

Machines for the manufacture of constructional products from concrete and calcium-silicate — Safety —

**Part 7: Stationary and mobile
equipment for long line manufacture
of prestressed products**

ICS 91.220

National foreword

This British Standard is the UK implementation of EN 12629-7:2004+A1:2010. It supersedes BS EN 12629-7:2004 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee MCE/3/7, Machines for precast concrete and calcium silicate products — Safety.

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

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**Machines for the manufacture of constructional products from
concrete and calcium-silicate - Safety - Part 7: Stationary and
mobile equipment for long line manufacture of prestressed
products**

Machines pour la fabrication de produits de construction en
béton et silico-calcaire - Sécurité - Partie 7: Equipements
fixes et mobiles pour la fabrication sur bancs de produits en
béton précontraint

Maschinen für die Herstellung von Bauprodukten aus Beton
und Kalksandsteinmassen - Sicherheit - Teil 7: Stationäre
und fahrbare Einrichtungen für die Herstellung von
Spannbetonelementen

This European Standard was approved by CEN on 3 November 2003 and includes Amendment 1 approved by CEN on 5 August 2010.

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Contents

	page
Foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	6
3 Terms and definitions.....	7
3.1 Products	7
3.2 Equipment	8
4 List of significant hazards	11
5 A1 Safety requirements and/or protective measures A1	26
5.1 General.....	26
5.2 Layout - Circulation - Means of access	27
5.3 Control of the machines, modes of operation	27
5.4 Safety of machines and working equipment - General.....	27
5.5 Noise and vibration.....	28
5.6 Additional requirements for specific machines and equipment.....	28
5.7 Summary of the safety measures given in relation to the significant hazards listed in clause 4	34
6 A1 Verification of safety requirements and/or protective measures A1	65
7 Information for use – Instruction handbook	66
7.1 Introduction	66
7.2 General information.....	66
7.3 Minimum recommendations for use of the machines	67
8 Marking	68
Annex A (informative) Pre-stressing bed.....	69
Annex B (informative) Bed sweeper, vacuum cleaner, oiler, wire-guide machine	74
Annex C (informative) Bed layout machine	76
Annex D (informative) Strand pushing/pulling machine	78
Annex E (informative) Spinner, extruder, vibrodistributor.....	80
Annex F (informative) Tarpaulin paying out and winding in machine	82
Annex G (informative) Sawing machine.....	84
Annex H (informative) Trilingual list of terms relative to pre-stressing manufacturing products and equipment.....	86
Annex ZA (informative) A1 Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC A1	88

Foreword

This document (EN 12629-7:2004+A1:2010) 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 March 2011, and conflicting national standards shall be withdrawn at the latest by March 2011.

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

This document includes Amendment 1, approved by CEN on 2010-08-05.

This document supersedes EN 12629-7:2004.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**.

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.

A1 *deleted text* **A1**

A1 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 rooftile making machines

Part 5.1: Concrete pipe machines manufacturing in the vertical axis

Part 5.2: Concrete pipe machines manufacturing in the horizontal axis

Part 5.3: Pipe prestressing machines

Part 5.4: Concrete pipe coating 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). **A1**

A1 *deleted text* **A1**

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This European Standard is a Type C standard as stated in [A1](#) EN ISO 12100 [A1](#).

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

This European Standard specifies the additional requirements to and/or the deviations from [A1](#) EN 12629-1:2000+A1:2010 [A1](#) 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 standard 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 standard 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 part of EN 12629, taken together with EN 12629-1:2000+A1:2010 applies to stationary and mobile equipment for the benching manufacture of prestressed products. The manufacturing bed is a machine with which other associated machines work simultaneously. Moreover, these machines are generally used on beds installed in parallel.

EN 12629-1:2000+A1:2010 specifies general requirements applicable to 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 12629-1:2000+A1:2010 specific to the machines it covers. 

1.2 This standard gives particular requirements for the design of the following machines:

- Pre-stressing bed (schematic representation is given in annex A);
- Bed sweeper, vacuum cleaner, oiler, wire-guide machine (schematic representation is given in annex B);
- Bed layout machine (schematic representation is given in annex C);
- Strand pushing/pulling machine (schematic representation is given in annex D);
- Spinner, extruder, vibrodistributor (schematic representation is given in annex E);
- Tarpaulin paying out and winding in machine (schematic representation is given in annex F);
- Sawing machine (schematic representation is given in annex G).

NOTE The manufacturing operations include some or all of the following:

- treating pre-stressing bed with release agent;
- "marking out" the elements (slabs, plain slabs, etc.) to be made;
- running the pre-stressing strands;
- pre-tensioning;
- installing the shutterings, (formwork, side shutters, end plates and inserts)
- fixing reinforcement;
- tensioning;
- concrete distribution and compaction;
- winding out the tarpaulin;
- heating;
- detensioning;
- removal of shettering, formwork, etc. ;
- strands cutting or sawing;
- removal of final products;
- bed cleaning.

The concrete supply interface which is taken into account for safety is also considered.

The sequence of these operations can be different according to the manufacturing process used in the factory and to the various types of products.

 The handling of the cut wires and their placement on beds is not covered by the present standard. 

1.3  This European Standard deals with all significant hazards pertinent to these machines, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4). This European Standard specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards. 

