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BSI Standards Publication

Collection of rationales for EN 1176 — Requirements

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National foreword

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Foreword

This document (CEN/TR 16598:2014) 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.

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Introduction

The intention of the safety standard for playground equipment was to avoid situations in which a child, due to his age or ability or stage of development, is unable to comprehend a **risk**.

It was the intention to eliminate traps and **risks** from which severe harm could occur for the user.

In consideration of this, the task group choose the form of a report in which the **objective** mentions repeatedly that the aim of the standard is always to protect the child from harm.

It has become apparent that users of the standard have sometimes lost sight of this and were just considering dimensions, functionality or spaces and special equipment parts without regard for the safety aim.

When considering the complexity of an equipment and the efforts to provide safety, these efforts should be proportionate to the incidents that take place in real life.

Dimensions should not be taken as absolute as juristic and safety treatments are different in relation to the risk of a deviation from the standard.

A large number of the **objectives** for the **rationales** are repeated. This is intentional as it reinforces the safety aim of the standard and prevents the misunderstanding of a **rationale** when taken in isolation.

Working on the **rationales** for the single paragraphs, it became obvious for the task group that there where parts in the standard which had been discussed very often and deeply (e.g. the damping qualities of surfaces, HIC) and there were other parts that had no or very little discussions (e.g. hard edges at the end of a falling space).

Noticing this it was nearly self-evident to have an assessment / evaluation proposal for all requirements:

a) fundamental safety issues:

   1) safety installations / regulations have to prevent situations that may cause the death of a user;

   2) safety installations / regulations have to prevent situations that may lead to a loss of extremities of a user;

   3) safety installations / regulations have to prevent situations that may cause a lifetime disability (blindness, paraplegia);

   4) safety installations / regulations have to prevent situations in which a user is not able to free himself out of a trap;

b) basic safety issues:

   1) safety installations / regulations should prevent situations which overburden the user according to his age and prevent accidents like bone fractures, bruises, abrasions although these injuries happen in everyday life as well and are accepted by society as things that may happen to a human being;

c) standard issues:

   1) man-made playground equipment is necessary because the city environments don’t offer natural play facilities. Therefore, this kind of equipment is meant to advance the development of the child.

As there are very different development levels during childhood it means that the equipment has to be engineered in such a tricky way that it supports the several stages of development and screens the different age groups.

At least it should be mentioned that the requirements of the standard are just a concern about the effect of an equipment on the user. They do not consider the necessity and the social impact of a playground e.g. in areas where children have no natural resources with which they could play.

The standard cannot account for the behaviour of children. The ideal is that children should use the play environment as a means of personal development. However, it is accepted that the behaviour of children cannot be controlled by a technical standard. The best way to deal with this is to adopt a Risk Assessment process, which will allow the behaviour of children to be considered as part of the inspection of the play environment.

Risk Assessment has to take into account the competence and ability of the potential users of the equipment and the foreseeable risks to those users. It is possible to allow greater challenge and opportunity in play equipment by controlling access to equipment, the control of access has to take in to account the abilities and skills of the user. The standard lists some ways in which access can be controlled.

It is not possible to control the way in which parents or carers may influence the use of play equipment, in particular if they allow, encourage or assist children to overcome controls on access imposed by the designer.

The task group did not review the annexes of the different parts of the standard EN 1176; even though these contain wording that can be considered to be hidden requirements.

Again, it turns out to be true that there is no overlapping with EN 71-8.

1 Scope

This Technical Report is intended to be read in conjunction with EN 1176.

The **rationales** given in this Technical Report describe the main reasons behind the requirements given in EN 1176. The requirements in the standard are the tools (e.g. measures, testing methods etc.) by which the **objectives** are intended to be reached.

2 Normative references

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

EN 1176 (all parts), *Playground equipment and surfacing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
objective
what is the intention of the clause in the standard

3.2
risk
what might happen to the user if the **objective** is not achieved

3.3
rationale
the reason for making this specific requirement

Note 1 to entry: Often you will find **rationales** in the notes given in the requirements. This is mentioned in the document.

3.4
addendum
additional comments as well as remarks

4 Part 1

4.1 Paragraph in Standard: 4.1.2 Flammability

Objective To avoid burning – particularly from those materials which produce flaming droplets of molten material which are difficult to extinguish.

Risk In the event of a flash fire there is insufficient time to intervene and protect the user. The outcome of a fire may be death or disfigurement.

Rationale The correct selection of materials to ideally prevent this occurring or allow escape from the equipment.

4.2 Paragraph in Standard: 4.1.3 Timber and associated products

Objective protect the user from harm as a result of unforeseen failure of equipment due to decay of wooden parts.

a) wood is a natural material and will decay with time, sufficient attention shall be paid to its design; protection and maintenance to ensure that structures made of wood are safe especially between maintenance cycles;

b) wood can splinter;

c) hazards from species and treatment of wood.

Risk

a) unforeseen failure of equipment;

b) puncture injuries, eye injuries;

c) allergic reaction, it is considered unlikely that poisoning by ingestion will occur.

Rationale

a) following the requirements of the standard the possibility of failure of the equipment can be controlled within the maintenance intervals;

b) and c) the selection of the wood type can reduce or eliminate this **risk**.

Addendum wood as a natural material will crack as part of the drying process; this does not necessarily present a dangerous situation.

4.3 Paragraph in Standard: 4.1.4 Metals

Objective protect the user from harm as a result of unforeseen failure of equipment due to corrosion of metal parts.

Risk injury may occur due to unforeseen failure of metal components.

Rationale

a) metals, either as a structural component or as an auxiliary component, can corrode either due to atmospheric conditions or by electrochemical reaction; sufficient attention shall be paid to its design; protection and maintenance to ensure that structures made of metal are safe, especially between maintenance cycles;

b) metals that produce toxic oxidation shall be coated.

4.4 Paragraph in Standard: 4.1.5 Synthetics

Objective protect the user from harm as a result of unrecognized failure of equipment due to aging or breaking of synthetic materials.

Risk reinforced materials can produce splinters and cuts; static supporting parts may break.

Rationale use of coloured gelcoats to indicate wear and maintenance according to intervals given by the manufacturer can prevent the **risk**.

4.5 Paragraph in Standard: 4.1.6 Dangerous substances

Objective protect the user from harm as a result of being exposed to dangerous substances.

Risk poisoning by skin contact; poisoning by mouth contact; chemical burns.

Rationale following the guidelines given in different standards can reduce the **risk**.

4.6 Paragraph in Standard: 4.2.1 (Design and manufacture) General

Objective protect the user groups from excessive demands.

Risk false estimation of equipment use.

Rationale play always includes **risks** (see the introduction to the standard). The intended user shall be able to use the equipment according to his mental and physical stage of development without getting in trouble caused by the equipment.

Remark the German translation does not completely correspond to the English original text.

4.7 Paragraph in Standard: 4.2.2 Structural integrity

Objective protect the user from harm as a result of breaking down of the used equipment.

Risk severe injuries may occur if a play structure or parts of it collapse during use.

Rationale equipment designed according to the methods described will be structurally suitable.

There may be cases where experience or tradition will ensure the integrity of the equipment.

Calculation has to be done under “worst case scenario”.

More attention shall be given to single post equipment, as these constructions may fail more easily than equipment based on more than two posts in a line.

Corrosion or rotting can make the single post construction break under use.

4.8 Paragraph in Standard: 4.2.3 Accessibility for adults

Objective children in dangerous, distressed or panic situations should always have the possibility to get help from grown ups.

Risk children may become trapped or pass out.

Rationale grown ups should be able to help children in dangerous or panic situations. Children should be able to leave an equipment safely when danger occurs.

In case of fire help from grown ups and escaping should be possible. Leaving the equipment shall always be possible.

4.9 Paragraph in Standard: 4.2.4.1 (Protection against falling) Types of protection

Objective protect the user from falls in accordance with the competence of the user and the type and height of the equipment.

Risk injuries from uncontrolled falls off the equipment.

Rationale falls are one of the main sources for severe injuries.

Addendum There are equipment which are accessible for children of all ages (easily accessible - lower **risk**) and there are equipment which are difficult to access for young children (not easily accessible – higher **risk**).

4.10 Paragraph in Standard: 4.2.4.2 Handrails

Objective provide users with the means of maintaining balance while using the equipment.

Risk injuries caused by falling due losing hold caused by losing balance.

Rationale falls are one of the main sources for severe injuries.

Offering a grasp position helps to keep balance.

Addendum the difference between grip and grasp means:

The grip position (closed fist) can support the body even when the user is in a hanging position, the grasp position (thumb not in contact with the other fingers) is more likely to secure balance.

600 mm comes from the anthropometrical data (centre of gravity).

4.11 Paragraph in Standard: 4.2.4.3 Guardrails

Objective protect users form falling off lower platforms.

Risk injuries caused by falling off the equipment; falling underneath or over a guardrail.

Rationale falls are one of the main sources for severe injuries. Provide a range of dimensions in which guardrails reduce the **risk** from falling off not easily accessible lower platforms.

4.12 Paragraph in Standard: 4.2.4.4 Barriers

Objective protect users from falling off higher and/or easily accessible platforms. Protect users from head entrapment situations.

Risk injuries caused by falling off the equipment or becoming trapped within or underneath the barrier.

Rationale falls are one of the main sources for severe injuries. Head entrapment shall be prevented.

Climbing and/or sitting on barriers shall be prevented.

If there are any gaps in barriers they shall be designed in such a way to prevent these **risks**.

4.13 Paragraph in Standard: 4.2.4.5 Strength requirements

See 4.2.2.

4.14 Paragraph in Standard: 4.2.4.6 Grip requirements

Objective ensure that where necessary a suitable and safe hold for the users hand is possible.

