

ICS 61.06
CCS Y78



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 38018-2019

Footwear - Test method for soles - Fatigue resistance

鞋类 鞋底试验方法 抗疲劳性能

Issued on: August 30, 2019

Implemented on: March 1, 2020

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

1	Scope
2	Normative References
3	Terms and Definitions
4	Principle
5	Test Equipment...
5.2	Thickness Measuring Instrument Measuring range: 0 mm ~ 50 mm, accurate to
6	Sample and Conditioning
6.1	Sample
6.1.2	Sample preparation
7	Test Procedures...
8	Result Expression
9	Test Report

1 Scope

China's national test method for the fatigue resistance of shoe soles. It specifies the terms and definitions, the principle, the test equipment, the specimen and its conditioning, and the procedure. The sole of a shoe flexes at the ball of the foot with every step, which for a shoe worn daily is on the order of a million cycles over its life, and it flexes around a crease that concentrates the strain in one line. What the test measures is whether a cut or crack introduced at that line will grow under repeated flexing. That is the failure mode of a sole: not wear through the tread, which happens gradually and visibly, but a crack that starts at a moulding flaw or a small cut and propagates across the sole until it splits. Testing it means starting from a deliberate notch, because a sole with no defect may last indefinitely while the same compound with a nick fails quickly, and it is the second condition that describes real footwear.

This Standard stipulates the test methods for soles in fatigue resistance. This Standard is applicable to finished shoes and shoe soles with the footwear size of 235 and above.

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 22049-2019 Footwear - Standard Atmospheres for Conditioning and Testing of Footwear and Components for Footwear

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 Fatigue Compression Fatigue compression refers to the process of applying several times of cyclic compression onto the sample; using the property variation of the test material before and after the cyclic compression to represent the material's recovery performance.

3.2 Fatigue Resistance of Anti-compression Fatigue resistance of anti-compression refers to material's capability of maintaining its performance, physical and mechanical properties and functions unchanged under the condition of certain pressure, certain time and certain numbers of compression.

4 Principle

At a certain rate, apply pressure onto the shoe sole material, which approaches the pressure value on the plantar part when a person is jogging. Simulate the foot's repeated compression process on the material during the actual wearing process. After a certain times of fatigue compression, test the material's thickness, property and appearance variation. Adopt thickness and property variation rate, and appearance Figure 1 -- Sketch Map of Punch Hammer Shape Used for Fatigue

5.1.4 Equipment's compression rate: 6 times/min ~ 240 times/min, adjustable.

5.1.5 Driver's force value (force value sensor): measuring range: 0 N ~ 5,000 N, accurate to 0.01 N. The minimum sampling frequency of force value is 100 Hz.

5.1.6 Data acquisition system: adopt a specific program to record the whole process of data acquisition from the force-sensing system.

5.2 Thickness Measuring Instrument Measuring range: 0 mm ~ 50 mm, accurate to

0.01 mm. Compression diameter: (10 ± 0.5) mm; intensity of pressure: (29.3 ± 0.1) kPa.

6.1 Sample

6.1.1 Sample quantity Sample of whole shoe (remove the upper band) or shoe sole shall be not less than 1 pair.

6.1.2 Sample preparation

6.1.2.1 Cutting of upper band In terms of whole shoe, along the bottom line of the upper part, cut off the upper part of the shoe. If there is an inner sole, double-sided adhesive tape may be used to fasten the inner sole onto the internal surface of the shoe sole (so as to guarantee that the inner sole will not have any displacement during the impact process).

NOTE: whole shoe sole includes all the material layers between human feet and the ground, such as external sole, midsole and insole, etc.

6.1.2.2 Selection of compression location On the internal surface of the shoe sole (the surface that touches feet, for example, the surface of insole or inner sole), select a compression location and mark it:

---Location of forefoot: select Point B, which is $75\% \pm 2$ mm of the insole length of the whole shoe. This point shall be equidistant with the internal side and the external side of the insole. In addition, take this point as the center to make a circle with the diameter of 30 mm;

---Location of heel: select Point A, which is $12\% \pm 2$ mm of the insole length of the whole shoe. This point shall be equidistant with the internal side and the

7.4 Select test rate: (120 ± 12) times/min, or, other test frequencies may also be selected in accordance with the actual demand.

7.5 Set up the times of test compression into 50,000, or, the times of compression may also be set up in accordance with the actual demand.

7.6 Initiate continuous compression mode; conduct continuous compression test on the sample.

7.7 After the compression test is completed, remove the compressed sample from the equipment; place it under the environmental condition stipulated in

6.2 for (24 ± 1) h. Determine the shoe sole thickness and other properties (such as impact shock attenuating property and resilience property) of the forefoot and the heel in the corresponding locations after the fatigue compression.

8 Result Expression

8.1 In accordance with Formula (1), respectively calculate the thickness variation rate of the forefoot and the heel of the shoe sole, accurate to 0.1%: Where, d_1

---thickness of sample after fatigue compression, expressed in (mm); d_0

---thickness of sample before fatigue compression, expressed in (mm).

8.2 Describe and record appearance variation of the shoe sole.

8.3 In accordance with demands, evaluate the variation of other properties (such as impact shock attenuating property and resilience property) of the shoe sole.

9 Test Report

Test report shall at least include the following content:

- a) Serial No. of this Standard;
- b) Specification, model and manufacturer information of test samples;
- c) Model of test equipment;
- d) Compression force value and compression frequency selected during the test;