1.4 Sub-clause 1.3 of  EN 12629-1:2000+A1:2010  applies.

 *deleted text* 



1.5  This document is applicable to equipment for long-line manufacture of pre-stressed product which are manufactured after 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 349:1993+A1:2008, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

EN 457, *Safety of machinery — Auditory danger signals — General requirements, design and testing (ISO 7731:1986, modified)*

EN 842, *Safety of machinery — Visual danger signals — General requirements, design and testing*

EN 953:1997+A1:2009, *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, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

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

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

EN 1093 (all parts), *Safety of machinery — Evaluation of the emission of airborne hazardous substances*

EN 1760-2, *Safety of machinery — Pressure sensitive protective devices — Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

EN 13862:2001+A1:2009, *Floor cutting-off machines — Safety*

EN 12629-1:2000+A1:2010, *Machines for the manufacture of constructional products from concrete and calcium-silicate — Safety — Part 1: Common requirements*

EN 60204-1, *Safety of machinery - Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN ISO 3457, *Earth-moving machinery — Guards — Definitions and requirements (ISO 3457:2003)*

EN ISO 7731:2008, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs* (ISO 13857:2008)

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 ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces* (ISO 13732-1:2006)

EN ISO 14122-1:2001, *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 14122-2:2001, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and gangways* (ISO 14122-2:2001)

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

EN ISO 14122-4:2004, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders* (ISO 14122-4:2004) ^{A1}

3 Terms and definitions

^{A1} For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003, EN 12629-1:2000+A1:2010 and the following apply. ^{A1}

3.1 Products

3.1.1

hollow core flooring slab

pre-stressed slabs incorporating longitudinal hole used in the construction of floors. They are considered as structural elements

3.1.2

beam

pre-stressed concrete element used in building or bridge structures. It has a supporting function; their section can be that of an I, T, Y, U, Π, a rectangle, a trapezium, etc.

3.1.3

joist

pre-stressed concrete element forming the supporting part of complex flooring. Its inverted T-shape section provides a support for infill blocks or slabs and in-situ concrete screed (compression slab)

3.1.4

lintel

part constructed of pre-stressed concrete, prismatic in shape with a generally rectangular section. It forms the top part of openings in walls and ensure support for masonry mounted above

3.1.5

plain slab

thin pre-stressed concrete elements designed to form the reinforced section of complex flooring. The compression slab is cast in situ

3.1.6

transmission line pole

pre-stressed concrete post designed to support overhead electric energy or communication cables

3.1.7

lighting column

rectilinear pre-stressed concrete post, designed to support public lighting (streets, parks, sports grounds, etc.)

3.1.8

railway sleeper

trapezium-shaped element of pre-stressed concrete designed to support the rails and maintain them at the required gauge

3.2 Equipment

NOTE There is no customary term for the machines dealt with in this standard. The term featured in the title is merely one of the more frequent terms, but other equivalent terms may be encountered, each combining the words in the following lists in a variety of ways:

production	machines	for the long line manufacture of	pre-stressed	hollow core flooring slab
manufacturing	workshop			plain slabs
	Hall			floor joists

In addition, annex H (informative) gives a trilingual list of terms relative to pre-stressing manufacturing products and equipment.

3.2.1

pre-stressing bed

3.2.1.1

pre-stressing bed for flat products

installation composed of two solid anchor blocks, and a slab connecting the two anchor blocs. The bed may incorporate a steel plate soffit on which concrete products (pre-slabs, joists, hollow slabs) are cast. At the ends of the bed, the blocks are provided with posts and anchor plates (abutment). Jacking devices allow tensioning and detensioning of wires or strands.

NOTE 1 The length of the slab is generally between 40 m and 150 m and the width is between 1,20 m and 2,40 m.

NOTE 2 The pre-stressing bed used for the manufacture of flat products is usually completed by rails arranged on both sides of the slab. The rails are intended to guide mobile machines."

3.2.1.2

pre-stressing bed for beam type products

installation composed of two solid anchor blocks, a slab connecting the two anchor blocs and two walls, generally movable. At the ends of the bed, the blocks are provided with posts and anchor plates (abutment). Jacking devices allow tensioning and detensioning of wires or strands.

NOTE 1 The length of the bed is generally between 80 m and 100 m and the width is between 0,50 m and 2 m.

NOTE 2 The beds may be single or double (parallel casting of two beams).

3.2.2

self stressing bed

structure enclosing or supporting shutterings and simply resting on the ground or on suitable supports. The length of this structure is between several meters (depending on the manufactured products) and a maximum size compatible with the overall stability and the forces developed by the tension in the strands

3.2.3

heating equipment

equipment intended to harden the products

NOTE heating equipment includes:

- a type of energy sources from:
 - electricity;
 - "free" steam;
 - steam or hot fluids in a closed circuit;
 - hot air
- and a heating system from:
 - heating soffits or heating elements under moulds or shuttering;
 - electric heating cable integrated into the bed;

- heated tarpaulin;
- heated shuttering or mould.

3.2.4

tensioning and tension relieving equipment

3.2.4.1

single strand tensioning

equipment consisting of a jacking device and its associated hydraulic machine (which is generally mobile) which supplies the energy needed to tension the strands: wire or strands. The jacking device takes its support on the anchorage utilising a barrel and conical wedge ensuring the restraint of pre-stressed reinforcement. The strands are anchored on the anchorage abutment

3.2.4.2

multi-strand tensioning

equipment allowing the simultaneous tensioning of all the strands on one bed. The anchor points in the transverse anchor are obtained by anchor grips or button-heads; the button-heads are made by cold forming the wire ends. The pre-stressing bed has a transverse anchor at either end. At one end, the transverse anchor is fixed and at the other is mobile and moved by hydraulic cylinders. A fixed hydraulic machine supplies the necessary energy.

After tensioning, the cylinders are locked in position by a mechanical device (support, auger) so that they do not stay under pressure during the following operations

3.2.4.3

detensioning

operation where, at first, the jacking devices are put under pressure slightly above the tensioning pressure to release the locking device (screw, support, etc.). Then, they act as a brake to release the tension in the strands (progressive release).

In the case of wide beds or asymmetry in the forces in the strands, a guiding and balancing device can be set up

3.2.5

concrete casting machines

3.2.5.1

vibro distributor

independent mobile machine providing the uniform distribution of concrete (in general for the manufacture of plain slabs or joists) compacting and controlling the concrete thickness by means of vibration.