Risk falling due to an unsafe hold for the hands of the user, losing grip may result in falling off the equipment.

Rationale a safe hold enables the user to secure himself (during slower movement on the equipment).

E.g. While climbing a 3-dimensional grip provides a better possibility to secure himself.

Addendum the difference between grip and grasp means:

The grip position (closed fist) can support the body even when the user is in a hanging position, the grasp position (thumb not in contact with the other fingers) is more likely to secure balance.

The measures are taken from the anthropometrical data of children.

4.15 Paragraph in Standard: 4.2.4.7 Grasp requirements

Objective ensure that where necessary a suitable and safe hold for the users hand is possible.

Risk falling due to an unsafe hold for the hands of the user, losing grip may result in falling off the equipment.

Rationale the possibility of grasping a bar keeps the balance during faster movement on the equipment.

E.g. while running across a bridge a grasp provides enough hold to keep the balance.

Addendum see 4.2.4.6.

4.16 Paragraph in Standard: 4.2.5 Finish of equipment

Objective protect the user from harm as a result of sharp, splintered or spiky parts.

Risk injuries caused by wooden splinters, sharp edges or spiky pieces.

Rationale unintended contact with surfaces or parts of the equipment shall not lead to injuries.

Addendum sharp is not a sufficient criteria to cause harm, it is the combination of **sharp and hard** that causes danger.

4.17 Paragraph in Standard: 4.2.6 Moving parts

Objective protect the users body and limbs from getting caught or being pinched / sheared.

Risk moving equipment parts could shear or pinch parts of the users body especially when those parts are heavy and have high energy (W = m*s).

Rationale The construction shall be done in such a way that the critical body measures are observed as minimum limits.

400 mm is an agreed measure (not related to anthropometrical data) to allow sufficient space for ground clearance.

4.18 Paragraph in Standard: 4.2.7.1 (Protection against entrapment) General

Objective protect the user from harm as a result of dimensional changes in equipment during use leading to traps.

Risk strangulation or entrapment situations in which the user can’t free himself.

Rationale before this paragraph of the standard had been given fatal accidents occurred.

Materials / structures can change shape during use as a result of loading, temperature etc.

This shall be considered during the design process.

4.19 Paragraph in Standard: 4.2.7.2 Entrapment of the head and neck

Objective protect the users head and neck from harm as a result of being trapped by openings within the equipment.

Risk breaking the neck, strangulation, shearing or crushing of neck or head.

Rationale As a fundamental safety issue the users head and neck shall be protected.

Above 600 mm above ground the **risk** of head traps shall be prevented because head traps can lead to strangulation or other significant injuries.

Below 600 mm the user can stand on the ground or platform and can support his body weight.

Shearing and crushing points (regardless of height above the ground) present nearly the same severity of injury as entrapment to the neck/head and shall be prevented.

Addendum It should be noted that entrapment itself does not necessarily constitutes a dangerous situation. However movement in entrapped situations creates a potential for injuries.

4.20 Paragraph in Standard: 4.2.7.3 Entrapment of clothing/hair

Objective protect the user from harm as a result of the users clothing or hair being trapped by parts of the equipment.

Risk fatal or severe injuries and accidents in particular strangulation or scalping.

Rationale A number of fatalities and severe injuries have occurred where children were strangled, pulled into moving equipment or caught on clothing around their necks. Due to the very short time available for intervention it is essential that these situations are eliminated.

Children died when the cords of their parkas were caught in the starting section of slides.

Same happened when children fell off a platform with a climbing pole.

4.21 Paragraph in Standard: 4.2.7.4 Entrapment of the whole body

Objective prevent children from being trapped in tunnels or being crushed between or under equipment parts.

Risk tunnel may cause traps from which children cannot escape and can panic; heavy moving parts may crush the user.

Rationale children shall be able to leave an equipment without help. But help from adults shall also be possible.

Injuries caused by heavy moving parts shall be prevented.

Measurements from Table 1 are agreed dimensions and based on experience.

4.22 Paragraph in Standard: 4.2.7.5 Entrapment of the foot or leg

Objective protect users feet and legs from being trapped.

Risk entrapped feet causes falls or fracture of leg or foot.

Rationale Gaps and openings in the running surface or in climbing surfaces shall be designed in such a way that they cannot entangle the foot.

The 30 mm dimension from Figure 13 is taken in the direction of travel. This is because the foot (ankle) can rotate into the opening.

4.23 Paragraph in Standard: 4.2.7.6 Entrapment of fingers

Objective protect users fingers from being trapped.

Risk when the user falls from a height of more than 1 m above the standing position or undergoes a forced movement an entrapped finger may get fractured or amputated. Crushing of fingers may occur between moving parts.

Rationale accidents have occurred and those openings shall be prevented.

The 8 mm finger probe describes the situation that a finger cannot get into an opening, the 25 mm finger probe guarantees that a finger can get out under nearly any circumstance, the requirement for 12 mm clearance between moving parts guarantees that the finger up to the knuckle is not being crushed.

Dimensions are taken from anthropometrical data.

4.24 Paragraph in Standard: 4.2.8.1 (Protection against injuries during movement and falling) Determination of free height of fall

Objective protect the user from harm as a result of falling off the equipment.

Risk falls are causing most of the injuries from fractures to concussions on playgrounds.

Rationale falls from equipment in order not to be harmful and cause severe injuries shall be controlled.

3 m falling height (3 m food support / 4 m hand support) are agreed maximum falling heights.

4.25 Paragraph in Standard: 4.2.8.2.1 (Determination of spaces and areas) General

No need for **rationale**.

4.26 Paragraph in Standard: 4.2.8.2.2 Minimum space

Objective this is actual a definition (see 3.8).

Risk not applicable.

Rationale To fulfil the requirements for creating standards this paragraph has been added.

Otherwise there would have been a definition without a requirement.

4.27 Paragraph in Standard: 4.2.8.2.3 Free space

Objective protect the user from harm during a forced movement on the equipment.

Risk while undergoing a forced movement the user could be injured or entrapped by parts that extend into the space the body of the user passes through.

Rationale The cylinder method allows the easy test of the construction regarding forced movement.

The cylinder method helps to design the free space for a safe use of equipment with forced movement.

The dimension of 350 mm minimum clearance between climbing poles and adjacent platforms is valid only for the starting platform; elsewhere the cylinder method has to be used.

4.28 Paragraph in Standard: 4.2.8.2.4 Extend of the impact area

Objective protect the user from harm as a result of unintended falls to the ground from the equipment.

Risk severe injuries can occur when falling on not defined surfaces especially when the user gets additional speed from the equipment.

Rationale when leaving an equipment with additional movement falls on hard ground can be dangerous to the user.

Therefore, the extent and the quality of the impact area shall be controlled.

4.29 Paragraph in Standard: 4.2.8.2.5 Extend of the falling space

Objective protect the user from harm as a result of unintended falls to the ground from the equipment.

Risk falling off an equipment may cause severe injuries if the ground is not damped.

Rationale falling space minimum measures shall reduce the possibility that the user suffers severe injuries in case of falling. Falling spaces including impact areas may overlap as the likelihood of two users unintentionally falling into the same space at the same time is very low.

Falling spaces and frees spaces should not overlap as collisions between users undergoing forced movement may cause severe injuries.

4.30 Paragraph in Standard: 4.2.8.3 Protection against injuries in the free space for users undergoing a movement that is forced by the equipment

Objective protect the user from harm as a result of using an equipment with forced movement.

Risk obstacles or equipment parts in the free space may cause severe injuries as the user cannot avoid collision with these during the movement.

Rationale the user cannot stop the movement. Minimum measures in the operating space shall reduce the possibility that the user gets injuries during the use of the equipment.

4.31 Paragraph in Standard: 4.2.8.4 Protection against injuries in the falling space

Objective protect the user from harm during a fall from the equipment but before hitting the playground surface.

Risk obstacles or equipment parts in the falling space may cause severe injuries as the user cannot avoid collision during the fall – self-protection is not possible.

Rationale the requirements of the falling space shall reduce the possibility that the user gets severe injuries during a fall off the equipment.

4.32 Paragraph in Standard: 4.2.8.5.1 (Protection against injuries from the surface of the impact area) General

Objective protect the user from harm as a result of falling onto an impact absorbing surface which is itself hazardous or from insufficient loose fill surface due to displacement.

Risk obstacles or sharp edged parts in the impact absorbing surface may cause severe injuries as the user cannot sidestep during the impact.

Traps at the end of the impact absorbing surface may cause falls.

Rationale the impact should be distributed over as large an area as possible and not concentrated on one point (=spike) or line (=sharp).

Maintenance is important for removing sharp or spiky parts in or on the impact absorbing surface.

Minimum measures for the thickness of the impact absorbing surface shall guarantee that falls of the user follow defined conditions.

Addendum Maintenance is a fundamental safety issue on playgrounds.

The effect of hard or sharp objects lying on a rubber surface is more severe for the user than on loose fill.

Therefore the maintained interval for rubber should be shorter. This is not to criticize rubber surfaces but to draw attention to need for specific knowledge relating to maintenance and installation.

4.33 Paragraph in Standard: 4.2.8.5.2 Equipment with a free height of fall greater than 600 mm or with forced movement

Objective protect the user from harm as a result of falling onto an impact area from a platform higher than 600 mm above ground or from equipment with forced movement.

Risk severe injuries caused by falls onto inappropriate impact absorbing surface.

Rationale minimum measures for the thickness and quality of the impact absorbing surface shall guarantee that falls of the user follow defined conditions.

Remark the examples for forced movement named in brackets includes rocking equipment.

The authors don’t feel well with this.

The typical characteristics of forced movement do not apply to all types (in particular type 2a and 2b) because the intensity of rocking can be stopped by the user in a very short time.

