BUREAU OF INDIAN STANDARDS
DRAFT FOR COMMENTS ONLY

Doc .: PGD 41 (24204) WC
August 2025

भारतीय मानक मसौदा

जिम्नास्टिक में प्रयुक्त लैंडिंग मैट — विशिष्टि

Draft Indian Standard

Landing Mats Used In Gymnastics — Specification

ICS 97.220.30

Sports Goods Sectional Committee, PGD 41	Last date for comments : 60 days from the date of circulation of WC draft

FOREWORD

(Formal clauses will be added later)

Landing mats are gymnastic equipment which are used both in physical training and in competitions. The gymnast performs on the bar by movements of swinging and vaulting. They play a pivotal role in gymnastics, providing a crucial interface between the athlete and the floor. Recognizing the imperative to uphold the highest standards of quality, safety, and performance in gymnastics equipment, the Sports Goods Sectional Committee has undertaken the task of formulating standard for landing mats.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2: 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.’

Draft Indian Standard

LANDING MATS USED IN GYMNASTICS — SPECIFICATION

1 SCOPE

This standard covers the requirements for landing mats used in gymnastic competitions and training.

2 TERMINOLOGY

2.1 Acceleration — The instantaneous time rate of change of velocity, expressed in m/s^2, which may be positive or negative.

2.2 Base plane — The starting reference plane of the landing mat system from which the total deflection and total height of rebound is determined. It is taken as the top plane of the landing mat system.

2.3 Deflection — The measured distance (in mm) between the base plane and the maximum displacement of the impactor below the base plane.

2.4 Force (F) — The product of the mass of the impactor, expressed in kg, and the acceleration of the impactor, expressed in m/s^2.

2.5 Maximum Force (F_{max}) — The maximum value of force measured during the impact and expressed in Newton.

2.6 Height of rebound — The measured distance (in mm) between the Base plane and the maximum displacement of the impactor above the Base plane.

2.7 Impactor — The striking part of the test apparatus.

2.8 Impact velocity — The velocity of the impactor, expressed in m/s, immediately prior to crossing the base plane on impact.

2.9 Theoretical drop height — A calculated drop height which equates the measured velocity of the impactor at the moment of impact to a height that would generate the same velocity if the test were performed at sea level and there was no friction to retard the impactor during a drop from that height.

3 CONSTRUCTION AND WORKMANSHIP

3.1 The upper surface of the mat shall be horizontal, smooth, and free of gaps. Indentations caused by compressive forces shall not trap body parts or restrict movement and shall not be too deep or narrow. If a cover is used, it shall not create pleats or folds that obstruct movement. The mat's surface material shall balance anti-slip properties and controlled slippage, ensuring it shall not too slippery or overly resistant. The mats shall remain stable during use and shall have an anti-skid cover on the underside to prevent displacement.

3.2 The border zones of mats that are joined together should have functional properties identical to the rest of the surface. Impacts on the border zones should not cause different indentations

compared to the rest of the mat. To ensure this consistency, continuous runners should be provided to bridge the joints.

4 REQUIREMNETS

4.1 Colour

The colour of the landing mats are left to the discretion of the manufacturers and suppliers. It is recommended that the mats be provided in uniform colours. The upper surface shall not show optically disturbing patterns or insignia.

4.2 Shape and Dimensions

The landing mats shall have thickness of (30 ± 1) cm, (20 ± 1) cm, (10 ± 1) cm or (5 ± 0.5) cm. The specific shape and other dimensions of the mats are not prescribed; instead, they may be agreed upon between user and the manufacturer.

5 PERFORMANCE TEST REQUIREMENT

5.1 For the landing mats of thickness (5 ± 0.5) cm, the density of foam shall be minimum 25 kg/m^3.

5.2 For other mats, they shall be tested according to the procedures described in Annex A. The overall mean values of the measured variables shall be within the figures of Table 1.

Table 1 Requirements of Landing Mats
(*Clause* 5)

Sl No.	Requirements	Values
(1)	(2)	(3)
For 10 cm Landing Mats		
i)	Deflection, mm	≤ 65
ii)	Height of rebound, mm	≤ 80
iii)	F_{max}, N	≤ 3750
For 20 cm and 30 cm Landing Mats		
i)	Deflection, mm	≤ 110
ii)	Height of rebound, mm	≤90
iii)	F_{max}, N	≤3000

6 PACKGING AND MARKING

6.1 Packing

The landing mats shall be packed as agreed to between the purchaser and the supplier.

