SLOVENSKI STANDARD
SIST EN 17088:2021

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Sistemi prezračevanja stranskih zaves - Varnost

Side curtains ventilation systems - Safety

Lüftungssysteme mit Seitenvorhang - Sicherheit

Systèmes de ventilation à rideau latéral - Sécurité

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ICS:

65.040.10	Poslopja, naprave in oprema za živino	Livestock buildings, installations and equipment
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning systems

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Side curtain ventilation systems - Safety

Systèmes de ventilation à rideau latéral - Sécurité

Lüftungssysteme mit Seitenvorhang - Sicherheit

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 17088:2021) has been prepared by Technical Committee CEN/TC 422 “Side curtains ventilation systems - safety”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2022, and conflicting national standards shall be withdrawn at the latest by January 2022.

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 has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2006/42/EC.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

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

Introduction

In 2010, there was a fatal accident when a child of a farmer was trapped by an automatic stable display. This accident happened both in the Netherlands and Belgium.

This accident triggered some Dutch experts to use the existing Dutch Technical Agreement NTA 8344: 2012 “Side curtains – Safety” for the development of the first European Standard “Side systems curtains ventilation systems – Safety”.

This standard is a type-C standard as specified in EN ISO 12100:2010.

The machinery concerned and the extent to which hazards are covered are indicated in the scope of this standard. These hazards are specified to the Side curtains ventilation systems.

Where provisions of this type C are different from those which are stated by type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

In order to make the objective of this concept clear and eliminate uncertainties when reading it, the following assumptions are made:

a) components without specific requirements are components

   1) designed according to the common design and calculation methods, including all failure mechanisms;

   2) of a solid mechanical and electrical construction;

   3) manufactured from sufficiently strong material with a suitable quality;

   4) of which general electrical hazards are dealt with by application of the standards for electrical installations, such as EN 60204-1:2018;

b) with the exception of the following provisions, is a mechanical supply built according to the requirements of good craftsmanship and the requirements in this standard concept:

   1) agreements between the manufacturer and the buyer about the special conditions of use, and place where the screen is used in connection with health and safety;

   2) the location of the installation will be suitable for this;

   3) the place of installation will allow a safe use of the screen.

These assumptions do not limit the need for sufficient information in this concept standard before use.

1 Scope

1.1 General

This document specifies the standardization of side curtain ventilation systems as defined in 3.1. This document specifies the safety aspects and performance. Included are machines that operate using the potential energy stored by the earlier application of human or animal force, such as stretched springs.

This document addresses the following significant hazards associated with side curtain systems:

— crushing;

— cutting or severing;

— drawing-in or trapping;

— entanglement;

— shearing;

— suffocation;

— electrocution and shock;

— incorrect design, location or identification of control devices.

1.2 Exclusions

This document does not apply to the following, which are intended for a different use:

— doors and side curtains when used as doors which are specified in EN 13241:2003+A2:2016;

— systems inflated by air;

— screens supplied for the control of fire or smoke;

— screens that move instantaneously upon the application of human force;

— side curtains when used to control ventilation conditions in a toxic or explosive environment.

This document is not applicable to side curtain ventilation systems manufactured before the date of its publication.

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 1991-1-4:2005[1)], *Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions*

EN 14717:2005, *Welding and allied processes - Environmental check list*

1) As impacted by EN 1991-1-4:2005/A1:2010.

EN 60204-1:2018, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016)*

EN IEC 61000-6-2:2019, *Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments (IEC 61000-6-2:2016)*

EN 61000-6-3:2007[2)], *Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:2006)*

EN 62061:2005[3)], *Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005)*

EN ISO 12100:2010, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2015, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13849-2:2012, *Safety of machinery - Safety-related parts of control systems - Part 2: Validation (ISO 13849-2:2012)*

EN ISO 13850:2015, *Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015)*

EN ISO 13857:2019, *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

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

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

3.1
side curtain ventilation systems
systems supplied for environmental control, installed on farm buildings, that use a barrier made from a flexible foil or fabric which moves via a rolling or folding action, or rigid panels that slide

3.2
automatic control
action where the screen is operated without human intervention

2) As impacted by EN 61000-6-3:2007/A1:2011.

