PD CEN/TR 16598:2023

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Collection of rationales for EN 1176 — Requirements

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National foreword

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

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Sammlung von grundsätzlichen Überlegungen zur EN 1176 - Anforderungen

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European foreword

This document (CEN/TR 16598:2023) 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.

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

This document supersedes CEN/TR 16598:2014.

In comparison with the previous edition, the following technical modifications have been made:

— Clause 4 – Content has been updated to reflect the changes listed in EN 1176-1:2017 European Foreword

— Clause 5 - Content has been updated to reflect the changes listed in EN 1176-2:2017 European Foreword

— Clause 6 - Content has been updated to reflect the changes listed in EN 1176-3:2017 European Foreword

— Clause 7 - Content has been updated to reflect the changes listed in EN 1176-4:2017 European Foreword

— Clause 9 - Content has been updated to reflect the changes listed in EN 1176-6:2019 European Foreword

— Informative Annex A “Template for comments/requests regarding the rationales for specific clauses of the EN 1176 series” added

— Informative Annex B “Tools for better understanding Stage 2 and 4” added.

This document is intended to be read in conjunction with EN 1176 (all parts).

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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Introduction

To better control the development of EN 1176, CEN TC 136 SC1 has produced a template for the submission of comments or requests for change to the standard. An example of the template can be found in Annex A.

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 foresee and comprehend a risk.

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

In consideration of this, the task group chose 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 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 because 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 (e.g. 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;

c) standard issues:

   1) man-made playground equipment is necessary because urban environments may not offer natural play facilities. Therefore, this kind of equipment is meant to advance the development of the child.

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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.

The 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.

This technical report does not review the annexes of the different parts of the standard EN 1176.

There is no overlap with EN 71-8.

In order to create a common consciousness of the standard the task group rationales recommend considering the following SC1 statement:

‘A strong principle of EN 1176 is to accept that some risks offer a strong benefit to users in their development. These are usually those that are apparent/foreseeable and offer excitement and challenge to the provision’.

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1 Scope

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
objective
intention of the clause in the standard

3.2
risk
possible outcome for the user if the objective is not achieved

3.3
rationale
reason for making this specific requirement

Note 1 to entry: Rationales may be given in the notes given in the requirements. This is mentioned in the document.

3.4
addendum
additional comments and remarks

4 Part 1

4.1 Paragraph in standard: 4.1.2 Flammability

Objective: 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.

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

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

Addendum: as a natural material, wood will crack as part of the drying process but 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.

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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 ingestion; 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.

Addendum: 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 equipment collapse.

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 adults.

Risk: children may become trapped or pass out.

Rationale: adults 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 adults 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 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 from 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, with emphasis on younger users who require greater protection.

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 three-dimensional grip provides a better possibility to secure himself.

Addendum: the difference between grip and grasp is, 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.

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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 cannot 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

a) Completely Bound Openings

Objective: protect the user's 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 user's head and neck shall be protected. The anthropometric basis for the EN 1176 tools are:

- The 89 mm dimension of the torso probe equals the fifth percentile value of 7 to 9 month old babies' chest depth (Childata – Snyder 1975).

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- The 230 mm dimension of the large head probe is in excess of the ninety fifth percentile head length (dimension from forehead to back of head) of an 18 year old. Pictures No. 394 (chest depth) and 10 (head length).

b) Partially Bound and V Shaped Openings

Objective: protect the user's 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 user's head and neck shall be protected. The anthropometric basis for the EN 1176 tool is:

- The 45 mm dimension represents a 25 % compression of the fifth percentile of 2 to 3.5 year old's neck (Childata – Snyder 1977). Picture No. 393.
- The 155 mm dimension represents the ninety seventh percentile head breadth of a 12 year old (Childata – Pheasant 1988). Picture No. 12.

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 user's 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.

When EN 1176 was first drafted most children's clothing, and in particular jackets and anoraks, had continuous cords around the necks and hoods with significant strength and certainly enough to support a hanging child. However today (2021) the greatest risk is from older clothing which does not have modern break away cord designs. Therefore the risk is diminishing year on year as this clothing is disposed of.

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: tunnels may create traps from which children cannot escape and cause panic; heavy moving parts may crush the user.

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