4.34 Paragraph in Standard: 4.2.8.5.3 Equipment with a free height of fall not exceeding 600 mm and without forced movement

Objective no **objective**.

Risk not applicable.

Rationale applicable.

4.35 Paragraph in Standard: 4.2.8.5.4 Adjacent platforms

Objective protect the user from harm as a result of falling from a platform higher than 1 m above another platform.

Risk severe injuries caused by falls on a hard surface.

Rationale demanding the quality of the impact absorbing surface shall guarantee that falls of the user follow defined conditions.

1 m is an agreed measure.

4.36 Paragraph in Standard: 4.2.8.6 Protection against injuries due to other types of movement

Objective protect the user from harm as a result of moving in, on or around an equipment.

Risk injuries caused by running against equipment parts or fall onto equipment parts.

Rationale unexpected obstacles shall not be in the moving space of the user.

4.37 Paragraph in Standard: 4.2.9.1 (Means of access) Ladders

Objective protect the user from harm as a result of climbing a ladder.

Risk falls from a ladder causing severe injuries, traps may occur which cause falls with severe injuries.

Rationale head may get entrapped in openings between rungs, loose cross bars or rungs prevent secure grip which may result in fall, unequal spacings between rungs may cause stumbling and/or falling, little space behind the rungs may prevent that the foot can hold balance on the rung.

Keep the users balance on a ladder prevents uncontrolled falls from a ladder.

The 90 mm measures the shoe of the user in average and shall be related to the head probe (probe shall not get in!), the ± 3° is agreed.

4.38 Paragraph in Standard: 4.2.9.2 Stairs

Objective protect the user from harm as a result of using a stair.

Risk falls from a stair causing injuries, traps may occur which cause falls with injuries.

Rationale if the stand on a tread of a stair is not protected by a guardrail or barrier, the user might fall off the stairs.

If the handrail does not fit the ergonomic measures of the children, keeping balance is more difficult and the user might fall.

Unequal spacings between the treads may cause stumbling and/or falling, insufficient space behind the rungs may prevent the foot keeping balance on the rung.

Keep the users balance on a stair prevents falls from a stair.

Measures are agreed (partly taken from other standards and regulations).

Addendum The requirement for at least three treads is a question of defining what is a stair and not a safety issue.

4.39 Paragraph in Standard: 4.2.9.3 Ramps

Objective protect the user from harm as a result of falling off or onto a ramp.

Risk falls onto or off a ramp may cause injuries.

Rationale ramps inclined more than 38° (agreed measure) cannot be used in an upright bodyposition and falls may occur.

If ramps were not protected by guardrails or barriers, the user might fall off the ramp. Keep the users balance on a ramp prevents falls from or onto a ramp.

4.40 Paragraph in Standard: 4.2.9.4 Steep play elements

Objective protect the user from harm as a result of falling through the access opening of a steep element and to allow openings in barriers / guardrails.

Risk fall through the access opening of the steep play element on the platform.

Rationale the requirement is valid for easily accessible platforms / platform parts combined with steep elements. Limiting the width of the access opening reduces the **risk** of falls through the opening.

Limiting the target platform height to 2 m enables grown ups to provide help if needed.

4.41 Paragraph in Standard: 4.2.9.5 Easily accessible playground elements

This clause contains no requirements but gives information and examples about means of easy access.

4.42 Paragraph in Standard: 4.2.10 Connections

Objective protect the user from harm as a result of collapsing equipment parts.

Risk falls or other injuries can occur.

Rationale loosening of connecting parts may cause a collapse of equipment parts or the equipment itself. Under use this situation could be dangerous for the users. Secured connection parts ensure integrity of the equipment between maintenance intervals.

4.43 Paragraph in Standard: 4.2.11 Consumable components

Objective protect the user from harm as a result of loosened equipment parts (loosened by user).

Risk falls or other injuries can occur.

Rationale loosened parts may cause a collapse of equipment parts or the equipment itself.

Under use this situation could be dangerous for the users.

Secured connection parts ensure integrity of the equipment between maintenance intervals.

4.44 Paragraph in Standard: 4.2.12.1 (Ropes) Ropes fixed at one end

Objective protect the user from harm as a result of uncontrolled collision with equipment parts, prevent noose and as a result - strangulation.

Risk uncontrolled collisions; strangulations; uncontrolled dangerous moments.

Rationale as climbing on ropes means the user may rotate and swing with the rope, uncontrolled collisions with equipment parts may occur.

Strangulation may be possible when ropes are soft (and thin) or fastened too near to adjacent parts of the equipment.

Interference with swings in the same bay could cause dangerous moments by allowing the user to enter the path of the swing.

Good grip shall be provided to make climbing easier, minimum clearance between the rope and adjacent parts prevent the **risk** of collision.

A stiff rope prevents the **risk** of making nooses and getting strangulated. Measures are agreed.

The diameters 25 mm and 45 mm are a compromise between grip function and safety issues. (see also 4.2.4.6).

Small rope diameter = small nooses, large rope diameter = large nooses.

4.45 Paragraph in Standard: 4.2.12.2 Ropes fixed at both ends (climbing ropes)

Objective protect the user from harm as a result of uncontrolled collision with equipment parts, prevent noose and as a result – strangulation.

Risk strangulations.

Rationale strangulation may be possible when ropes connected at both ends are soft and too long.

The same **risk** occurs when the rope is fixed too near to an adjacent element of the play structure.

Good grip shall be provided to make climbing easier, minimum clearance between the rope and adjacent parts prevent the **risk** of strangulation. A stiff rope prevents the **risk** of making nooses and getting strangulated.

4.46 Paragraph in Standard: 4.2.12.3 Wire ropes

Objective protect the user from harm as a result of corroding and collapsing steel wires and of protruding single wires as well as of unstable play structures.

Risk dangers from structure failures due to collapsing wire ropes.

Rationale corroding wires may break under the load of the user, protruding single steel wires at the end of ferrules may penetrate or cut the skin, turnbuckles which can be opened by the user may lead to a unstable status of the play structure.

Unstable play structures or - under user load - breaking parts of the equipment shall be prevented.

4.47 Paragraph in Standard: 4.2.12.4 Sheathed wire ropes

Objective protect the user from harm as a result of slipping off a coated steel rope.

Risk skin cuts; falls due to loosing grip on a rope.

Rationale monofilament coated steel wires bear the **risk** that during climbing or slipping off the rope, the skin is cut by the monofilaments.

If each steel cord is not coated with synthetic or natural fibres, the coating may slip on the steel core and thus prevent secure grip on the rope; and the coating will wear much faster.

Braided steel ropes prevent the **risk** of skin cuts.

This clause is not in isolation but should be re-read in conjunction with Clause 4.2.12.3.

4.48 Paragraph in Standard: 4.2.12.5 Fibre ropes (textile type)

Objective protect the user from harm as a result of falling from a breaking textile rope.

Risk falls due to breaking ropes, cuts and abrasions.

Rationale textile ropes can be damaged easily by children. Under the load of a user they may break then.

Monofilament ropes bear the **risk** that during climbing or slipping off the rope, the skin is cut by the monofilaments.

Due to the movement on a rope (climbing, slipping) skin cuts shall be avoided and a safe grip has to be provided.

4.49 Paragraph in Standard: 4.2.13 Chains

Objective protect the user from harm as a result of fingers becoming trapped in chain links.

Risk finger injuries; e.g. breaking, amputation.

Rationale due to the usage of chains in swing structures the users fingers could get trapped in the chain links when the user jumps off a swing or off another equipment with forced movement.

The openings in chain links shall be big or small enough not to entrap fingers.

The measure of 8,6 mm is related to production methods of chains. 12 mm is an agreed measure.

4.50 Paragraph in Standard: 4.2.14 Foundations

Objective protect the user from harm as a result of fall onto and over the foundation and from breaking structure.

Risk severe injuries due to fall onto and over foundation and due to breaking structures.

Rationale foundations which stick out of the impact absorbing surface are dangerous for users that might fall onto or over these foundations.

Wrong foundations may lead to a fast corrosion of the vertical members of the play structure.

The foundations shall be covered either by the construction itself or by a thick enough impact absorbing surface.

For steel and wooden vertical members (especially one-post-constructions) that stick in concrete foundations special construction details shall be observed.

4.51 Paragraph in Standard: 4.2.15 Heavy suspended beams

Objective protect the user from harm as a result of being hit or crushed by a suspended heavy beam.

Risk injuries due to become crushed or hit by heavy masses.

Rationale the mass of a suspended heavy beam that swings with users on it may be bigger than the mass of a child passing the swing way. Therefore the passing child will be pushed away.

If the clearance under such a beam is not sufficient children that fell underneath may get crushed by the beam.

Rounding the edges of the suspended beam lowers the **risk** of injuries on passing children.

Underneath the beam a minimum clearance reduces the **risk** that a fallen child is crushed.

4.52 Paragraph in Standard: 5 Test methods and reports

Rationale Clause 5 gives a guideline for the report of equipment testing.

Addendum protect the user from harm as a result of not producing consistent quality or building equipment that does not follow the standard.

If the production would not be controlled, a consistency and correspondent safety quality cannot be maintained, thus resulting in playground installations that may bear **risks** for the user.

Controlled consistent production according to the standard provides security for the users.

4.53 Paragraph in Standard: 6 Information to be provided by the manufacturer/supplier

Rationale protect the user from harm as a result of not providing necessary information for planning installation, operation, maintenance and surfacing.

If there is insufficient information from the manufacturer, the operator may make mistakes in planning, installation, inspecting and maintaining the site which could lead to failure of the equipment.

The manufacturer knows best which critical parts shall be observed, which maintenance intervals should be followed and which wearing parts should be replaced. So this information shall be provided.

