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Machines for the manufacture of constructional products from concrete and calcium-silicate - Safety - Part 6: Stationary and mobile equipment for the manufacture of precast reinforced products

Maschinen für die Herstellung von Bauprodukten aus Beton und Kalksandsteinmassen - Sicherheit - Teil 6: Stationäre und fahrbare Einrichtungen für die Herstellung von bewehrten Fertigteilen

Machnines pour la fabrication de produits de construction en béton et silico-calcaire - Sécurité - Partie 6: Equipements fixes et mobiles pour la fabrication de composants en béton armé

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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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Contents

Foreword

This document (EN 12629-6:2004) 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of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

This document 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 document.

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

Part 1: Common requirements

Part 2: Block making machines

Part 3: Slide and turntable machines

Part 4: Concrete roof tile 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 long line manufacture of prestressed products

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

This document is complementary to part 1 and is intended to be used in combination with that part.

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

Introduction

This document is a Type C-standard as stated in EN 1070.

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

When provisions of this type C document are different from those, which are stated in type A or B documents, the provisions of this type C document take precedence over the provisions of the other documents, for machines that have been designed and built according to the provisions of this type C document.

This document specifies the additional requirements to and/or the deviations from EN 12629-1:2000 specific for the stationary and mobile equipment for long-line manufacture of pre-stressed products as defined in Clause 3.

With the aim of clarifying the intentions of the document it should be noticed that the following assumptions were made when producing it:

— specific conditions of use or environmental conditions out of the scope of the document shall be the subject of negotiations between the manufacturer and the user/owner

— the equipment will only be used by competent and designated persons

— the place of use/installation is adequately lit

— All operations are carried out by specially trained operators

1 Scope

1.1 This document is intended to be used together with EN 12629-1 “Machines for the manufacture of constructional products from concrete and calcium-silicate — Safety — Part 1: Common requirements", which specifies general requirements of machines for the manufacture of constructional products from concrete and calcium–silicate.

This document specifies the additional requirements to and/or the deviations from EN 12629-1_specific for the stationary and mobile equipment for the manufacture of precast reinforced products as defined in Clause 3.

This document applies to these machines also when used for the manufacture of non-reinforced moulded products.

1.2 This document applies to the modules comprising production machines (with or without turnover demoulding) for the manufacturing of reinforced moulded products as shown below and illustrated in informative Annexes A and B.

NOTE This machinery can consist of three modules and they are generally designed to obtain a large moulding capacity (middle length of the products from 3 to 4 meters), with a limit height of demoulding of 1 m and a maximum width of 1,50 m.

Module A: Manufacturing machines by vibration or compression and floating, with or without turnover.

Module B: Stocking/hardening unit.

Module C: Assembly for palletising/packaging of the concrete products. This module also permits the inspection of the products.

These machines are designed to perform the following cyclic operations:

— manufacturing by vibration and even compression (oiling, mould feeding – concrete + reinforcement –, vibration, floating, interlocking, turnover, removing from mould);

— storage of moulds and pallet boards for concrete hardening;

— products destacking and packaging;

— moulds and pallet boards return to the manufacturing module.

Any of these operations may be manual, semi-automatic or automatic.

This document deals with automatic and semi-automatic operations of modules A and C and with automatic operations of module B.

There are two main types of stationary and mobile equipment for manufacture of precast reinforced products:

— equipment with instant removing from mould on pallet boards or on the floor;

— equipment with delayed removing from mould (collection of moulds: the concrete products are hardened in the mould).

This standard does not deal with the machines for:

— mixing of concrete;

— manufacturing of the reinforcing steel;

— evacuation of the products to the stockyard;

— manufacturing of products (e. g. slabs or blocks) covered by other parts of EN 12629.

Annex A shows the most common types of units as well as their variations: immediate demoulding unit and delayed demoulding unit.

1.3 This document is limited to the units comprising a fixed or movable manufacturing module with or without rolling over of the mould, a module or storage area for storing/hardening of the products and a products palletising/packaging module. It deals with the significant hazards pertinent to these machines, when used as intended under the conditions foreseen by the manufacturer (see Clause 4), except noise hazards, which are partly dealt with.

NOTE An amendment is under preparation to deal with noise, in particular for measures to reduce noise at source and a noise test code including noise declaration.

This document specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards, particularly:

— following a malfunction during the automatic mode of operation;

— during manual or semi-automatic manufacturing processes;

— during end-of-shift cleaning procedures, adjustment and maintenance.

This document deals with the significant hazards generated by handling equipment for palletising and stacking/destacking that are gantries. Complementary safety measures can be necessary if other type of handling equipment is used.

1.4 This document is not applicable to stationary and mobile equipment for the manufacture of precast products, which are manufactured before the date of publication of this document by CEN.

