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Collection of rationales for EN 1176 — Requirements

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Sammlung von grundsätzlichen Überlegungen zur EN 1176 - Anforderungen

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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.

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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.

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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.

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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.

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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**).

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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:

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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.

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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.

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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.

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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.

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