BRITISH STANDARD

BS EN 1176-2:2008

Incorporating corrigendum August 2008

Playground equipment and surfacing —

Part 2: Additional specific safety requirements and test methods for swings

ICS 97.200.40

BSI British Standards

National foreword

This British Standard is the UK implementation of EN 1176-2:2008. It supersedes BS EN 1176-2:1998 which will be withdrawn on 31 May 2009.

The UK participation in its preparation was entrusted to Technical Committee SW/65, Children's playground equipment.

Operators and providers are advised that equipment conforming to EN 1176 require regular maintenance. Guidance on this and appropriate inspection, maintenance and operation schedules are contained within BS EN 1176-7:2008.

National standards have been published by BSI on children's playground equipment since BS 3178 was first issued in 1959, this standard concentrated on specifications for specific types of equipment. It was replaced in 1979 by BS 5696 which switched focus to a design and safety approach.

With the increasing introduction of overseas equipment BSI led the way by calling for a European Standard to address the conflicting safety advice and standards from other countries. This was published in 1999 as BS EN 1176 and further focused on the safety of playground equipment.

All standards published by BSI are regularly assessed and this revision is part of the process, it takes into account new design concepts and the operating experience available to the standards committees.

It is advised that the previous version of BS EN 1176 will not be withdrawn until 31 May 2009 to give manufacturers time to amend their product lines.

Playground equipment not complying with this revision should not automatically be considered as being unsafe or to require replacement. A risk assessment by competent persons should be used to determine what action, if any, is necessary. Manufacturers and Inspectors of the Register of Play Inspectors International (RPII) are amongst those that will be able to assist in this.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2008

ISBN 978 0 580 64113 8

Amendments/corrigenda issued since publication

Date	Comments
30 September 2008	Correction to national foreword

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1176-2

May 2008

ICS 97.200.40

Supersedes EN 1176-2:1998

English Version

Playground equipment and surfacing - Part 2: Additional specific safety requirements and test methods for swings

Equipements et sols d'aires de jeux - Partie 2: Exigences de sécurité et méthodes d'essai complémentaires spécifiques aux balançoires

Spielplatzgeräte und Spielplatzböden - Teil 2: Zusätzliche besondere sicherheitstechnische Anforderungen und Prüfverfahren für Schaukeln

This European Standard was approved by CEN on 25 April 2008.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 1176-2:2008: E

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Foreword

This document (EN 1176-2:2008) has been prepared by Technical Committee CEN/TC 136 “Sports, playground and other recreational facilities and equipment”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2008, and conflicting national standards shall be withdrawn at the latest by May 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1176-2:1998.

This European standard consists of a number of parts as follows:

EN 1176-1, *Playground equipment and surfacing — Part 1: General safety requirements and test methods*

EN 1176-2, *Playground equipment and surfacing — Part 2: Additional specific safety requirements and test methods for swings*

EN 1176-3, *Playground equipment and surfacing — Part 3: Additional specific safety requirements and test methods for slides*

EN 1176-4, *Playground equipment and surfacing — Part 4: Additional specific safety requirements and test methods for cableways*

EN 1176-5, *Playground equipment and surfacing — Part 5: Additional specific safety requirements and test methods for carousels*

EN 1176-6, *Playground equipment and surfacing — Part 6: Additional specific safety requirements and test methods for rocking equipment*

EN 1176-7, *Playground equipment and surfacing — Part 7: Guidance on installation, inspection, maintenance and operation*

EN 1176-10, *Playground equipment and surfacing — Part 10: Additional specific safety requirements and test methods for fully enclosed play equipment*

EN 1176-11, *Playground equipment and surfacing — Part 11: Additional specific safety requirements and test methods for spatial network*

This part of EN 1176 should not be used in isolation, but in conjunction with parts EN 1176-1, EN 1176-7 and EN 1177.

For inflatable play equipment see:

EN 14960, *Inflatable play equipment — Safety requirements and test methods*

The principal changes from the previous edition of this part of EN 1176 are as follows.

a) Addition of requirements for contact swings and the amendment of requirements for single-point swings.

b) Inclusion of additional requirements for the extent of the falling space.

c) Deletion of a requirement not to mix cradle seats and flat seats in the same swing bay.

d) Impact test for swing seats now uses the mean of ten impacts.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part of EN 1176 specifies additional safety requirements for swings intended for permanent installation for use by children. Where the main play function is not swinging, the relevant requirements in this part of EN 1176 may be used, as appropriate.

