



Designation: D4640 – 86 (Reapproved 2022)

# Standard Test Method for Determining Stroke Cure Time of Thermosetting Phenol-Formaldehyde Resins<sup>1</sup>

This standard is issued under the fixed designation D4640; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method covers the determination of the cure rate at any specified temperature for a thermosetting phenol-formaldehyde resin. The time at that temperature required to make a fluid mixture change into a hard immovable mass indicates speed of cure.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *stroke cure time, n*—the time required for a resin being held at a specified temperature on a hot plate and being stroked with a spatula, to adhere to the hot plate and not to the spatula.

## 3. Summary of Test Method

3.1 This test method employs the use of controlled heat and a thin layer of resin to determine the time in seconds required to change from a fluid stage to a cured immovable stage.

## 4. Significance and Use

4.1 This method is significant as a process control for polymerization time.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.33 on Polymers and Resins.

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4.2 When the cure times are determined at several temperatures and plotted as time versus temperature, different resins can be compared for curing characteristics.

## 5. Apparatus

5.1 *Electric Hot Cure Plate*, with a smooth surface free of rough spots with adjustable control to hold the temperature within 3.5 °F (2 °C) (**Note 1**).

5.2 *Spatula*, 3 by 7/16 in. (75 by 10 mm), stainless.

5.3 *Stopwatch*.

5.4 *Knife*, brass, putty with straight edge.

## 6. Procedure

6.1 Adjust the hot plate to the desired test temperature.

**NOTE 1**—Usual temperatures are 300 °F (150 °C), 320 °F (160 °C), and 330 °F (165 °C).

6.2 Place an approximately 0.5-g specimen on the hot plate and spread over an approximately 2-in.<sup>2</sup> (130-mm<sup>2</sup>) area with a clean spatula as quickly as possible. Start the stopwatch immediately upon adding the specimen to the hot plate, then stroke steadily across the specimen in alternating smoothing and patting motions.

6.3 As the resin approaches the cured stage, it becomes more viscous and stringy. Stop the stopwatch when the resin on the hot plate and the spatula no longer adhere to each other. Record the elapsed time.

6.4 Remove cured resin from hot plate immediately with the straight edged putty knife.

**NOTE 2**—The longer on the hot plate, the harder it is to remove.

**NOTE 3**—Test results can be affected by differences in construction of hot plates, the stroking and patting with spatula, and the starting and stopping of the stopwatch.

## 7. Report

7.1 Report the following information:

7.1.1 Stroke cure time in seconds; record to the nearest whole number.

7.1.2 Test temperature.

## 8. Precision and Bias

8.1 No statement is made about either the precision or bias of this method for measuring stroke cure since the result merely states whether there is conformance to the criteria for success specified in the procedure.

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## 9. Keywords

9.1 phenol-formaldehyde resins; stroke cure time

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