



International  
Handball  
Federation

# **XIII.**

# **Technical Regulations**

## **c) Floor Regulations**

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# Article 1

## 1. General Principles

These Regulations are to define the IHF criteria for handball floors which have to be met. In addition, the criteria concerned apply for the handball floor to be provided with the IHF seal of approval.



# Article 2

## 2. Technical Criteria for Handball Floors

### 2.1. The Playing Court

The playing court (Diagram 1) is a 40 m long and 20 m wide rectangle consisting of two goal areas and a playing area. The longer boundary lines are called side lines, and the shorter ones are called goal lines (between the goalposts) or outer goal lines (on either side of the goal)

There should be a safety zone surrounding the playing court, with a width of at least 1 m along the side lines and 2 m behind the goal lines.

All other technical provisions relating to play are set out in the IHF Rules of the Game (Rule 1).

See Diagram 1 for further technical specifications

The diagram illustrates the layout of a handball court, which is rectangular with a total length of 4000 and a width of 2000. The court is divided into two halves by a center line. Key features and dimensions include:

- Goal Area:** Located at each end, it features a goal line, a goalkeeper's restraining line, a goal-area line, a 7-meter line, and a free-throw line.
- Goal and Net:** The goal is positioned at the center of the goal line, with a net attached.
- Substitution Lines:** Located on the right side of the court, these lines are 450 units from the side line and 350 units from the center line.
- Bench for substitutes:** Two benches are located on the right side, one for each half of the court.
- Table for timekeeper and scorekeeper:** A table is located on the right side, between the two benches.
- Dimensions:** The total length is 4000, with each half being 1992,5. The width is 2000. The goal area is 700 units wide, and the goal itself is 300 units wide. The goalkeeper's restraining line is 400 units from the goal line, and the goal-area line is 600 units from the goal line. The 7-meter line is 700 units from the goal line, and the free-throw line is 900 units from the goal line.

## 2.2. Requirements for Handball Floors

### 2.2.1. Standard References

Standard Reference	Title
EN 1569	Surfaces for sports areas – Determination of the behaviour under a rolling load
EN 12235	Surfaces for sports areas – Determination of vertical ball behaviour
EN 14808	Surfaces for sports areas – Determination of shock absorption
EN 14809	Surfaces for sports areas – Determination of vertical deformation
EN 13036	Road and airfield surface characteristics – Test methods – Method for measurement of slip/skid resistance of a surface: The pendulum test
EN ISO 5470	Rubber- or plastic-coated fabrics – Determination of abrasion resistance – Taber abrader

### 2.2.2. Summary of Tests and Norms

Test	Referenced Norm
Force Reduction	BS EN 14808:2005 Surfaces for Sports Areas. Determination of shock absorption
Vertical Deformation	BS EN 14809:2005 Surfaces for sports areas. Determination of vertical deformation
Ball Rebound	BS EN 12235:2013 Surfaces for sports areas. Determination of vertical ball behaviour
Slip Resistance	BS EN 13036-4:2011 Road and airfield surface characteristics. Test methods. Method for measurement of slip/skid resistance of a surface: The pendulum test.
Resistance to Wear	EN ISO 5470:2016 Rubber- or plastic-coated fabrics – Determination of abrasion resistance – Part 1: Taber abrader
Resistance to Rolling Load	BS EN 1569:2020 Surfaces for sports areas. Determination of the behaviour under a rolling load

### 2.2.3. Flooring Requirements

Performance Property	IHF Flooring Requirements	
Force Reduction	Point Elastic: 25% - 75%	Uniformity (absolute) ±5% from average
	Mixed Elastic: 45% - 75%	
	Area Elastic: 40% - 75%	
	Combined Elastic: 45% - 75%	
Vertical Deformation	Point Elastic: ≤ 3.5 mm	Uniformity ±0.7 mm from average
	Mixed Elastic: ≤ 3.5 mm	
	Area Elastic: 1.5 mm – 5.0 mm	
	Combined Elastic: 1.5 mm – 5.0 mm	
Ball Rebound	≥90%	
	Uniformity (absolute) ±3% from average	
Linear Friction	Dry	Average: ≥80 ≤110
	Wet (Outdoor Venues)	Average: ≥55 ≤110
Resistance to Wear	Synthetic Surface	≤ 1000 mg
	Coated/ Lacquered Surface	≤ 80 mg
Rolling Load	Permanent indentation of ≤ 0.5 mm	



## Article 3

### 3. IHF Seal of Approval

#### 3.1. General Rules

1. The IHF reserves the right to withdraw, at any time during the period of certification, the seal of approval if technical defects are identified on the approved material.
2. If the IHF Floor Regulations are changed, improved or upgraded at any point in time, the certified floor will lose its certification if the product is not re-tested to ensure that it meets the new criteria. The IHF has the right to amend the IHF Floor Regulations and the technical specifications at any time. The manufacturer must have the floors re-tested before the end of the contractual year during which the IHF Floor Regulations and technical specifications have been approved and enforced and prior to the renewal of the next contractual year.
3. A list of floor manufacturers with an IHF seal of approval is kept by the IHF Head Office and is available free of charge.