Generally, vibro distributors incorporate auxiliary systems that allow to carry out the roughness of the upper face for plain slabs

3.2.5.2

sheer compactor and extruder

mobile automatic machine that distributes the concrete while forming (generally for the manufacture of hollow core flooring slabs and joists), compacting and finishing the product. These operations are generally carried out using the principle of a vibrating and sliding core.

The machine can be moved under its own power (sheer compactor) or by reaction due to the thrust against the concrete applied during the feed (sheer compaction)

3.2.6

auxiliary machines

3.2.6.1

bed cleaning machine

independent moving carriage assemblies, towed or self-propelled to ensure:

- the sweeping the soffit or moulds;
- the removal of hardened concrete;

— the spraying of release agents onto the soffit or moulds.

In some cases, they locate the pre-stressing strands.

3.2.6.2

marking out machine

independent machine consisting of self-propelled mobile carriages designed to ensure the layout of product in terms of dimension and shape. Generally they are used for the manufacture of floor shuttering slabs

3.2.6.3

machine for laying and removing block ends

independent towed or self-propelled mobile carriage machines to handle, store, install and remove inserts (also called combs) to install and remove them. These machines are used to manufacture the floor joist and plain slabs. They ensure their set up and their withdrawal

3.2.6.4

strand pulling machine

self-propelled carriages, or machines propelled by other means, travelling sidewise or over the bed and, in their movements, pulling one or several strands in such a fashion as to cut them to length.

The strands are available in coils. They are held in dispensers or turntables

3.2.6.5

strand pushing machine

machine situated on the side of the beds and pushing each strand in a casing all along the beds, cutting them automatically to the desired length. When the desired number of strands has been cut, the casing opens and releases the strands on the side of the bed.

The strands are then pulled on the bed

3.2.6.6

strands setting up machine

independent or towed mobile carriages used for positioning the pre-stressing strands on the bed.

These strands are generally stored in coils or are pre-cut.

Some similar machines can set down or fix the passive transverse reinforcement. This equipment is more specifically used in the manufacture of plain slabs

3.2.6.7

tarpaulin paying out machine

independent or towed mobile carriage carrying a tarpaulin pay out drum. For movement in a given direction, the tarpaulin is rolled out over the product to be heated; for a movement in the opposite direction, it is wound in and thus uncovers the hardened products. These operations can be mechanised or manual

3.2.6.8

bed sawing machine

independent or towed mobile carriage which includes a concrete or strand sawing. Depending upon its orientation, sawing can be longitudinal, transverse or angled. Some of the carriages can be programmed to automatically execute all the cuts for a bed

3.2.6.9

concrete vacuum machines

independent or towed mobile carriage which includes a vacuum device to remove green concrete spillage (between two products)

4 List of significant hazards

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

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Annexes A to G (informative) illustrate examples of the following common machine types:

- pre-stressing bed, strands setting up machine, fixed or mobile tensioning equipment and self stressing bed;
- sweeper/vacuum machine/oiler;
- bed layout machine;
- strand pulling/pushing machine;
- sheer compactor, extruder, vibrodistributor;
- tarpaulin paying out and winding in machine;
- strand and concrete sawing machine.

In accordance with clause 4 of  EN 12629-1:2000+A1:2010  the hazard zones described in the following tables are illustrated in annexes A to G.

Table 1 — Pre-stressing bed, strands setting up machine, fixed or mobile tensioning equipment and self stressing bed

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figures A.1 and A.3
1	Mechanical hazards		
1.1	Crushing	detensioning cylinders, jacking devices releasing	1
		falling of the single wire stressing jack	3
1.2	Shearing	between button-heads and transverse anchor (during pre-tensioning)	4
		with the bed accessories (removable walls, mobile vibrator)	5
		with the mobile part of the single wire stressing jack during tensioning	6
1.3	Cutting	sharp edges in beds and casing	7
1.4	Drawing-in or trapping	strands (wire or bundles) under tension (failure of the anchoring, slippage of the locking device)	8
		by strands (wire or bundles) during setting up	9
1.5	Impact	strands (wire or bundles) under tension (failure of the anchoring, slippage of the locking device)	8
		by strands (wire or bundles) during setting up	9
		chain or guard ejection due to rupture of strands (wire or bundles)	2
		falling of the end bed mobile guard (mobile cover, shield, grid)	10
		falling of accessories (combs, inserts, layout of product sides and ends) during mechanical or manual handling operations	8
		rupture of a transverse anchor	4
1.6	Ejection of fluids under pressure	hoses under hydraulic pressure, hot fluids of the hydraulic circuits, feeding of the cylinders for tensioning of reinforcements	11
		steam pipes, valves: breaking, leakage	12
1.7	Ejection of parts	chain or guard ejection due to rupture of strands (wire or bundles)	2
		rupture of the pneumatic rope of the bed vibrator	13
1.8	Slip, trip and falling	oiled beds (walking on the beds after spraying of the releasing agents)	8
		rails on both sides of the bed that constitute obstacles for the passage and falling from a height	14
		machine ends, hydraulic pipes on the ground	14
		falling into the tensioning hole	15
		falling from/into the casing (assembly of the reinforcements, concrete smoothing...)	5
2	Electrical hazard		
2.1	Electrical contacts (direct or indirect)	motor, branch boxes, electrical resistances under the beds, plugs	13-16
3	Thermal hazards		
3.1	Burns	heat radiation from the bed (heating of the beds): feet burns	8
		steam pipes (location, isolation, leakage)	8-12
4	Hazards generated by noise		
4.1	Hearing losses (deafness)	hydraulic groups of the tensioning cylinders of strands (wire or strands)	16
		fix and mobile vibrators on vibratory bed, poker vibrator	13