NOTE Recommendations on the design and siting of swings are given in Annex A.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1176-1:2008, *Playground equipment and surfacing — Part 1: General safety requirements and test methods*

3 Terms and definitions

For the purposes of this European standard, the terms and definitions given in EN 1176-1:2008, together with the following apply.

NOTE In order not to confine the application of this European Standard to those items of equipment currently in use and to allow freedom of design for the manufacture of new equipment, only the fundamental forms of equipment and motion are defined.

3.1
swing
moving equipment where the weight of the user is supported below a pivot or universal joint

3.2
swing with one rotational axis (Type 1)
seat, flexibly suspended individually from a load bearing cross beam that can swing to and fro in an arc at right angles to the cross beam (see Figure 1)

Figure 1 — Example of a swing with one rotational axis (Type 1)

3.3
swing with several rotational axes (Type 2)
seat suspended from one or more load bearing cross beams, supported in such a way that it can move at right angles or longitudinally to cross beams (see Figure 2)

Figure 2 — Example of a swing with several rotational axes (Type 2)

3.4
single point swing (Type 3)
seat or platform with cables or chains that meet at one fixing point (see Figure 3) such that the swing can move in all directions

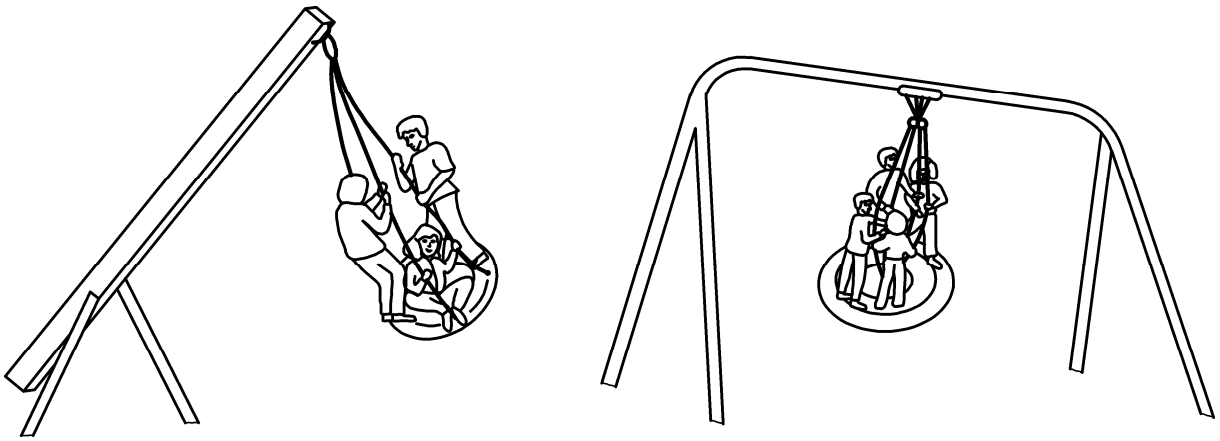
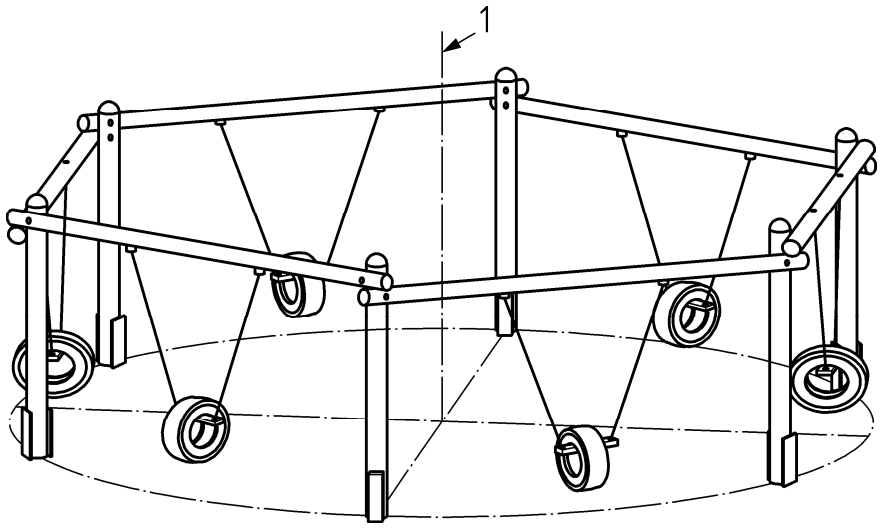