### **3.2. Application Procedure**

1. The IHF seal of approval may be awarded upon application to any floor manufacturer if the manufacturer fulfils the technical and financial requirements. The applicant shall submit the below information and guarantees to the IHF.
2. The manufacturer shall prove to be a producer of floors and cannot be a licence company. Alongside the contract, an official statement from the manufacturer on this matter will be required.
3. The applicant shall have an international sales/marketing/R&D programme and shall inform the IHF of its experience in the field.
4. The applicant must agree that the IHF will not be liable for any damages that occur to a third party caused by the materials provided by the applicant.
5. The applicant shall contact Sports Labs Ltd, the designated IHF testing laboratory at [info@sportslabs.co.uk](mailto:info@sportslabs.co.uk) with details of the flooring product the applicant seeks to have approved. The applicant will be provided by Sports Labs Ltd with a brief sample form and quotation for the testing required.  
Furthermore, the applicant shall submit the completed application form in Appendix 1 (Test Form) to the IHF and Sports Labs Ltd.
6. The applicant shall ship their product to the testing laboratory ensuring that it is of sufficient size and well packed to avoid any damage during transport, include a copy of the applicant's completed sample form with the shipment (Appendix 3 – Samples and Sample Conditioning). Once received, the laboratory will confirm receipt and begin the process of conducting the required tests.
7. Upon completion of testing, the applicant will receive a detailed results report presenting the products' performance against the IHF requirements. Where the product successfully met all requirements set for receiving the IHF seal of approval, the laboratory shall submit the report to the IHF. The IHF, after reviewing the results report and the application form in Appendix 1 (Test Form), will then decide on granting the IHF seal of approval.
8. Following the signing of the contract and payment of the licence fee, the applicant's product will receive the IHF seal of approval.

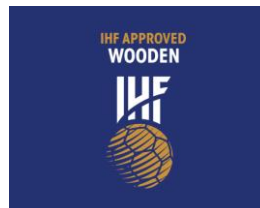
### **3.3. Identification of IHF Approved Floors**

Outside the court on the outer goal line, IHF approved floors shall be clearly printed, in colour, with the official IHF logo and the designation 'IHF Approved Synthetic' or 'IHF Approved Wooden' (max. 80 cm high) as follows:

### IHF Approved Synthetic



### IHF Approved Wooden



## 3.4. Use of IHF Approved Floors

1. IHF approved floors are certified for a period of one year and up to a maximum of three years. The manufacturer shall apply for retesting after the third year in order to receive the renewed seal of approval.
2. Only floors with the IHF seal of approval may be used at official IHF competitions.



## Article 4

### 4. Licence Fee

1. On payment of the licence fee, the manufacturer gains the right to affix one of the IHF seals of approval mentioned in Article [3.3](#) to floors of the tested and approved type. The licence takes the form of a contract drawn up by the IHF Head Office.
2. The licence fee shall be paid in Swiss francs on conclusion of the contract, and before the certificate is delivered by the IHF.





# Appendix 1 – Test Form



## TEST FORM FOR HANDBALL FLOORS



Manufacturer's name: .....

Location of the factory: .....

Contact person of the sales director:  
.....

Protocol of installation: .....

ISO norms available: .....

Sustainable policy: .....

Recyclability terms: .....

TVOC emission result: .....

REACH raw materials  
compliance: .....

Flooring: Synthetic ☐ .....

Wooden ☐

Cleaning: recommended equipment  
.....  
recommended cleaning liquid  
.....

Warranty terms in years:  
.....

What subfloor do you recommend for:  
Elite events .....  
All other events .....

Name of every surface  
requesting IHF approval: .....

.....  
.....

Type of elasticity:      Point elasticity   ☐   Area elasticity   ☐   Combined elasticity   ☐

General remarks:      .....  
.....

.....  
Place / Date

.....  
Name / Signature of Examiner



## Appendix 2 – Standard Contract

### STANDARD CONTRACT - FLOORS -

#### C O N T R A C T

between the

**INTERNATIONAL HANDBALL FEDERATION**, hereinafter named 'IHF',

with its Head Office at  
Peter Merian-Strasse 23  
P.O. Box  
CH-4002 Basel  
Switzerland

and represented by

.....

and

.....

hereinafter named 'Floor Manufacturer'

with its headquarters in

.....  
.....  
.....

and represented by

.....

## § 1: Rights

The IHF shall grant the Floor Manufacturer the IHF seal of approval for handball floor(s) and, in accordance with the IHF Floor Regulations, the non-exclusive right to use the IHF seal of approval and imprint the floors it produces as mentioned under § 3 with the clear coloured imprint, containing the IHF logo and the designation 'IHF Approved Wooden' or "IHF Approved Synthetic" (80 cm high at most).

The Floor Manufacturer shall have the right to receive a certificate for each type of floor certified by IHF.

## § 2: Obligations

1. The Floor Manufacturer shall agree that the IHF will not be liable for any damages that occur to a third party caused by the materials provided by the Floor Manufacturer.
2. The Floor Manufacturer shall never misuse the IHF flooring certification or any other IHF trademark/logo.
3. The Floor Manufacturer shall declare any installation of its IHF certified floor and shall be able to provide a list to the IHF upon request.
4. The Floor Manufacturer shall notify the IHF in confidence of the last contractual year's production and sales figures for the floor type as mentioned under § 3 of the contract. The IHF is obliged not to make these figures known to any third parties except the members of the IHF Executive Committee.
5. The IHF Floor Regulations form an integral part of this contract and shall be recognised by the Floor Manufacturer as authoritative.

## § 3: Specification of floor types

The rights listed under § 1 shall be granted only to the following floor type(s):

.....

Should the Floor Manufacturer require the rights listed under § 1 for further products, an additional contract shall be necessary.

