GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 61.060

CCS Y 78

GB/T 30907-2025

Replacing GB/T 30907-2014

Rubber shoes - Test method for shock attenuating properties of athletic shoes

胶鞋 运动鞋减震性能试验方法

Issued on: March 28, 2025 **Implemented on: October 1, 2025**

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

Table of Contents

Foreword 3
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Test principle 6
5 Test equipment 7
6 Specimens 10
7 Specimen conditioning 11
8 Test steps 12
9 Test results 13
10 Test report 14

Rubber shoes - Test method for shock attenuating properties of athletic shoes

WARNING: People who use this document shall have practical experience in regular laboratory work. This document does not point out all possible safety issues. Users are responsible for taking appropriate safety and health measures and ensuring that the conditions stipulated by relevant national laws and regulations are met.

1 Scope

This document describes the test principles for the shock-attenuating properties of rubber shoes and athletic shoes under specified test conditions, and specifies the test equipment, test specimens, test specimen conditioning, test procedures, test results and test report contents.

This document is applicable to the evaluation of the shock-attenuating effect of rubber shoes and athletic shoes.

2 Normative references

The provisions of the following documents constitute the essential clauses of this document through normative references in this text. Among them, for referenced documents with dates, only the versions corresponding to the dates are applicable to this document; for referenced documents without dates, the latest versions (including all amendments) are applicable to this document.

GB/T 2941 Rubber - General procedures for preparing and conditioning test pieces for physical test methods

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 cushioning system

One or more sole components that distribute pressure and/or attenuate shock.

NOTE: The sole components are the insole, innersole, midsole and outsole or their combination.

3.2 tup

It is in contact with the sample during the impact process and is the most important component of the impact device of the equipment.

3.3 impact

Collision between the tup and the cushioning system.

3.4 drop height

The height from which the impact device is dropped.

NOTE: The distance between the upper surface of the test specimen and the lower end of the tup.

3.5 maximum energy applied

The energy applied to a sample to produce its maximum compressive displacement.

3.6 absorb energy

The energy absorbed by a cushioning system during a single impact cycle.

3.7 moderate impact

The reaction force of the ground is greater than or equal to 1.5 times and less than 3 times the wearer's body weight, and the peak axial acceleration of the lower limbs is greater than or equal to 4 gravitational accelerations (4*g*) and less than 8 gravitational accelerations (8*g*).

3.8 high impact

The reaction force of the ground is greater than or equal to 3 times the wearer's body weight, and the peak axial acceleration of the lower limbs is greater than or equal to 8 gravitational accelerations (8*g*).

4 Test principle

The test specimen is fixed on a hard platform and continuously impacted by a falling impact device. The sensor is used to measure the force and displacement when the tup impacts the test specimen during the impact cycle and record them as a related curve. The peak value and the rebound rate of the tup during the impact process are calculated from the collected data to evaluate the shock-attenuating effect of the test specimen.

6 Specimens

6.1 Specimen preparation

The upper of the specimen is cut off at 10.0 mm±5.0 mm above the adhesive line between the upper and the sole. The remaining upper shall not affect the falling of the impact device. If it affects the falling of the impact device, the remaining upper shall be cut off.

To avoid interference with the cushioning system during the removal of the upper, the bonding between the sole and the upper (which may affect the shock attenuating properties) shall be retained to serve as a fixing device for any loose parts of the cushioning system.

6.2 Specimen shape

The specimen shall have a flat plane and be circular with a diameter of at least 65.0 mm. The center of the plane shall be aligned with the center of the tup. When the tup contacts the specimen, there shall be a spacing of not less than 10.0 mm between the edge of the tup and the edge of the specimen on all sides.

NOTE: The shape of the specimen varies with the design of the shoe itself. The shape of the shoe is a factor that affects the shock-attenuating properties, and this factor may be detected by this test method. Therefore, this document does not specify a standard specimen shape; the results obtained from samples of different shapes, thicknesses and sizes are not comparable.

6.3 Specimen test position

6.3.1 Heel

When testing the shock-attenuating properties of the heel, as shown in Figure 4, the center of the tup is aligned with a point on the surface of the specimen (shoe). The point is at a distance from the heel that is 12% of the inner length of the upper surface of the specimen. The distance between this point and the two sides of the specimen is equal, and the deviation shall not exceed 2.0 mm.