4.54 Paragraph in Standard: 7 Information to be provided by the manufacturer or supplier of the impact-attenuating surfacing

Rationale protect the user from harm as a result of not providing necessary information on the equipment.

If an equipment had no identifications marks on it, it might be difficult to order the right spare parts or wearing parts. Wrong parts may rise the **risk** of improper function or early wear of equipment parts.

Not marking the top of play level could complicate the inspection and maintenance with the **risk** of having low thickness of the impact absorbing surfacing, thus creating the **risk** of dangerous falls off the site.

Inspection and maintenance is responsible for a safe long-term operation of the equipment.

Identifying the site type, manufacturer and date of the applied version of the standard as well as marking the top of play level is relevant for the correct installation and maintenance according to the manufacturers information.

5 Part 2

5.1 Paragraph in Standard: 4.2 (Safety requirements) General

Objective to avoid the body being hurt by a swing (with a child sitting on it).

Risk getting crushed by the swing seat (with a child sitting on it).

Rationale as one cannot prevent children (of any age) from being in the swinging area, care has to be taken that a child being in the swinging direction cannot be rolled or crushed by the swing seat (with a user on board).

In former times swing seats used to be more heavy than today.

Reducing the measure to 100 mm in case of contact swings is possible due to the repellent character of the tires in swing direction.

The dimension of 400 mm and 350 mm (for less heavy seats) are agreed measures based on experience.

5.2 Paragraph in Standard: 4.3 Seat clearance for single point swing (Type 3)

Objective to avoid the user being hurt by a swing.

Risk getting crushed by the swing seat.

Rationale owed to the fact that the mass of a one beam swing seat is greater than on other swings the measure of 400 mm is a concession.

5.3 Paragraph in Standard: 4.4.1 (Minimum clearance and lateral stability of swing seats with more than one point of suspension) Minimum space between the seats of swings

Objective to avoid extremities getting hurt, in case of falling off the swing avoid injuries of the user.

Risk arms or legs getting hurt by contact to other users or parts of the equipment.

Rationale as the swing direction can be influenced by the user and as the swinging speed can be high there has to be enough clearance space between the users and the equipment parts.

5.4 Paragraph in Standard: 4.4.2 Lateral stability of swing seats (Figure 7b)

Objective to avoid extremities getting hurt - in case of falling off the swing avoid injuries of the user.

Risk alternately swinging users could hurt themselves when they swing with outstretched arms or legs.

Rationale conical suspended swing seats may prevent swinging in diagonal direction.

5.5 Paragraph in Standard: 4.5 Means of suspension

Objective prevent injuries caused by inflexible suspensions.

Risk rigid suspensions may cause injuries to children which run into the swing unit.

Rationale due to the speed and the mass of a swing (suspended seat plus user) a rigid suspension would cause more severe injuries than chain suspensions.

5.6 Paragraph in Standard: 4.6.1 (Impact attenuation of swing seats) Swing seats and vertical tyre seats and 4.6.2 Cradle swing seats

Objective prevent injuries especially head injuries caused by a swing seat in motion without a user on it.

Risk head injuries.

Rationale in former times swing seats were made of wood. When children fell of the swing it happened that their head was hit by the seat and this was causing severe injuries. Therefore, acceleration and the surface pressure of the edges as a quotient of the mass of the seat and the damping of the edges have to be controlled.

5.7 Paragraph in Standard: 4.6.3 Swing seats and platforms for several users

Objective prevent injuries especially head injuries caused by a swing seat in motion without a user on it.

Risk head injuries.

Rationale given in note.

5.8 Paragraph in Standard: 4.7 Dynamic load for swing equipment, 4.8.1 Structural integrity and 4.8.2

Objective protect children from harm caused by breaking equipment.

Risk breaking equipment parts will cause severe injuries especially when supporting beams or swing suspensions fail.

Rationale the test according to Annex C shall ensure the stability of the whole swing structure even in between the maintenance intervals.

5.9 Paragraph in Standard: 4.9 Framework

Objective protect children from harm as a result of getting hit by a swing seat with user on it.

Risk injuries caused by the impact of a child or a moving swing seat.

Rationale given in note.

5.10 Paragraph in Standard: 4.10.1 (Height of fall and impact area) Free height of fall and 4.10.2 Dimensions of falling space and impact area

Objective prevent injuries caused by falling off the swing onto the ground.

Risk fractures of extremities, head injuries.

Rationale defining the free fall of height and the extensions of the falling space enables the supplier to determine the correct characteristics of the shock absorbing surface.

5.11 Paragraph in Standard: 4.11 Additional requirements for swing seats with several rotational axes (Type 2)

Objective prevent injuries due to entrapment of arms or legs.

Risk entrapped arms or legs can lead to dangerous situations on a swing.

Rationale the requirements shall reduce the **risk** of arms or legs getting entrapped.

5.12 Paragraph in Standard: 4.12 Additional requirements for single-point swings (Type 3)

Objective prevent strangulation and entrapment as well as injuries caused by breaking of the suspension parts.

Risk head and clothes entrapment, strangulation.

Rationale a hinge is the most common solution for the problem. Special care is needed when hinges are chosen that are not specially constructed for swings.

5.13 Paragraph in Standard: 4.13 Additional requirements for contact swings (Type 4)

Objective prevent injuries caused by collision of two users.

Risk breaking extremities and head injuries.

Rationale given in the requirement.

5.14 Paragraph in Standard: 5 and 6

See Part 1.

6 Part 3

6.1 Paragraph in Standard: 4.2 Access

Objective prevent injuries due to falls off the access unit or the entrance section of a slide.

Risk uncontrolled falls from a stair, ladder or platform may cause severe injuries.

Rationale limiting the fall line to a falling height of 2500 mm or 2000 mm reduces the **risk** of severe injuries, providing crossbars in the starting section does the same.

6.2 Paragraph in Standard: 4.3.1 (Starting section) Length and angle

Objective prevent injuries due to falls off the entrance section of a slide.

Risk uncontrolled falls from a starting section may cause severe injuries.

Rationale providing a long enough starting section enables the user to sit down and start sliding in a safe manner 350 mm is an agreed measure based on experience.

The limitation of the inclination of the starting section helps to provide a safe standing position.

6.3 Paragraph in Standard: 4.3.2 Guarding section

Objective prevent injuries due to falls off the entrance section of a slide.

Risk uncontrolled falls from an entrance platform may cause severe injuries.

Rationale the **risk** to fall off the starting section of a slide is similar to **risks** on a platform.

Therefore, similar requirements were made.

6.4 Paragraph in Standard: 4.3.3 Width

Objective prevent injuries due to instable starts of the sliding movement.

Risk falls, loss of body control and the so caused injuries.

Rationale in order to start the slide movement in a controlled way, length and direction of the starting section is important.

6.5 Paragraph in Standard: 4.3.4 Lateral protection (sides)

Objective prevent entrapment of arms, fingers or clothing in the starting section, in case of falls prevent injuries due to sharp edges.

Risk entrapped fingers or parts of clothes (e.g. cords) while already sliding down can cause very sever injuries (strangulation).

Rationale there shall not be any entrapment for body parts or clothing parts in the starting section of a slide. There have been several deadly ending accidents on slides due to these entrapments.

6.6 Paragraph in Standard: 4.4.1 (Sliding section) Angle

Objective prevent users from getting too fast or from falling onto the slide when the shift of incline produces a jump.

Risk falls onto the sliding section or falls in the runout section.

Rationale see note in 4.4.1, measurements are agreed and taken from experience.

6.7 Paragraph in Standard: 4.4.2 Width

Objective prevent injuries caused by two users using the slide.

Risk falls off the slide due to squeeze of the users.

Rationale limiting the width of the slide to 700 mm / 950 mm allows only one use to slide down, two or more users need adequate space measurements are agreed and taken from experience.

6.8 Paragraph in Standard: 4.4.3 Sides and profile of the slide Objective prevent injuries due to falls off the sliding section Risk falls off the slide during sliding

Rationale depended on the falling height of the slide the rails have to be high enough to protect the users from falling off during the sliding movement.

6.9 Paragraph in Standard: 4.5 Run-out section

Objective prevent the user from harm as a result of falling in and from the runout section of a slide.

Risk uncontrolled falls under high speed in the runout section, head, neck or back injuries.

Rationale providing a runout section long enough to reduce the sliding speed enables the user to get off the slide in a controlled way. In case the user falls after the runout section and hits the end of the slide with his head, neck or back the deflection of the slide sheet should be sufficient.

See also note in 4.5.

6.10 Paragraph in Standard: 4.6 Surface of the slide

Objective prevent entrapment of parts of clothes.

Risk strangulation, entrapments causing immobility of the user when hanging in his clothes.

Rationale there shall not be any entrapment for clothing parts in the whole section of a slide.

There have been several deadly ending accidents on slides due to these entrapments. See also notes in 4.6

6.11 Paragraph in Standard: 4.7 Free space

Objective prevent the user from harm as a result of being hit by parts during the slide movement.

Risk fractures, bruises.

Rationale as the user cannot stop the slide movement there shall be no parts that could hit him on the way down.

6.12 Paragraph in Standard: 4.8 Impact area

Objective prevent the user from harm as a result of falls from the slide or falls in and after the runout section.

Risk severe injuries.

Rationale the shock absorbing surface had to be extended as there is an additional speed element causing extended **risks**.

6.13 Paragraph in Standard: 4.9.1 Clearance

Objective prevent the user from harm as a result of being trapped or tossed and turned inside the slide.

Risk bruises, injuries due to tumbling (at greater dimensions).

Rationale the user – if too fat may get trapped.

If the diameter is too small the user could hit the upper parts of the slide while moving down.

Measurements are agreed and taken from experience.

6.14 Paragraph in Standard: 4.9.2 Position

Objective prevent the user from harm as a result of hitting the begin or the upper end of the tunnel.