## § 4: Licence fee

According to a decision of the IHF Executive Committee the licence fee has been set at

CHF ..... (Swiss francs)

The licence fee for the contractual year(s), from ..... to ....., is payable upon the contract's conclusion and shall be paid into the following IHF bank account:

Bank: Bank CIC (Schweiz) AG, 4001 Basel  
IBAN: CH15 0871 0043 4600 5200 1  
SIC / Clearing number: 08710  
SWIFT-BIC: CIALCHBB  
Account holder: International Handball Federation

The certificate of the seal of approval will be delivered only after such payment has been received by the IHF. Then the Floor Manufacturer gains the right to affix the official IHF seal of approval to floors of the tested and approved type(s).

#### **§ 5: IHF logo**

The IHF logo shall be provided to the Floor Manufacturer at the time the contract comes into force.

#### **§ 6: Duration of contract**

This contract shall be valid for up to three years in accordance with Article [3.4.1](#) of the Floor Regulations.

The Floor Manufacturer, in order to renew its certification, shall send a new request to the IHF along with the payment for the new contractual year. The Floor Manufacturer does not have to provide a new report unless the last report is older than three years or the technical requirements of the IHF have changed.

#### **§ 7: Termination of contract**

The contract shall terminate at the end of the contractual year(s).

The contract can also be terminated prior to the end of the certification for the following reasons:

- a) in case of misuse of the IHF seal of approval or any other IHF trademark/logo, or
- b) in case the Floor Manufacturer culpably breaches its obligations under this contract (including failing to preserve the good quality of the certified floors) and such breach is not being remedied within a reasonable time after receipt of the IHF's written notice claiming such breach, or
- c) in case the reputation of the Floor Manufacturer is in a way significantly and publicly damaged, giving the IHF comprehensible reason to believe that this may threaten its reputation as well.

#### **§ 8: IHF's duty to provide information**

The IHF shall display all floors mentioned in this contract in the section reserved for IHF seals of approval on the [IHF official website's marketing page](#).

## §9 Miscellaneous

1. The Floor Manufacturer may not assign or transfer this contract nor any rights or obligations hereunder without the prior written consent of the IHF.
2. This contract is written in English. English shall always be the language used to interpret the contract.
3. This contract shall be governed by and interpreted in accordance with Swiss law.
4. This contract shall come into effect immediately upon signing by the two parties.

## § 10: Disputes

In case of any disputes arising out of or in connection with this contract, the parties shall exert best efforts and strive for an amicable settlement. If an agreement cannot be reached, any dispute concerning the existence of the contract, its validity, interpretation, or performance shall be referred to and resolved by arbitration, to the exclusion of ordinary courts, under the Procedural Rules of the CAS Code (R27 and seq.). These Rules are deemed to be incorporated by reference into this clause. The CAS shall act as an ordinary court of arbitration.

The place of jurisdiction shall be Switzerland.

Place and date .....

INTERNATIONAL HANDBALL FEDERATION

Signature .....

Name .....

Function .....

Floor Manufacturer

Signature .....

Name .....

Function .....

## Appendix 3 – Samples and Sample Conditioning

Flooring samples categorised as area elastic shall be supplied in sections to form a 3.5 m x 3.5 m square. Flooring samples categorised as point elastic shall be supplied in 1.0 m x 1.0 m samples. Samples should be representative of the surface in its installed state including any surface lacquers, varnishes, and coatings.

Samples shall be conditioned in an ambient temperature of  $23 \pm 2$  °C and relative humidity of  $50 \pm 15\%$  for a minimum of three hours prior to testing. Where a surface is deemed to be humidity sensitive, samples shall be conditioned for a period of at least 88 hours. Flooring types are categorised into the following constructions:

1. Area elastic: Sports floor, to which the application of a point force causes deflection over a relatively large area around the point of application of the force. See Figure 1: Area Elastic Deformation Profile.
2. Point elastic: Sports floor, to which the application of a point force causes deflection only at or close to the point of application of the force. See Figure 3: Point Elastic Deformation Profile.
3. Combined elastic: Area-elastic sports floor with a point-elastic top layer, to which the application of a point force causes both localised deflection and deflection over a wider area. See Figure 2: Combined Elastic Deformation Profile.
4. Mixed elastic: Point-elastic sports floor with a synthetic area-stiffening component. See Figure 4: Mixed Elastic Deformation Profile.

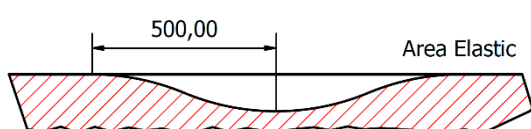


Figure 1: Area Elastic Deformation Profile

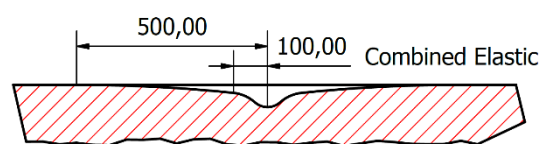


Figure 2: Combined Elastic Deformation Profile

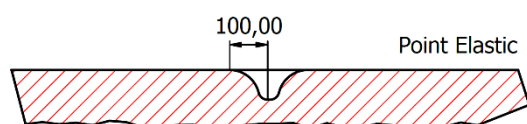


Figure 3: Point Elastic Deformation Profile

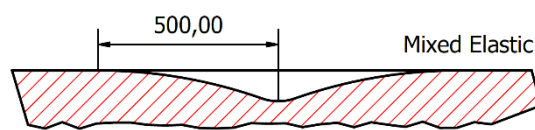


Figure 4: Mixed Elastic Deformation Profile

All samples must be supplied with all components forming the make-up of the system in its installed form including but not limited to any shock absorbing layers, clips, and joining elements in keeping with the intended installation construction.