Table 1 (continued)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figures A.1 and A.3
5	Hazards generated by vibration		
5.1	Neurological and vascular disorders	contact with vibrating bed and/or moulds (direct vibration by poker vibrators, vibrating beams, fixed or mobile vibrators)	13
6	Hazards generated by materials and products		
6.1	Contact or inhalation of dangerous mist, oil, fluids, gas, fumes, dusts	releasing agents (contact and inhalation during spraying on the bed)	8-13
		hydraulic fluids (tensioning equipment, cylinders)	16
6.2	Contact with harmful products	contact with green concrete (cement caused affections)	8-13
		cleaning products of the transverse anchor	4
6.3	Fire	releasing and hydraulic oil	8-13-16
		electrical groups (hydraulic group, control of the heating of the beds)	13-16
		cleaning products of the transverse anchor	4
6.4	Perforation, puncture	Ends of strands (breaking of reinforcement or button-holding, or button-heads slipping in the anchors)	4
		transverse anchor disengagement after cutting of the steel	4
		breaking of the strand or wire (damaged wires or short length)	8-3
7	Hazards generated by neglecting ergonomic principles in machine design		
7.1	Unhealthy postures	location of the tensioning and tension relieving equipment for single strand compared to the tensioned wires and to the manometer	16
		location of the controls of the hydraulic equipment compared to the bed	16
		access to the tensioning holes	15
7.2	Excessive efforts	tensioning by single wire cylinder (height, support of the single wire stressing jack)	3
7.3	Inadequacy with human anatomy	low position of the beds and height of the casings during manufacturing, cleaning and handling operations (curved back or tilted in the casing)	8-13
		lack of opening of the beds to facilitate the reinforcements mounting (posts, beams)	13
7.4	Neglecting use of personal protective equipment	lack of advice, written instructions, PPE adapted to human (glasses, gloves, sound protection)	3-8-13
		initial training of the personnel	2-9
7.6	Human error	not respecting the order of tensioning the wires (breaking risks)	3
		non-stop of the tensioning at the indications provided on the bed or on the manometer (breaking of the steels and of the equipment)	8
		additional traction on the strand (several tensioning strokes with the single wire stressing jack)= risk of breaking of the wire	3
		assembling of the pins (mixing of new, old, different... parts), forget to clean and to check	4
8	Hazards generated by failure of energy and other malfunctions		
8.1	Failure of control system	failure of the hydraulic balancing of the multi-strand tensioning cylinders: mechanical break	1
8.2	Errors of fitting	inverting the tensioning equipment hydraulic ropes	11

Table 1 (concluded)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figures A.1 and A.3
9	Hazards generated by temporary missing or incorrect positioning of safety related equipment		
9.1	All kinds of guards	lack of guards on the bed during the tensionning	2
		bed end guards kept open after the pre-tensioning of the wires	2-10
		covers of the vibrators not mounted after the adjustments	13
		lack of sound or light signals to warn of tensioning	3-8

Table 2 — Sweeper/vacuum machine/oiler

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure B.1
1	Mechanical hazards		
1.1	Crushing	between the machine and an other machine or obstacle on the same bed	1
		of the driver or other operator at crossing of machines located on 2 neighbouring beds	2
		of feet by the wheels of the machine on rails	3
		when changing of tracks (lifting)	4
		when changing the brush	5
1.2	Shearing	of the upper parts of the body by the mobile transmission parts (pinions, chains, pulling cables, slide, cylinders...)	6
1.3	Cutting	sharp edges of the frame of the machine and tools	7
1.4	Drawing-in or trapping	by the sweeper	5
		by the loops formed by the pre-stressing wires when they are pulled by a tendon pulling machines	7
		by the electrical cable into the drum	8
1.5	Impact	with an obstacle or by the machine, when changing of track (lifting)	1-4
		with an other machine (or obstacle) on the same track	1
		with an other machine (or obstacle) situated on a bed in the vicinity	1
		by the reduced visibility of the driver when travelling in the opposite direction	2
		by the high and over-located position of the operator (on platform): impact with obstacles or loads handled over the machine (bucket...)	2
1.6	Ejection of fluids under pressure	hydraulic ropes of the cylinders and of the hydraulic group: break, leakage	6
1.7	Ejection of parts	parts of the rotating sweeper	5
		breaking of the lifting accessories during the lifting	4
1.8	Slip, trip and falling	checking/filling of the oil tank	9
		access at a height during hooking and unhooking of the machine to change its bed	2-4
		connection of the machine to the aerial electrical power line (mobile stick)	14
		falling at descending from the passage/stair	2

Table 2 (continued)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure B.1
2	Electrical hazards		
2.1	Electrical contacts (direct or indirect)	motor, derivation boxes, protruding plugs, panels, electrical boxes	10
		electrical power source by <i>electric line</i> and/or stick or cable drum on soil or rubbing against mobile parts (insulation, position, connection, wear, shut down)	8
		presence of water	1-7
3	Thermal hazard		
3.1	Burns	hot hydraulic oil (leakage of cylinders and ropes)	6
4	Noise hazard		
4.1	Hearing losses (deafness)	hydraulic groups, motors	10
		sweeper work	5
		Suction/Vacuum	11
5	Vibration hazards		
5.1	Neurological and vascular disorders	resonance generated by the sweeper rotation, the vacuum machine	5-6
6	Hazards generated by materials and products		
6.1	Contact or inhalation of dangerous mist, oil, fluids, gas, fumes, dusts	dust when sweeping, aspiration of the sprayed oil	5-6
		hydraulic oil (cylinders, group)	6
6.2	Contact with harmful products	contact with the dry concrete (dust), of cleaning (diseases caused by cement)	1-7
6.3	Fire	simultaneous presence of oil and electricity	9-10
7	Hazards generated by neglecting ergonomic principles in machine design		
7.1	Unhealthy postures	handling of the machine from one bed to an other	4
		location of the machine actuators and limited field of vision and inadequate position of the driver	2
		access to the machine controls for cleaning and maintenance	5-6
7.2	Excessive efforts	change of manufacturing, adjustments, machine parts or tools' handling, (sweeper)	5-6
7.3	Inadequacy with human anatomy	access to a height when lifting up and down the machine to change its way	2-4
		driving hampered by a lack of visibility from the operator's position	2
		inadequacy of the driver support (seat, feet support, setting...)	2
7.4	Neglecting use of personal protective equipment	absence of advice, written instructions, PPE in inadequacy with the human body (glasses and vapour, gloves, ear protectors, dust mask and oils)	2
		initial training of the personnel	2
7.6	Human error	non stop of the machine at the end of the bed or in front of an obstacle (person, machine)	1-7-2
		derailment when transferring (risk of machine fall)	4
8	Hazards generated by failure of energy and other malfunctions		
8.1	Failure of control system	falling of the sweepers supports	5
8.2	Errors of fitting	unintended start up (sweeper)	2-5
8.3	Errors of mounting	installation and setting of oil spraying nozzles	12

