Special attention should be given to 'sealed-for-life' parts and equipment where stability relies on one post.

c) annual main inspection (see 3.28).

Special attention should be given to 'sealed-for-life' parts and equipment where stability relies on one post.

NOTE 3 The annual main inspection may require excavation or dismantling of certain parts.

6.1.4.3 The instructions shall also specify the following:

a) if necessary, the servicing points and methods of servicing, e.g. lubrication, tightening of bolts, re-tensioning of ropes;

b) that replacement parts shall conform to manufacturer's specifications;

c) if special disposal treatment is required for some equipment or parts;

d) identification of spare parts;

e) any additional measures to be taken during the run-in period, e.g. tightening of fastenings, tensioning of ropes;

f) the need to keep drainage holes clear:

g) that surfacing shall be maintained: in particular, the levels of loose fill materials.

h) that GRP (glass-reinforced plastics) should be replaced or repaired before the glass fibres become exposed through wear or damage. This particularly applies to slides.

6.2 Information to be provided by the manufacturer or supplier of impact attenuating surfacing

6.2.1 Pre-information for impact attenuating surfacing

The manufacturer/supplier shall provide the following information concerning the performance of the impact attenuating surfacing prior to the acceptance of the order (does not apply to turf/topsoil):

a) where particulate materials that are included in Table 4 are specified, clear information about the type of material (see Table 4) and the depth of the layer to be used shall be provided, or, if not included in Table 4, the critical fall height of the surfacing as tested in accordance with EN 1177, together with copies of test reports or certificates;

b) outline of the installation procedure, climatic limitations on installation and other precautions required;

c) procedures to be followed for the operation, inspection and maintenance of the surfacing;

d) factors that could affect the properties of the impact attenuating surfacing in service;

e) period for which the adequate level of impact attenuation is expected with adequate maintenance;

f) how the material allows for routine inspection of equipment foundations, particularly where one-post equipment is to be surrounded by wet pour/poured-in place material;

g) whether the material is intended for indoor or outdoor use, or both;

h) availability of spare parts (if any) and methods to be used for the repair of localized areas of damage;

i) compliance of impact attenuating surfacing materials with 4.1 (namely 4.1.6), if applicable;

j) a note drawing the operator's attention to the need to increase the frequency of inspection/maintenance if the impact attenuating surfacing is subject to heavy use and/or any conditions that could reduce the impact attenuation (e.g. degradation of organic materials or vandalism as well as influence of ageing due to UV exposure);

k) a warning to take care, in relation to specific hazards to children, during incomplete installation or during maintenance.

6.2.2 Installation information for impact attenuating surfacing

The manufacturer/supplier of playground surfacing shall provide full and detailed installation instructions in the appropriate language(s) of the country in which the surfacing is to be installed and used. These instructions shall conform to the following:

a) instructions shall be printed legibly and in a simple form;

b) illustrations shall be used wherever possible; and

c) instructions shall include at least the following information:

1) complete procedure for the preparation of the ground, substrate, drainage, etc.;

2) assembly and installation details for the surfacing and equipment required to ensure that the adequate level of impact attenuation is provided;

3) how to deal with edges, perimeters and junctions with other materials, if necessary;

4) any weather limitations during the installation and any subsequent weather protection required;

5) specific instructions if a particular landscape profile is necessary for safe installation and performance;

6) conditions to meet impact attenuation surfacing needs according to the free height of fall of the equipment.

The manufacturer/supplier shall supply the details necessary for inspection of the playground impact attenuating surfacing prior to its first use.

6.2.3 Inspection and maintenance information for impact attenuating surfacing

NOTE Attention is drawn to EN 1176–7.

6.2.3.1 The manufacturer/supplier of playground surfacing shall provide instructions for maintenance and inspection procedures, e.g. removal of contaminants, with a statement that the frequency of inspection will vary with the type of impact attenuating surfacing material used and its surroundings, e.g. access/exit areas, and other factors, e.g. heavy use, levels of vandalism, coastal location, air pollution, ageing of material.

NOTE Lack of maintenance can reduce the impact attenuation properties.

6.2.3.2 Maintenance instructions shall provide all information necessary for retaining the required performance (e.g. minimum depth of particulate impact attenuating surfacing) and, when appropriate, repair or refill of the impact attenuating surfacing. For all types of impact attenuating surfacing particular attention shall be given to the effects of ageing (exposure to UV, heat, cold), pollution, causing degradation or the loss of impact attenuating properties.