## Appendix 4 – Summary of Test and Test Locations

Where surfaces are being tested in situ, a minimum of eight test locations shall be assessed for shock absorption and deformation, with four locations on each half of the court. The test locations shall be selected in areas representative of both high and low use areas.

### **Area and Combined Elastic**

Flooring samples of an area or combined elastic nature shall be tested for force reduction, vertical deformation and ball rebound in a minimum of five locations across the surface of the sample. The test locations should be selected such that the points of differing structural conditions are assessed. Examples include but are not limited to; over and between cushion pads, over end joints in substructure layers, over edge joints in substructure layers, over and between battens in substructure layers, over voids within the substructure layers. Each test set shall be conducted on a previously untested location with each test location being no less than 100 mm from any other and a minimum of 600 mm from the edges of the sample.

In cases where the sample construction does not allow for all points of varying structure to be assessed whilst maintaining the above location criteria, a larger sample size should be supplied.

### **Point and Mixed Elastic**

Flooring samples of point and mixed-elastic nature shall be tested for force reduction, vertical deformation and ball rebound in a minimum of three locations across the surface of the sample. Each test set shall be conducted on a previously untested location with each test location being no less than 100 mm from any other and a minimum of 200 mm from the edges of the sample.



## Appendix 5 – Force Reduction

### Principle

Force reduction is the ability of the surface to provide cushioning to the athlete when landing from jumps and during running. It focuses on the forces generated by the lower extremities, and it is thought that force reduction values that are too low represent increased chances for injuries (such as shin splints), and that joint discomfort increases as force reduction decreases. It involves comparing the impact force generated by the Artificial Athlete on the sports surface to those generated on concrete and is presented in units of a percent (i.e., 55%). Higher force reduction values indicate a softer sport surface.

### Apparatus

Force reduction is measured using the Artificial Athlete (AA) apparatus consisting of a load cell, measuring load over the duration of the impact whereby a spring of constant stiffness is struck by a falling mass of weight  $20 \pm 1$  kg. The design and operation of the AA equipment is defined in full in EN 14808. The equipment must be calibrated annually.

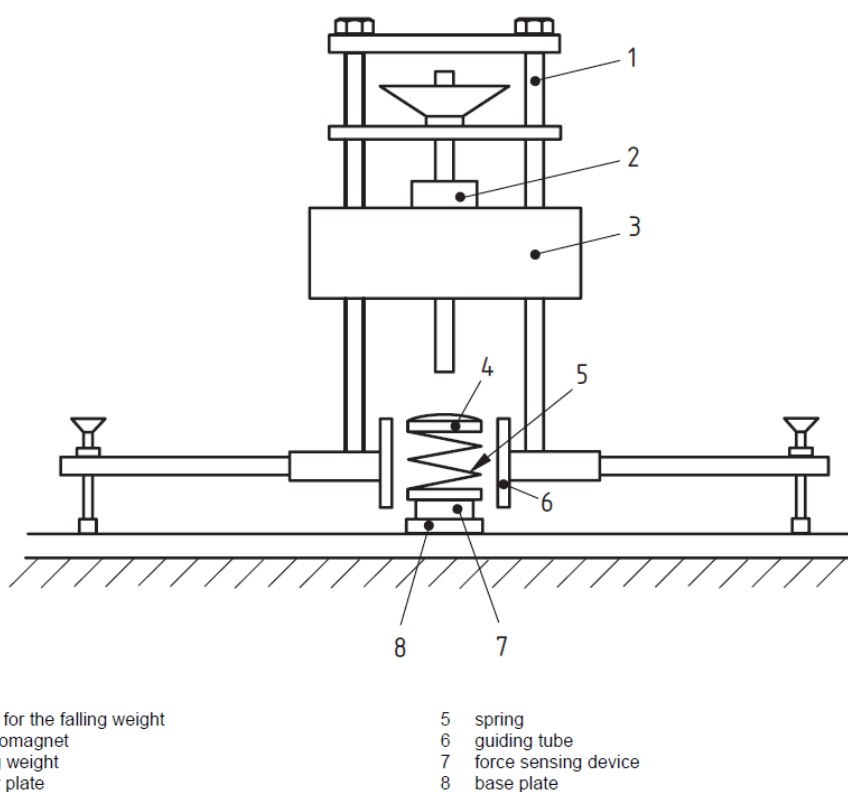


Figure 5: Artificial Athlete Apparatus – Force Reduction Arrangement

### Procedure

Full detail of the test procedure is provided within EN 14808, which is summarised below.

- The reference force reduction value  $F_r$  is first attained through measurement on a concrete floor with a minimum mass of 1,000 kg and a minimum thickness of 100 mm.
- Position the apparatus vertically on the concrete floor and set the height of the lower face of the impact weight  $55 \pm 0.25$  mm above the force-measuring assembly. Release the weight allowing it to fall onto the force-measuring assembly. Record the peak force applied to the surface during the impact.
- Repeat the procedure ten times, giving a total of eleven impacts. Record the mean value of the peak force from the second to the eleventh impact as the value of  $F_r$ .
- Following the determination of  $F_r$ , position the apparatus vertically above the test sample ensuring the impact location is a minimum of 200 mm from the edges of the sample. For area- and mixed-elastic surfaces, this should be extended to 1000 mm from the edges of the sample.
- Release the weight from a height of  $55 \pm 0.25$  mm allowing it to fall onto the force-measuring assembly. Record the peak force applied to the surface during the impact. The mass must be lifted and reattached to the drop mechanism within 5 seconds.
- Repeat the drops in the same location two additional times with an interval of  $60 \pm 10$  seconds between each drop recording the peak force applied during the impact. Calculate the mean value of the peak forces measured during impacts two and three and record this as  $F_t$ .