Table 2 (concluded)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure B.1
9	Hazards generated by temporary missing or incorrect positioning of safety related equipment		
9.1	All kinds of guards	after maintenance and/or cleaning operation	13
		after an impact on the guard that render it ineffective	13
	controls	locking of the moving controls to make the operator free during the operation which has been rendered semi-automatic (return of the machine)	2-10
		uncontrolled failure of the safety devices (cells, switches, emergency stops, relays...)	2-10

Table 3 — Bed layout machine

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure C.1
1	Mechanical hazards		
1.1	Crushing	of a person between the machine and an other machine or obstacle on the same bed	1
		of feet by the wheels of the machine on rails	2
		when changing of track (lifting)	3
		by mobile working parts (layout head)	4
1.2	Shearing	of fingers by mobile transmission parts (pinions, chains, belts, sliding, cylinders...)	5
		by mobile working parts (layout head)	4
		of feet between 2 machines	1
1.3	Cutting	sharp angles of the frame of the machine and of the tool	6
1.5	Impact	with an obstacle or by the machine, when changing of track (lifting)	3
		with an other machine (or obstacle) on the same track	1
		with an other machine (or obstacle) situated on a bed in the vicinity	1
1.6	Ejection of fluids under pressure	pneumatic hoses of the cylinders: braking, leakage	5
1.5	Ejection of parts	Breaking of the lifting accessories during the lifting	3
1.7		connection of the machine to the aerial power line (movable stick)	7
2	Electrical hazards		
2.1	Electrical contacts (direct or indirect)	motor, derivation boxes, protruding plugs, panels, electrical boxes, batteries	8
		electrical power source by <i>collector wires</i> and/or stick or cable drum on soil or rubbing against mobile parts (insulation, position, connection, wear, cutting) or batteries	7-8-9
		presence of water	1
3	Thermal hazard		
3.1	Burns, explosion	batteries	9
6	Hazards generated by materials and products		
6.2	Contact with harmful products	paint that serves to layout	4
6.4	Perforation, puncture	by the moving layout head	4

Table 3 (concluded)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure C.1
7	Hazards generated by neglecting ergonomic principles in machine design		
7.1	Unhealthy postures	handling of the machine from one track to an other	3
		reach of the machine actuators during manual operation mode	8
		reach of machine actuators for cleaning and maintenance	4-5
7.2	Excessive efforts	changing of manufacturing, adjustments, handling of parts or tools	4-8
7.4	Neglecting use of personal protective equipment	initial training of the personnel	8
		derailment during the transfer (risk of machine fall)	3
8	Hazards generated by failure of energy and other malfunctions		
8.1	Failure of energy supply	loss of the references (computerized or automatic machine)	8
8.2	Failure of control system	unintended start up	4-8
9	Hazards generated by temporary missing or incorrect positioning of safety related equipment		
9.1	All kinds of guards	after maintenance and/or cleaning operation	4-5
		after an impact on the guard that render it ineffective	10
	controls	non stop of the machine at the end of the bed or in front of an obstacle (person, machine, safety chain...): design and location of the limiting devices	1
		uncontrolled failure of the safety devices (cells, switches, emergency stops, relays...)	10

Table 4 — Strand pulling/pushing machine

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure D.1
1	Mechanical hazards		
1.1	Crushing	on the falling of several wires from the intermediary casing of the wire-saw on the operator's feet	2
1.2	Shearing	of the upper parts by the mobile transmission parts (pinions, chains, pulling cables, cylinders, rods...)	3
		by mobile working parts (layout and pushing rollers, cutter)	4
		of fingers: movement of the wires evacuation beam, machine cleaning, adjustments.	5
1.3	Cutting	machine or tools' sharp edges	6
1.4	Drawing-in or trapping	by wire-guiding, laying out and pulling rollers	4
		by roping of the wires during distribution	1
		by rotation of the drums	1
1.5	Impact	with the strand pulling carriage	7
		by the end of a bobbin (whipping of the free wire end)	1
		with the rotation of the drums	1
1.6	Ejection of fluids under pressure	hydraulic ropes of the cylinders and of the hydraulic group: break, leakage	8
1.7	Ejection of parts	breaking of the pulling carriage wire, during the machine operation	9
1.8	Slip, trip and falling	on the remaining oil on soil	10