2 Normative references

The following referenced documents are indispensable for the application 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 294, *Safety of machinery — Safety distance to prevent danger zones being reached by the upper limbs*

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

EN 547-1, *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, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings*

EN 547-3, *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, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

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

EN 894-1, *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 953, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards*

EN 1005-3, *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

EN 1050:1996, *Safety of machinery — Principles for risk assessment*

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

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

EN ISO 12100-1:2003, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003)*

EN 12629-1:2000, *Machines for the manufacture of constructional products from concrete and calcium-silicate - Safety - Part 1: Common requirements*

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

EN ISO 14122-1, *Safety of machinery - Permanent means of access to machinery - Part 1: Choice of fixed means of access between two levels (ISO 14122-1:2001)*

EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and gangways (ISO 14122-2:2001)*

EN ISO 14122-3, *Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

prEN ISO 14122-4, *Safety of machinery - Permanent means of access to machinery - Part 4: Fixed ladders (ISO 14122-4:2004)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1070:1998, EN 12629-1:2000 and the following apply.

3.1
customary terms
there is no customary term for the machinery dealt with by this standard. The term featured in the title is one term frequently used, but other equivalent terms may be encountered, each combining the words in the list below in a variety of ways.

production making	unit assembly machines	with without	or turnover	For the manufacturing of concrete	moulded elements precast products	reinforced	1)

3.2
concrete hopper

1) In French, these kinds of machines are also commonly called “long products” manufacturing machines.

concrete receiving container. It is fitted, in its low part, with a mechanised device distributing the concrete into the mould (discharge gate, rotating disk distributor, paddle wheel, distributing belt...)

3.3
concrete feeding conveyor (feeding belt, overhead conveyor...)
mechanised system delivering concrete from the mixing plant to the concrete hopper

3.4
pallet board
flat element carrying concrete products during hardening (in the case of immediate removing from mould), from the manufacturing zone to the packaging area

3.5
mould
element, generally with a parallel piped shape, which allows the forming and the hardening (in case of delayed demoulding) of the products

3.6
core
internal shape of the mould forming the hollow part of the concrete products

3.7
core extractor
mechanism for placing a core before concrete is poured and removing it after completion of the manufacturing operation

3.8
drawer
guided bottomless case, designed to ensure mould filling with concrete, by backward and forward motions. The drawer can contain varied accessories, specially designed to improve the filling of the mould with concrete

3.9
concrete distributor
element which permits mould filling with green concrete, moving longitudinally over the mould, and rotating around a vertical axis above the mould

3.10
tamper [ram]
tool which presses the concrete within the mould at the end of the manufacturing process to give the product the compactness, the height and the upper shape desired

3.11
float
mechanised rotating disk, allowing the finishing of the upper surface of the products

3.12
vibration beam
component, which finishes the upper surface of the products by backward and forward motions, perpendicular to its direction of movement

3.13
egg-layer
machine covering the functions of A and B modules (see 1.2), with demoulding on the floor or on levelling table or on pallet boards

3.14
manufacturing gantry
gantry covering the functions of A and B modules (see 1.2) with demoulding by stacking up. The manufacture is carried out on a stationary vibrating table or beam, or on a movable vibrating mould

3.15
storage
a) dynamic: (See also Figure B.4)

storage in which the pallet boards carrying the concrete products (or the moulds containing them) move forward all along a motorised or not way (rollers, chains, belts...)

The pallet board, or moulds, can previously be stacked up with or without insets.

The pallet board, or moulds, return is carried out by another way.

b) warehouse rack: (See also Figure B.1)

storage in which pallet boards, or moulds, are pushed one after the other on racks carried out with superposed metallic guides.

The pallet boards or mould return is done on one of the metallic guides or by the means of another conveying device.

c) on floor:

storage in which the products are directly demoulded on the floor, with or without a pallet board. In this case, the pallet boards return is not taken into account.

d) by stacking up: (See also Figures B.2 and B.3)

storage in which the pallet boards or moulds are moved and stacked up one after the other with a gantry.

The empty pallet boards join the module A by means of a return way (tilted rolling way).

3.16
elevator
equipment that rises pallet boards or moulds, to the relevant storage level, an introduce them in the zone by an appropriate means

3.17
lowerator
equipment that brings down the pallet boards or moulds, to the palletising and packaging level

3.18
levelling table
mechanical unit receiving one or more pallet boards (or moulds) at a certain level, as to transfer them at an evacuation level: as a variant, boards piling/depiling machine

3.19
stacking/destacking mobile gantry
automatic machine or with carried driver, moving the pallet boards or moulds

3.20
rack
transportable support on which the finished products are placed. It can either be mechanised, or automated

3.21
fixed palletising gantry
equipment that carries out delayed demoulding and/or packaging of the concrete products. The automatic arrival and evacuation of the pallet boards are carried out by another mechanism (see 3.15 to 3.17)

3.22
mobile palletising gantry
equipment that carries out hardened concrete products arrival, demoulding (eventually), packaging, and also evacuation at the end of the installation

3.23
inset
intermediary elements placed (manually or automatically) between two products beds or moulds)

4 List of hazards

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

The significant hazards and hazardous situations (based upon EN 1050) are given in Tables 1 to 4 each of which relates to a particular designated type of machine. The tables show in which module and where the hazard might be expected to occur.

Before using this standard it is important to carry out a risk assessment of the machine to check that it has the hazards identified in this Clause