

A. Scope

For a complete list of GDTs, see the Table of Contents.

Use this test method to determine the following:

- Bond to concrete mortar
- Extrusion rate
- Tack free time
- Movement capability and adhesion
- Non-volatile content of silicone sealants

B. Apparatus

The apparatus consists of the following:

1. All necessary equipment required by GDT 58 to make and cut briquets.
2. Testing Machine: Use the machine specified in ASTM D 638 and equipped with a drive to allow speed of testing of 0.30 in (8 mm) per minute.
3. Self-Aligning Grips: Use suitable self-aligning grips for testing briquets in accordance with AASHTO T 132.
4. Caulking Gun: Use an air-powered caulking gun that operates at 90 lbs/in² (620 kPa).
5. Cabinet: Use a cabinet or room that maintains a temperature of 77 °F, ± 3 °F (25 °C, ± 1 °C) at 50 percent, ± 5 percent relative humidity.
6. Spatula: Use a steel spatula with a 4 to 5 in (100 to 125 mm) long narrow blade.
7. Freezer: Use a chest-type freezer that maintains a temperature of 0 °F (-18 °C).
8. Extension Machine: Use a machine with one or more screws rotated by an electric motor through suitable gear reductions. The machine must have self-aligning plates or grips, one of each pair fixed and the other carried by the rotating screw or screws, to hold the test specimens in position during the test.
9. Concrete Test Blocks: Cut concrete test blocks, approximately 1 x 1 x 3 in (25 x 25 x 75 mm), from any convenient size specimen of concrete. Use Class A concrete or better. Thoroughly clean and oven-dry the blocks at 230 °F, ± 9 °F (110 °C, ± 3 °C).
10. Scale or Balance: Use a scale accurate to 1 g and a balance accurate to 0.001 g.
11. Paper Cups: Use unwaxed paper cups with a 16 oz (480 ml) capacity and a 3 in (76 mm) diameter base.
12. Stopwatch or Timer
13. Forced Draft Oven

C. Sample Size and Preparation

No sample preparation is needed.

D. Procedures

1. Follow these procedures:
 - a. Bond to Concrete
 - 1) Prepare cement mortar briquets according to GDT 58.
 - 2) Cool briquets.
 - 3) “Butter” matching briquets with sealant and squeeze them together to force the excess sealant out. Squeeze until the briquet halves are tightly fit together with only a thin film of sealant between them.
 - 4) Hold the specimen halves in place with tight rubber bands until cured according to Subsection 833.2.06.A of the Specifications.
 - 5) Make and test five specimens.

- 6) Test the tensile strength of the specimens at a loading rate of 0.30 in (8 mm) per minute using the briquet testing grips mounted in the testing machine.
- b. Extrusion Rate
 - 1) Place an appropriate size caulking tube of silicone in the air-powered caulking gun. Carefully square-cut the nozzle to give an inside diameter opening of 1/8 in (3 mm). Break the seal or cut the tip of the cartridge.
 - 2) Set the air pressure at the caulking gun to 90 lbs/in² (620 kPa).
 - 3) Use a disposable container of sufficient size and determine its weight.
 - 4) Use the caulking gun to eject the entire contents of the cartridge into the container. Use a stopwatch to time the extrusion.
 - 5) Weigh the container and sealant to the nearest gram.
 - c. Tack Free Time (to Skin Over)
 - 1) Fill the outside bottom indentation of a 16 oz (480 ml), unwaxed paper cup with silicone.
 - 2) Strike off the silicone with a spatula. Record the time or start a timer to track the Tack Free Time.
 - 3) If you need to record the actual tack free time, occasionally touch the silicone with your finger. Tack free time is the time it takes for the material to skin over so that no material adheres to the finger.
 - 4) If you want to determine whether the material is tack free at the maximum tack free time, make only one check at that required time.
 - 5) Report the actual tack free time as less than (the required tack free time) or greater than (the required tack free time).
 - d. Movement Capability and Adhesion
 - 1) Prepare a total of 10 specimens for testing, using 1 x 1 x 3 in (25 x 25 x 75 mm) concrete blocks.
 - 2) Make simulated roadway joints by bonding two sawed block faces together so that in the middle two inches (50 mm) of the formed joint the silicone will be 3/8 in deep x 1/2 in wide (9.5 mm deep x 13 mm wide).
 - 3) Cure the prepared specimens before testing. If you use Type A silicone, cure for 21 days. If you use Type B or C silicone, cure for 28 days.
 - 4) After curing, soak five specimens in water for 7 days.
 - 5) Test all specimens at 0 °F (−18 °C).
 - 6) Mount the specimens in the extension machine grips and extend them at a rate of 1/8 in (3 mm) per hour. One cycle is defined as the extension to 1 in (25 mm) wide and the return to the initial 1/2 in (13 mm) width.
 - 7) Passing specimens will complete 10 cycles at 0 °F (−18 °C) with no adhesive or cohesive failures.
 - e. Non-Volatile Content
 - 1) Place approximately 0.02 lb (10 grams) of uncured sealant in an aluminum foil cup approximately 2 in (50 mm) diameter and 1/2 in (13 mm) deep. Weigh as soon as possible to the nearest 0.001 g.
 - 2) Place the cup in a forced draft oven at a temperature of 137 °F, ± 9 °F (105 °C, ± 5 °C) for 24 hours.
 - 3) At the end of 24 hours, remove the sample and immediately weigh to the nearest 0.001 g.
 - 4) Place the sample back in the oven for an additional hour and then remove and reweigh again. There should be no change in weight.
 - 5) If the material has not reached a constant weight, repeat [step 4](#) until the material reaches a constant weight.
 - 6) When ready, place the sample in a desiccator until the sample has cooled to room temperature.
 - 7) Weigh the sample again to the nearest 0.001 g. This is the final weight of the sample.

E. Calculations

- a. Extrusion Rate
 - 1) Calculate the weight of sealant extruded by subtracting the weight of the container from the total weight.
 - 2) Calculate the extrusion rate per minute as follows:

$$\text{Extrusion} = (W \div T) \times 60$$

where:

W = weight of silicone extruded, in grams

T = elapsed time, in seconds

60 = 1 minute (60 seconds)

b. Non-volatile Content

1) Calculate the percent of non-volatile material as follows:

$$\% \text{ Non volatile} = (A \div B) \times 100$$

where:

A = Final weight of sample

B = Original weight of sample

F. Report

1. Report the following on Form 168:
 - a. The average bond strength obtained on the five specimens, discarding any erratic results
 - b. The extrusion rate in grams per minute
 - c. The actual tack free time as less than (required tack free time) or greater than (required tack free time)
 - d. The movement capability and adhesion as satisfactory or unsatisfactory
 - e. The non-volatile content