Table 4 (concluded)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure D.1
3	Thermal hazard		
3.1	Burns	hot hydraulic oil (leakage of the cylinders and ropes)	8
4	Hazards generated by noise		
4.1	Hearing losses (deafness)	hydraulic group	8
		operation of the engines, rollers, sawing, falling of wires	4-6-5
		distribution of the wires from the drums	1
5	Hazards generated by vibration		
5.1	Neurological and vascular disorders	circulation of the wire in the guide	11
6	Hazards generated by materials and products		
6.2	Contact with or inhalation of fluids, gas, mist	hydraulic oil (cylinders, group)	8
6.3	Fire	simultaneous presence of oil and electricity	8 - 12
6.4	Perforation, puncture	by cut wires and strips	1
7	Hazards generated by neglecting ergonomic principles in machine design		
7.1	Unhealthy postures	location of the machine actuators and their relating operation	12
		access to the machine parts for cleaning and maintenance	3-4
7.2	Excessive efforts	manual pressurisation on the mechanical devices for locking the pulling wires	4
		changing of manufacturing, adjustments, handling of parts or tools	4
7.3	Inadequacy with human anatomy	fall into the wire-guide delivery pit	2
7.4	Neglecting use of personal protective equipment	absence of advice, written instructions, PPE in inadequacy with the human body (glasses and vapour, gloves, ear protectors, dust mask and oils)	4
		initial training of the personnel	4
7.5	Inadequate local lighting	constraining location (shadow, dazzling, insufficient lighting)	4
7.6	Human error	Inadequate layout of actuators, inconsistency between the direction of the actuators' operation and the direction of the mobile parts	12
8	Hazards generated by failure of energy and other malfunctions		
8.2	Failure of control system	unintended start up (rollers, cutting)	12
8.3	Errors of mounting	changing of manufacturing, adjustments	4
9	Hazards generated by temporary missing or incorrect positioning of safety related equipment		
9.1	All kinds of guards	after maintenance and/or cleaning operation	4
	controls	insufficient emergency stop device taking into account the length of the guiding beam	12
		uncontrolled failure of the safety devices (switches, emergency stops, relays...)	12

Table 5 — Sheer compactor, extruder, vibrodistributor

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure E.1
1	Mechanical hazards		
1.1	Crushing	of a person between the machine and an other machine or obstacle on the same bed (including impact of a person between the mobile hopper and the machine hopper)	1
		of the driver or other operator at the crossing point of the machines located on 2 near and close beds	2
		of feet by the wheels of the machine on rails	3
		when changing of track (lifting)	4
		by mobile working parts (vibrating box, drawer, smoothing system, sealing helmets and harrow of hopper concrete)	6
1.2	Shearing	of the upper parts by the mobile transmission parts (pinions, chains, winches and pulling cables, slides, cylinders...)	7
		of the upper parts by the mobile working parts (vibrating box, drawer, guillotine/cutter, support of the poker vibrator, sealing helmets and harrow of the concrete hopper)	6
		of feet between 2 machines or machine parts	1
		of fingers: cleaning of the concrete feeder screws	9
		Of the mechanized devices for concrete collect and discharge between hollow core slabs	24
1.3	Cutting	sharps edges of the frame of the machine and tools	10
1.4	Drawing-in or trapping	by the harrow of the concrete hopper	9
		by the drum of the electrical power line of the machine	11
		with the pulling wire of the machine and the winch	
1.5	Impact	with an obstacle during the change of track (lifting)	4
		with the moving machine	1
		with an other machine or obstacle and the machine on the same track	1
		with an other machine (or obstacle) situated on a bed in the vicinity	1
1.6	Ejection of fluids under pressure	hydraulic ropes of the cylinders and of the hydraulic group: breaking, leakage	13
		compressed air of the poker vibrator (breaking of a rope)	14
		water ropes under high pressure (concrete smoothing)	15
1.7	Ejection of parts	breaking of the pulling wire of the spinner during machine operation	16
		breaking of the lifting accessories during the lifting	4
1.8	Slip, trip and falling	verification of the concrete level in the concrete hopper	18
		during cleaning of the hopper	18
		access at a height during hooking and unhooking of the machine to change its bed	4
		connection of the machine to the aerial electrical power line (mobile stick)	19
		with the pulling wire of the spinner or electrical cable of the machine on soil or on bed	16-11
		falling when descending from the passage/stair	20

Table 5 (continued)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure E.1
2	Electrical hazards		
2.1	Electrical contacts (direct or indirect)	motor, derivation boxes, protruding plugs, panels, electrical boxes	21
		electrical power source by collector wires and/or stick or cable drum on soil or by rubbing of the electrical cables against mobile parts (insulation, position, connection, wear, shut down) or batteries	19 – 11
		simultaneous presence of water and electricity	1 – 15
3	Thermal hazard		
3.1	Burns	hot hydraulic oil (leakage of cylinders and ropes)	7-13
4	Hazards generated by noise		
4.1	Hearing losses (deafness)	hydraulic group	13
		fixed vibrators on vibrating boxes or vibrating beams and poker vibrators	22
4.2	Interference with speech communication	alternate movements of drawers and helmets of concrete hopper	5-6
		movements of the green concrete smoothing systems	
5	Hazards generated by vibration		
5.1	Neurological and vascular disorders	resonance generated by the vibrators of the machine, the bed and/or the extruders	5-22
6	Hazards generated by materials and products		
6.1	Contact with or inhalation of fluids, gas, mist	demoulding oil on beds and machine tools	5
		hydraulic oil (cylinders, group)	13
6.2	Unhealthy substances	contact with the green concrete during casting, finalising, cleaning (disease generated by the cement)	18-6-5
		projection of concrete during cleaning of the machine: projections into the eyes	5 – 6 – 18
6.3	Fire	simultaneous presence of oil and electricity	13 – 21
6.4	Explosion	batteries	21
6.5	Perforation, puncture	with the grating harrow towed by the machine	1
7	Hazards generated by neglecting ergonomic principles in machine design		
7.1	Unhealthy postures	handling of the machine from one track to an other	4
		location of the machine controls, limited field of vision and adequate position of the driver: survey of the concrete, casting, the circulation ways of the machine	23
		access to the machine parts for cleaning, adjustments and maintenance	5-6-9
		absence of mechanised devices for handling of the accessories linked, for a moment, to a machine part and to be inserted into the green concrete	1
		absence of mechanised devices for handling and fastening of the inserts/combs	24
		absence of mechanised devices for removal of the "soffit" (hollow core slab) with machine parts towed by the vibrodistributor (mobile bucket)	24