6.3.2 Forefoot

When testing the shock-attenuating properties of the forefoot, as shown in Figure 4, the center of the tup is aligned with a point on the surface of the specimen (shoe). The point is at a distance from the heel that is 75% of the inner length of the upper surface of the specimen. The distance between this point and the two sides of the specimen is equal, and the deviation shall not exceed 2.0 mm.

8 Test steps

8.1 Method A

8.1.1 Fix the specimen on the fixed platform device, with the center of the impact position to be tested being aligned with the center of the tup, and it shall not move during impact.

8.1.2 Select and adjust the test instrument according to the maximum energy applied to the specimen. In method A, a maximum energy of 5.0 J±0.5 J is generally applied to the specimen.

8.1.3 For athletic shoes that are subjected to moderate impact during normal wear, an energy of 5.0 J is applied. For athletic shoes that are subjected to high impact, an energy of 7.0 J is applied. If an energy different from 5.0 J or 7.0 J is used, it shall be stated in the test report. The deviation of the maximum energy applied to the athletic shoes shall not exceed 10%.

NOTE: The impact test is a test method designed to simulate the impact of energy, pressure and load speed on the cushioning system of athletic shoes during daily wear. For general-purpose athletic shoes, a reference energy of 5.0 J is more suitable. However, the reference energy value may also change with the model of the athletic shoes to be tested and the different parts to be tested (heel or forefoot). For athletic shoes that are subjected to moderate impact on the cushioning system during normal wear, the reference energy value is 5.0 J, including running shoes (heel) and multi-functional fitness shoes (heel and forefoot); for those subjected to high impact, the reference energy value is 7.0 J, including basketball shoes, tennis shoes and volleyball shoes.

8.1.4 Lower the tup and lightly touch it on the upper surface of the specimen, reset the displacement sensor, and then adjust the tup drop height to 50.0 mm±2.5 mm.

NOTE: If the impact energy is 7 J, the drop height of the tup shall be 70.0 mm±2.5 mm. If other impact energies are used, the appropriate drop height shall be adjusted according to the impact energy.

8.1.5 Start the instrument and impact 30 times continuously. The first 25 times are used as adjustments for the specimen, and the shock attenuating property data is collected during the 26th~30th cycles. Record the force-displacement test data of the last 5 impact cycles.

8.1.6 Remove the specimen from the instrument, and observe and record any damage or loss on the specimen surface.

8.2 Method B

8.2.1 Fix the specimen on the fixed platform device so that the tup is aligned with the center of the impact position on the specimen to ensure that the specimen does not move

when impacted.

8.2.2 Lower the tup and lightly touch it on the upper surface of the specimen, reset the displacement sensor, and then adjust the tup drop height to 50.0 mm±2.5 mm, recorded as H_y, to ensure that the displacement sensor displays the corresponding height.

8.2.3 Start the instrument and release the tup to allow it to fall freely and impact the specimen.

8.2.4 After the tup has come to rest, lift it up to the same height again and repeat the impact 4 times, with the interval between each repeated impact being 2 seconds.

8.2.5 Stop the test and check the recorded test data curve. If the maximum acceleration deviation of the tup does not exceed 5 m/s^2 and the maximum depth deviation does not exceed 0.5 mm in the last three tests, then end the test. Otherwise, repeat the test until the deviation of the output results for three consecutive times is within the above range.

8.2.6 Record the maximum acceleration, maximum depth and first rebound height H_f of the tup in the last impact test. The maximum acceleration shall be accurate to an integer, and the maximum depth and first rebound height shall be accurate to one decimal place.

8.2.7 Remove the specimen from the instrument, and observe and record any damage or loss on the specimen surface.

9 Test results

9.1 Numerical calculation

The following values are calculated based on the relative relationship between force and displacement and appropriate conversion factors. The corresponding relationship between the values is shown in Figure 3.

1) Maximum shock attenuating force (FM): the maximum value recorded by the force sensing system, in Newtons (N).

2) Maximum deformation of the cushioning system (DM): the maximum value recorded by the displacement sensing system, in millimeters (mm).

3) Maximum energy applied (UM): at the point where the displacement peak occurs, in joules (J).

4) Absorb energy by the cushioning system (UF): at the point after the peak force, and the force value is zero; the unit is joule (J).

9.2 Result calculation

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------