6.2 Marking

6.2.1 The landing mats shall be marked with the followings:

a) Manufacturer’s name and trade-mark
b) Month and year of manufacture.

7 BIS CERTIFICATION MARKING

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the standard mark.

ANNEX A
(*Clause* 5)

STATIC TRACTION STRESS TEST

A-1 TEST SPECIMEN

The test specimen submitted for testing shall consist of a complete landing mat as it is intended to be used during training and/or competition. The minimum horizontal dimensions (length × width) for any test specimen shall be 200 cm × 120 cm.

A-2 TEST APPARATUS

A-2.1 Impact Test Machine

Any type of dynamic testing apparatus that is capable of impacting a test specimen at a prescribed impact velocity and monitoring and recording the acceleration - time history of the impactor is acceptable. The impact test machine and the impactor shall have sufficient rigidity to eliminate undesirable vibrations in the apparatus which might be recorded on the acceleration - time curve. The impact test machine shall also be designed in such a manner that only the impact face of the impactor contacts the test specimen at any time during the test procedures.

A-2.2 Impactor

The impactor shall be (20 ± 0.2) kg and shall have a flat impact face with a (10 ± 0.5) cm diameter. The edge of the impactor face should be relieved to eliminate sharp edges. Provision shall be made so that the accelerometer can be securely fastened parallel to the vertical axis of the impactor with a maximum deviation of ± 5 degree.

A-2.3 Recording Equipment

A-2.3.1 *Acceleration – time*

The selection of the specific acceleration - time recording equipment, including transducers and recorders, is at the discretion of the test laboratory. However, the recording system shall have a frequency response adequate to measure the peak acceleration value to an accuracy of ± 5 percent of the true value. The total system, detection and recording, shall be capable of measuring impact accelerations of up to 200 g at frequencies from 2 to 1 000 Hz to an accuracy of ± 5 percent. The minimum sampling rate of the data acquisition system shall be 5 000 Hz.

A-2.3.2 *Displacement – time*

It is optional, but desirable, that the displacement - time history is recorded by a separate transducer. Any transducer that provides a linear signal proportional to the displacement of the impactor along the impact axis which can be monitored simultaneously with the acceleration - time trace is acceptable. If displacement is recorded, the test equipment shall have means to determine and record the top plane (base plane) of the test specimen from which the total deformation and rebound height are determined.

A-2.3.3 *Filtering*

The signal from all transducers shall be conditioned with a low pass filter which complies with Channel Class 1000 of SAE Recommended Practice J211. A fourth-order Butterworth low pass filter with a cut-off frequency of 1 000 Hz meets this requirement.

A-3 TEST PROCEDURE

A-3.1 Place the test specimen under the impact test machine on a smooth, solid floor (concrete or metal plate) and orient the impactor such that the centre of the impact face will contact one of the designated impact test sites.

A-3.2 Raise the impactor to an appropriate drop height such that it will contact the test specimen with an impact velocity of 3.96 m/s for 20 cm mats and 2.8 m/s for 10 cm mats ± 3 percent. This corresponds to a theoretical drop height of 0.8 m and 0.4 m for 20 cm and 10 cm mats respectively.

A-3.3 Release the impactor and capture the acceleration - time history and displacement - time history (if applicable) using recording equipment described in **A-2.3**.

A-3.4 Upon completion of a given impact test, raise the impactor off the surface of the test specimen.

A-3.4 The duration between tests at a given impact site shall not be less than 120 seconds.

A-3 Each test specimen shall receive a total of 90 impacts. Impact each of the nine impact sites ten times.

A-4 CALCULATIONS

A-4.1 Immediately following each test, record the following measurements: F_{max} (N), Deflection (mm) and Height of rebound (mm).

A-4.2 The last eight tests for each impact site shall be used to determine the arithmetic mean value of a measured variable for each impact site and for the overall mean value of a measured variable across all impact sites.

A-4.3 Calculate the mean values of Deflection, Height of rebound and F_{max} across all impact sites rounded to zero decimal places.