The instructions shall also specify the following:

a) that replacement parts shall conform to manufacturer's specifications;

b) if special disposal treatment is required for the material or parts;

c) the identification of spare parts (connectors, slabs, …);

d) any additional measures to be taken, specifically methods of cleaning, disinfecting, repairing etc.;

e) the need to keep drainage system functioning;

f) that surfacing shall be maintained: in particular, the depth of loose fill materials.

NOTE The annual main inspection may require excavation and access to foundations and subsequent repair of the impact attenuating surfacing.

6.2.4 Identification of impact attenuating playground surfacing

The surfacing shall be labelled by the manufacturer or supplier, or written information shall be provided for its identification and performance.

7 Marking

7.1 Equipment identification

The equipment shall be marked legibly, permanently and in a position visible from ground level with at least the following:

a) name and address of manufacturer or authorized representative;

b) equipment reference and year of manufacture; and

c) the number and date of this European Standard, i.e. EN 1176-1:2017.

7.2 Basic level mark

Equipment shall be marked legibly and permanently with the basic level mark (see Figure 24).

Annex A
(normative)

Loads

A.1 Permanent loads

A.1.1 General

Loads "Q" (in Newtons) on equipment and equipment elements are created by the gravity (g) of masses (Q = G × g; masses "G" in kg) as well as by dynamic effects of these masses (e.g. from swings), but also from connected elements (e.g. ropes, chains) and from external influences (e.g. wind). The calculation of the total loads (forces "F" and "T" in Newtons) and their combination, acting on different examples of equipment, is described in the following clauses.

For static analysis (stress-calculations) in load bearing parts of equipment the safety factors for the loads as given in B.2 shall be used.

The permanent loads (Q_p) consist of:

a) loads created by the mass of self-weight of the structure and of the assemblies (Q_p);

b) pre-stressing loads, e.g. space nets, cableways (Q_t); and

c) loads created by the mass of water if any water containers are involved (Q_p).

A.1.2 Loads created by self-weight

Loads created by the mass of self-weight of the structure and assemblies shall be assessed.

A.1.3 Pre-stressing loads

Pre-stressing loads are considered to be permanent loads. The maximum and minimum pre-stressing loads have to be considered.

NOTE Because of creep or relaxation, pre-stress is time dependent. It could be necessary to verify two situations:

a) initial pre-stress; and

b) end pre-stress.

A.1.4 Mass of water

The highest and lowest possible water levels in the container shall be considered.

A.2 Variable loads

A.2.1 General

The variable loads (Q_i) consist of:

a) user loads;

b) snow loads;

c) wind loads;

d) temperature loads; and

e) specific loads.

A.2.2 User loads

The loads resulting from users of playground equipment shall be based on the following load system:

a) total mass

$$G_n = n \times m + 1{,}64 \times \sigma \sqrt{n} \qquad \text{(A.1)}$$

where

G_n is the total mass of n children, in kilograms;

n is the number of children on the equipment or part thereof, as given in A.3;

m is the mean mass of a child in a specified age group;

σ is the standard deviation of the age group concerned.

For open public and private playgrounds the following values can be used:

m = 53,8 kg

σ = 9,6 kg

These values are based on data for children of 14 years of age. However the calculated loads include safety factors, which ensure structures may also be used by adults.

For playgrounds with supervision open to well-defined age groups only (e.g. day-care centres), the following values can be used:

— age up to 4 years: m = 16,7 kg σ = 2,1 kg;

— age up to 8 years: m = 27,9 kg σ = 5,0 kg;

— age up to 12 years: m = 41,5 kg σ = 7,9 kg.

NOTE 1 The mass of children up to 14 years is based on the anthropometric data of age group 13,5 to 14,5 years, including 2 kg for clothing. For the other age groups, the mass includes 0,5 kg, 1 kg and 1,5 kg for clothing for 4, 8 and 12 years respectively.

b) dynamic factor

$$C_{dyn} = 1 + 1/n \qquad \text{(A.2)}$$

where

C_{dyn} is a factor representing the load caused by movement (running, playing, etc.) of the users, including material behaviour under impact loading;

n is as given in a).

c) total vertical user load

$$F_{tot;v} = g \times G_n \times C_{dyn} \quad \text{(A.3)}$$

where

$F_{tot:v}$ is the total vertical user load on the equipment caused by n children, in Newtons;

g is the acceleration due to gravity (10 m/s²);

G_n is as given in a);

C_{dyn} is as given in b).

