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

GB/T 45175-2024

**Footwear - Test methods for whole shoe - Fatigue resistance of
touch and close fasteners**

鞋类 整鞋试验方法 粘扣带抗疲劳性能

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1 Scope

GB/T 45175-2024 gives the whole-shoe test method for the fatigue resistance of hook and loop fasteners. The fastener on a child's shoe or a sports shoe is opened and closed several times a day for the life of the shoe, and it fails gradually rather than suddenly: the hooks deform, the loops fill with lint and fibre, and the peel strength falls until the shoe no longer holds. Testing the tape on a roll does not predict this, because the failure depends on how the tape is attached and on the angle at which the shoe pulls it apart, which is why the test is done on the finished shoe. The standard describes the principle, the test equipment, the sampling, the environmental conditioning, the test steps, the test results and the test report. It takes effect on 1 July 2025.

This document describes the test methods for the fatigue resistance of touch and close fasteners on whole shoes after repeated opening and closing. This document applies to the touch and close fasteners used on various whole shoes. The raw materials of touch and close fasteners shall refer to this document.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 2703 Footwear - Vocabulary

GB/T 3903.20-2008 Footwear - Test methods for accessories. Touch and close fasteners - Peel strength before and after repeated closing

GB/T 16825.1 Metallic materials - Calibration and verification of static uniaxial testing machines - Part

1. Tension/compression testing machines - Calibration and verification of the force-measuring system

GB/T 22049 Footwear - Standard atmospheres for conditioning and testing of footwear and components for footwear

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in GB/T 2703 and the following apply.

3.1 fatigue Performance degradation or material breakage of a material caused by damage or deformation accumulation under long-term or repeated load and strain.

3.2 fatigue resistance Ability of touch and close fasteners to resist fatigue damage after repeated opening and closing under specified conditions.

3.3 peel strength Under specified test conditions, force required per unit effective width to separate a bonded touch and close fastener from one end. [Source: GB/T 3903.20-2008, 3.1]

3.4 shear strength Under specified test conditions, the maximum force used to longitudinally pull apart per unit effective area of the specified bonding area of a touch and close fastener. [Source: GB/T 3903.21-2008, 3.1, modified]

3.5 shear force Under specified test conditions, the maximum force used to longitudinally pull apart the specified bonding area of a touch and close fastener.

3.6 effective width Width of the vertical long side of touch and close fasteners, excluding the base side. [Source: GB/T 3903.20-2008, 3.2]

4 Principle

Simulate the repeated opening and closing process of touch and close fasteners when putting on and taking off shoes, test the performance changes of touch and close fasteners after a certain number of opening and closing, and use peel strength, shear strength or shear force to evaluate the fatigue resistance of touch and close fasteners.

5 Test equipment

5.1 Tension testing machine It shall meet the requirements of class 2 in GB/T 16825.1 and meet the following requirements.

- a) the moving speed of the clamp is (100 ± 10) mm/min;
- b) the force value is continuously recorded during the test.

5.2 Roller It shall comply with the provisions of

5.2 in GB/T 3903.20-2008.

5.3 Fork It shall comply with the provisions of

5.3 in GB/T 3903.20-2008.

5.4 Whole shoe touch and close fastener repeated opening and closing testing machine
The whole shoe touch and close fastener repeated opening and closing testing machine is shown in Figure 1, which includes the following components. - roller device, of which the diameter is (55 ± 2) mm, the stroke is adjustable in the range of 5 mm ~ 80 mm, and the repeated opening and closing frequency is adjustable in the range of 10 times/min ~ 60 times/min; - touch and close fastener fixing device, including a touch and close fastener pressing plate and a roller bayonet pressing plate, which fix the touch and close fastener, and can be adjusted according to the length of the touch and close fastener; - during the rotation of the roller, the roller applies a force of (1.0 ± 0.1) N per millimeter width to the touch and close fastener; the horizontal displacement of the roller is adjustable so that the touch and close fastener will not separate from each other when repeatedly opened and closed.

5.5 Steel ruler The division value shall be at least

6 Sampling

Each group of samples shall contain at least one pair of whole shoes. Cut the hook and loop parts of the touch and close fasteners from the whole shoes as samples. The touch and close fasteners shall remain intact, and the upper connected to the touch and close fasteners shall be retained for easy clamping and fixing.

7 Environmental conditioning

Before the test, place samples under the reference standard environmental conditions specified in GB/T 22049 for conditioning for at least 24 h. The test for samples is also carried out in this environment.

8.1 Peel strength

8.1.1 Measure the effective width of the hook side and loop side of the touch and close fastener to an accuracy of 1 mm, and take the smaller of the two width values as the

effective width of the touch and close fastener. When the width of the touch and close fastener removed from the whole shoe is irregular, measure the effective width of the two ends and the middle of the touch and close fastener, and take the average value as the effective width of the touch and close fastener.

8.1.2 Take the touch and close fastener sample removed from the whole shoe, along the opening direction of the touch and close fastener, gently bond the hook side and loop side.

8.1.3 Use the roller rolling method to firmly bond the touch and close fastener according to the following steps.

a) Adjust the fork (5.3) and roller (5.2) device to apply a force of (1.0 ± 0.1) N per millimeter width of the touch and close fastener.

b) Use the roller (5.2) to press the entire bonded touch and close fastener horizontally.

c) Turn the touch and close fastener left and right and repeat step b).

c) 4 times, so that the touch and close fastener is horizontally pressed by the roller a total of 10 times. NOTE. During the rolling process, the center of gravity of the roller does not deviate from the center line of the touch and close fastener, and the roller covers the entire width of the bonded touch and close fastener.

8.1.4 Along the opening direction of the touch and close fastener on whole shoes, partially peel off the touch and close fastener from the end, fix the loop side of the touch and close fastener to the upper clamp of the tension testing machine, and fix the hook side of the touch and close fastener to the lower clamp. If there is a clampable upper, the touch and close fastener may not be partially peeled off.

8.1.5 Clamp the two ends of the touch and close fastener in the normal opening direction on the upper and lower clamps of the tension testing machine, respectively, ensuring that the long side of the sample is parallel to the axis of the machine.

8.1.6 Start the tension testing machine, the moving speed of the clamp is (100 ± 10) mm/min, and completely peel off the touch and close fastener.

8.1.7 Determine the average value of the peeling force from the force value curve of the recording system, in Newton (N).

8.1.8 Repeat the test steps of

8.1.7 twice, and record the test results of 3 times.