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Machines for the manufacture of constructional products from concrete and calcium-silicate - Safety - Part 1: Common requirements

Maschinen für die Herstellung von Bauprodukten aus Beton und Kalksandsteinmassen - Sicherheit - Teil 1: Gemeinsame Anforderungen

Machines pour la fabrication de produits de construction en béton et silico-calcaire - Sécurité - Partie 1: Exigences communes

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This European Standard was approved by CEN on 12 May 2000.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 151 "Construction equipment and building material machines - Safety", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by December 2000, and conflicting national standards shall be withdrawn at the latest by December 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

The series "Machines for the manufacture of constructional products from concrete and calcium-silicate - Safety" consists of the following parts:

Part 1: Common requirements

Part 2: Block making machines

Part 3: Slide and turntable machines

Part 4: Concrete rooftile making machines

Part 5: Pipe making machines

Part 6: Stationary and mobile equipment for the manufacture of precast reinforced products

Part 7: Stationary and mobile equipment for the benched manufacture of prestressed products

Part 8: Machines and equipment for the manufacture of constructional products from calcium-silicate (and concrete).

The Annex A is informative and contains "Machines for the manufacture of constructional products from concrete and calcium silicate", Annex B is informative and contains "Guarding examples".

Introduction

This European Standard is a Type C-standard as stated in EN 1070:1998.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in 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.

Reference to pertinent standards mentioned above is made where requirements of such standards are relevant.

1 Scope

1.1 This European Standard applies to machines for the manufacture of constructional products from concrete and/or calcium silicate examples of which are listed in annex A of this part. It gives concepts and general and common requirements for the design, operation and maintenance of such machines.

1.2 This European Standard deals with the hazards listed in clause 4 which can arise during the operation and maintenance, including the interfaces, of the machines for the manufacture of constructional products from concrete and calcium silicate, when carried out in accordance with the specifications given by the manufacturer or his authorised representative.

Parts 2 to 8 of this standard give additional specific requirements and therefore have to be applied together with this part.

1.3 The preparation of concrete and/or calcium-silicate mixture and the transport from the mixer to the manufacturing plant are not part of this European Standard (see prEN 12151:1995). The equipment for the transport and handling of formed products, other than the integrated transport systems, is not covered by this standard.

1.4 Those hazards that are relevant for all mechanical, electrical, pneumatic, hydraulic or other equipment of machinery and that are dealt with in standards for common use (Type A, B1 and B2 standards) are not covered by this European Standard.

1.5 At the time of drafting, machine specific noise test codes for prEN 12629-2 to -8 are not available to fulfil the requirements of 5.7.2 and 7.4.2. When they are available, they will be incorporated in these standards.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1:1991, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology*

EN 292-2:1991+ A1:1995, *Safety of machinery - Basic concepts - General principles for design - Part 2: Technical principles and specifications*

EN 294:1992, *Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs*

EN 349:1993, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body*

EN 418:1992, *Safety of machinery - Emergency stop equipment, functional aspects - Principles for design*

EN 457:1992, *Safety of machinery - Auditory danger signals - General requirements, design and testing*

EN 547-1:1996, *Safety of machinery - Human body measurements – Part 1: Principles for determining the dimensions required for openings for whole body access into machinery*

EN 547-2:1996, *Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings*

EN 547-3:1996, *Safety of machinery - Human body measurements – Part 3: Anthropometric data*

EN 574, *Safety of machinery - Two hand control devices – Functional aspects - Principles for design*

EN 614-1:1995, *Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles*

EN 626-1:1994, *Safety of machinery - Reduction of risks to health from hazardous substances emitted by machinery - Part 1: Principles and specifications for machinery manufacturers*

EN 811:1996, *Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs*

EN 894-1:1997, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 1: General principles for human interactions with displays and control actuators*

EN 894-2:1997, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 2: Displays*

EN 894-3:2000, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 3: Control actuators*

EN 953:1997, *Safety of machinery – Guards - General requirements for the design and construction of fixed and movable guards*

EN 954-1:1996, *Safety of machinery – Safety-related parts of control systems - Part 1: General principles for design*

EN 982:1996, *Safety of machinery - Safety requirements for fluid power systems and their components - Hydraulics*

EN 983:1996, *Safety of machinery - Safety requirements for fluid power systems and their components – Pneumatics*