Table 5 (concluded)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure E.1
7.2	Excessive efforts	changing of manufacturing, adjustments, handling of parts or tools	6
		absence of mechanised devices for removal of the "soffit" (hollow core slab)	24
7.3	Inadequacy with human anatomy	access at a height during hooking and unhooking of the machine to change its track	18 19 20
		driving hampered by a lack of visibility from the operator's position	2 23
		inadequacy of the driver support (seat, feet support, setting...)	2 23
7.4	Neglecting use of personal protective equipment	absence of advice, written instructions, PPE in inadequacy with the human body (glasses and vapour, gloves, ear protectors, dust mask and oils)	18 22 6
		initial training of the personnel	23
7.5	Inadequate local lighting	embarked lighting that is insufficient, misallocated or not vibration-, water-... proofed	6
7.6	Human error	moving the machine disregarding its intended aim (when manufacturing, moving on rails and lifting) linked to a location, characteristics and warnings in inadequacy with the actuators	23
		non stop of the machine at the end of the bed or in front of an obstacle (person, machine)	1
		derailment when transferring (risk of machine fall)	4
8	Hazards generated by failure of energy and other malfunctions		
8.1	Failure of energy supply	during its track changing (machine on lifting and translating motor/jacks)	4
8.2	Failure of control system	unintended start up (harrow of hopper, tilting of surface finishing device)	9
8.3	Errors of mounting	Inversion of the directions of rotation of concrete feeding screws, connections of jacks/cylinders, of vibrators	9-22
9	Hazards generated by temporary missing or incorrect positioning of safety related equipment		
9.1	All kinds of guards	after maintenance and/or cleaning operation	6
		after an impact on the guard that render it ineffective	6 21
	controls	locking of the moving controls to make the operator free during the operation which has been rendered semi-automatic (return of the machine)	22
		uncontrolled failure of the safety devices (cells, switches, emergency stops, relays...)	21
	particular	putting out of order the safety devices (cells, switches) to make some particular operations (starting of a bed, control of the concrete in the hopper...)	21

Table 6 — Tarpaulin paying out and winding in machine

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure F.1
1	Mechanical hazards		
1.1	Crushing	between the machine and an other machine or obstacle on the same bed	1
		of feet by the wheels of the machine on the rail	2
		during the track change (lifting)	3
		by incarceration of a person into the tarpaulin during its winding in	4
1.2	Shearing	of the upper parts between the beams of the winding in tarpaulin's rims and the structure of the machine	5
		of fingers into the mobile transmission parts (chains, pinions)	6
1.3	Cutting	sharp edges of the frame of the machine	7
1.4	Drawing-in or trapping	by incarceration into the tarpaulin during its winding in	4
1.5	Impact	with an obstacle during the track change (lifting)	3
		with an other machine or obstacle and the machine, on the same track	1
1.6	Ejection of parts	breaking of the transmission chain or roller during the machine operation	6
		breaking of the lifting accessories of the machine during lifting (track change)	3
1.8	Slip, trip and falling	caused by the condensation under the tarpaulin (moistening the environment)	4
		access at a height during hooking and unhooking of the machine to change its bed	3
		foot on the tarpaulin during winding in	4
2	Electrical hazards		
2.1	Electrical contacts (direct or indirect)	motor, derivation boxes, protruding plugs, panels, electrical boxes	8
		electrical power source by <i>collector wires</i> and/or stick or cable drum on soil or rubbing against mobile parts (insulation, position, connection, wear, cutting) or batteries	9
		presence of water	10
3	Thermal hazard		
3.1	Burns	of hands by contact with the hardened concrete products	10
		contact with batteries	9
3.2	Temperature increase	paying out: sudden release of heat	4
3.3	Limited visibility	reduced visibility during paying out (steam mist emission)	4
6	Hazards generated by materials and products		
6.1	Contact with or inhalation of fluids, gas, mist	oil on the tarpaulin	4
6.2	Unhealthy substances	contact with the green concrete during winding in (diseases caused by cement)	10
6.3	Fire	tarpaulin soaked with oil, electricity near	4

Table 6 (concluded)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure F.1
7	Hazards generated by neglecting ergonomic principles in machine design		
7.1	Unhealthy postures	manual winding in/paying out of tarpaulins	4-5
		location of the machine actuators and field of vision and adequate position of the driver	9
		replacement of a tarpaulin	4-5
7.2	Excessive efforts	manual winding in/paying out of tarpaulins	4-5
7.3	Inadequacy with human anatomy	access at a height during hooking and unhooking of the machine to change its track	3
		driving hampered by a lack of visibility from the operator's position	9-5
7.5	Inadequate local lighting	Constraining due to the machine, tarpaulin rolled up (shadow, dazzling, insufficient lighting)	4
7.6	Human error	moving the machine disregarding its intended aim (when lifting and moving on rails) linked to a design and location in inadequacy with the actuators' position	3-9
		non stop of the machine at the end of the bed or in front of an obstacle (lack of visibility, of marks, emergency stop)	1-9
8	Hazards generated by failure of energy and other malfunctions		
8.2	Failure of control system	unintended start up	9
8.3	Errors of mounting	direction of fixing the tarpaulin	4
9	Hazards generated by temporary missing or incorrect positioning of safety related equipment		
9.1	All kinds of guards	after maintenance operation	6-8
		after an impact on the guard that render it ineffective	6-8
		locking of the moving controls to make the operator free during the operation which has been rendered semi-automatic	9

