EXPERIMENT NO: 14

DUCTILITY OF BITUMINOUS MATERIAL

AASHTO DESIGNATION: T 51-93
(ASTM DESIGNATION: D 113-79)



1. SCOPE

1.1 The ductility of a bituminous material is measured by the distance to which it will elongated before breaking when two ends of a briquette specimen of the material, of the form describe in Section 2, are pulled apart at a specified speed and at a specified temperature. Unless otherwise specified, the test shall be made at a temperature of 77°±0.9°F (25°±0.5°C) and with a speed of 5 cm/min, + 5.0 percent. At other temperatures the speed should be specified.

2. APPARATUS

2.1 Mould - the mould shall be similar in design to that shown in Figure 14.1. Dimensions shown Figure 1 shall be as given with the permissible variations indicated. The mould shall be made of brass, the ends b and b' being known as clips, and the parts a and a' as sides of the mould. The dimensions of the mould shall be such that, when properly assembled, it will form a briquette specimen having the following dimensions:

Table 14.1: Dimensions of Ductility Test apparatus.

Total length	7.45 to 7.55 cm
Distance between clips	2.97 to 3.03 cm
Width at mouth of clip	1.98 to 2.02 cm
Width at minimum cross section (halfway between clips)	0.99 to 1.01 cm
Thickness throughout	0.99 to 1.01 cm

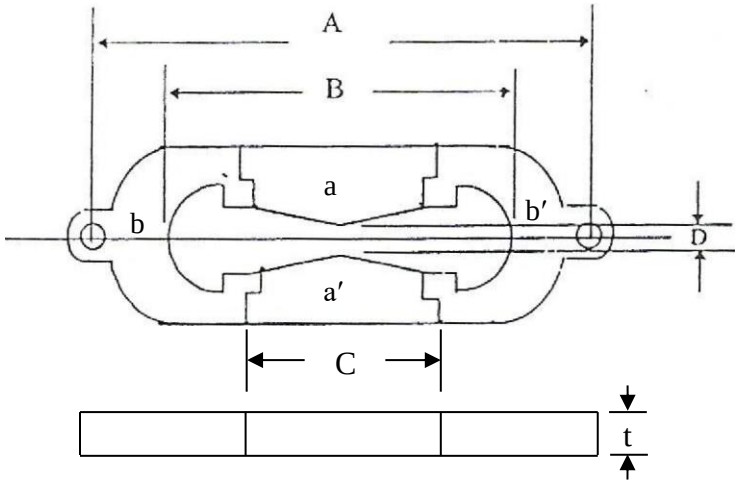


Figure 14.1 Mold for Ductility Test Specimen

Table 14.2: Dimensions of different parts of Ductility Test apparatus shown in Figure 14.1.

A	Distance between centers	111.5 to 113.5 mm
B	Total length of briquette	74.5 to 75.5 mm
D	Width at minimum cross section	9.9 to 10.1 mm
t	Thickness	9.9 to 10.1 mm

2.2 Water Bath - The water bath shall be maintained at the specified test temperature, varying not more than 0.18°F (0.1°C) from this temperature. They volume of water shall be not less than 10 liters, and the specimen shall be immersed to a depth of not less than 10 cm and shall be supported on a perforated shelf not less than 5 cm from the bottom of the bath.

2.3 Testing Machine - For pulling the briquette of bituminous material apart, any apparatus may be used which is so constructed that the specimen will be continuously immersed in water as specified in Section 3.3, while the two clips are pulled apart at a uniform speed, as specified, without under vibration. Figure 14.2 shows the ductility testing machine.



Figure 2: Ductility Testing Machine

2.4 Thermometer - A thermometer having a range as shown below and conforming to the requirements prescribed in Specification E1 for Standard Thermometer.

Table 14.3: Specifics of Standard Thermometer for Ductility Test.

