

Method of Test for  
**GEL TIME DETERMINATION OF EPOXY RESIN SYSTEMS**  
DOTD Designation: TR 703-85  
**METHOD A**  
(Gel Time - Probe Method)

DOTD TR 703-85  
Adopted 10/85  
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Method A

### Scope

1. This method of test is intended to determine the gel time of mixed epoxy resin systems by probing the mixed components with a tongue depressor or small spatula.

### Apparatus

2. (a) *Balance* - A Type I or II, Class D balance conforming to AASHTO M 231.
- (b) *Cup* - An 8 oz, unwaxed paper cup having a nominal base diameter of 3 1/2 in.
- (c) *Beaker* - A 250 ml (minimum) graduated disposable plastic beaker.
- (d) *Timer* - A clock or watch capable of measuring minutes and seconds.
- (e) *Mixing Tools* - Stainless steel spatulas or wooden tongue depressors.
- (f) *Wooden Block* - 4 by 4 by 1 in. minimum.
- (g) *Bath* - A temperature controlled water bath capable of maintaining  $77 \pm 2$  °F.
- (h) *Thermometer* - A thermometer conforming generally to the requirements for ASTM 1C or 1F thermometers.

### Safety Precautions

3. The following precautions should be observed when handling epoxy components and cleaning fluids:
  - (a) Persons handling these materials should use appropriate protective clothing, including rubber or plastic gloves, and appropriate eye protection such as safety glasses.
  - (b) If any epoxy or cleaning material should contact the skin, the material should be removed immediately with a dry cloth or paper towel, and the affected area should be washed thoroughly with soap and water.
  - (c) If any material should come in contact with the eyes, flush immediately with water and contact

a physician.

- (d) Adequate ventilation is necessary to prevent excessive inhalation of vapors.
- (e) Observe all precautions as specified by the manufacturer before handling each material.

### Sample Preparation

4. (a) Prior to mixing, condition the individual components and any equipment with which they will come in contact, to the test temperature of  $77 \pm 2$  °F by use of a water bath and/or laboratory temperature control.
  - (b) Thoroughly stir the individual components, for at least one minute, immediately before testing.
  - (c) Start timer and immediately combine and mix sufficient quantities of components A and B, in accordance with the manufacturer's recommendations, such that a sample quantity of approximately 125 ml is obtained. If the manufacturer does not recommend a mixing time, mix the sample for at least 3 minutes. Use separate mixing tools when obtaining and mixing the desired quantities of each component to avoid contamination.
  - (d) Transfer  $100 \pm 1$  g of the mixed epoxy into the 8 oz unwaxed paper cup immediately after mixing.

### Procedure

5. (a) Set the cup on a wooden block in a location maintained at the conditioning temperature and not subjected to excessive air movement.
  - (b) Probe the sample with the tongue depressor or small spatula every two minutes, starting 10 minutes from the initiation of mixing.
  - (c) Record the elapsed time at which a semi-solid gel is observed to have formed.

### Report

6. Report the elapsed time to the nearest minute.

Normal testing time is one day.

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**GEL TIME DETERMINATION OF EPOXY RESIN SYSTEMS**

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**METHOD B**

(Gel Time - Gel Timer Method)

**Scope**

1. This method of test is intended to determine the gel time of mixed epoxy resin systems with the use of a Shydo Model 100 gel-timer, or equivalent.

**Apparatus**

2. (a) *Balance* - A Type I or II, Class D balance conforming to AASHTO M 231.

(b) *Cup* - An 8 oz, unwaxed paper cup having a nominal base diameter of 3 1/2 in.

(c) *Beaker* - A 250 ml (minimum) graduated disposable plastic beaker.

(d) *Gel Timer* - Shydo model 100 gel timer with stirrer, or equivalent.

(e) *Mixing Tools* - Stainless steel spatulas or wooden tongue depressors.

(f) *Timer* - A clock or watch capable of measuring minutes and seconds.

(g) *Thermometer* - A thermometer conforming generally to the requirements for ASTM 1C or 1F thermometers.

(h) *Bath* - A temperature controlled water bath capable of maintaining  $77 \pm 2$  °F.

**Safety Precautions**

3. The following precautions should be observed when handling epoxy components and cleaning fluids:

(a) Persons handling these materials should use appropriate protective clothing, including rubber or plastic gloves, and appropriate eye protection such as safety glasses.

(b) If any epoxy or cleaning material should contact the skin, the material should be removed immediately with a dry cloth or paper towel, and the affected area should be washed thoroughly with soap and water.

(c) If any material should come in contact with the eyes, flush immediately with water and contact a physician.

(d) Adequate ventilation is necessary to prevent excessive inhalation of vapors.

(e) Observe all precautions as specified by the manufacturer before handling each material.

**Sample Preparation**

4. (a) Prior to mixing, condition the individual

components and any equipment with which they will come in contact, to the test temperature of  $77 \pm 2$  °F by use of a water bath and/or laboratory temperature control.

(b) Thoroughly stir the individual components, for at least one minute, immediately before testing.

(c) Start timer and immediately combine and mix sufficient quantities of components A and B, in accordance with the manufacturer's recommendations, such that a sample quantity of approximately 125 ml is obtained. If the manufacturer does not recommend a mixing time, mix the sample for at least 3 minutes. Use separate mixing tools when obtaining and mixing the desired quantities of each component to avoid contamination.

(d) Transfer  $100 \pm 1$  g of the mixed sample into the 8 oz unwaxed cup.

(e) Record the mixing and weighing time as (A).

**Procedure**

5. (a) Zero the gel timer counter.

(b) Place the cup with sample into the gel timer retaining ring.

(c) Attach the wire stirrer hook into the hole in the motor shaft.

(d) Start the gel timer and adjust the cup to prevent the stirrer from touching the sides or bottom of the cup.

(e) After the gel timer stops, record the reading on the counter as (B).

**Calculations**

6. Calculate the gel time according to the following formula:

$$G = A + B$$

where:

G = Gel time in minutes and seconds

A = mixing and weighing time in minutes and seconds

B = reading from the gel timer in minutes and seconds

**Report**

7. Report the gel time to the nearest whole minute.

Normal testing time is one day.