### Calculation and Expression of Results

Calculate the percentage force reduction for the surface using the following formula

$$R = \left(1 - \frac{F_t}{F_r}\right) \times 100$$

where

$R$	is the force reduction, expressed as a percentage (%)
$F_t$	is the measured maximum peak force for the test piece, expressed in newton (N)
$F_r$	is the measured maximum peak force for the concrete, expressed in newton (N)

The force reduction value for each test location shall be expressed to the nearest whole percentage. The calculated force reduction value for each tested location must fall within the tolerances detailed in Article [2.2.3](#).

## Appendix 6 – Vertical Deformation

### Principle

Vertical Deformation is the ability of the surface to deform during a landing from a jump, during running or during any foot-floor contact. The test focuses on the deformation generated at the point of impact, and it is thought that vertical deformation values that are too high decrease foot stability. It involves computing a normalised deformation, measured in millimetres, under a standard load of 1500 N (i.e., 2.4 mm). A higher value for vertical deformation means that the sport surface deforms more during foot-floor impacts.

### Apparatus

Deformation is measured using the Artificial Athlete (AA) apparatus which utilises linear variable differential transformers (LVDTs) to measure deformation in the surface whilst a spring of constant stiffness is struck by a falling mass of weight of  $20 \pm 1$  kg. The design and operation of the AA equipment is defined in full in EN 14808. The equipment sensors must be calibrated annually.

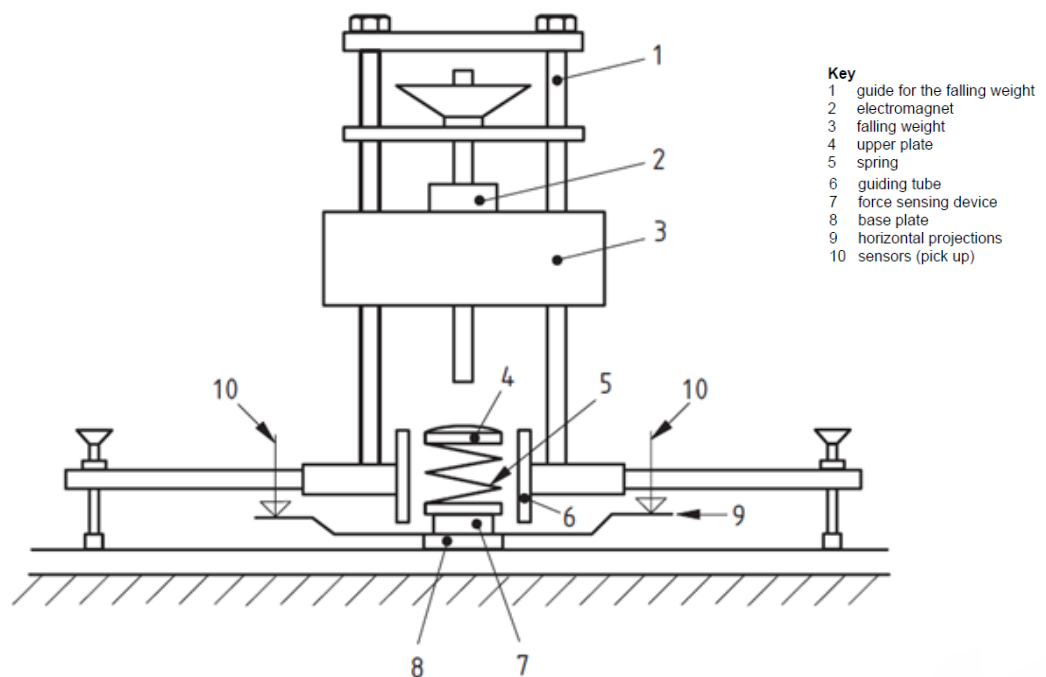


Figure 6: Artificial Athlete Apparatus – Vertical Deformation Arrangement

### Procedure

Full detail of the test procedure is provided within EN 14809, which is summarised below.

- Position the apparatus vertically on the sample surface ensuring the impact location is a minimum of 200 mm from the edges of the sample, for area- and mixed-elastic surfaces this should be extended to 1000 mm from the edges of the sample.

- Adjust the LVDTs such that both sensors are equidistant from the central measuring assembly and are in contact with the lobes (10). Set the height of the lower face of the impact weight  $120 \pm 0.25$  mm above the force-measuring assembly.
- Release the weight allowing it to fall onto the force measuring assembly. Record the peak force applied to the surface and the corresponding deformation during the impact duration. The mass must be lifted and reattached to the drop mechanism within 5 seconds.
- Repeat the above steps on the same location two additional times with an interval of  $60 \pm 10$  seconds between each drop giving a total of three impacts. The mean value of the second and third impacts should be recorded.