Temperature Range	ASTM Thermometer No
-8 to 32°C	63°C
18 to 89°F	63°F

3. PROCEDURE

3.1 Molding Test Specimen - Heat the sample with care to prevent local overheating until it has become sufficiently fluid to pour. Strain the melted sample through a No. 50 sieve conforming to ASTM Specification E11, for Wire cloth Sieves for Testing Purposes, and, after a thorough stirring

pour it into the mold. Assemble the mold on a brass plate and, to prevent the material under test from sticking, thoroughly amalgamate the surface of the plate and interior surface of the sides a and a', Figure 1, of the mold or coat with a mixture of glycerin and dextrin, tale, or china clay. The plate upon which the mold is placed shall be perfectly flat and level so that the bottom surface of the mold will touch it throughout. In filling the mold, take care not to disarrange the parts and thus distort the briquette. In filling, pour the material in a thin stream back and forth from end to end of the mold until the mold is more than level full. Let the mold containing the material cool to room temperature or a period of from 30 to 40 min and then place it in the water bath maintained at the specified temperature of test for 30 min; then cut off the excess bitumen with a hot straight edged putty knife or spatula to make the mold just level full as shown in Figure 14.3.



Figure 14.3: Molding and Cutting of Test Specimen

3.1.1 Caution - Careless handling of mercury will create a definite health hazard. The rules prescribed as follows should be observed at all times:

1. Store the mercury in a closed jug in a cool place.
2. Strictly avoid spilling any mercury.
3. Remove mercury vapors by working under a ventilated hood.
4. Keep amalgamated brass plates and other apparatus at no higher than normal room temperature.

3.2 Keeping Specimen at Standard Temperature - Place the brass plate and mold, with briquette specimen, in the water bath and keep at the specified temperature for a period of from 85 to 95 min. Then remove the briquette from plate, detach the side pieces, and immediately test the briquette.

3.3 Testing - Attach the rings at each end of the clips to the pins or hooks in the testing machine and pull the two clips apart at a uniform speed as specified until the briquette ruptures as shown in Figure 14.4.

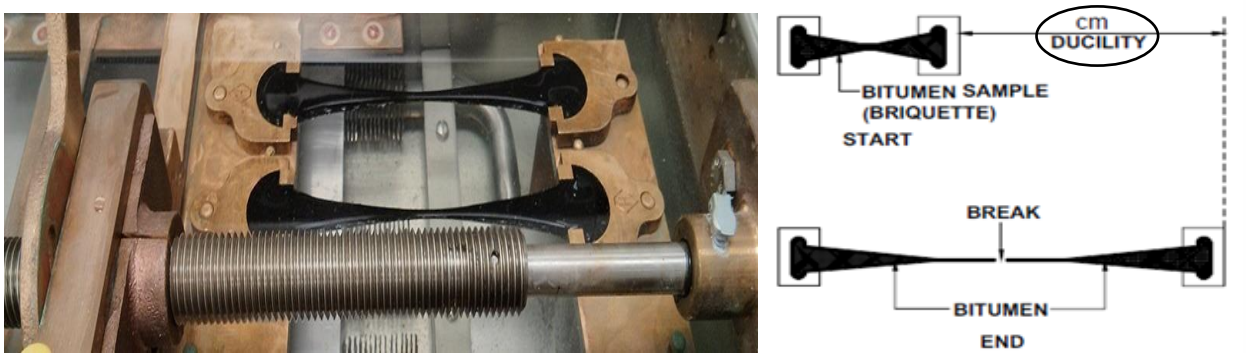


Figure 14.4: Ductility Testing

A variation of + 5 percent from the speed specified will be permissible. Measure the distance in centimeters through which the clips have been pulled to produce rupture. While the test is being made, the water in the tank of the testing machine shall cover the specimen both above and below it by at least 2.5 cm and shall be kept continuously at the temperature specified within +0.9°F (0.5°C).

4. REPORT

4.1 A normal test is one in which the material between the clips pulls out to a point or thread until rupture occurs at the point where the thread has practically no cross-sectional area. Report the average of three normal tests as the ductility of the sample.

4.2 If the bituminous material comes in contact with the surface of the water or the bottom of the bath, the test shall not be considered normal. Adjust the specific gravity of the bath by the addition of either methyl alcohol or sodium chloride so that the bituminous material neither comes to the surface of the water, nor touches the bottom of the bath at any time during the test.

4.3 If a normal test not obtainable on three terms, report the ductility as being unobtainable under the conditions of the test.

5. PRECAUTIONS

5.1 Owing to possible danger to health if mercury is handled carelessly, the following rules should be observed at all times:

5.1.1 Store the mercury in a closed jug in a cool place.
5.1.2 Strictly avoid spilling any mercury.
5.1.3 Remove mercury vapors by working under a suitable hood with good ventilation.
5.1.4 Keep amalgamated brass plates and other apparatus at not above normal room temperature.