Figure 3 — Examples of a single point swings (Type 3)

3.5
contact swing (Type 4)
group of seats flexibly suspended individually from load bearing cross beams, which are arranged around a central axis (a centre point), typically six in number (see Figure 4)



Key
1 central axis

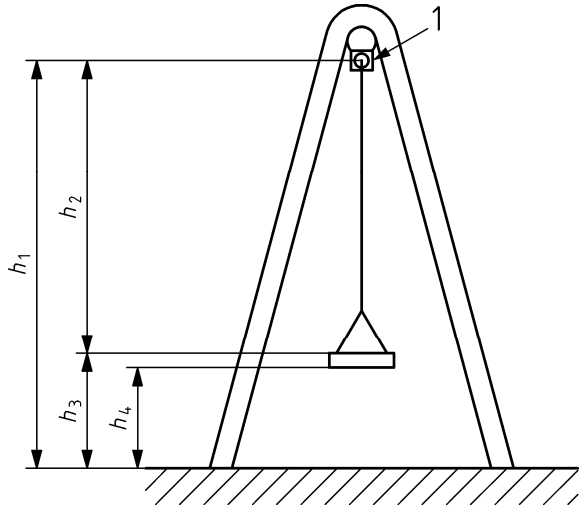
Figure 4 — Example of a contact swing (Type 4)

3.6
swing height
distance between the middle of the fulcrum of the suspension and the playing surface (see Figure 5)

3.7
length of swing suspension member
distance between the middle of the fulcrum of the suspension member and top surface of the seat or platform (see Figure 5)

NOTE Suspension members include chains and ropes.

3.8
ground clearance
distance between the lowest part of the seat or platform and the playing surface when the swing is at rest (see Figure 5)

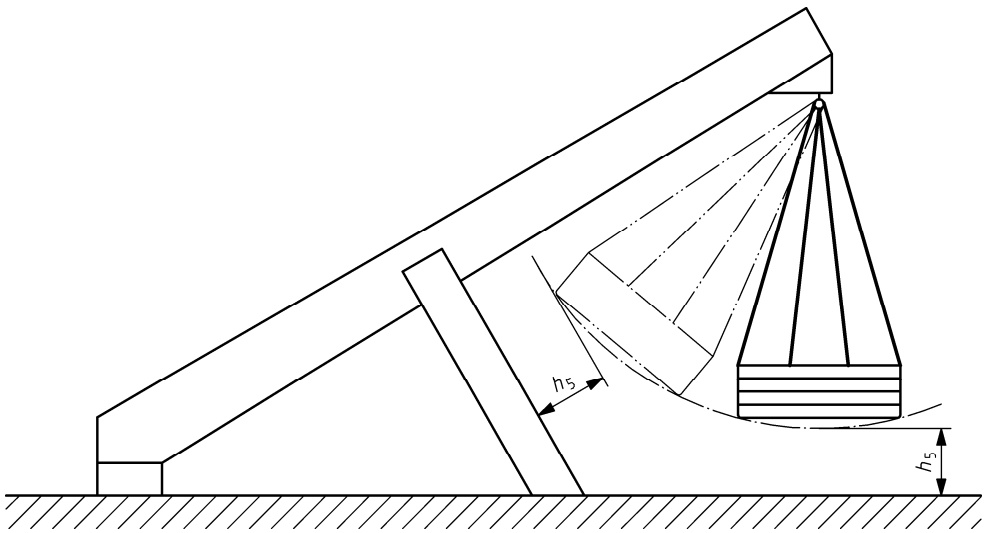


Key
1 rotational axis
h_1 swing height
h_2 length of swing suspension member (h_1-h_3)
h_3 height of seat
h_4 ground clearance

Figure 5 — Height dimensions

3.9
height of seat
distance between the top of the seat or platform and the playing surface (see Figure 5)

3.10
seat clearance
distance between the lower edge of the seat and any obstacle adjacent to the path of the swing (see Figure 6)



Key
h_5 seat clearance

Figure 6 — Example of a Type 3 swing showing seat clearance

3.11
flat swing seat
seat without back and side protections

3.12
cradle swing seat
seat provided with greater body support for younger or less able users, typically designed so that the user cannot slip through the constructional parts surrounding the seat

4 Safety requirements

4.1 General

Swings shall conform to EN 1176-1 unless otherwise specified in this part of EN 1176.

4.2 Ground clearance

The minimum ground clearance (see Figure 5) at rest position shall be 350 mm.

