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

GB/T 3903.6-2024

Replacing GB/T 3903.6-2005

Footwear - Test methods for whole shoe - Slip resistance

鞋类 整鞋试验方法 防滑性能

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1 Scope

GB/T 3903.6-2024 specifies how the slip resistance of a whole shoe is measured. Slips are the largest single cause of workplace injury in most economies, and slip resistance is also the property most often claimed and least often substantiated in footwear marketing, because the result depends entirely on the test conditions: the surface, ceramic or steel, the

contaminant, water with detergent or glycerol, the angle of the shoe, forward heel strike or flat, and the normal force. The standard fixes all of them and describes the apparatus and the procedure, the preparation and conditioning of the shoe, the measurement of the coefficient of friction in the forward heel, forward flat and backward flat modes, the number of measurements and the calculation, and the expression of the result. The 2024 edition replaces GB/T 3903.6-2005 and aligns with the current international method. For a footwear maker, a safety footwear buyer or a laboratory in China, this is the method a slip resistance claim rests on.

This document describes the test method for the slip resistance performance of the whole shoe or sole. This document is applicable to the determination of the slip resistance performance of the whole shoe or the sole. The slip resistance performance of the sole material is determined with reference to this document. This document is not applicable to the determination of the slip resistance performance of shoes with spikes, metal spikes or similar structures on the outsole.

2 Normative references

The contents of the following documents constitute the essential terms of this document through normative references in the text. Among them, for dated references, only the version corresponding to the date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 6682-2008 Water for analytical laboratory use - Specification and test methods

GB/T 19766-2016 Specification for natural marble for building slab

GB/T 20239-2023 Wooden flooring for gymnasium

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

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Static friction force When two objects in contact have a tendency to slide relative to each other but

5.2 Test medium

5.2.1 Glycerol aqueous solution Glycerol aqueous solution, which has a mass fraction of 85.3% ~ 92.6% and a viscosity of (0.2 ± 0.1) Pa·s [(200 ± 100) cP]. Since glycerol aqueous solution is hygroscopic in air with a relative humidity greater than 32%, the glycerol aqueous solution on the test interface shall be replaced when the test time exceeds 30 min.

5.2.2 Detergent solution Sodium dodecyl sulfate aqueous solution, which has a mass fraction of $(0.5 \pm 0.05)\%$.

5.2.3 Grade-3 water It shall meet the requirements of grade-3 water in GB/T 6682-2008.

5.2.4 Cleaning fluid or antifreeze mixture Ethanol aqueous solution which has a mass fraction of $(50 \pm 5)\%$.

5.3 Test interface

5.3.1 Glass interface Glass plate with a smooth surface.

5.3.2 Ceramic tile interface Dry-pressed ceramic tiles, which have a water absorption rate of less than or equal to 0.5%, shall be 10 mm thick. The dry friction coefficient of the ceramic tiles, which is measured by the method specified in Appendix A, is within 0.57 ~ 0.63; the wet friction coefficient is within 0.44 ~ 0.50.

Note 1: See GB/T 3810.3 for the test method of water absorption of ceramic tiles.

Note 2: See GSB 16-4167 for national standard specimens of ceramic tiles.

5.3.3 Wood floor interface The solid wood composite floor with maple surface layer shall be 24 mm thick. The dry friction coefficient of the wood floor measured by the method specified in Appendix A is within 0.47 ~ 0.53. The physical and chemical properties of wooden flooring shall comply with the provisions of solid wood composite flooring in Table 6 of GB/T 20239- 2023; the functional requirements shall comply with the provisions of suspended paving and fixed paving for competition, training, teaching in Table 8 of GB/T 20239-2023.

6.1 Specimens

6.1.1 Number of specimens Whole shoes or soles: Not less than 1 pair.

6.1.2 Specimen preparation

6.1.2.1 Cleaning Before each test, the test part of the specimen shall be cleaned with cleaning fluid (5.2.4) and dried.

6.1.2.2 Lasting For whole shoe specimens, select the corresponding last for lasting; use appropriate methods to ensure that the test last and the insole or insole do not slide relative to each other; for sole specimens, use adhesive to stick the sole to the bottom of the corresponding last.

6.2 Environmental conditioning Place the prepared specimen in the reference standard environmental conditions specified in GB/T 22049 for at least 4 hours.

7.1 Test conditions

7.1.1 The test speed is (0.30 ± 0.03) m/s. Special requirements can be selected within

0.1 m/s ~

0.5 m/s.

7.1.2 The vertical load is selected according to the shoe size. For shoes with a shoe size of 250 (inclusive) or above, the vertical load is (400 ± 20) N; for shoes with a shoe size of less than 250 and more than 205 (inclusive), the vertical load is (350 ± 20) N; for shoes with a shoe size of less than 205, the vertical load is (160 ± 20) N. Special requirements can be selected within 100 N ~ 600 N.

7.1.3 The test shall be carried out under the reference standard environmental conditions specified in GB/T 22049. wedge block; in the forefoot mode, place the bottom of the specimen flat on the wedge block; align the edge of the specimen forefoot plane with the 4 mm marking line of the wedge block.

7.3.1.4 Apply the required vertical load to the specimen within

0.2 s before sliding (see 7.1.2); test at the speed specified in 7.1.1. The test curve is shown in Figure 1. Record the first peak friction force of the specimen after the start of sliding, which is the static friction force of the specimen. At the same time, record all the friction forces of the specimen within

0.3 s ~

0.6 s after the start of sliding; calculate the average friction force within

0.3 s ~

0.6 s, which is the dynamic friction force of the specimen.

7.3.1.5 The same specimen is tested three times in total according to the steps of 7.3.1.1 ~ 7.3.1.4.

7.3.2 Slip resistance performance test of wet interface (except frost interface)

7.3.2.1 Operate according to the steps of 7.3.1.1 ~ 7.3.1.3.

7.3.2.2 Select the corresponding test medium according to the test purpose or the product standard (see 5.2); measure 20 mL of the test medium; pour it on the test interface surface below the test part of the specimen. Before each test, if the previous test leaves traces of specimen movement, the test interface shall be wiped clean and the test medium shall be weighed and poured again. Each time other test media are changed, the test interface shall be cleaned with a rag and cleaning fluid (5.2.4) before testing.

7.3.2.3 Test and record in accordance with the provisions of 7.3.1.4.

7.3.2.4 The same specimen shall be tested three times in total according to the steps of 7.3.2.1 ~ 7.3.2.3.