Risk bruises, head injuries.

Rationale user shall not slide into a tunnel in order to prevent the **risk** of hitting upper parts of the tunnel entrance.

Tunnels may not have openings in the sliding sections as the users head could hit upper parts of this opening. The tunnel shall open before the runout section begins in order to prevent the user from hitting upper parts of the tunnel end.

6.15 Paragraph in Standard 5 and 6

See Part 1.

7 Part 4

7.1 Paragraph in Standard: 4.2 Framework and fixing points of the cable

Objective protect the user from harm as a result of a breakdown of equipment parts and as a result of a too high/low wire sag.

Risk severe injuries in case of breaking equipment parts, uncontrolled falls.

Rationale the requirement shall ensure the stability of the whole structure even in between the maintenance intervals.

Due to wrong wire sag falls can occur.

7.2 Paragraph in Standard: 4.3 Calculation of forces on the cable of a cableway

Objective prevent injuries due to cable failure.

Risk sudden falls from the seat.

Rationale the test according to Annex A shall ensure the stability of the cable even in between the maintenance intervals.

7.3 Paragraph in Standard: 4.4 Stops

Objective prevent injuries due to falls in the traveller section.

Risk uncontrolled falls may cause severe injuries.

Rationale due to the speed on a cableway the **risk** to fall off the seat in the runout section is high if the speed is not lessened.

7.4 Paragraph in Standard: 4.5 Traveller

Objective prevent injuries due to sudden stops of the traveller or hand contact with the cable.

Risk falls, hand injuries.

Rationale hand contact with the cable shall be prevented.

If there were two travellers collisions would occur. Cable damages shall be prevented.

7.5 Paragraph in Standard: 4.6 Suspension assembly

Objective prevent injuries caused by inflexible suspensions.

Risk rigid suspensions may cause injuries to children which run into the suspension assembly.

Rationale due to the speed and the mass of a cableway suspension unit (plus user) a rigid suspension would cause more severe injuries than flexible suspensions.

7.6 Paragraph in Standard: 4.7 Cableways arranged in parallel

Objective prevent users from harm as a result of colliding with each other.

Risk fractures, bruises.

7.7 Rationales for EN 1176-4 Cableways

Rationale choosing the measure of 2m minimum distance shall guarantee that collisions of users on the cableway and in case of falling off the suspension units do not occur.

7.8 Paragraph in Standard: 4.8 Grips

Objective enable users to dismount or release their hold, prevent the user from harm as a result of impacts with the eye with parts of the grip.

Risk injuries of the eye, dangerous situations due to trapped hands or arms.

Rationale the user shall be able to leave the cableway at any time e.g. in order to avoid dangerous situations.

Travellers without a user sliding along the cable could be harmful for children passing the way of the traveller, especially if the grip end of the traveller is capable of hurting the eyes.

7.9 Paragraph in Standard: 4.9 Seats

Objective prevent entrapment of the user.

Risk dangerous situations due to trapped user, head injuries.

Rationale the user shall be able to leave the cableway at any time e.g. in order to avoid dangerous situations.

Due to the speed on a cableway acceleration and the surface pressure of the seat edges as a quotient of the mass of the seat and the damping of the edges have to be controlled.

7.10 Paragraph in Standard: 4.10 Speed

Objective protect the user from harm as a result of too high speed.

Risk uncontrolled falls / movements under high speed.

Rationale the measure of 7 m/s is approximately the speed a child is able to handle the speed (bicycle speed).

7.11 Paragraph in Standard: 4.11 Free height of fall

Objective prevent injuries caused by falling off the cableway onto the ground.

Risk fractures of extremities, head injuries.

Rationale limiting the free height of fall reduces the **risk** of severe injuries.

7.12 Paragraph in Standard: 4.12 Ground clearance

Objective protect the user from harm as a result of a collision with the cableway suspension.

Risk fractures, head injuries.

Rationale as one cannot prevent children (of any age) from being in the cableway area, care has to be taken that a child being in the cable direction cannot be rolled or crushed by the traveller (with a user on board).

7.13 Paragraph in Standard: 4.13 Cable height

Objective protect the user from contact with the cable.

Risk hand injuries.

Rationale neither in sitting nor in standing position should the user be able to get in contact with the cable except there is no way to get finger trapped.

7.14 Paragraph in Standard: 4.14 Falling space and impact area

Objective prevent injuries caused by falling off the traveller onto the ground.

Risk fractures of extremities, head injuries.

Rationale defining the extensions of the falling space shall provide correct characteristics of the shock absorbing surface.

7.15 Paragraph in Standard: 5 and 6

See Part 1.

8 Part 5

8.1 Paragraph in Standard: 4.1 Safety requirements General

Objective The aim of this part of the standard is to protect the user against hazards, which are specific for carrousels. The specified requirements in this part are additional to part 1 and prevail part 1. The additional requirements follow from the energy of the moving mass and the speed of the user.

Risk All kinds of injuries, as mentioned in following paragraph, as a possible consequence of the use of carrousels and a failure of the equipment.

Rationale Applying of EN 1176-5 leads to reduction of hazards, because several specific hazards are not covered by applying part 1 exclusively.

Explanation See **objective** and **rationale**.

Addendum Related to the additional requirements, the requirements for handrails as specified in part 1, paragraph 4.2.4.2 are not applicable, because those requirements may obstruct a safe use of carrousels.

8.2 Paragraph in Standard: 4.2 Free height of fall

Objective To protect the user against the consequences of a fall from the equipment with a free height of fall greater than 1000 mm and to protect the user against the consequences of a fall on a surface without sufficient impact attenuating properties, due to the forced movement of the user.

The user (active and passive) may be injured through a fall from the moving equipment. The combination of height and movement may lead to a more severe injury.

Risk Puncture injuries and broken limbs.

Rationale Reduction of the free height of fall and application of an impact attenuating surface decrease the **risks**.

There is an additional **risk** on rotating systems, therefore the falling height was reduced to an agreed measure of 1000 mm / 1500 mm.

8.3 Paragraph in Standard: 4.3 Free space / falling space

Objective To protect the user against the consequence of a fall with acting centrifugal forces by means of extension of the impact area and the extension of the free space.

Risk Broken limbs and puncture injuries.

Rationale This is substantiated by the fact that the centrifugal force which is generated by the carousel often leads to the user leaving the carousel in an uncontrolled movement. Therefore, attention should be paid to there being no obstacles in the falling space.

There is an additional **risk** on rotating systems from centrifugal force, therefore the extent of the free space / falling space was increased to 2000 mm.

8.4 Paragraph in Standard: 4.4 User stations

Objective To protect the user against the consequences of entrapment of body parts and clothing, while using the equipment or getting off the equipment.

Risk Entanglement and entrapment. Burns through friction and broken limbs when getting caught while moving.

Rationale Compliance with the requirements reduces the mentioned **risks**. Text in standard: "*User stations of type A carousels that are supplied with seats shall be equipped with a backrest or hand grip".*

Objective To protect the user from harm as a result of a fall from the moving equipment and is getting hurt through the fall or though the impact of the equipment itself.

Risk Puncture injuries, head injuries.

Rationale This type of carousel lacks a turning bottom, causing more hazards when using the equipment.

Compliance with the requirements reduces the **risks**.

Addendum The specified requirement does not fit in this paragraph. Maybe 5.1 is more suitable.

8.5 Paragraph in Standard: 4.5 Axis

Objective To protect the user against greater **risk** when using inclined turning planes and to reduce the additional **risks** caused by gravity and speed, when „out of control".

This type of equipment does have a greater **risk** for falling „out of control", resulting in more liability of injuries.

Risk Puncture injuries and broken limbs

Rationale Limitation of the inclination reduces the **risk**.

The 5 degree dimension is to control the ground clearance beneath the carousel and the ground such that a user will not be drawn into a diminishing opening.

8.6 Paragraph in Standard: 4.6 Speed of rotation

Objective To protect the users against the effects from a (too) high turning speed. No speed limit leads to more and severe injuries when falling or caught by the equipment.

Risk Puncture injuries, broken limbs and friction injuries.

Rationale A high speed makes it more difficult to react adequately en to evaluate the **risks**.

A speed of less than 5 m/sec gives the opportunity to get off the equipment. Even an unintentional getting off the equipment is possible without the **risk** of severe injuries.

5 m/s have never been verified, it is an imagined measure.

8.7 Paragraph in Standard: 4.7 Grip handles

See EN 1176-1:2008, 4.2.4.6.

8.8 Paragraph in Standard: 4.8 Load capacity and stability

Objective To ensure a stable and correct structure when used by the mentioned amount of users. An insufficient construction leads to disintegration and to accidents.

Risk Several kinds of severe injuries.

Rationale Avoiding unforeseen failures of the equipment by means of a stabile construction and foundations.

Calculation of the loads are taken from the Euro Codes.

8.9 Paragraph in Standard: 5.1 (Type specific requirements) Carousel Type A (rotating chairs)

Objective To protect the user against specific hazards of this type of carousel.

Risk Injuries of body and body parts through collisions, getting entrapped and through the impact of moving parts of the carousel.

Rationales

1. Limitation of the diameter to 2000 mm reduces the **risk** of entering the moving carousel and decreases the speed of the carousel on the periphery.

2. The requirement for the ground clearance reduces the **risk** of the body being hit through turning parts of the carousel, when landed under the carousel.

3. Equal spacing of at least 3 user stations emphasizes the rotating movement and reduces the danger of entering the moving carousel and to be hit by a user station.

4. Rounded parts and parts free from burrs reduce the **risk** of injuries when unintentional contact with parts of the equipment is occurring.

5. Construction of the seats: see several requirements in EN 1176-2.

8.10 Paragraph in Standard: 5.2.1 (Carousel Type B (classical carousel)) General

Objective To protect the user against specific **risks** of this type of carousel.