For tyre seats of swings of Types 1, 2 and 3, the ground clearance in the resting position shall be at least 400 mm. In the case of contact swings with vertical tyres as seats (see Figure 11), the ground clearance can be reduced to 100 mm minimum.

NOTE Contact swings with vertical tyres may have a lower ground clearance because their construction is flexible; if an impact occurs the tyre is deflected and the impact is reduced. Also, the tyre is made from impact attenuating material.

4.3 Seat clearance for single point swing (Type 3)

The minimum seat clearance (see Figure 6) shall be at least 400 mm except in the direction of the beam on which the suspension is fixed.

NOTE If during use, the side of the swing seat can come into contact with the swing frame, then protective material may be fitted to the frame at this point to protect the beam.

4.4 Minimum clearance and lateral stability of swing seats with more than one point of suspension

4.4.1 Minimum space between the seats of swings

The minimum horizontal dimension, *C*, between the side (see Figure 7a) of a swing seat and the adjacent structure in the rest position shall be

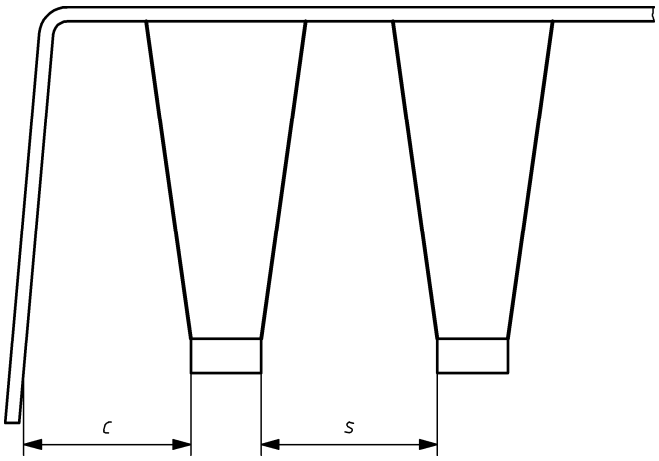
≥ 20 % length of the suspension member (+ 200 mm).

The minimum horizontal dimension, *S*, between adjacent swing seats (see Figure 7a) in the rest position shall be

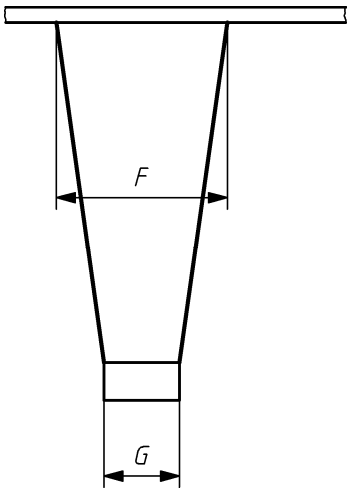
≥ 20 % length of the suspension member (+ 300 mm).

For Type 4 swings the minimum distance between the seat surface and the central axis shall be 400 mm when the seat is at an angle of 90° (see Figure 7c).

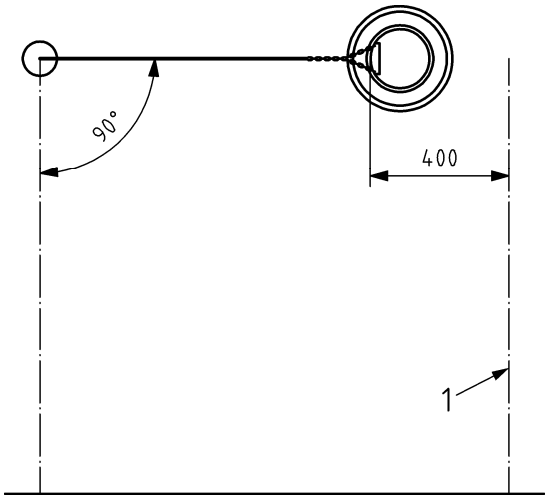
Dimensions in millimetres



a) Minimum space between the seats of swings and an adjacent structure



b) Lateral stability of swing seats



c) Type 4 swing minimum clearance

Key
F distance between the suspension members
G distance between the support points on the swing seat
C distance between the seat and adjacent structure
S distance between adjacent seats
1 central axis

Figure 7 — Minimum clearance and lateral stability of swing seats with more than one point of suspension

4.4.2 Lateral stability of swing seats (see Figure 7b)

The distance between the suspension members *F* (see Figure 7b) shall be

≥ *G* + 5 % length of the suspension member.

