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October 2017

### Selected standards in the series Textiles

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Textile test methods

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### **No. 26.2-94/ISO 4920:1981 IDT**

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Détermination de la masse  
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**CAN/CGSB-4.2**

**No. 12.2-2012**

**Supersedes CAN/CGSB-4.2  
No. 12.2-95**

# **Textile test methods**

## **Tearing strength — Trapezoid method**

ICS 59.080.01



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**Textile test methods  
Tearing strength — Trapezoid method**

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# Textile test methods

## Tearing strength — Trapezoid method

### 1 Scope

This method determines the tearing strength of woven and nonwoven fabrics by the trapezoid procedure.

Two procedures for the calculation of tearing strength are given, one for woven fabrics and the other for nonwoven fabrics. The two procedures do not usually give the same result.

The testing and evaluation of a product against this method may require the use of materials and/or equipment that could be hazardous. This method does not purport to address all the safety aspects associated with its use. Anyone using this method has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any applicable regulatory requirements prior to its use. CGSB neither assumes nor accepts any responsibility for any injury or damage that may occur during or as the result of tests, wherever performed.

### 2 Principle

The force observed in the propagation of a tear across the fabric is measured, in which the force is applied parallel to the yarns that are ruptured in the tear.

### 3 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this method. The referenced documents may be obtained from the source noted below.

An undated reference is to the latest edition or revision of the reference or document in question, unless otherwise specified by the authority applying this method. A dated reference is to the specified revision or edition of the reference or document in question. However, parties to agreements based on this method are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below.

#### 3.1 Canadian General Standards Board

CAN/CGSB-4.2 — *Textile Test Methods*:

No. 1 — *Precision and Accuracy of Measurements*

No. 2 — *Conditioning Textile Materials for Testing*.

##### 3.1.1 Source

The above may be obtained from the Canadian General Standards Board, Sales Centre, Gatineau, Canada K1A 1G6. Telephone 819-956-0425 or 1-800-665-2472. Fax 819-956-5740.  
E-mail ncr.cgsb-ongc@tpsgc-pwgsc.gc.ca. Web site [www.tpsgc-pwgsc.gc.ca/ongc-cgsb](http://www.tpsgc-pwgsc.gc.ca/ongc-cgsb).

## 4 Apparatus

**4.1 Constant-rate-of-extension (CRE) machine:** a testing machine in which one end of the specimen is held by a virtually stationary clamp and the other end of the specimen is gripped in a clamp that is driven at a constant speed. A suitable system is provided for detecting and recording the force applied.

**4.2 Constant-rate-of-traverse (CRT) machine:** a testing machine in which one end of the specimen is held by a clamp driven at a constant speed while the other end is gripped in a clamp attached to a weighing mechanism of a type that permits movement of the attached clamp, e.g. as in pendulum machines. The specimen is therefore not extended at a constant rate (see Note). A suitable system is provided for recording the force applied.

NOTE Significant errors due to inertia are frequently encountered in testing machines in which the moving parts of the weighing mechanisms are massive (e.g. CRT machines), especially if such machines are used on materials with low extensibilities or are operated at high speeds. Caution should therefore be exercised in testing anything other than conventional materials and in testing specimens that break near the lower end of the force range of such machines.

**4.3** Both types of machines shall have a suitable capacity (see 6.2) and operate with the driven clamp moving at a speed of  $300 \pm 10$  mm/min (see Note)

NOTE Due to presence of inertia factors in the pendulum-type testing machine, the values for tearing strength of a given fabric determined by this method on pendulum and inertialess types of machines will usually differ. The difference is usually small and varies with the fabric under test. Values from the two types of machines cannot be correlated by any numerical factor valid for fabrics in general.

**4.4** Both gripping surfaces of the clamps shall measure 25 x 75 mm or more, with the longer dimension perpendicular to the direction of the application of the force. The distance between the clamps at the start of the test shall not be more than 25 mm. The ratchet pawls of the CRT (pendulum) type machine shall be rendered inoperative during the test.

## 5 Test specimens

**5.1** Specimens shall be cut 75 mm wide and 150 mm long. Two sets of at least five specimens each (see 5.2) shall be tested, one set for warp or machine direction tearing strength, having the longer dimension parallel to the warp yarns, the other set for weft or cross direction tearing strength, having the longer dimension parallel to the weft yarns (see 6.2). No two warp-tearing specimens shall contain the same warp yarns nor shall any two weft-tearing specimens contain the same weft yarns. An isosceles trapezoid with a length of 75 mm and bases of 25 mm and 100 mm in width is marked on each specimen, preferably with the aid of a template (Figure 1). A cut 5 to 10 mm in length is then made at the centre of, and perpendicular to, the 25 mm trapezoid edge.

**5.2** If the precision with which the tearing strength to be measured is specified, refer to CAN/CGSB-4.2 No. 1 for procedures to determine the required number of test specimens. If the precision is unknown, then the number of specimens indicated in 5.1 shall be taken.

## 6 Procedure

**6.1** Condition the specimens in accordance with CAN/CGSB-4.2 No. 2. Clamp each specimen in the testing machine with the longer edges of the jaw faces accurately aligned with the non-parallel sides of the trapezoid (Figure 2). Start the machine and record the force reached during the tearing of the specimen.