Risk Injuries in general, puncture injuries, body injuries, head limbs through entrapment under the rotating platform and being hit by the construction itself and/or protrusions.

Rationales A fully enclosed solid platform, without protruding parts, superstructures inside of the outside edge of the platform and all parts moving in the same direction, reduces the **risks**.

The requirements related to the height of the platform and the surrounding ground, prevents entrapment of body and body parts.

8.11 Paragraph in Standard: 5.2.2 Rotating platform flush to the ground

Objective Preventing entrapment of fingers and stumbling.

Risk Broken fingers or lost of finger (parts). Puncture injuries and broken limbs when falling against obstacles.

Rationale Preventing entrapment of fingers, as specified in part 1 and avoiding that the platform can be an obstacle for the user by limitation of the vertical displacement.

8.12 Paragraph in Standard: 5.2.3 Rotating platform not flush with the ground

Objective To protect the user for harm as a result of entrapment and/or the impact of rotating platforms above the user.

Risk Crushing, entanglement and getting injured by parts of the rotating floor.

Rationale Solid and smooth undersides reduce the **risks**.

8.13 Paragraph in Standard: 5.2.4 Rotating platform between 110 mm and 400 mm with a skirt

Objective To protect the user from getting injured as result of entrapment and/or the impact of rotating platforms above the user.

Risk Crushing, entanglement and getting injured by parts of the rotating floor.

Rationale Providing a rigid skirt reduces the **risk**.

8.14 Paragraph in Standard: 5.2.5 Rotating platform over 400 mm with a skirt

Objective To protect the user from getting injured as result of entrapment and/or the impact of rotating platforms above the user.

Risk Crushing, entanglement and getting injured by parts of the moving floor.

Rationale providing a rigid skirt reduces the **risk**.

8.15 Paragraph in Standard: 5.2.6 Rotating platform over 110 mm without a skirt

Objective To protect the user from getting injured as result of entrapment and/or the impact of rotating platforms above the user.

Risk Crushing, entanglement and puncture injuries by parts of the rotating floor.

Rationale Compliance with the requirements reduces the **risks**.

8.16 Paragraph in Standard: 5.3.1 (Carousel Type C (spinning mushrooms, hanging glides)) General

Objective Protecting the user from injuries caused by suspended user stations.

Risk Head injuries, concussion and eye injuries.

Rationale Flexible suspensions and user stations of equal height (and at least 1,8 m) reduce the **risks**.

8.17 Paragraph in Standard: 5.3.2 Structural integrity

Objective To protect the user from the consequences of an insufficient construction and unforeseen failure of the structure. The consequences of a failing construction may lead to very serious injuries, because the structure is moving for the biggest part above the user.

Risk Major head injury, serious body injuries, and broken limbs.

Rationale Compliance with the requirements of this standard ensures the integrity and stability of the structure.

Following the requirements of the standard, the possibility of failure of the equipment can be controlled within the maintenance intervals.

8.18 Paragraph in Standard: 5.3.3 Suspended user station impact requirements

Objective To protect the user from the consequences of unintentional contact with the suspended user stations.

Risk Head injuries, concussion and eye injuries.

Rationale Restriction of the impact of the user stations according EN 1176-2 reduces the **risks**.

8.19 Paragraph in Standard: 5.3.4 Free space / falling space

Objective To protect the user from obstacles in the free space and impact area, considering the influence of the centrifugal force.

Risk Major head injuries, severe bodily harm, broken limbs and even permanent damages, caused by falling and jumping from the fast rotating structure.

Rationale Applying the extended free space and falling space reduce the mentioned **risks**.

30° and 1 000 mm are agreed dimensions.

8.20 Paragraph in Standard: 5.4.1 (Carousel type D (track-driven carousel)) Drives

Objective To protect the user from specific **risks** using this type of carousel, paying attention especially to entrapment of fingers, hands and feet.

Risk Foot and hand injuries, crushing, broken fingers.

Rationale Compliance with the requirements reduces the **risks**.

8.21 Paragraph in Standard: 5.4.2 Drive wheels

Objective To protect the user from the specific **risks**, when using drive wheels.

Risk Injured hands and lost of (parts of) fingers.

Rationale Compliance with the requirements reduces the **risk** of getting injured.

8.22 Paragraph in Standard: 5.4.3 Components of the supporting structure

Objective To protect the user from the consequences of a bad construction and to ensure that the rotating structure does not loose contact with the central axis.

Risk Unforeseen failure of the constructions, resulting in body, feet and hand injuries.

Rationale Compliance with the requirements ensures the safety of the construction.

Following the requirements of the standard, the possibility of failure of the equipment can be controlled within the maintenance intervals.

100 mm measure comes from the former DIN 7926 (former manufacturer proposal)

8.23 Paragraph in Standard: 5.4.4 Tracks

Objective To protect the user from specific **risks** when using this type of carousel, especially paying attention to entrapment of fingers, hand and feet.

Risk Hand and feet Injuries through entrapment, broken limbs and crushing.

Rationale A correct installation, compliance with the requirements and shaping the surface in a right way, reduce the **risks**.

8.24 Paragraph in Standard: 5.5.1 (Carousel type D (giant revolving disks)) General

Objective To protect the user from specific **risks** of this type of carousel.

Risk Head injury, internal injury, bodily harm and broken limbs.

Rationale An exact circular shape, a limited and a stabile structure and foundation reduce the mentioned **risks**.

8.25 Paragraph in Standard: 5.5.2 Upper side

Objective To protect the user from the consequences of falls caused by obstacles on the upper side.

Risk Head injury, bodily harm, broken limbs.

Rationale A smooth upper side, without obstacles reduces the **risk** of falling. Rounded edges reduces the possibility of getting injured.

8.26 Paragraph in Standard: 5.5.3 Underside

Objective To protect the user from injury when getting entrapped under the carousel

Risk Crushing, entanglement and body injuries.

Rationale A smooth surface with no radial variations to the ground clearance reduces the **risks**.

8.27 Paragraph in Standard: 5.5.4 Ground clearance

Objective To protect the user from specific **risks** of this type of carousels as collisions, getting entrapped and unintentional contact with the rotating mass and parts of the equipment.

Risk Body part injuries

Rationale Compliance with the requirements for ground clearance reduces the **risk** of getting hit by rotating parts, when under the equipment.

Addendum It is worth noting that the choice of surface beneath giant revolving disk is important.

Loose fill yield in use and will allow the user caught beneath the carousel to be pressed into the surface in the event that the ground clearance is too small, otherwise the body or head may be rolled between a rubber surface and the disk with the potential of significant injury.

8.28 Paragraph in Standard: 5.5.5 Free space / falling space

Objective To protect the user from obstacles in the free space and impact area, considering the influence of centrifugal forces.

Risk Serious head and body injury, broken limbs and permanent injury.

Rationale Applying of the required extended free space and falling space reduces the **risks**.

8.29 Paragraph in Standard 5 and 6

See Part 1.

9 Part 6

9.1 General concerns of the task group

The requirements of Part 6 of the standard related to Table 1 do not seem to produce safety in all cases. In particular:

a) the exclusion of 230 mm ground clearance requirements if damping is provided may produce the **risk** of entrapment. The provision of damping will not always eliminate this **risk**.

b) the task group could not find a **rationale** to backup the requirements for entrapment.

c) providing foot rests does not exclude the **risk** of entrapment of head or body.

9.2 Paragraph in Standard: 4.1 (Safety requirements) General

Objective Aim of this part of the standard is to protect the user, against hazards, which are specific for seesaw and rocking equipment. The specified requirements in this part are additional to part 1 and these requirements have priority above part 1. The additional requirements follow from the moving mass and the age of the user (mostly young users).

Risk All kinds of injuries as a result of the use of rocking equipment and as a result of a failure of the equipment.

Rationale Applying of EN 1176-6 leads to reduction of the hazards, when using seesaw/rocking equipment, because several specific hazards are not covered by applying part 1 exclusively.

9.3 Paragraph in Standard: 4.2 Free height of fall

Objective To protect the user from harm as a consequence of a fall from seesaw/rocking equipment.

Risk Puncture injuries and broken limbs. The user can get injured when falling from the equipment. The combination of height and rocking movement is possibly leading to more severe injuries.

Rationale Reduction of the free height of fall for the different types of rocking equipment decreases the **risks**. The free height of fall in this clause is related to the first column of Table 1.

The different fall heights relate to the different kind of equipment and the different user ages and competences.

E.g. the restriction of fall height of 1 500 mm to axial see saws is analogous to the fall height of cableways which are used by skilled users. Rocking equipment (type 2 etc.) is used by younger children and therefore the fall height is reduced to 1 000 mm.

Types 5 and 6 are designed for older users and a fall height of 2 000 mm is acceptable.

9.4 Paragraph in Standard: 4.3 Seat / stand slope

Objective To protect the user against falling, caused by losing balance and unintentional sliding of the supporting element.

Risk Puncture injuries.

Rationale The **risk** of sliding from the equipment is minimised by limiting the angles. The values of 20° and 30° are empirical.

9.5 Paragraph in Standard: 4.4 Pinch, crush

Objective To protect the user against pinching and crushing, caused by shearing and moving openings in the supporting components and accessible joints.

Risk Finger and foot injuries and crushing.

Rationale Application of EN 1176-6:2008, Annex C and EN 1176-6:2008, 4.2.6 and 4.2.7 reduces the hazards.

Repetition of part 1 requirements points out the importance of strictly applying the standard especially the dimensions of the gaps up to 12 mm.

9.6 Paragraph in Standard: 4.5 Restraint of motion

Objective To protect the user against the consequences of a sudden stop or sudden reversal of the motion.