For contact swings the distance between the suspension members *F* shall be

≥ *G* + 30 % length of the suspension member.

4.5 Means of suspension

Fully rigid suspension members shall not be used (see EN 1176-1:2008, 4.2.12 and 4.2.13).

The triangular openings formed by the chain or suspension members branching towards the swing seat are exempt from the requirements of EN 1176-1:2008, 4.2.7.2.

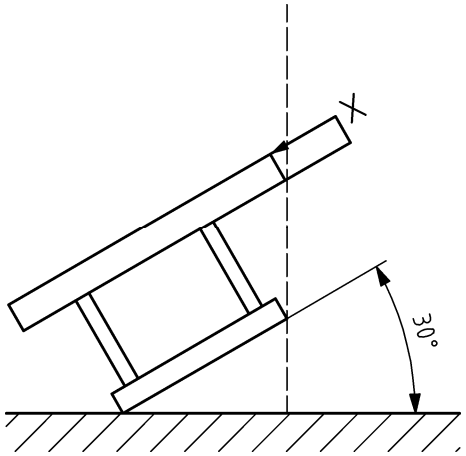
4.6 Impact attenuation of swing seats

4.6.1 Swing seats and vertical tyre seats

When tested in accordance with Annex B, there shall be no peak values of acceleration greater than 50 g and the average surface compression shall not exceed 90 N/cm^2.

4.6.2 Cradle swing seats

The seat section of cradle swing seats shall conform to 4.6.1. If the outermost edge of the superstructure (*X*) protrudes beyond a vertical line drawn from the outermost edge of the seat when tipped at an angle of 30° as shown in Figure 8, then this shall also conform to 4.6.1.



Key
X outermost edge of superstructure

Figure 8 — Cradle seat showing seat and superstructure at an angle of 30°

4.6.3 Swing seats and platforms for several users

If the diameter of the platform is greater than 900 mm, when tested in accordance with Annex B there shall be no peak values of acceleration greater than 120 *g* and the average surface compression shall not exceed 90 N/cm^2. If the diameter is less than 900 mm it shall conform to 4.6.1. Test in accordance with B.3.1.

NOTE Large round seats may have a higher level of peak *g* because children more easily identify the larger seat as a hazard, and the benefit to children of playing on these large seats is high. For a fuller explanation of risk and benefit see EN 1176-1:2008, introduction and scope.

4.7 Dynamic load for swing equipment

When tested in accordance with Annex C the components in the suspension system shall show no cracks, permanent deformation or damage and no connection shall be loosened. There shall be no dimensional change in the components that can be seen with normal/corrected vision.

4.8 Structural integrity

4.8.1 When calculated in accordance with EN 1176-1:2008, Annex B, the reaction forces of the structure shall be greater than the calculated forces resulting from use.

4.8.2 When tested in accordance with EN 1176-1:2008, Annex C, there shall be no signs of cracks, or permanent deformation when examined with normal corrected vision.

4.9 Framework

Swings with more than two seats shall be divided by construction parts into bays so that there are no more than two seats per bay.

NOTE This is to discourage children from crossing the path of swings in use.

Swing frames or their top bar should only be attached to other equipment where specific measures are taken to segregate them from other activities, e.g. additional 1,5 m circulation area, barriers, enclosures.

4.10 Height of fall and impact area

4.10.1 Free height of fall

The free height of fall *D* of a swing is determined from the middle of the seat vertically to the ground when the swing seat is raised by 60°. Alternatively, the free height of fall can be determined by the formula:

Free height of fall (*D*) = (length of the suspension member (h_2) ÷ 2) + height of swing seat at rest (h_3) (see Figure 9).

4.10.2 Dimensions of falling space and impact area

4.10.2.1 The falling space shall correspond to the impact area extended to a height equivalent to *D* (see Figure 9).

For all swings the extent of the impact area shall be calculated by taking the point A reached horizontally by the centre of the swing seat when it has travelled through an arc of 60° (which can be calculated as 0,867 × the length of the suspension member, h) and adding a fixed distance *B* or *C* (depending on the construction of the surface).

In the case of an impact area that is level with the surrounding surface (normally synthetic) the fixed additional length *B* shall be 1,75 m and in the case of surface that is contained (normally loose fill) the fixed additional length *C* shall be 2,25 m (see Figure 9).