**6.2** If the tearing strength of a single specimen is less than 10% of the capacity of the testing machine, then use composite specimens to obtain a tearing force of at least 10% of the capacity of the machine. In such cases, no fewer than five composite specimens shall be tested. Composite specimens shall consist of two or more individual specimens, superimposed and clamped together in the machine, to be torn simultaneously. The individual specimens included in each composite specimen shall be fastened together at the corners to assist in aligning them correctly in the clamps of the testing machine.

## 7 Calculations

**7.1** For woven fabrics, the autographic record obtained will normally consist of a succession of peak force values corresponding to the rupturing of successive yarns or groups of yarns during tearing. Disregard the initial peak force because it is frequently greater than subsequent peak forces and therefore shall not be included in the calculation of the average tearing strength. Immediately after the first peak, record the maximum force for each of the five successive 5 mm intervals of tearing in the specimens. Calculate the tearing strength of each single or composite specimen by averaging the five maximum force values obtained from the record.

**7.2** For nonwoven fabrics, note the maximum force recorded for each specimen (single or composite).

**7.3** For each direction of the fabric, calculate the average tearing strength as the sum of the values obtained for all specimens (single or composite) divided by the number of individual specimens torn.

## 8 Report

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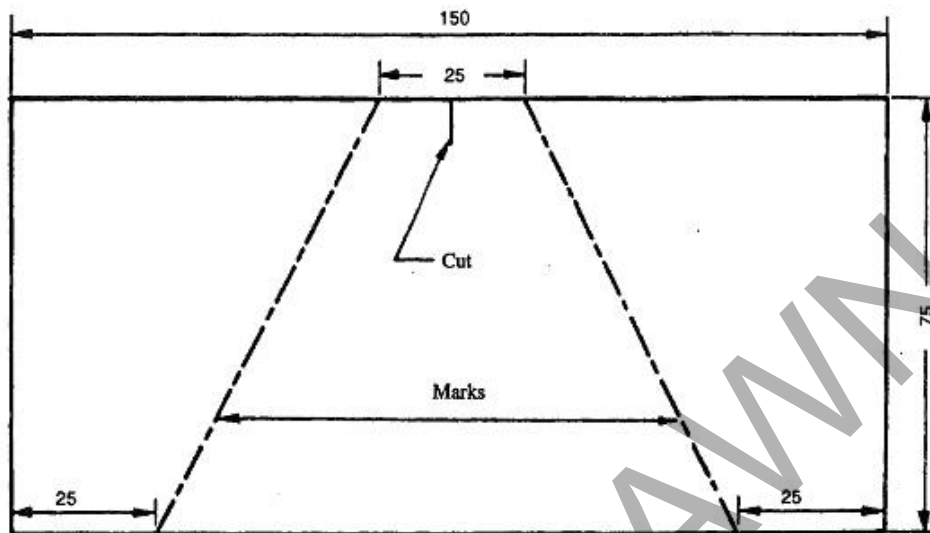
**8.1** The average tearing strength (trapezoid method) values, in newtons.

NOTE The average result for the specimens tested is an estimate of the true average for the material under test. A measure of the reliability of this estimate can be obtained by determining the confidence interval (see 6.2, CAN/CGSB-4.2 No. 1) within which the true mean will lie for any given probability.

**8.2** The type of calculation used (see 7.1 or 7.2). If composite specimens are used, record the number of layers of fabric.

**8.3** The type of machine on which the tests were carried out (see 4).

**8.4** The number of this method: CAN/CGSB-4.2 No. 12.2-2012.



NOTE All dimensions are in millimetres.

FIGURE 1

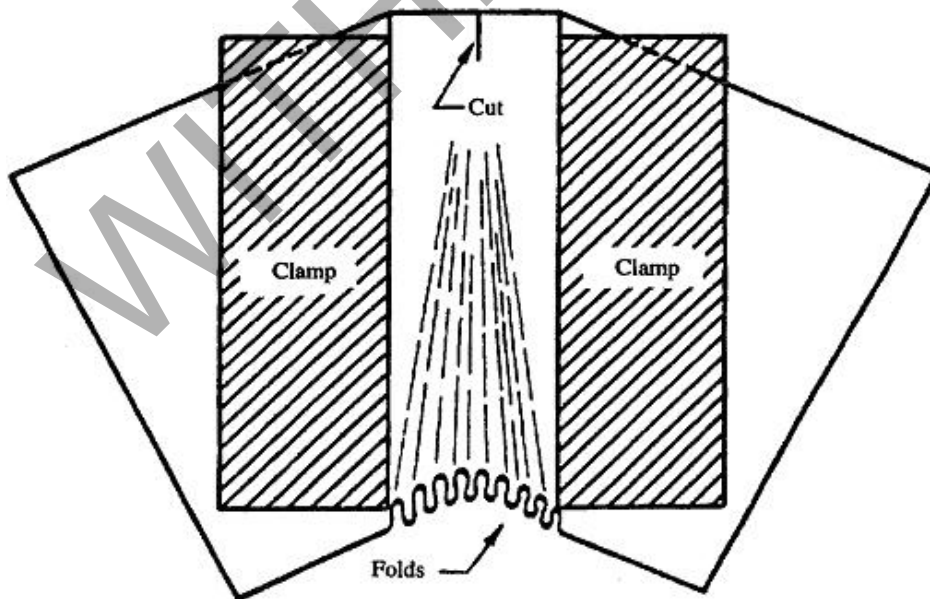


FIGURE 2