NOTE 2 Calculated examples are given in Table A.1 for information.

Table A.1 — Total vertical load for playground intended for use by children of all ages

Number of users n	**Mass of *n* users** G_n kg	**Dynamic factor** C_{dyn}	**Total vertical user load** $F_{tot;v}$ N	**Vertical load per users** $F_{1;v}$ N
1	69,5	2,00	1 391	1 391
2	130	1,50	1 948	974
3	189	1,33	2 516	839
5	304	1,20	3 648	730
10	588	1,10	6 468	647
15	868	1,07	9 259	617
20	1 146	1,05	12 033	602
25	1 424	1,04	14 810	592
30	1 700	1,03	17 567	586
40	2 252	1,025	23 083	577
50	2 801	1,02	28 570	571
60	3 350	1,017	34 058	568
∞		1,00		538
NOTE At infinity the vertical load per user equals the average mass.				

d) total horizontal user load

The total horizontal user load is 10 % of the total vertical user load in accordance with A.2.2 c) and acts on the same level, together with the vertical load:

$$F_{tot;h} = 0{,}1F_{tot;v} \quad \text{(A.4)}$$

NOTE 3 This load allows for movement of children playing and inaccuracies in the structure.

e) distribution of user loads

The user loads are uniformly distributed over the element considered as follows:

1) point loads

$F = F_{tot}$ in Newtons; (A.5)

F is acting on an area of 0,1 m × 0,1 m;

2) line loads:

$q = F_{tot}/L$ in Newtons per metre; (A.6)

where: L is in accordance with A.3.3;

3) area loads:

$p = F_{tot}/A$ in Newtons per metre squared; (A.7)

where: A is in accordance with A.3.4;

4) volume loads:

$q = F_{tot}/L$ in Newtons per metre (A.8)

or

$p = F_{tot}/A$ in Newtons per metre squared. (A.9)

NOTE 4 Volume loads are expressed either in line loads or area loads, depending on the type of elements that form the structure.

A.2.3 Snow loads

Snow loads shall be taken from EN 1991-1-3, allowing for a reference period of 10 years.

A.2.4 Wind loads

Wind loads shall be taken from EN 1991-1-4, allowing for a reference period of 10 years.

A.2.5 Temperature loads

Temperature loads shall be taken from EN 1991-1-2, allowing for a reference period of 10 years.

A.2.6 Specific loads

A.2.6.1 Swing seats

The number of users n on a swing seat in motion shall be calculated from the following:

a) for a traditional swing $n = 2$;

b) for a gondola, n shall be calculated as given in A.3;

c) for a single point swing $n = L/0,6$ with $n \geq 2$;

where

L is the total length of the outer edge of the swinging platform in metres.

The forces caused by motion of swings shall be considered for all the most onerous positions relevant for the element being considered.

The user loads in accordance with A.2.2 c) and d) need not be considered.

NOTE 1 In the case of swings, the mass can be considered as being uniformly distributed on the equipment between the points of support.

The maximum swing angle $\alpha_{max.}$ considered for swing seats suspended from ropes or chains is 80° from the vertical position.

NOTE 2 In Annex B the method to be used for calculating the forces resulting from the motion of a swing is included. A worked example is also given.

A.2.6.2 Carousels

The number of users on a carousel shall be the highest number calculated from:

a) number of seats, as given in A.3.3 where L_{pr} is the total length of the seats; or

b) platform dimensions, as given in A.3.4 where A_{pr} is the area of the platform.

For carousels, two load cases shall be considered for the user loads:

c) the load F_{tot} is evenly distributed over the entire carousel;

d) the load F_{tot} (1/2 L_{pr} or 1/2 A_{pr}) is evenly distributed over one half of the carousel.

NOTE Vertical and horizontal user loads act at the same time. Centrifugal forces need not be considered additionally, as they are covered by the horizontal user load.

A.2.6.3 Cableways

The maximum tension in the cable of a cableway shall be calculated for the situation where the users are swinging in a vertical direction in the middle of the cable.