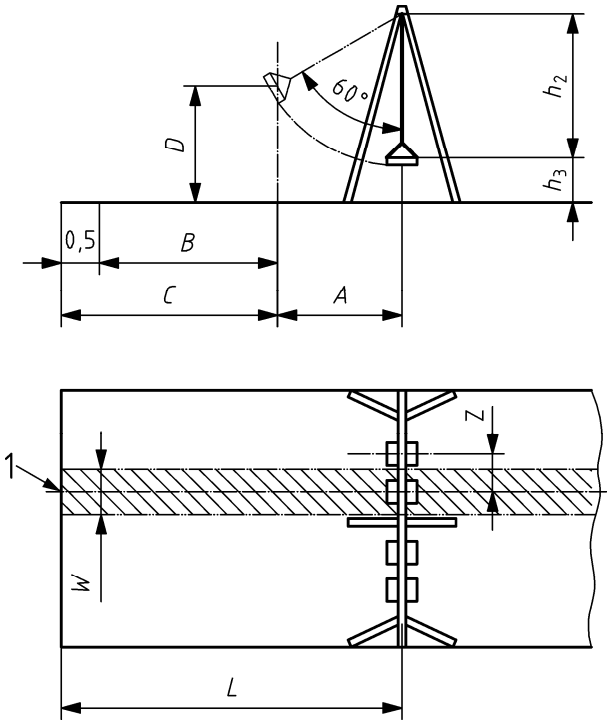
Additionally for an impact area that is level with the surrounding surface, where *B* is 1,75 m, there shall be an additional area with a length of 0,5 m in the swing direction free from obstacles.

NOTE 1 The extent of the impact attenuating surface should be based on the foreseeable use of the swing.

The falling spaces of swing seats attached to different swing frames shall not overlap. Falling space may overlap with free space, when swing seats are attached to the same swing frame, provided that they comply with 4.4.1. When swings are placed near other items of play equipment, the falling space of the swing and the falling space of the other play equipment shall not overlap.

NOTE 2 Free space, falling space and impact area for a swing is shown in Figure 10.

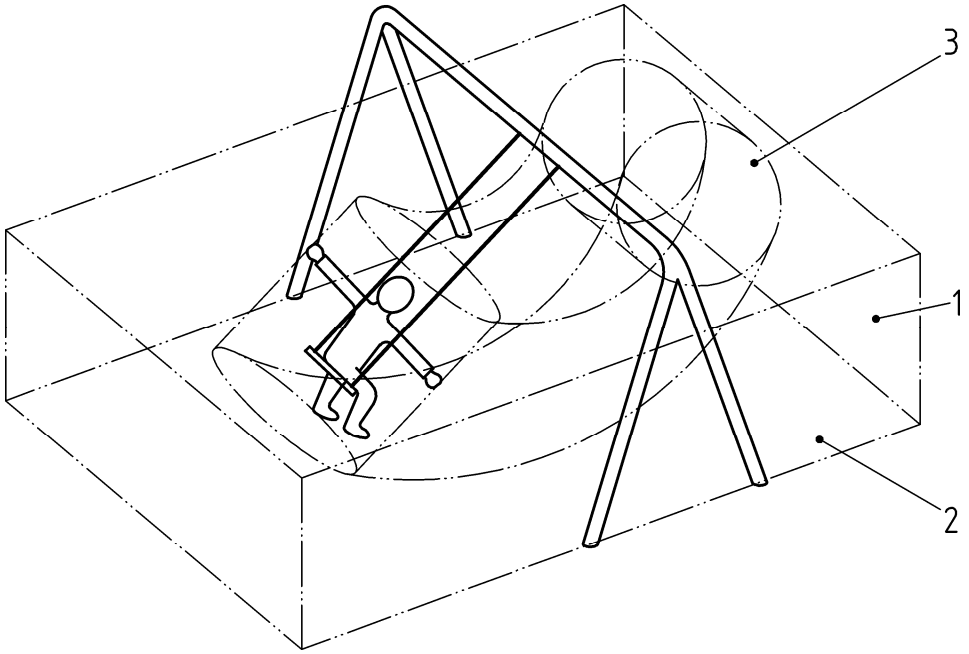
Dimensions in metres



Key

A 0,867 × *h*
B 1,75 m for level impact absorbing surface (normally synthetic)
C 2,25 m for contained impact absorbing surfaces (normally loose fill)
D maximum free height of fall
L *A* + *B* or *A* + *C*
W width of the falling space
Z distance from swing axis to swing axis
h_2 length of swing suspension member
h_3 height of seat
1 area to be covered by impact absorbing surface under each swing position

Figure 9 — Free height of fall and surfacing requirements beneath a swing



Key
1 space occupied by the equipment
2 falling space
3 free space

Figure 10 — Free space, falling space and impact area of a swing

4.10.2.2 For swing seats with a width not greater than 500 mm suspended by one or more rotational axis (Types 1, 2 and 4), the impact area shall have a minimum width of 1,75 m. If the seat is greater than 500 mm the width of the impact area shall be increased by the difference between 500 mm and the actual width of the seat.

