SLOVENSKI STANDARD
SIST EN 536:2015

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Stroji za gradnjo cest - Oprema za mešanje materialov za gradnjo cest - Varnostne zahteve

Road construction machines - Mixing plants for road construction materials - Safety requirements

Straßenbaumaschinen - Mischanlagen für Materialien zum Straßenbau - Sicherheitsanforderungen

Machines pour la construction des routes - Centrales d'enrobage pour matériaux routiers - Prescriptions de sécurité

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Road construction machines - Mixing plants for road construction materials - Safety requirements

Machines pour la construction des routes - Centrales d'enrobage pour matériaux routiers - Prescriptions de sécurité

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 536:2015) 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of an identical text or by endorsement, at the latest by February 2016, and conflicting national standards shall be withdrawn at the latest by February 2016.

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This document supersedes EN 536:1999.

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.

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Introduction

This European Standard is a type C standard as stated in EN ISO 12100.

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

1 Scope

This European Standard specifies the safety requirements applicable to stationary and relocatable mixing plants for the production of materials (e.g. hot-mix asphalt, cold-mix asphalt, cement gravel) used for the construction and maintenance of traffic routes (roads, highways, sidewalks, airfields, etc.) water retaining works, dam walls, culverts, etc.

This European Standard applies to the following types of mixing plant:

a) hot asphalt mixing plant;

b) cold mixing plant (e.g. for production of cement gravel, cold mix asphalt);

c) mixing plant for bituminous or non-bituminous reclaimed materials;

d) mixing plant for mastic asphalt, also including natural asphalt.

Machines moving during the working process (e.g. mobile mastic asphalt mixers) and crushers are not covered by this European Standard.

Those types of asphalt mixing plants can also be combined or enlarged by additional installations (e.g. Plant for storage of binders (e.g. bituminous, synthetic, vegetal).

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

This European Standard does not apply to machines for the production of cement concrete and mortar as covered in EN 12151.

This European Standard does not deal with hazards caused by flammable gases. As soon as information is available it will be included.

This European Standard is not applicable to mixing plants for road construction materials, which are manufactured before the date of publication of this European Standard by CEN.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 547-1:1996+A1:2008, *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+A1:2008, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings*

EN 618:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of bulk materials except fixed belt conveyors*

EN 620:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for fixed belt conveyors for bulk materials*

EN 746-1:1997+A1:2009, *Industrial thermoprocessing equipment — Part 1: Common safety requirements for industrial thermoprocessing equipment*

EN 795:2012, *Personal fall protection equipment — Anchor devices*

EN 842:1996+A1:2008, *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 1037:1995+A1:2008, *Safety of machinery — Prevention of unexpected start-up*

EN 12600:2002, *Glass in building — Pendulum test — Impact test method and classification for flat glass*

EN 13482:2013, *Rubber hoses and hose assemblies for asphalt and bitumen — Specification*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 6204-1:2005, modified)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 7010:2012, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2011)*

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

EN ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

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

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 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

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 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*

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 walkways (ISO 14122-2:2001)*

EN ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, 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)*

ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-2:2004, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 3864-3:2012, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 6405-1:2004, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

3 Terms and definitions

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

3.1
mixing plant
complex installation of machines and functionally connected, performing a combination of the following functions (depending on the type of the plant) for example:

— storage and charging of aggregates and reclaimed materials;

— dosing of aggregates and reclaimed materials;

— scalping of cold aggregates and reclaimed materials;

— drying and heating of aggregates and if applicable reclaimed materials;

— screening;

— removal of dust from the gases emitted from the dryer;

— reintroduction of reclaimed fines;

— storage and dosing of imported fines;

— introduction of imported fines;

— storage and dosing of hot hydrocarbon binders;

— storage and dosing of cold hydraulic or hydrocarbon binders;

— storage and dosing of the hot aggregates and reclaimed materials;

— storage and dosing of other products (e.g. liquid additives, solid additives powder, fibres, bags);

— mixing of the constituents to obtain a homogeneous material;

— transfer of the final mix to storage and discharging of the final mix;

— storage and use of fuels

3.1.1
hot asphalt mixing plant
plant for the production of hot mix asphalt (containing e.g. aggregates, filler, binder (e.g. bitumen), additives)

Note 1 to entry: During the process the aggregates are heated (e.g. drum dryer).

Note 2 to entry: Other materials can be heated, e.g. binder, additives.

3.1.2
cold mixing plant
plant for the production of cold mix asphalt or cold mixes with hydraulic binders (containing e.g. aggregates, filler, binder (e.g. bitumen emulsion, cement), additives, water)

Note 1 to entry: During the process the aggregates are not heated.

Note 2 to entry: Other materials can be heated, e.g. binder, additives.

3.2
stationary plant
fixed plant which is not being moved during operation and not designed to be moved (e.g. installed on permanent foundations)

3.3
relocatable plant
3.3.1
transportable plant
plant which is not being moved during operation, but which is designed in such a way as to enable it to be transported from one place to another (e.g. with lifting points, telescopic legs to be picked up, sized to be transported in a standard container)

Note 1 to entry: The transportable plant can be disassembled to be transported easily (e.g. in components).

3.3.2
mobile plant
plant which is not being moved during operation, but which is mainly equipped with wheels for transportation by towing as to enable it to be moved easily from one place to another

Note 1 to entry: Components of the mobile plant can be disassembled to be moved easily and transported separately.

