, it shall be rejected and the supplier will have to replace it free of cost at the earliest.
- 7.3 For any deviation demanded by the supplier from the specification, prior approval of BHEL must be obtained in writing.

8.0 Test Certificates

- 8.1 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 Reference:

- (a) PO No.
- (b) Specification No.

Supplier's Reference

- (a) Supplier's name
- (b) Date of Manufacture
- (c) Date of expiry
- (d) Batch number
- (e) Test results as per Clause No. 4
- (f) Specific recommendations, such as dilution chart for summer and addition level for winter.
- (g) Material safety data sheet (MSDS)

- 8.2 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.



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9.0 PACKING AND MARKING

The resin shall be supplied in blue coloured drums with net weight of 200 to 250 kg and the catalyst in suitable black colour containers with net weight of 50 to 125 kg. The packing shall be that of the original manufacturer. The containers should be of suitable material HDPE/Steel, which do not have any reaction with the resin/catalyst. The weight and material of the drum shall be as per purchaser requirement. Each drum/container shall be marked with the following information:

- (a) Supplier's name and trade mark, if any.
- (b) Item Description, Batch No.
- (c) Date of manufacture
- (d) Date of expiry
- (e) Net weight and gross weight

10.0 Referred standards (latest publications)

IS3944