4.10.2.3 For single point swings (Type 3) the extent of the impact attenuating surface shall be circular with a radius as specified in 4.10.2.1.

4.11 Additional requirements for swings with several rotational axes (Type 2)

If there is a backrest the angle between the backrest and the actual seat shall not change when the swing is in motion. When measured in one direction the clear distance between the backrest and the actual seat shall be not less than 60 mm and not more than 75 mm.

4.12 Additional requirements for single-point swings (Type 3)

The fixing point shall be such that when the swing revolves the supporting cables will not twist.

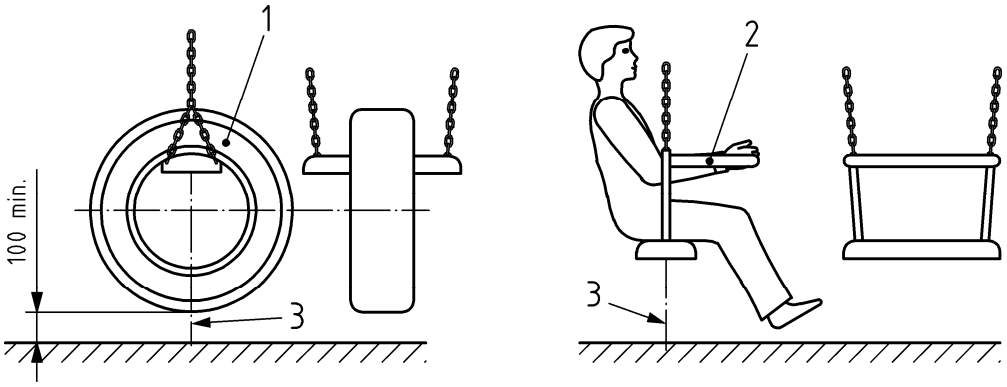
NOTE This can be achieved by using a revolving universal joint

If a universal joint is used that is not specifically designed and engineered for the purpose, there shall be a secondary means of supporting the swing seat to prevent collapse if the primary joint between the cables or chains and the supporting structure collapse.

4.13 Additional requirements for contact swings (Type 4)

Seats shall be constructed to discourage jumping from them to the central axis while swinging. This can be achieved, e.g. by using a vertical tyre or a restraining bar, see Figure 11. Seats shall conform to the requirements of 4.6.

Dimensions in millimetres



Key
1 tyre or similar
2 restraining bar
3 centre of the seat

Figure 11 — Example of seats for contact swings

5 Test reports

Test reports shall be in accordance with EN 1176-1:2008, Clause 5, in addition to the following:

a) test report regarding compliance with EN 1176-2;

b) certification of conformity with the relevant requirements of EN 1176-1 and EN 1176-2;

c) number and date of this European Standard, i.e. EN 1176-2:2008.

6 Marking

Swings shall be marked in accordance with EN 1176-1:2008, Clause 7.

Marking shall be positioned on the swing in a location that will be visible when erected on site.

Annex A
(informative)

Recommendations for design and siting of swings

Further to the recommendations in EN 1176-1:2008, 4.2.8.2.1, if fences are used as an enclosure, they should have one or more entrances in corners of the enclosure nearer the centre of the play ground to discourage children from waiting or moving behind the swings. Entrances should be designed so as to restrict the speed of entry.

Fences should be positioned at least 1,5 m from the side edge of the swing seat.

Annex B
(normative)

Determination of swing seat impact attenuation

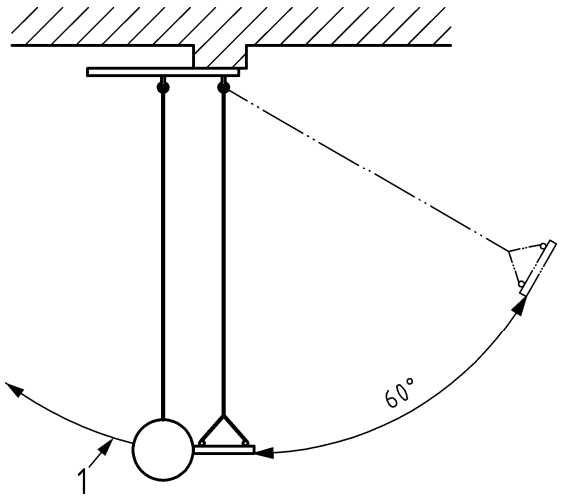
B.1 Principle

Swing seats are raised and allowed to swing to strike a test mass. The signal emitted by an accelerometer during each impact is processed to determine the peak value of acceleration and the surface compression.

