BRITISH STANDARD METHOD OF TEST FOR

# WETTABILITY OF TEXTILE FABRICS

## FOREWORD

This British Standard has been published by arrangement between the Textile Institute and the British Standards Institution.

A method of test for wettability of cotton fabrics was given in the 1963 edition of BS Handbook No. 11, ' Methods of test for textiles ', but the reliability of the test was unsupported by any published evidence or inter-laboratory work. The method was examined at the Shirley Institute, together with the A.A.T.C.C.* standard method and a third method developed from a combination of these. This third method was found to be superior to the other two in that the end-point of the test is clearer and the experimental error is less. A Textile Institute Working Party set up to examine the new test method conducted inter-laboratory trials, and a supporting paper† gives the results of these trials together with a summary of the research work undertaken.

The method requires some practice before reliable results are obtained. Operators unfamiliar with the method tend to be over-cautious in interpreting the end-point. The reproducibility of the method is such that in trials carried out in five laboratories differences in mean results obtained on one specimen by different operators were always less than 30% and rarely exceeded 20%. It is known that changes in wettability of less than about 30% have no significance for most practical purposes.

Wettability measurements are particularly useful as an index of the efficiency of scouring, for the investigation of defects due to local wettability variations, and as a guide to the suitability of fabrics for special purposes where speed of uptake of liquid is important.

## METHOD

### 1. SCOPE

This British Standard describes a method of test for wettability of textile fabrics and is primarily intended for fabrics containing hydrophilic fibres. Fabrics giving times exceeding 200 seconds are considered to be unwettable (see clause 2) and are therefore outside the scope of this standard.

### 2. DEFINITION

For the purposes of this British Standard the following definition applies:

*Wettability*. The time in seconds taken for a drop of water or 50% sugar solution to sink into the fabric.

Fabrics giving times greater than 200 s with water are considered to be unwettable.

* American Association of Textile Chemists and Colorists.
† See *J. Text. Inst.*, 1969, 60, 14.







### 3. PRINCIPLE

A drop of water or sugar solution is allowed to fall on to the fabric, and the time taken for it to sink into the fabric is measured under standard conditions. The shorter the time, the more wettable is the fabric.

### 4. APPARATUS AND REAGENTS

**4.1** The following apparatus is required:

(1) A burette (see Appendix A) for each liquid.

(2) Clamps for supporting the burettes in a vertical position so that both the glass tube and the jet are firmly clamped.

(3) A microscope spot lamp of at least 30 W giving a beam which, when at an angle of incidence of 45° to a horizontal plane, illuminates an area not less than 20 mm across at a distance of about 250 mm.

(4) A heat filter* placed in front of the light source to ensure that the temperature in the vicinity of the specimen does not exceed the limits of the standard atmosphere for testing textiles.

(5) A viewing ring of outside diameter 45 mm and inside diameter 20 mm, adjustable in height and inclined downwards at 45° to the vertical.

It is preferable to construct the above five items as a fixed unit with a matt black shield shading the specimen from external light: see Fig. 1.

(6) An embroidery frame of diameter about 150 mm.

(7) Stopwatch or clock, reading to 0·1 s.

(8) Means for providing the standard atmosphere for testing textiles specified in Clause 5.

**4.2** The following reagents are required:

(1) Distilled water.

(2) 50% sugar solution (see Appendix B).



### 5. CONDITIONING AND TESTING ATMOSPHERE

The atmosphere required for conditioning and testing is the standard atmosphere for testing textiles as specified in BS 1051†, i.e. relative humidity of 65 ± 2% and temperature of 20 ± 2°C.

### 6. TEST SAMPLES

Prepare test samples of suitable size for clamping in the embroidery frame, i.e. approximately 200 mm × 200 mm. Avoid creased or folded places in the fabric. After receipt handle the fabric as little as possible and do not sharply

* Chance HA3 heat filter is suitable.
† BS 1051, ' Terms relating to the conditioning of textiles and methods for the determination of correct invoice weight '.

fold, iron or treat it in any way other than by conditioning. Unless otherwise agreed, take three samples from different places in the fabric to represent it as fully as possible, and make five measurements on each sample.

## 7. PREPARATION OF TEST SAMPLES

Condition the test samples for at least 24 h in the atmosphere defined in Clause 5.

## 8. PROCEDURE

### 8.1 Setting up the apparatus

**8.1.1** If a light shield is not used, care must be taken that the test is not carried out in direct lighting from any other source (e.g. bright daylight).

**8.1.2** Mount the conditioned test sample securely (without undue stretching) in the embroidery frame and place it in a horizontal position.

**8.1.3** Fill the clean, dry burette with distilled water and mount it in a vertical position, so that the tip of the jet is approximately 6 mm above the surface of the fabric.

**8.1.4** Clamp the viewing ring so that it is about 150 mm from the burette, and so that an imaginary line joining its centre to the point on the test sample immediately below the tip of the jet is at an angle of inclination of approximately 45°.

**8.1.5** Arrange the spot lamp at least 250 mm from the burette so that the beam of light illuminates the area of the test sample immediately below the tip of the jet at an inclination of 45°, and in a vertical plane passing through the centre of the viewing ring. This condition can be achieved by placing a microscope slide coverglass on the test sample immediately below the tip of the jet and adjusting the position of the beam until the light reflected from the coverglass passes through the viewing ring.

### 8.2 Testing the fabric

**8.2.1** Note the air temperature close to the test sample.

**8.2.2** Allow a drop to fall from the burette on to the fabric and start the stop-watch at this instant.

**8.2.3** When the diffuse reflection from the liquid vanishes and the liquid is no longer visible above the surface of the fabric, stop the watch and note the time (see Appendix C). Care must be taken not to move the embroidery frame during this time. Record times of less than 10 s to the nearest 0·1 s and longer times to the nearest second.

**8.2.4** If the time is less than 2 s, change the burette for one containing 50 % sugar solution.





**8.2.5** Repeat the test on four other areas of the test sample such that no area has a centre nearer than 25 mm to that of any area previously tested.

**8.2.6** Test two other test samples in a similar manner, to make 15 measurements in all.

**8.2.7** Note the temperature again and record the mean of the two observations.

**8.2.8** If sugar solution has been used, rinse the burette thoroughly with hot water and then distilled water immediately testing is completed, or if more than half an hour will elapse before the next test. Clean, but wet, burettes must be either oven-dried and allowed to cool to room temperature, or given a final rinse in acetone and allowed to dry, before being used again.

## 9. CALCULATION AND EXPRESSION OF RESULTS

Calculate the mean of the 15 measurements of wetting time and apply the appropriate correction for temperature (see Appendix D). Record times less than 10 s to the nearest 0·1 s and longer times to the nearest second.

## 10. REPORT

**10.1** The report shall state that the tests were performed in accordance with this method.

**10.2** The report shall also state the following:

(1) the number of test samples taken and the number of measurements made on each test sample;

(2) the individual measurements made of wetting times;

(3) the mean of the wetting times corrected for temperature, and quote this as the ' wettability ' of the fabric;

(4) the test liquid used (see Appendix E);

(5) the date of the test*.



* Wettability can change with time, for example, owing to the migration of fats and waxes to the surface of the cloth.