### Calculation and Expression of Results

Calculate the percentage vertical deformation for the surface using the following formula

$$D = \left( \frac{1500N}{F_{max}} \right) \times f_{max}$$

where

$f_{max}$  is the maximum deformation of the sports floor in the falling weight axis, expressed in millimetres (mm) (mean of each of the maximum pick-up values);

$F_{max}$  is the maximum force (peak value), expressed in newton (N).

The deformation value for each test location shall be expressed to the nearest 0.1 mm. The calculated deformation value for each test location must fall within the tolerances detailed in Article [2.2.3](#).



## Appendix 7 – Ball Rebound

### Principle

An IHF certified match ball (size 3) is released from a height of 1.8 m and the height of its rebound from the surface is calculated in accordance with BS EN 12235 and expressed as a percentage relative to that of a rebound on concrete. Surfaces with higher rebound values make balls rebound to levels that are closer to those generated on concrete.

### Apparatus

A size 3 IHF-certified match ball. An electromagnetic or vacuum release mechanism that allows the handball to free-fall vertically from a height of  $1.80 \pm 0.01$  m (measured from the bottom of the ball) without imparting any impulse or spin. An acoustic timing device capable of measuring to an accuracy of 1 ms or video-based system of equivalent accuracy and laser or fixed measuring device of a minimum accuracy of  $\pm 1$  mm, which shall be adopted in setting the handball drop height.

### Procedure

Set the electromagnetic or vacuum release mechanism at a height such that when the ball is attached, it hangs  $1.80 \pm 0.01$  m above a concrete surface of a minimum size of 1000 mm x 1000 mm when measured from the underside of the handball. Release the ball and record the rebound height. Repeat this procedure to collect a total of five readings within a 1000 mm radius. Calculate and record the mean of the five rebound values. If the mean value falls out with the requirement of  $1050 \pm 25$  mm, the inflation pressure is adjusted until the mean rebound height meets the required height. Record the final mean rebound height as  $R_c$ .

Using the calibrated handball, repeat the rebound procedure on the test surface overlaid upon the concrete making sure to adjust the drop height accordingly. Calculate the mean rebound height of five drops and record the value as  $R_s$ .

When testing portable flooring products, rebounds should be conducted on the centre of tiles/panels in addition to junctions between panels.

### Calculation and Expression of Results

Calculate the percentage rebound value for the surface using the following formula

$$R\% = \frac{R_s}{R_c} \times 100$$

where

$R\%$  is the relative percentage rebound height

$R_s$  is the rebound height from the sports surface, in metres

$R_c$  is the rebound height from concrete, in metres

The relative percentage ball rebound value for each test location shall be expressed to the nearest whole percentage. The calculated ball rebound value for each tested location must fall within the tolerances detailed in Article [2.2.3](#).



## Appendix 8 – Slip Resistance

### Principle

Slip resistance or dynamic friction is a measure of the surface's ability to resist slippage and to provide adequate grip to allow players to make safe changes in direction during the game. The test simulates the shoe-surface interface. Linear slip resistance, as detailed in EN 13036-4, is the indicative friction of the surface under skidding or quick stopping activities and is presented in whole number value (i.e., 100).

### Apparatus

Slip resistance is measured using the Slip Resistance Pendulum apparatus which utilises a pendulum mounted sprung slider assembly. The slider assembly incorporates a rubber pad of specified resilience and hardness which is dragged across the test surface through the pendulum motion. The angle to which the pendulum climbs following the disengagement from the surface indicates the frictional value between the rubber and test surface.

An infrared radiation thermometer (pyrometer), or electronic thermometer with a surface probe, with an accuracy of  $\pm 0.5$  °C.

The design and operation of the slip resistance equipment defined in full in EN 13036-4 where the following alterations and additions are made:

- The type 57 slider material is to be replaced with CEN rubber for the purpose of all handball surface testing.
- Surfaces shall be tested in 3 directions, these should be conducted at relative angular directions of 0, 45, and 90° to one another. If the surface exhibits a directional pattern, such as wood grain, the first direction should be positioned perpendicularly to the pattern direction.
- The CEN slider material shall be reconditioned between each surface by conducting ten swings on a surface overlaid with pink lapping film.