B.2 Apparatus

B.2.1 Test rig, comprising test mass (B.2.2), accelerometer (B.2.3), impact measuring equipment (B.2.4), chains (B.2.5) (see Figure B.1).

B.2.2 Test mass, consisting of an aluminium ball of diameter 160 mm ± 5 mm, mass 4,6 kg ± 0,05 kg, surface roughness less than 25 µm such that the impacting part between the surface struck and the accelerometer is homogeneous and free from voids.



Key
1 measuring equipment

Figure B.1 — Testing arrangement

B.2.3 Accelerometer, mounted at the centre of gravity of the test mass (B.2.2) assembly with the sensitive axis aligned to within 2 degrees of the direction of travel of the test mass, capable of measuring acceleration triaxially.

B.2.4 Impact measuring equipment

Chains, two 6 mm gauge, of equal length suspended from pivots 600 mm apart at the same height as the bearings of the swing seat such that they meet at the point of connection to the test mass (B.2.2).

B.3 Procedure

B.3.1 Flat swing seats

Hang the seat on 6 mm chains so that the bottom of the leading edge of the seat is vertically 2,4 m ± 10 mm below the suspension bearings.

B.3.2 Cradle swing seats

Hang the seat on 6 mm chains so that the bottom of the leading edge of the seat is vertically 1,8 m ± 10 mm below the suspension bearings.

B.3.3 Arrangement of test rig

Arrange the test rig so that the leading edge of the seat just touches the leading edge of the test form at its centre of gravity.

B.3.4 Raising seat for test

Raise the seat along its arc of travel until the side view projection of a straight line through the pivot point and index mark forms an angle of 60°.

When the seat is suspended from chains etc., some curvature will be produced in the suspending elements. Adjust the seat position to determine the curvature which provides a stable trajectory.

Caution should be exercised to prevent damage to the test equipment. Where there is any possibility of the accelerometer range being exceeded, preliminary tests should be made at lower angles (e.g. 10°, 20° and 30°). If there is doubt concerning the seat trajectory or stability, the test mass and/or guidance structure, trial releases should be made without impacting the test mass.

Some seats of a flexible nature will require a brace to maintain the seat configuration during the test procedure. The mass of brace should not exceed 10 % of the mass of the seat after test.

B.3.5 Support and release of seat

Support the seat in the raised position by a mechanism that provides release without the application of external forces which would disturb the trajectory of the suspended member. Ensure that the seat and suspending elements are motionless. Release the seat so that the assembly travels in a smooth downward arc without any visible oscillations or rotations of the seat which would prevent it from striking the test mass at the impact point.

B.3.6 Collection of data

Once satisfactory system operation and calibration are obtained, collect data for ten impacts. Measure the peak acceleration for each impact and the area of contact between seat and test form.

B.3.7 Peak acceleration

Record the peak acceleration as the mean value from the 10 impacts.

B.3.8 Surface compression.

Record the surface compression as the mean value from the 10 impacts.

B.3.9 Average surface compression

Measure the area of the seat that has made contact with the test mass. Calculate the average surface compression by dividing the force exerted by the seat by the area at the seat that has made contact with the test mass. Record the value in $N \cdot cm^{-2}$.

Annex C
(normative)

Dynamic load test for suspension systems of swings

C.1 Principle

The suspension system consisting, e.g. of chains, bearings and connections is loaded with a test load and swung through an arc for a defined number of times. The suspension system is examined for damage.

C.2 Procedure

Load the seat assembly with the test load in accordance with EN 1176-1:2008, Table A.1.

Either:

a) swing the seat assembly; or

b) rotate the suspension point assemblies, continually for 10^5 cycles through an arc of not less than 120°.

Remove the loads and visually inspect the equipment for signs of damage or wear.

WARNING: Ensure that the weights are securely attached to the equipment.

Bibliography

EN 1177, *Impact attenuating playground surfacing — Determination of critical fall height*

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