3) As impacted by EN 62061:2005/A1:2013 and EN 62061:2005/A2:2015.

3.3
environmental aspect
element of an organization's activities or products or services that can interact with the environment

Note 1 to entry: A significant environmental aspect has or can have a significant environmental impact.

[SOURCE: EN ISO 14001:2015, 3.2.2 – modified, Note 1 to entry has been modified and Note 2 to entry has been deleted.]

3.4
environmental impact
change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects

[SOURCE: EN ISO 14001:2015, 3.2.4]

3.5
folded screen
curtain which is mounted in such a way when opened it is folded

Note 1 to entry: In Annex A, some versions of side curtain ventilation systems with their operating principles are mentioned.

3.6
life cycle assessment
LCA
compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle

[SOURCE: CEN/TR 13910:2010, 3.1]

3.7
moveable curtain
automatically- or manually-operated, mechanical- or electric-powered protection against, among other things, weather influences, capable of moving

Note 1 to entry: The curtain has a power drive: this can be mechanical, electrical, pneumatic or hydraulic.

3.8
packaging
all items made of any material of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer

Note 1 to entry: In this report, the goods are referred to as “packaged product” or “product”, in order to distinguish it from the packaging.

[SOURCE: CEN/TR 13910:2010, 3.5]

3.9
prevention of pollution
use of processes, practices, techniques, materials, products, services or energy to avoid, reduce or control (separately or in combination) the creation, emission or discharge of any type of pollutant or waste, in order to reduce adverse environmental impacts

Note 1 to entry: Prevention of pollution can include source reduction or elimination, process, product or service changes, efficient use of resources, material and energy substitution, reuse, recovery, recycling, reclamation and treatment.

[SOURCE: EN ISO 14001:2015, 3.2.7]

3.10
rigid panel
vertical lifting panel for ventilation purposes manually and/or power operated and interlinked by a flexible device (e.g. cable, chain, rope…)

Note 1 to entry: The rigid panel is installed on the wall of a building.

3.11
roller blind
rollable curtain where the screen rolls on a tube during opening and closing

3.12
integrated safety component
component which fulfils a safety function within the completed machine and cannot be separated from machinery without modification in the design, therefore cannot be independently placed on the market

3.13
single rolling curtain
rolling element of the curtain, usually at the lower extremity of the curtain, takes in a single foil as it rotates, as shown in Annex A Type D, Type F and Type H

3.14
double rolling curtain
rolling element of the curtain, usually situated in the centre of the curtain, takes in two foils as it rotates, as shown in Annex A Type E, Type G and Type I

3.15
pulse action
amount an automated side curtain will be driven in a continuous movement before stopping

3.16
pause interval
period of time an automated side curtain will remain stationary between two pulse actions

4 List of hazards

This clause contains all the significant hazards, risk areas and hazardous situations and events as far as they are dealt with in this document, identified by risk assessment performed according to EN ISO 12100:2010 as significant for this type of machinery and which require action to eliminate or reduce the risk. See Annex C, Table C.1.

5 Requirements

5.1 General

Machinery shall comply with the safety requirements and/or protective/risk reduction measures of this clause. In addition, the machine shall be designed according to the principles in EN ISO 12100:2010 for relevant but not significant hazards which are not dealt with by this document.

The manufacturer shall perform a risk analyses, assessment and reduction process. For an example how to perform such a process, see Annex E.

5.2 Mechanical requirements

5.2.1 General

Side curtain systems shall be designed and constructed so that they are capable of being installed, maintained, repaired, used and dismantled in a safe manner.

5.2.2 Mechanical strength

The side curtain and its components, including its fixings for attachment to the building, shall be designed so that, during normal operation, no part of the system, including the fixings, shall be permanently deformed.

The side curtain shall be designed so that elastic deformations under operational forces or torques which occur during normal use do not affect the function of the system.

The design shall be in accordance with recognized engineering stress/yield calculations or test methods using adequate safety factors, see Table 1, taking into account the most unfavourable static and dynamic forces occurring during the operating cycle or the use of the safety equipment within the side curtain.