EN 999, Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body

EN 1037:1995, Safety of machinery - Prevention of unexpected start-up

EN 1070:1998, *Safety of machinery - Terminology*

EN 1088, *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection*

prEN 12437-1:1996, *Safety of machinery - Permanent means of access to machines and industrial plants - Part 1: Choice of a fixed means of access between two levels*

prEN 12437-2:1996, *Safety of machinery - Permanent means of access to machines and industrial plants - Part 2: Working platforms and walkways*

prEN 12437-3:1996, *Safety of machinery - Permanent means of access to machines and industrial plants - Part 3: Stairways, stepladders and guard-rails*

prEN 12437-4:1996, *Safety of machinery - Permanent means of access to machines and industrial plants - Part 4: Fixed ladders*

EN 60204-1:1997, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:1997)*

EN 61310-1:1995, *Safety of machinery - Indicating, marking and actuation - Part 1: Requirements for visual, auditory and tactile signals (IEC 61310-1:1995)*

EN 61496-1:1997, *Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests (IEC 61496-1:1997)*

EN ISO 3746:1995, *Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995)*

EN ISO 11204:1995, *Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Method requiring environmental corrections (ISO 11204:1995)*

EN ISO 11688-1:1998, *Acoustics – Recommended practice for the design of low- noise machinery and equipment - Part 1: Planning (ISO /TR 11688-1:1995)*

3 Definitions

For the purposes of this European Standard, the definitions stated in EN 1070:1998 apply.

Additional definitions specifically needed for prEN 12629 series are given below:

3.1
products
constructional items manufactured from concrete or calcium silicate

3.1.1
blocks [bricks]
generally cuboid product made from concrete or calcium silicate. They are used in the construction of buildings for example, and can be solid or hollow

3.1.2
concrete kerbs unit
unit of precast concrete (see prEN 1340:1993), intended to separate surfaces of the same or different level to provide:

— physical or visual declination or containment;

— drainage channels, either on their own or in combination with other units;

— separation between surfaces submitted to different kinds of traffic.

3.1.3
concrete flag
precast concrete unit (see prEN 1340:1993) used as a surfacing material that satisfies the following conditions:

— overall length does not exceed 1 m;

— overall length divided by its thickness is greater than four.

3.1.4
element
generally cuboid product of calcium silicate bigger than a block used in the construction of buildings

3.1.5
constructional element
generally large product that is manufactured from concrete or calcium silicate, with or without reinforcement material forming an integral part used in the construction of buildings, bridges, roads

3.1.6
roof or wall tile
thin slab of concrete for external application to roofs and walls

3.1.7
Pipe
cylindrical or cuboid hollow body manufactured of concrete to convey liquids

3.1.8
prestressed concrete product
prestressed concrete product incorporating tensioned elements

3.1.9
reinforced concrete product
reinforced concrete product incorporating reinforcing elements which are not tensioned

3.2
mould
tool used to form, make or press a product

3.3
material
3.3.1
concrete
a composition of aggregates, cement and water with possible mixtures and additions which sets to form solid mass

3.3.2
calcium silicate
a composition of lime, natural siliceous materials (e.g. sand, crushed or uncrushed siliceous gravel or rock) with possible additives which sets to form solid mass by the action of steam under pressure

3.4
mixture
either fresh concrete or calcium silicate which has not set and which feeds the producing machines

3.5
green product
formed, compressed or de-watered product which has not hardened

3.6
vibration
physical phenomena generating the motion of the particles of a body in alternately opposite directions to enable the mixture to flow in the mould

3.7
compression
the application of force on the surface of the mixture within a mould

3.8
compaction
the application of vibration, impact, compression and/or vacuum in the mixture within a mould

3.9
integrated transport system
equipment forming an integral part of the manufacturing assembly used to move green products from the making point to the handling equipment

4 List of significant hazards

This clause contains all hazards, as far as they are dealt with in this European Standard, identified by risk assessment significant for this type of machinery and which require action to eliminate or reduce risk.

NOTE This standard covers many different type of machines for the manufacturing of products from concrete and calcium-silicate. Therefore, the following requirements correspond to a general risk assessment. When designing a specific machine, the manufacturer needs to make a specific risk assessment to ensure that the machine does not generate different or additional risks and to take the adequate protective measure

Detailed description of hazards identified and specific hazards are contained in the specific standards parts 2 to 8.