3.4
batch plant
asphalt mixing plant in which the material dosing and mixing operations are undertaken by successive batches in a mixer

3.5
continuous plant
asphalt mixing plant in which the material dosing and the mixing operations are undertaken by continuous equipment and handling systems which does not interrupt the material flow

3.6
mastic asphalt plant
plant, similar to hot mix asphalt plant (see 3.1.1), for the production of mastic asphalt (produced by a very rich mix of bitumen and filler)

Note 1 to entry: This plant can be equipped with heaters for the filler and also storage silos equipped with heaters and mixers (e.g. stirrers).

Note 2 to entry: Usual processing temperatures of mastic asphalt are higher than used for hot mix asphalt.

3.7
workstation/main control station
combination of energy supply, control cabinet/s and controls for operating the plant, including monitoring of the main parameters of the production process and warning signals

Note 1 to entry: It specifically contains:

— Indicators of operational parameters;

— display screens;

— tools to dialogue with the automation;

— possibly a flow diagram;

— control units to switch to manual operation (safety);

— a means to visually monitor the asphalt mix loading into collection vehicles (e.g. dump-haul truck).

3.8
skip hoist
equipment composed of a bucket generally trailed by one (or more) cable(s) and guided along its path by a system of inclined or vertical rails

Note 1 to entry: The bucket transports, by an automatic cycle, a volume of materials of defined maximum density, from a fixed bottom loading point to one or more high fixed discharge points.

3.9
equipment for storage
any type of silo, hopper or tank capable of holding materials

3.9.1
silo
permanent storage unit for granular material and powders (e.g. reclaimed fines, hot mixed asphalt)

Note 1 to entry: The silo is usually charged from the top and discharged from one or more outlets at the bottom or side.

3.9.2
tank
storage unit of fluids (e.g. hydrocarbon or synthetic binders, gases)

3.9.3
hopper
temporary storage unit with usually funnel-shaped section towards the bottom. It is used to channel solids towards a gravity discharge outlet during the process

Note 1 to entry: The hopper is usual emptied at the end of the process.

3.10
reclaimed asphalt pavements (RAP) drum dryer
equipment used to dry and heat reclaimed asphalt pavements

3.11
passage opening
opening (e.g. door, manhole) which allows the movement or the entry of a person's entire body

3.12
access opening
opening through which a person can lean forward, reach forward, or extend the upper body, head, arm, hand, a finger or several fingers, leg or foot

3.13
visual inspection opening
opening, where due to design or size only visual inspections are possible

3.14
interlocking device [interlock]
mechanical, electrical or other type of device, the purpose of which is to prevent the operation of machine elements under specified conditions (generally as long as a guard is not closed)

3.15
movable guard
guard which can be opened without the use of tools

3.16
fixed guard
guard affixed in such a manner (e.g. by screws, nuts, welding) that it can only be opened or removed by the use of tools (e.g. key, spanner) or destruction of the affixing means

3.17
troubleshooting
act of methodically determining the reason that the plant, or portions of the plant, has failed to perform the task or function as intended

3.18
transfer skip
equipment composed of a bucket generally moved either by one (or more) cable(s) or driven axles, and guided along its path by a system of horizontal rails

Note 1 to entry: The bucket transports, by an automatic cycle, a volume of materials of defined maximum density from a fixed loading point to one or more fixed discharge points.

4 List of significant hazards

This clause contains all significant hazards, hazardous situations and events, identified by risk assessments significant for this type of machinery and which require action to eliminate or reduce risk.

Table 1 — List of significant hazards

No.	Hazards	Locations/circumstances	Safety requirements and/or measures, reference in Clause
1	Burying	— in hoppers for delivery or storage by treated or untreated materials	5.3.1, 5.3.2, 5.3.3
1.1	Crushing	— when erecting machines; — in the operating area of skips	5.14 5.3.2, 5.17.1, 5.17.2
1.2	Cutting or severing	— with moving elements of the machines, e.g. — screw conveyors; — with the hopper discharge doors	5.16.2 5.16.5 5.12, 5.15.2.3
1.3	Drawing-in or trapping	— in the support rollers of rotating drums; — on belt conveyors; — on ventilator fans; — on bucket elevators and slat conveyors; — with the moving parts of mixers	5.3.2 5.16.1 5.16.3.1, 5.19.1 5.16.4 5.16.3.3
1.4	High pressure fluid injection	— flexible piping under hydraulic pressure; hot and flammable fluids in the circuits of thermal oil systems and bitumen distribution systems	5.3.3, 5.6, 5.9
1.5	Ejection of parts/materials	— on the material sampling systems	5.2.3.3, 5.11
1.6	Loss of stability	— insufficient supporting capability of the foundations; — erection of transportable machines	5.13 5.13, 7.2
1.7	Falling Slipping	— into hoppers, silos and tanks; — from walkways or access platforms; — on walkways or access platforms	5.2, 5.2.3.1 5.16.1, 5.17.2.2, Annex D 5.16.1, 5.17.2.2
1.8	Falling of parts/materials	— on walkways, working areas or access platforms	5.12
2	**Electrical hazards**		
2.1	Electrical contact (direct or indirect)	— power circuit	5.4
3	**Thermal hazards**		
3.1	Burns from contact or radiation	— the heating equipment of dryers, drum mixers and recycling drums and the equipment for heating binders; — screens, storage hoppers, mixers, weighting hoppers; — piping - especially flexible connections - and, in particular, those carrying hot products (thermal oil, hydrocarbon binders); — overflow from bitumen tanks	5.8 5.8 5.6, 5.8 5.8, 5.9.2, 5.15.2