Table 1 — Safety factors

Loading conditions	Safety factors for calculation purposes	Safety factor for testing purposes
Stress due to differential pressure	1,5 min breaking stress	1,0
Stress due to other loads (e.g. dead weight)	1,5 min breaking stress	1,0

5.2.3 Resistance to wind load

The resistance to wind load of a side curtain is its capacity to withstand a specified differential wind pressure.

NOTE The construction of the side curtain system depends on the pressure of a number of factors including, e.g. the maximum wind speed anticipated in the area, the location, height, size and shape of the building, and the position of the side curtain on the building.

When definite wind load classes or pressures are not stated by the specifier, side curtains shall be designed in order to resist specified differential wind pressure, and shall be classified with the wind load classes as specified in Annex F. See Figure F.1 for a typical wind map of Europe.

The requirements of this clause apply to the ability of the closed side curtain and not to their ability to be opened or closed under wind load.

For correct operation of side curtains, the manufacturer shall state the maximum wind speed (within the operating instructions, 5.9.4) where the system can be operated without risk of failure of the system.

The deflection of the curtain or other elements resulting from the differential pressure specified shall not cause permanent deformations which will affect the functioning of the system or create any risk of jamming.

5.2.4 Steel wire ropes, synthetic ropes, and straps

5.2.4.1 General

Steel wire ropes, synthetic ropes, and straps, etc. shall be suitable for the intended application with regards to strength, durability and corrosion resistance.

For suspension elements, a single wire rope, synthetic rope, or strap, etc. can only be used if a failure of the element will result in the curtain falling under gravity in a safe manner, i.e. the falling curtain will be restrained in a controlled manner that would not expose people near to it to increased risk of crushing, shearing, entanglement, drawing-in or trapping.

Where two or more suspension elements are used, it shall be ensured that the dead loads are shared in a pre-determined way.

The guaranteed minimum breaking strength of such a suspension element determined by calculations of the maximum load it has to support, multiplied by the safety factor (Table 1).

All such suspension elements shall have terminations and/or joints with a breaking load of no less than 90 % of that of the element, or a suspension element safety factor design working load. Terminations on a drum shall always have a minimum of two full turns left on a drum in the terminal position. Measures shall be taken to ensure that terminations cannot be accidentally detached.

Where such suspension elements enter grooves on drums or pulleys, the design shall ensure that the elements are aligned correctly to allow entry of the suspension elements.

Suspension element drums mounted up to a height of 2,7 m above floor level or another permanent level shall be fitted with a guard.

5.2.4.2 Steel wire ropes

For steel wire ropes, where failure of the rope would result in increased levels of risk to crushing, shearing, entanglement, drawing-in or trapping:

— each steel wire rope shall have a safety factor of no less than 6 (minimum breaking strength/static load);

— rope pulleys and rope drums shall have a pitch circle diameter (P.C.D.) at least equal to 20 times the rope diameter;

— rope drums shall be grooved, and the ropes coiled in only one layer;

— rope pulleys shall be designed so that the steel wire rope cannot jump out of the pulley.

Steel wire ropes used commonly in systems typically will not result in increased levels of risk, i.e. if the curtain falls down in safe manner (e.g. within the wind bracing). For steel wire ropes where failure of the rope would not result in increased levels of risk:

— each steel wire rope shall have a safety factor of no less than 3 (minimum breaking strength/static load);

— rope pulleys and rope drums which have a pitch circle diameter (P.C.D.) less than 20 times the rope diameter shall be tested so as to ascertain the number of cycles until failure of the cable when

supporting the design load. This number of cycles shall then be used in calculating the service life of the rope, and this then stated in the operating instructions, 5.9.4, to the end user.

5.2.4.3 Synthetic ropes and straps

For a synthetic rope or strap where failure of the rope would result in increased levels of risk to crushing, shearing, entanglement, drawing-in and trapping, the rope or strap shall have a safety factor not smaller than 6 (minimum breaking strength/static load).

For a synthetic rope or strap where failure of the rope would not result in increased levels of risk, the rope or strap shall have a safety factor not smaller than 3 (minimum breaking strength/static load).

5.2.5 Mechanical durability

A side curtain is subject to dynamic forces both from weather and from the curtain itself moving. The manufacturer of the system shall consider the presence of these dynamic forces when specifying components and fixings within the product.