Risk Spinal injuries.

Rationale Reducing the **risk** by use of springs or other damping elements as given in NOTE 2.

9.7 Paragraph in Standard: 4.6 Foot rest

9.7.1 1st and 2nd paragraph

Objective To protect the user against injuries caused by getting trapped of feet and legs when the equipment is not damped and the ground clearance is less than 230 mm.

Risk Crushed feet and broken legs.

Rationale Using of foot rests reduces the hazards.

Addendum The **rationale** task group is concerned about this clause in relation to axial seesaws damped with tires at the end because of the **risk** of crush injuries between the tires and the end of the seesaw.

9.7.2 3rd paragraph

Objective To protect the user against injuries, when violently hit by foot rests.

Risk Eye injuries and puncture injuries.

Rationale Compliance with the test according Annex E for the end reduces the hazards.

The principle of the control ring links to protrusion gauges given in ASTM F1487.

9.8 Paragraph in Standard: 4.7 Hand support

9.8.1 Whole Clause 4.7

Objective To protect the user against falls during use of the equipment.

Risk Puncture injuries.

The user can get injured as a result of falling from the equipment. The combination of height and rocking movement may lead to more severe injuries.

Rationale Hand supports increase the level of safety.

9.8.2 3rd and 4th paragraph

Objective To protect the user against falling through application of the right diameter of the hand support and to protect the user from harm as a result of loosing hold.

Risk Losing hold and falling from the equipment.

Rationale Compliance with EN 1176-1:2008, 4.2.4.6 reduces the **risk** of injuries.

Repetition of part 1 requirements points out the importance of strictly applying the standard especially the diameter of 16 mm for grip support.

9.8.3 5th paragraph and Note

Objective To protect the user against injuries, when violently hit by hand support.

Risk Eye injuries, puncture injuries.

Rationale Compliance with the test according Annex E for the end of the hand supports reduces the hazards. 15 cm^2 is based on anthropometric data.

9.9 Paragraph in Standard: 4.8 Side view profiles

Objective To protect the user (active and passive) against injuries, when violently hit by the equipment.

Risk Punctures and eye injuries.

Rationale Changes in the shape of edges and rounded parts, as required, reduce the **risk**.

20 mm is a chosen from experience.

9.10 Paragraph in Standard: 4.9 Entrapment

9.10.1 Whole Clause 4.9

Objective Preventing entrapment between ground and equipment (user and passing children). Protecting the users and passing children from harm as a result of unforeseen entrapment between the equipment and the ground.

Risk Serious injuries (puncture, pinching, crushing).

Rationale a + b: see general comment of the task group at the beginning of this section; c: see note in clause.

9.10.2 Last paragraph

Addendum Optional in Table 1 for type 2A and type 3A equipment is not logical.

Little „a“ might be in the wrong place and should be located at row 2 and row 4 at the end of the table.

Otherwise there is the question: which option can be chosen in case of type 2A or type 3A equipment?

9.11 Paragraph in Standard: 4.10 Falling space

Objective To protect the user against the consequences of falling from the equipment.

Risk Puncture injuries and broken limbs.

Rationale Compliance with the requirements reduces the hazard.

Because the user is seated, the distance to which a user could fall is reduced. Accident statistics don’t show significant accidents in which users have been falling from this type of equipment.

9.12 Paragraph in Standard: 5.1 (Additional type requirements) Axial seesaw (Type 1)

Objective To protect the user and passing children against the effects of sudden shocks.

Risk Spinal injuries.

Rationale The measure of 140 mm shall ensure that the regardless of the lateral deviation of the beam it will always strike the damping mechanism when this is mounted in the ground.

Addendum The task group thinks that this requirement for damping does not meet the definition for damping.

9.13 Paragraph in Standard: 5.2 Multi-point seesaw / rocking equipment (Type 3A)

Objective To protect the users and passing children against unforeseen lateral movement of the equipment in relation to the mass of the equipment and the amount of users.

Risk Puncture injuries.

Rationale Compliance with the requirements reduces the hazards.

The choice of 5° seemed to be right.

9.14 Paragraph in Standard: 5.3 Rocking seesaw (Type 4)

Objective To protect the users and passing children against unforeseen axial movement of the equipment, in relation to the total mass of equipment and users.

Risk Puncture injuries and broken limbs.

Rationale Limitation of the range (e.g. max. 300 mm to both sides) of the movement reduces the **risk**. The limitation to the complete range was an agreed measure.

9.15 Paragraph in Standard: 5.4 Overhead axis seesaw (Type 6)

Objective To protect the user against the consequences of falling from the equipment and/or being violently hit by the central post (second **objective** is not mentioned in the text, only shown in Figure 12).

Risk Falling from the seat similar to swings, impact injuries from collision with the central post.

Rationale Limitation of the height and the maximum angle of the swinging part reduce the **risks**.

The measure of 20° is a help to define measuring points.

Addendum There are less written requirements in the clause than shown in Figure 12. When looking at the Figure 12, the measure of min. 230 mm as an absolute dimension indicates that „little a“ in Table 1 should be positioned to the values „optional“.

9.16 Paragraph in Standard: 5 and 6

See Part 1.

10 Part 7

10.1 General comment from the task group

Part 7 of the standard gives very helpful suggestions for installation, operation and maintenance. The clauses are different from the technical requirements for playground equipment given in the other parts in the standard. The principal reason is that in the majority of European countries national legislation exists which controls these aspects of playground operation.

It is a code of practice providing a framework to ensure at the minimum the equipment is installed, operated and maintained in a safe way.

10.2 Paragraph in Standard: 4.1 General

Objective protect the user from harm as a result of

— the equipment is being mounted or maintained;

— the shock absorbing surface is not yet installed;

— during inspection it is found that the operation reliability cannot be guaranteed.

Risk severe injuries in case of loose or breaking equipment parts, uncontrolled falls etc.

Rationale read in the clause.

10.3 Paragraph in Standard: 4.2

Objective protect the user from harm as a result of unorganised work related to maintaining the playground.

Risk severe injuries in case of unmaintained equipment etc.

Rationale recording helps to organize the work and documents that the necessary works have been carried out.

10.4 Paragraph in Standard: 5 Installation

Objective protect the user from harm as a result of not following guidance and provisions accordingly.

Risk severe injuries in case of loose or breaking equipment parts, uncontrolled falls, wrong installation etc.

Rationale not following guidance and provisions accordingly will evoke unsafe structural environment.

10.5 Paragraph in Standard: 6.1 Inspection and Maintenance

Objective protect the user from harm as a result of not following the maintenance instructions of the manufacturer.

Risk severe injuries in case of loose or breaking or corroded equipment parts, uncontrolled falls etc.

Rationale not following guidance and provisions accordingly will evoke unsafe structural environment.

10.6 Paragraph in Standard: 6.2

Objective protect the user from harm as a result of not following the inspection instructions of the manufacturer.

Risk severe injuries in case of loose or breaking or corroded equipment parts, uncontrolled falls due to corroded parts, worn parts or loosened parts etc.

Rationale inspections help to keep the site in a proper condition.

10.7 Paragraph in Standard: 6.3.1 (Specific recommendations) Reinforced materials

Objective protect the user from harm as a result of not following the inspection intervals especially for reinforced material.

Risk glas fibres sticking out of the surface of a reinforced material (slide e.g.) cause painful injuries when piercing or cutting the skin.

Rationale inspections help to foresee the expiration date of the gel coat of a laminate.

10.8 Paragraph in Standard: 6.3.2 One post equipment

Objective protect the user from harm as a result of not following the inspection intervals and procedures for one post constructions.

Risk equipment which is based on a single pole, if it fails will produce extreme danger for the users.

Rationale inspections help to foresee the wear of the supporting post, especially in the transition area between the ground and air.

10.9 Paragraph in Standard: 7.1 Inspection schedule

Objective protect the user from harm as a result of not organizing the inspection procedures.

Risk due to the special knowledge which is needed to examine playground equipment unorganised inspections procedures may lead to uncontrolled **risks** on the site.

Rationale avoid the **risks** of accidents on a site due to unorganised inspections.

10.10 Paragraph in Standard: 7.2

Objective protect the user from harm as a result of not securing the equipment during an inspection.

Risk if an inspection determines that parts or the whole equipment have to be replaced, unsecured or unblocked access might cause severe accidents.

Rationale closing down or dismantling an equipment make a site safe during maintenance works.

10.11 Paragraph in Standard: 8.1.1 (Operation) General recommendations

Objective protect the user from harm as a result of not following all of the instructions of the manufacturer.

Risk severe injuries in case of loose or breaking or corroded equipment parts, uncontrolled falls, wrong installation, wrong inspections etc.

Rationale as the manufacturer normally has the best equipment expertise his instructions are essential.

10.12 Paragraph in Standard: 8.1.2

Objective protect the user from harm as a result of not organizing the safety management.

Risk severe injuries in case of unorganised operated playgrounds.

Rationale in order to control the open **rationale** sequences on a playground it is necessary to set up an organization system.

10.13 Paragraph in Standard: 8.2.1 (Specific recommendations) Assessment of safety measures

Objective protect the user from harm as a result of not controlling all safety installations on a playground site minimum once a year.

Risk severe injuries in case of wrong inspections, wrong maintenance etc.

Rationale routine check ups may not detect faults in safety installations, therefore an intensive examination of these parts is necessary to maintain the safety level.

10.14 Paragraph in Standard: 8.2.2 Personnel

Objective protect the user from harm as a result of not using the required knowledge about playground equipment.

Risk severe injuries in case of wrong installation, wrong inspections, wrong maintenance etc.

Rationale people working as maintenance, inspection or installation personal need to have a level of training appropriate to the task.

10.15 Paragraph in Standard: 8.2.3 Documentation

Objective protect the user from harm as a result of not having a written documentation about the playground equipments.