4.1 Mechanical hazards

Mechanical hazards caused by moving parts of the machine and products

4.1.1 Crushing hazards

4.1.2 Shearing hazards

4.1.3 Cutting or severing hazards

4.1.4 Entanglement hazards

4.1.5 Drawing-in or trapping hazards

4.1.6 Impact hazards

4.1.7 High pressure ejection hazards

4.1.8 Slip, trip or fall hazards

4.2 Electrical hazards

4.3 Hazards generated by noise

4.4 Hazards generated by materials and products

4.5 Hazards generated by neglecting ergonomic principles

4.6 Hazards caused by failure of energy supply

5 Safety requirements and/or measures

Machinery shall comply with the safety measures and/or technical provisions of this clause and in addition with EN 292-1:1991 and EN 292-2:1991 for hazards relevant but not significant which are not covered by this standard.

Concerning the design of guards the relevant clauses of EN 953:1997 shall be observed. Moreover, they shall be fitted as close as possible to hazardous mobile parts taking into account the requirements contained in EN 294:1992, EN 349:1993 and EN 811:1996.

NOTE 1 The protective devices stated in this clause were fixed taking into consideration the criteria described in clause 7 of EN 1088:1995.

NOTE 2 Some guarding examples to avoid contact with hazardous parts are described in Annex B.

Where it is necessary to see the working process, guards shall be designed to allow visibility e. g. grids, transparent material or electro-sensitive devices.

When using electro-sensitive protective devices, the requirements described in 4.2.2 of EN 61496-1:1997, shall be fulfilled.

As far as possible guards shall be separated from the noise enclosures. However, these guards can be combined if it is impossible for a person to be present between the guard and the hazardous mobile parts of the machine (see table 5 of EN 294:1992) and if the setting, changing of mould, cleaning and maintenance works can be done easily and safely (see EN 614-1:1995). Additional requirements are, if needed, described in the machine specific prEN 12629-2 to -8.

When the application of a B level standard is required, the manufacturer shall carry out an adequate risk assessment for the requirements there of where choice is necessary.

5.1 Mobile parts of power transmission

5.1.1 Mobile parts to which access during the machine operation is not necessary shall be protected by fixed guards according to clause 3.2 of EN 953:1997 (see B.1).

5.1.2 If the frequency of access to mobile parts of the power transmission does not exceed once a week and if the work can be done without energy supply fixed guards according to 3.2 of EN 953:1997 shall be fitted.

5.1.3 If the frequency according to 5.1.2 exceeds once a week or if the work cannot be done with energy supply isolated, interlocking guards shall be fitted according to 3.5 of EN 953:1997 the circuits of which comply with category 3 of EN 954-1:1996 (see B.2).

5.1.4 If the time taken to gain access to the dangerous zone is less than the after-running accrues, interlocking guards with guard locking according to 3.6 of EN 953:1997 shall be fitted.

5.2 Mobile parts taking part in the working process

5.2.1 Mobile parts taking part in the working process and to which access during the operation is not necessary shall be protected by fixed guards according to 3.2 of EN 953:1997 (see B.1).

5.2.2 If work in the dangerous zones is necessary more than once a week, interlocking guards according to 3.5 of EN 953:1997 shall be used, the circuits of which shall comply with EN 954-1:1996 (e. g. with two mechanical controllers according to 6.2.2 of EN 1088:1995).

If trip devices according to 3.23.5 of EN 292-1:1991 are selected, they shall meet the requirements of EN 61496-1:1997 and give an equivalent level on integrity as described in the previous sentence (see B.2, B.3, B.4).

5.2.3 If operations have to be carried out beneath suspended parts which may unintentionally drop, independent restraint devices which are engaged when access to the moving parts is to be made shall be provided in accordance with 3.23.6 of EN 292-1:1991. Means shall be provided to ascertain that the restraint device is engaged. Moreover, the restart of the machine shall not be possible as long as this device is engaged.

Where access beneath the suspended parts is required as part of the manufacturing cycle, the restraint device shall be engaged automatically.

5.2.4 If it is possible to enter the danger zone before the mobile parts have come to rest, interlocking guards with guard locking according to 3.6 of EN 953:1997 shall be fitted.