The mechanical performance of the side curtain shall be ensured, subject to prescribed maintenance, for a number of operational cycles or a minimum time period when operated automatically, to be declared by the manufacturer.

5.2.6 Protection against cutting and abrasion

There has to be protection against cutting and shearing, either with guarding the dangerous zones or using combinations of risk reducing methods. A speed of $v < 33$ mm/s is seen as safe against cutting and shearing with adult persons. With children, the combination of a speed of $v < 33$ mm/s and pulse-pause (5.4.4.2) in automatic mode, the risk is effectively minimized.

As far as their purpose allows, accessible parts of the machinery shall have no sharp edges, no sharp angles and no rough surfaces which are likely to cause injury.

5.2.7 Mechanical maintenance

5.2.7.1 General

The following requirements for through life maintenance of the side curtain shall be adhered to in the design of the system. Subclause 5.9 details the documentation required to advise the end user of when and how the system will need to be maintained to ensure through life safe operation.

5.2.7.2 Machinery maintenance

Adjustment and maintenance points shall be located outside of danger zones. It shall be possible to carry out adjustment, maintenance, repair, cleaning and servicing operations while the system is at a standstill. The machine has to be cut off from the energy supply and any remaining or stored energy discharged.

Components that may have to be changed routinely throughout the operating life of the system (stated in the maintenance instructions, 5.9.6) shall be capable of being removed and replaced easily and safely. Access to the components shall enable these tasks to be carried out with the necessary technical means in accordance with a specified operating method.

5.2.7.3 Access to workplaces and servicing areas

The side curtain shall be designed and constructed in such a way as to allow safe access to all areas where intervention is necessary during operation, adjustment and maintenance.

Fixed guards shall be used to protect people from hazards when in general operation which are then required to be removed for maintenance purposes. Such guards will conform to the requirements referred to in 5.4.4.3.

5.2.7.4 Disconnecting power sources

The machine shall be fitted with mechanisms with which it can be disconnected from each of its power sources. These mechanisms shall be clearly identified. It shall be possible to lock them if the reconnection could endanger people exposed to this risk. It shall also be possible to lock the mechanism if an operator is unable to check that the power is still cut off from any of the locations where he should be.

5.2.7.5 Energy supply other than electricity

When a machine comprises, drives or stores energies other than electricity, this shall be designed, constructed and defined in such a way that all potential risks involved are excluded.

Forms of energy other than electricity can be:

— potential energy from static forces;

— linetic energy from dynamic forces;

— energy stored in springs; or

— kinetic or potential energy from wind, snow or ice load present at the time.

It shall be possible to discharge the remaining or stored energy that may be present after disconnecting the machine, without endangering the persons exposed to this risk.

Notwithstanding the requirement given in 5.2.7.4, certain circuits may remain connected to their energy sources in order, for example, to hold parts in place, to protect information, light interiors and so on. In this case, special precautions shall be taken to ensure the safety of the operators.

5.3 Requirements for moving parts (excluding drawing-in points)

The mechanical features of a side curtain shall be designed so that the risk to the operator and adjacent persons of crushing, shearing, entanglement, and trapping is eliminated as far as possible.

Closing gaps which are accessible during the curtain movement shall be eliminated or guarded up to a height of 2,7 m above floor level or other permanent access level.

The movement of the side curtain towards its end positions, and potential hazardous overrunning of the end positions needs to be considered.

5.4 Requirements for drawing-in points

5.4.1 General

To determine the necessary protective measures required for an identified drawing-in point, a number of factors have to be considered. These factors and conditions (referred to in Annex C, C.2.2 degree of automation) each influence the associated level of risk involved with the drawing-in point.

The following 5-stage process shall be used to evaluate the technical conditions for the drawing-in point which can then be combined to detail the minimum protective measures that shall be applied.

Stage 1: Define the degree of automation of the side curtain, subclause C.2.2

Stage 2: Define the type of material creating the drawing-in point, subclause 5.4.2

Stage 3: Define the type of person in contact with the drawing-in point, subclause 5.4.3

Stage 4: Consider which of the protection methods available are applicable for the drawing-in point, subclauses 5.4.4 and 5.4.5