The user loads as given in A.2.2 c) and d) need not be considered.

The maximum forces in the foundation of the cableway can be based on the static situation with the users in the middle of the cable.

The number of users n on a traditional cableway is $n = 2$.

NOTE In Annex B, a method that can be used for calculating the forces resulting from the motion of users suspended from a cableway is included. A worked example is also given.

A.2.6.4 Spatial networks

The number of users in a spatial network shall be calculated in accordance with A.3.5 on the basis of the volume V defined by the periphery of the spatial network.

For spatial networks two load cases shall be considered for the user loads as follows:

a) load F_{tot} (V) is equally distributed over the entire structure;

b) load F_{tot} (1/2 V) is equally distributed over one half of the structure.

A.2.6.5 Access ladders and stairs

The number of users on an access ladder or stair shall be calculated in accordance with A.3.3 on the basis of the sum of the length of all rungs or treads.

A.2.6.6 Barriers and guard rails

The horizontal load on barriers and guard rails is 750 N/m acting in a horizontal direction on the top rail.

A.2.6.7 Seats

The number of users on a seat is the highest value of the following:

a) one user, the load to be treated as a point load;

b) number specified in this standard for specific equipment; the load to be treated as a distributed load; or

c) number calculated as given in A.3.2.

A.2.6.8 Lateral protection of slides

The vertical and horizontal loads applied to the lateral protections of slides are given in A.2.2.

A.3 Number of users on the equipment

A.3.1 General

Calculate the number of users for each structural element likely to be loaded by users.

The calculated number shall be rounded up to the next whole number.

NOTE Rounding up in this context means that 3,13 becomes 4,0, for example.

A.3.2 Number of users on a point

Unless stated differently elsewhere in this part of EN 1176, the number of users, n, on a point is as follows:

$$n = 1$$

Every single point of playground equipment for standing, walking or climbing upon, or a flat surface greater than 0,1 m wide and which has less than a 30° angle from the horizontal, shall be able to carry the load caused by one user.

NOTE This also applies to rungs or steps for supporting the user's feet.

A.3.3 Number of users on line type elements

The number of users, n, on a line shall be calculated from the following:

a) line elements with an inclination up to and including 60°:

$$n = L_{pr}/0{,}6; \quad \text{(A.10)}$$

b) line elements with an inclination greater than 60°:

$$n = L/1{,}20 \quad \text{(A.11)}$$

where

L is the length of the element in metres;

L_{pr} is the length of the element projected down to a horizontal plane, in metres.

Line type elements are rungs in ladders and in climbing frames, poles and ropes.

A.3.4 Number of users on an area

The number of users, n, on a surface area shall be calculated from the following:

a) planes with inclination up to and including 60°:

$$n = A_{pr}/0{,}36; \quad \text{(A.12)}$$

b) planes with inclination greater than 60°:

$$n = A/0{,}72 \quad \text{(A.13)}$$

where

A is the area, in metres squared;

A_{pr} is the area projected down to a horizontal plane, in metres squared.

Area type elements are platforms, lattice type platforms, ramps and nets.

The width of the plane shall be greater than 0,6 m. Planes having a smaller width shall be treated as line type elements.

Where these types of element can be used from both sides, e.g. nets or grids, the number of children, n, shall be based on the area of one side only. These types of element will not be loaded as densely as platforms.

A.3.5 Number of users in a volume

The number of users, n, in a volume shall be calculated from the following:

— for volumes $V \leq 4{,}3\,\text{m}^3 : n = V/0{,}43$; (A.14)

— for volumes $4{,}3\,\text{m}^3 < V \leq 12{,}8\,\text{m}^3 : n = (V - 4{,}3)/0{,}85$; (A.15)

— for volumes $V > 12{,}8\,\text{m}^3 : n = 20 + (\text{V} - 12{,}8)/1{,}46$. (A.16)

where

V is the volume defined by the periphery of the playground equipment in cubic metres.

The volume is used to determine the maximum number of users on playground equipment, e.g. climbing frames, spatial networks.

NOTE The volumes mentioned are based on the following dimensions:

a) 0,60 m × 0,60 m × 1,20 m = 0,43 m³;

b) 0,75 m × 0,75 m × 1,50 m = 0,85 m³;

c) 0,90 m × 0,90 m × 1,80 m = 1,46 m³.