Risk as a consequence of changing personal missing documents may lead to a lack of knowledge.

Rationale organized documentation ensures the controlled operation of a site.

10.16 Paragraph in Standard: 8.2.4 General safety measures

Objective protect the user from harm as a result of not having common safety precautions.

Risk missing information may lead to situations in which help may come too late.

Rationale in case of an accident people forget about appropriate behaviour or do not have the knowledge and thus should have some written advice and help can come quicker.

8.2.5 – 8.2.9 self-explanatory.

11 Part 10

11.1 Paragraph in Standard: 4.2.1 (Emergency procedures and fire safety management) Materials including flammability

Objective protect the user from harm as a result of burning materials.

Risk smoke poisoning, flash burns on plastics, drops of burning plastic, exposure to heat, smoke or flames.

Rationale following given standards make contained equipment more safe.

11.2 Paragraph in Standard: 4.2.2.1 (Evacuation) Accessibility for adults

Objective protect the user from harm as a result of missing help by others.

Risk in a contained play area some users might face situations where they need help to get out.

Rationale to avoid panic and to provide support for a helpless user access for adults should be possible.

11.3 Paragraph in Standard: 4.2.2.2 General requirements for entrapment of the whole body

Objective protect the user from harm as a result of being trapped by the construction.

Risk tunnel may cause traps from which children cannot escape and can panic.

Rationale children shall be able to leave an equipment without help. Help from adults shall also be possible.

11.4 Paragraph in Standard: 4.2.2.3 Evacuation routes

Objective protect the user from harm as a result of being hurt during a panic, a fire alarm, etc.

Risk contained equipments are often installed in buildings. as in many cases these playgrounds are used by many children at the same time a panic would lead to injuries if the capacity of the escape ways is not high enough.

Rationale it is necessary that a site can be evacuated in a short time. Therefore, the escape ways have to be wide enough to let the users get out in a short time.

11.5 Paragraph in Standard: 4.2.2.4 Evacuation slide

Objective protect the user from harm as a result of being hurt during a panic, a fire alarm, etc.

Risk escape slides that end far away from an exit (exit of a building? exit of the structure does not make sense) will not have the function as evacuation slides.

Rationale it is necessary that an evacuation can be carried out in a short time. Therefore, the distance from the end of a escape slide to an (emergency)-exit shall be short.

11.6 Paragraph in Standard: 4.2.2.5 Distance to the exit

Objective protect the user from harm as a result of being hurt during a panic, a fire alarm, missing support from others etc.

Risk structures too huge will make it difficult to leave the site in case of an alarm or in case an adult should provide help for a child.

Rationale a dimension of 18 m as the largest distance to the next exit of a structure was regarded as safe enough.

11.7 Paragraph in Standard: 4.2.2.6 Access and egress and 4.2.2.7 Capacity

Objective protect the user from harm as a result of being hurt during a panic, a fire alarm, missing support from others or a sudden evacuation situation etc.

Risk structures too huge or escape ways too small will make it difficult to leave the site in case of an alarm or in case an adult should provide help for a child.

Rationale according to the size of a structure the layout of escape ways and escape exits can be calculated with the help of the capacities given in the table.

11.8 Paragraph in Standard: 4.3.1 (Design and manufacture) Structural integrity

Objective protect the user from harm as a result of breaking down of the equipment.

Risk severe injuries may occur if a play structure or parts of it collapse during use.

Rationale equipment designed according to the methods described in part 1 will be structurally suitable.

Calculation has to be done under „worst case scenario“.

11.9 Paragraph in Standard: 4.3.2.1 (Impact protection) Free height of fall and 4.3.2.2 Impact attenuating surfacing (IAS)

Objective protect the user from harm as a result of falling onto an impact area.

Risk severe injuries caused by falls onto inappropriate impact absorbing surface.

Rationale minimum measures for the thickness and quality of the impact absorbing surface shall guarantee that falls of the user follow defined conditions.

11.10 Paragraph in Standard: 4.3.3 External climability

Objective protect the user from harm as a result of falling onto an impact area.

Risk severe injuries may be caused by falls.

Rationale limiting the climbing height reduces the **risk** of injuries when falling.

11.11 Paragraph in Standard: 4.3.4.1 – 4.3.4.3 Visibility

Objective protect the user from harm as a result of inadequate supervision possibilities.

Risk if the personal can't supervise the play activities users can get into situations when help is needed but will come too late.

Rationale contained play structures make it difficult to provide quick help. They need to supervise and the personal needs to have a good overview into all play areas.

11.12 Paragraph in Standard: 4.3.5.4 (Determination of spaces and areas), Free space

Objective protect the user from harm during a forced movement on the equipment.

Risk while undergoing a forced movement the user could be injured or entrapped by parts that extend into the space the body of the user passes through.

Rationale the cylinder method allows the easy test of the construction regarding forced movement.

The cylinder method helps to design the free space for a safe use of equipment with forced movement.

11.13 Paragraph in Standard: 4.3.6 Connections

Objective protect the user from harm as a result of collapsing equipment parts.

Risk falls or other injuries can occur.

Rationale loosening of connecting parts may cause a collapse of equipment parts or the equipment itself. Under use this situation could be dangerous for the users. Secured connection parts ensure integrity of the equipment between maintenance intervals.

11.14 Paragraph in Standard: 4.3.7 Rope features

Objective protect the user from harm using ropes.

Risk abrasions, strangulation, entrapments.

Rationale the wording of this clause is somehow porous as there are no measurements given.

The clause is more about that one should apply good craftsmanship when fabricating rope equipment.

11.15 Paragraph in Standard: 4.3.8 Lighting

Objective protect the user from harm when being near lighting elements, protect lighting elements.

Risk electric shock, burns of skin.

Rationale self-explanatory.

11.16 Paragraph in Standard: 4.4 ff. Specific equipment

Special equipment generally speaking has to follow the rules of the other parts of the standard, with some exceptions:

— access for slides shall be closed if there is no personal for qualified supervision.

— the starting section shall have a length of 1 m (why?).

— the inclination of slides may exceed the dimensions of part 3 up to 15 degrees (why?).

— the safety clearance at the run out section of a slide can be reduced to 1 m if the users stops before the end of the run out section.

— the shock absorbing area beneath a runway shall be designed for a falling height of 1 m

11.17 Paragraph in Standard: 4.4.3.1 ball pools

Objective protect the user from harm when passing by balls fallen out of the pool.

Risk the user outside of a ball pool may slip and fall.

Rationale porous wording in this clause.

11.18 Paragraph in Standard: 4.4.3.2 surfacing

Objective protect the user from harm when falling or jumping into the pool.

Risk often these pools are landing stations at the end of a platform and children jump into the pool. So the surfacing has to be adequate.

Rationale same requirements for shock absorbing surface as in other parts of the standard.

11.19 Paragraph in Standard: 4.4.3.3

Objective protect the user from bacteriological infection when getting in contact with the side surfaces.

Risk assumed that children spread bodily fluids in ball pools or drinks they carry with them this would cause bacteriological growth on the balls and the side surfaces.

Rationale easy cleaning which is carried out periodically prevents the growth of bacteria.

11.20 Paragraph in Standard: 4.4.3.5

Objective protect the user from being hurt by others jumping into the pool.

Risk if the user is completely covered with balls other children cannot see him and may jump on his back or head.

Rationale limiting the filling height shall reduce the **risk** of being unexpected hit by others.

11.21 Paragraph in Standard: 4.4.3.6

Objective protect the user from suffocation.

Risk if the balls in a pool are so small the user could put them into his mouth he could choke on these.

Rationale limiting the diameter to min. 70 mm reduces the **risk** of suffocation.

11.22 Paragraph in Standard: 4.4.3.7

Objective protect the user from being hurt by others jumping into the pool.

Risk jumping children may jump on others back or head or they may hit the surface underneath the balls.

Rationale limiting the falling height from adjacent platforms shall reduce the **risk** of fall accidents.

12 Part 11

12.1 Paragraph in Standard: 4.1 (Safety requirements) Protection against falling in spacial networks

Objective protect the user from harm as a result of falling through the network.

Risk severe injuries in case of uncontrolled falls.

Rationale use of the cylindrical principle (anthropometric data) prevents this special **risk**/ see the note.

12.2 Paragraph in Standard: 4.2 Mesh size in 3-dimensional arranged planar nets

Objective protect the user from harm as a result of falling through the network.

Risk severe injuries in case of uncontrolled falls.

Rationale use of the cylindrical principle (anthropometric data) prevent this special **risk** / see note.

12.3 Paragraph in Standard: 4.3 Protection against injuries in the falling space

Objective protect the user from harm as a result of falling off from the network.

Risk severe injuries in case of uncontrolled falls.

Rationale apply requirements from part 1 / see notes.

Falls on inclined rigid elements are less dangerous than falls on horizontal elements or surfaces because the inclination dissipates the impact energy into a horizontal and vertical component.

12.4 Paragraph in Standard: 4.4 Converging parts

Objective protect the user from harm as a result of entrapment.

Risk head / body entrapment.

Rationale it has been forgotten to exclude the requirement from EN 1176-1:2008, 4.2.7.1 related to the converting angles less than 60°.The excluding of EN 1176-1:2008, 4.2.7.2 b) means that a) is still valid, so the use of the probes C, D, E from EN 1176-1:2008, D is accepted but not the use of the probe from Figure D.2 Annex D part 1.

The spacial network offers more opportunity for body support and the **risks** of entrapment are reduced.

12.5 Paragraph in Standard: 5 and 6

See Part 1.

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[1] ASTM F1487, *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use*

[2] DIN 7926, *Playground equipment for children*

[3] EN 71-8, *Safety of toys - Part 8: Activity toys for domestic use*

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