Table 7 — Wire/strand and concrete sawing machine

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure F.1
1	Mechanical hazards		
1.1	Crushing	between the machine and an other machine or obstacle on the same bed	1
		of the driver or other operator at the crossing point of the machines located on 2 near and close beds	2
		of feet by the wheels of the machine on rails	3
		when changing of track (lifting)	4
1.2	Shearing	of the upper parts by the mobile transmission parts (tool moving support, guiding rollers...)	5
		of the upper parts by the mobile transmission parts (pinions, chains, winches and pulling cables, slides, cylinders...)	5
		of feet between 2 machines	1-3
		of fingers: by the rotating cutting wheel	6
1.3	Cutting	sharps edges of the frame of the machine and tools	6-7
		intervention with no regard on the braking time of the wheel	6-10
1.4	Drawing-in or trapping	by the cutting wheel	6
		by incarceration into the enclosure of the cutting area	6
1.5	Impact	with an obstacle during the track change (lifting)	4
		with an other machine or obstacle and the machine, on the same track	1
		with an other machine (or obstacle) situated on a bed in the vicinity	1-2
		by reduced visibility of the driver during moving in the opposite direction	2
1.6	Ejection of fluids under pressure	hydraulic ropes of the cylinders and of the hydraulic group: breaking, leakage	12
		ropes of water under pressure (for fixed station water saws)	12
1.7	Ejection of parts	blasting, breakage of the wheel during the machine operation	6
		breaking of the lifting accessories of the machine during the lifting	4
		projection of (concrete and steel) particles generated by the cutting operation	6
1.8	Slip, trip and falling	access at a height during hooking and unhooking of the machine to change its bed	4
		connection of the machine to the aerial electrical power line (mobile stick)	8
		falling when descending from the passage/stair	9
2	Electrical hazards		
2.1	Electrical contacts (direct or indirect)	motor, derivation boxes, protruding plugs, panels, electrical boxes	10
		electrical power source by <i>collector wires</i> and/or stick or cable drum on soil or rubbing against mobile parts (insulation, position, connection, wear, shut down) or batteries	8
		simultaneous presence of water and electricity	1

Table 7 (continued)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure F.1
3	Thermal hazard		
3.1	Burns	hot hydraulic oil (leakage of cylinders and ropes)	12
		Incandescent projections (steel)	6
		hot ends of the wires that have been cut	11
4	Hazards generated by noise		
4.1	Hearing losses (deafness)	hydraulic groups, motors	12
		cut of material	6
5	Hazards generated by vibration		
5.1	Neurological and vascular disorders	resonance generated by the cutting wheel on the material	6
6	Hazards generated by materials and products		
6.1	Contact with or inhalation of fluids, gas, mist	dust generated by cutting	6
		hydraulic oil (cylinders, group)	12
6.2	Unhealthy substances	contact with green concrete during cutting and from removal of soffit concrete (hollow core slab), cleaning (cement caused affections)	11
		projection of concrete during cutting, cleaning of the machine: projections in the eyes	6
6.3	Fire	simultaneous presence of oil and electricity	10-12
6.4	Perforation, puncture	With the wires cut by the wheel	6-11
7	Hazards generated by neglecting ergonomic principles in machine design		
7.1	Unhealthy postures	handling of the machine from one track to an other	4
		location of the machine actuators and limited field of vision and inadequate position of the driver: survey of the cut and of the circulation ways of the machine	10
		access to the machine parts for cleaning, adjustments and maintenance	12
		manual removal of the "soffit" (hollow core slab)	11
7.2	Excessive efforts	manual removal of the "soffit" (hollow core slab)	11
		adjustments, tool changing	12
7.3	Inadequacy with human anatomy	access at a height during hooking and unhooking of the machine to change its track	11
		driving hampered by a lack of visibility from the operator's position	10
		inadequacy of the driver support (seat, feet support, setting...)	2
7.4	Neglecting use of personal protective equipment	absence of advice, written instructions, PPE in inadequacy with the human body (glasses and vapour, gloves, ear protectors)	2-11
		initial training of the personnel	2-11
7.5	Inadequate local lighting	constraining location (shadow, dazzling, insufficient lighting) increased by the mobility of the machine	2-11
7.6	Human error	moving the machine disregarding its intended aim (when manufacturing, moving on rails and lifting) linked to a location, characteristics and warnings in inadequacy with the actuators	10
		non stop of the machine at the end of the bed or in front of an obstacle (person, machine)	1
		derailment when transferring (risk of machine fall)	

Table 7 (concluded)

Ref	Hazard according to annex A of EN 1050:1996	Localisation/scenario	See Figure F.1
8	Hazards generated by failure of energy and other malfunctions		
8.1	Failure of energy supply	during its track changing (machine on lifting and translating motor/jacks)	4
8.2	Failure of control system	unintended start up of the wheel in case of a presence of a person in the cutting area	6-10
8.3	Errors of mounting	bad fastening of the wheel and wheel in poor condition (damaged)	6
9	Hazards generated by temporary missing or incorrect positioning of safety related equipment		
9.1	All kinds of guards	after maintenance and/or cleaning operation	12
		after an impact on the guard that render it ineffective	12
	controls	locking of the moving controls to make the operator free during the operation which has been rendered semi-automatic (return of the machine)	10
		uncontrolled failure of the safety devices (cells, switches, emergency stops, relays...)	10
	particular	putting out of order the safety devices (cells, switches) to make some particular operations (beginning of cutting a bed after paying out the tarpaulin = steam)	10

5 Safety requirements and/or protective measures

5.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause and, unless otherwise specified in this standard, with the relevant requirements of EN 12629-1:2000+A1:2010. In addition, the machine shall be designed according to the principles of EN ISO 12100 for hazards relevant but not significant, which are not dealt with by this document.

NOTE For hazards which are to be reduced by the application of an A or B-level standard such as EN 349, EN 547, EN 614-1, EN 894, EN 953, EN 1088, EN ISO 7731, EN ISO 13850, EN ISO 13857, EN ISO 14122-1, and for hydraulic, pneumatic or other machinery dealt with in standards for common uses, the manufacturer should carry out a risk assessment to establish the requirements of the A or B-level or other standard which are to be applied. This specific risk assessment should be part of the general risk assessment of the machine.

Where it is known that the installation site already contains elements that can be considered as risk reduction means, the design of the machine may take these elements into consideration (see also Clause 7). 