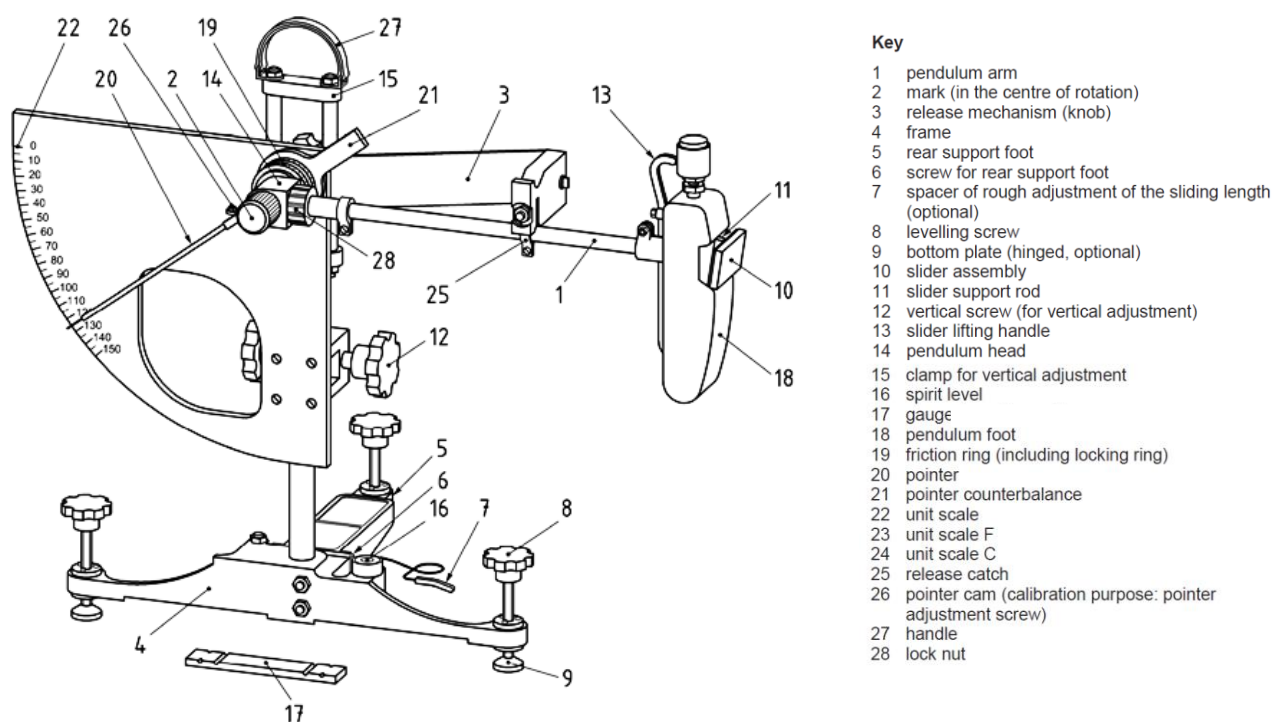


Figure 7: Slip Resistance Pendulum Apparatus

## Procedure

Full detail of the test procedure is provided within EN 13036-4, which is summarised below.

1. The sample surface shall be clean and free from residues, dust or other loose particles and secured rigidly such that no movement of the sample occurs during testing.
2. Measure and record the surface temperature of the tested location and position the pendulum apparatus such that the pendulum will strike the measured location. Ensure both the pendulum apparatus and surface are level using a spirit level.
3. Raise the pendulum pivot point such that the pendulum can swing without contacting the surface. Release the pendulum and ensure the pointer comes to rest at the zero position on the results scale. This shall be repeated two additional times to ensure the equipment is operating correctly. If the pointer rests above or below the zero marker, adjustments shall be made using the adjustment rings such that a zero reading is consistently achieved.
4. Lower the pendulum onto the surface and, using a pre-marked gauge, ensure the sliding length of the rubber to surface contact is  $126 \pm 1$  mm. This is achieved through incremental adjustments of the pendulum height.
5. From the locked position and respective pointer home position, release the pendulum allowing it to contact the surface and actuate the pointer, catch the pendulum arm on its return swing such that it does not re-contact the surface. Record the value indicated by the pointer to the nearest whole number before returning both the pointer and pendulum to their home and locked positions respectively.
6. Repeat the swing operation an additional four times providing a total of 5 measurements.



### **Calculation and Expression of Results**

Calculate the mean value from the five recorded measurements reporting this to the nearest whole number. Results shall fall within the requirements outlined in Article [2.2.3](#).

## Appendix 9 – Resistance to Wear

### Principle

This test measures the surfaces' ability to resist wear and provides results indicative to the expected lifetime of the surface or its coatings. Weighted abrasive wheels are repeatedly passed across the surface and the respective mass loss from the surface is measured.

### Apparatus

The design and operation of the Taber abrasion equipment are defined in full in EN ISO 5470, which is summarised below.

The Taber abrader equipment consists of two abrasive wheels of a diameter of  $51.6 \pm 0.1$  mm and thickness of  $12.7 \pm 0.1$  mm positioned parallel to one another and at equidistance from the central axis at  $26.2 \pm 0.1$  mm. For wood finishes, unfinished paints and other coatings used as part of scheduled maintenance, CS10 wheels shall be used and weighted such that they exert a force of  $5 \pm 1$  N onto the sample surface. Synthetic surfaces shall be worn using H18 abrasive wheels and loaded to transmit a force of  $10 \pm 1$  N onto the samples surface.

A rubber clad metal disc is positioned below the wheels upon which the sample of a diameter of  $114 \pm 1$  mm is overlaid, the disc is rotated around its central axis such that the test piece surface is abraded by the abrasion wheels. The equipment shall incorporate a suction device consisting of two nozzles of internal bore of  $8 \pm 0.5$  mm for removing any loose particulate from the surface of the sample. A suction pressure of  $2.55 \pm 0.5$  kPa is recommended for its function to be effective.

