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**requirements and test methods for impact attenuation of
playground surfacing**

运动场地地面冲击衰减的安全性能要求和试验方法

(English Translation)

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Foreword

Chapter 4 of this standard are mandatory, the rest are recommended.

This standard was drafted in accordance with GB/T 1.1-2009 given rules.

This standard by the National Sporting Goods Standardization Technical Committee (SAC/TC291) and focal points.

This standard was drafted. Shanghai Shun Ho Technology Co., Ltd., Tianjin Niuwei Te Rubber Products Co., Ltd., Yu Taikang Physical Fitness Facilities Manufacturing Co., Ltd, China Federation of Sporting Goods Industry, Beijing state system Century Sporting Goods Quality Certification Center, Guangzhou, with limited equipment Xinkang the company, Intertek Testing Services Limited Shanghai, Beijing Sport University, Jiangmen City River Chemical Industrial Group Co., Ltd., Nanjing Wande tour Music Equipment Co.

1 Scope

This standard specifies the site ground motion attenuation impact safety performance of the terms and definitions, classification, requirements and test methods.

This standard applies to sports venues ground.

2 Terms and definitions

The following terms and definitions apply to this document.

Playground sports venues to carry out the fitness, sports training and competitions provided venues.

Sports venues ground playgroundsurfacing Shop for sports venues surface of an artificial or

natural materials, also known as the stadium ground floor.

Shock attenuation impactattenuation Sports venues ground by local deformation or displacement of features to reduce the impact of peak or peak acceleration.

The critical drop height criticalfalheight; CFH Under test conditions, sports venues ground to meet the maximum drop height impact-attenuating properties.

Head injury evaluation value headinjuryriterion (HIC) value Under specified test conditions, the degree of injury to infer human head by the drop impact caused during eigenvalues.

Maximum acceleration Gmax Head impact simulation maximum acceleration to the gravitational acceleration g multiple representation.

Loose granular material looseparticulatematerial Small, separate and distinct, they can move materials, such as. sand, gravel, wood chips, shredded rubber.

Point elastic sports venues ground point-elasticportssurface in the case point by force, the force point or very close to the surface of the point position deformation occurs, such as. plastic venues.

Surface elastic stadium ground floor area-elasticportssurface in the case of force by point, the deformation of the surface layer of a large area around the power point that occur, such as. sports wood floor venue.

2.10

Collision area impactarea User space may fall through the collision area.

[GB 19272-2011, the definition 3.5] Category 3 in accordance with the main purpose of sports venues ground into two categories.

Class I. focus on safety performance sports venues ground. Such as. safety mats.

II class. focus on sports performance sports venues ground. Such as. synthetic material runway surface, ball games and so on the ground floor.

4 Requirements

Class 4.1 I ground

4.1.1

When playground equipment drop height greater than 600mm, the entire area should be installed with the impact of the collision damping of the sports venues Ground, which should be greater than the critical drop height drop height facilities.

4.1.2

Impact of the Ground motion attenuation performance indicators should be consistent with the maximum acceleration (Gmax) of not more than 200g and head injury evaluation value

(HIC) is not greater than 1000.

4.2

II class ground

Impact attenuation performance requirements shall comply with the requirements in Table 1.

Table 1 sports venues ground impact attenuation performance requirements

Number of sports venues ground impact attenuation value /%

1 Gymnasium wood Floors ≥ 40 2 tennis courts Synthetic surfaces 5 to 35 3 football field of artificial grass ground 55 to 70 4 ground synthetic materials runway 35-50

5 Test Methods

Class 5.1 I ground

5.1.1

The laboratory test conditions 5.1.1.1 test sample should be $(23 \pm 2) ^\circ\text{C}$, relative humidity $(55 \pm 10)\%$ condition for at least 48h.

5.1.1.2

the test shall be performed on a flat, hard concrete surface.

5.1.1.3

When loose granular material testing, you should use the internal dimensions of not less than 1m x 1m fixed frame, frame height should be able to meet the test Material thickness requirements.

5.1.1.4

Assembling the surface layer consists of at least four of the total size of not less than 1m x 1m assembled block composition, and including all connections and fixed-site element.

5.1.1.5

live production on the ground floor of the stadium can be any of the following ways to provide seamless connections or test sample.

--- Providing a test sample, the overall size of not less than 1m x 1m;

--- Provide nine test samples of not less than 500mm x 500mm each.

5.1.2.1 Principle

Simulated head from different heights on the ground impact test, shock received by the acceleration sensor signal, the data processing to get a head loss Injury evaluation value

(HIC values) and the maximum acceleration value (Gmax value). Draw HIC value of each impulse, Gmax value and impact height curve, Select the HIC value of 1000 and a value of 200g Gmax corresponding impact height as measured in the low ground of a critical drop height.

According to equation (1).

$$HIC(t_1, t_2) = \sqrt{\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} a^2 dt}$$

max

Where.

a --- acceleration to the gravitational acceleration g multiple representation;

t1, t2 --- t1 and t2 are any two intermediate value between the start time and end time. Time in milliseconds (ms).

NOTE: In the sampling period, the sampling frequency is not lower than 8000Hz, the impact of the process lasts for more than 3ms determined HIC is an effective process, showing Example. $(t_2 - t_1) \geq 3ms$.

Composition 5.1.2.2 test equipment

5.1.2.2.1 Test equipment includes an analog head with an acceleration sensor, the impact measurement system, drop height test system is schematically shown in Figure 1 as follows.

Explanation.

1 --- test sample;

2 --- simulated head;

3 --- Impact measurement systems;

4 --- computer;

5 --- acceleration sensor.

1 drop height test system diagram 5.1.2.2.2 simulation head, meet the following requirements.

--- Use material grades for 6061, aluminum alloy T6 heat treatment, processing to a diameter of $160mm \pm 5mm$, quality $4.6kg \pm 0.05kg$ hemisphere;

--- Three-dimensional acceleration sensor to be mounted on the center of gravity simulation head;

--- Vega when a speed sensor is mounted with its axis coincides with the axis of the head should be simulated, the deviation should be less than 5° ;