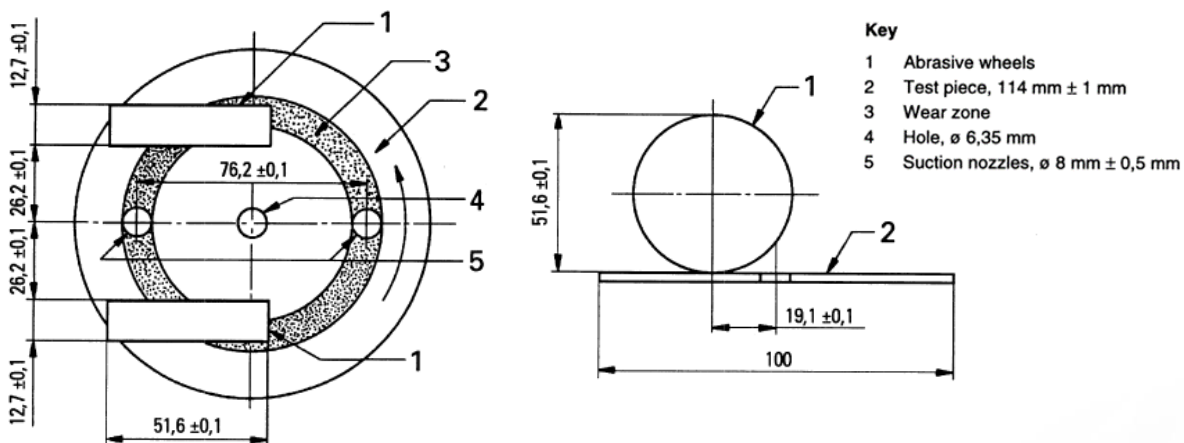


Figure 8: Taber Abrasion - Wear Wheel and Sample Plate Arrangement

### Procedure

Full detail of the test procedure is provided within EN ISO 5470, which is summarised below.

1. Cut the test sample to a diameter of  $114 \pm 1$  mm to ensure no delamination or separation of the wear surface occurs. Supporting structure of the sample may be removed such that it may be

mounted in the Taber apparatus. Care should be taken during this process not to damage or warm the upper surface of the sample.

2. Ensuring it is cleaned of any loose debris and dust, weigh the test sample to the nearest 1 mg and record this value at  $M_1$ .
3. Apply double-sided adhesive tape to the underside of the sample ensuring it is free from any wrinkles or creases which may affect the planarity of the test piece once mounted on the test apparatus. Mount the test sample upon the sample disc, pressing in place to secure.
4. For synthetic surfaces, H18 wheels and a 1 kg load should be adopted.
5. For lacquered or varnished wooden surfaces, CS10 wheels should be used with a 500 g load.
6. 1000 cycles should be conducted as per EN ISO 5470, ensuring abrasive wheels have been re-dressed prior to testing.
7. Weigh the test sample to the nearest 1 mg and record this value as  $M_2$ .

### **Calculation and Expression of Results**

Calculate the mass loss from the sample following 1000 wear rotations and express this value to the nearest 1 mg. Results shall fall within the requirements outlined in Article [2.2.3](#).

## Appendix 10 – Resistance to a Rolling Load

### Principle

A rolling load is repeatedly traversed across the upper surface of the flooring material to locally stress the surface and determine its ability to resist indentation. A weighted steel wheel is utilised in the application of the load representing a worst-case scenario of heavy equipment being rolled across the court.

### Apparatus

A complete specification of the loaded wheel apparatus is provided within EN 1569, which is summarised below.

A weighted carriage of rigid construction shall be supported upon three wheels, two of which are supporting wheels only and shall not produce a downwards load of more than 50 N as shown in Figure 9. The loaded wheel should be constructed from steel and shall be  $100 \pm 1$  mm in diameter and  $30 \pm 0.3$  mm in width. The edges of the loaded wheel shall have a radius of  $1 \pm 0.1$  mm.

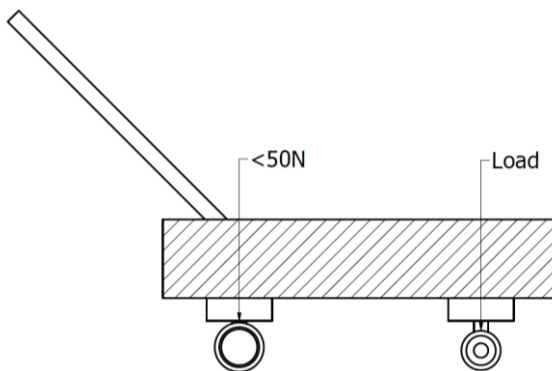


Figure 9: Resistance to Rolling Load Schematic

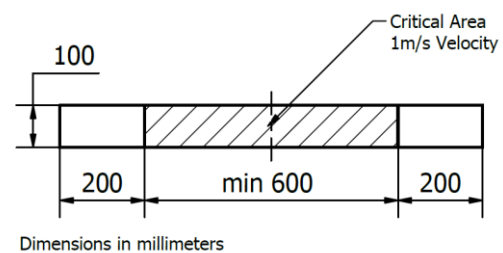


Figure 10: Resistance to Rolling Load - Test Area

### Procedure

- The sample shall be placed flat on a surface of rigid construction such as a floor of concrete construction and checked for any bowing. Where the samples are not flat, replacements should be sought.
- Where samples are of modular construction, whether portable or permanent, the test area should be located centrally over a junction.
- The loaded wheel should be positioned on the sample surface and rolled back and forth over its surface with a velocity of approximately 1 m/s within a test strip of a width of 100 mm as shown in Figure 10.
- A total of 300 traverses shall be conducted with a full back and forth movement constituting one cycle. A further 300 traverses should then be conducted at  $90^\circ$  to the first test strip ensuring the critical areas overlap centrally.

### **Calculation and Expression of Results**

Visually examine the test area for any cracking or damage to the surface and any indentation greater than 0.5 mm in depth. If such an indentation is apparent, the sample should be allowed to recover for a period of 15-20 minutes after which its depth shall be measured through the use of a 300 mm rule and Vernier callipers with minimum resolution of 0.01 mm.

Report the depth of any residual indentation to an accuracy of 0.1 mm, any visual damage to the surface such as cracking or scoring should be pictured and presented within the results report.