BS EN 536:2015

BSI Standards Publication

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

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 536:2015. It supersedes BS EN 536:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/513/1, Earth moving machinery (International).

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 81774 8

ICS 93.080.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2015.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 536

August 2015

ICS 93.080.10

Supersedes EN 536:1999

English Version

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

Straßenbaumaschinen - Mischanlagen für Materialien zum Straßenbau - Sicherheitsanforderungen

This European Standard was approved by CEN on 3 July 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 536:2015 E

Contents

Page

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.

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 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.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

No.	Hazards	Locations/circumstances	Safety requirements and/or measures, reference in Clause
3.2	Harmful effects by hot environment	— maintenance of the drum dryers and mixing drums; — changing the screen meshes; — maintenance on bag filters; — inside the mixing towers	5.16.3.1, 5.16.3.5 5.12, 5.16.8, 5.16.9 5.15.2.1, 5.19.2 5.7, 5.16.12, 5.16.13
4	**Hazards generated by materials and products (maintenance)**		
4.1	Contact with or inhalation of harmful dusts	Maintenance work: — in housings for screens and bag filters (5.9); — during the manufacture of special products incorporating harmful additives (5.13)	5.12, 5.16.8 5.16.7
4.2	Fire or explosion	— in drums as well as in dust filters; — in the storage tanks for fluid bitumen and in thermal oil heaters — fuel storage tank (oil tank, gas tank, coal dust silo)	5.19.2 5.15.2.2 5.15.2.1
5	**Hazards generated by neglecting ergonomic principles**		
5.1	Defective posture	— in control cabins (position of the consoles, poor viewing position of the terminals)	5.10.1, 5.10.2
5.2	Inadequate lighting at the control station	— poor layout of the control cabin in relation to natural and artificial lighting	7.5
5.3	Mental overload/underload	— design of control stations	5.10
5.4	Effort	— handling, size and weight of the spare parts are not in accordance with ergonomic principles	5.13
6	Hazards generated by failure of power supply and other malfunctions		
6.1	Failure in (electrical, pneumatic and hydraulic) energy supply	— automatic closure of the delivery gates on bins and material storage hoppers	5.4.2, 5.7
6.2	Unexpected loss of machinery stability, overturning	— particularly for transportable machines when being erected and set-up during assembly	5.14
7	**Hazards generated by lack or incorrect positioning of safety devices**		
7.1	Loading and unloading facilities	— sampling on operational machinery for production control	5.11, 5.13

No.	Hazards	Locations/circumstances	Safety requirements and/or measures, reference in Clause
7.2	Essential accessories for safety during maintenance	— lifting tackle for handling heavy and awkward spare parts (e.g. for elevators, screens, mixers) if these machines are positioned at a higher level	5.13
8	Noise hazards		5.21

5 Safety requirements and/or measures

5.1 General

Machinery shall comply with the safety requirements and all protective measures of this clause.

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 European Standard.

The required performance levels (PLr) of safety related functions of control systems shall be in accordance with EN ISO 13849-1.

For all safety related functions of control systems see Annex F.

NOTE The performance levels quoted in Annex F do not apply to safety devices that do not interact with control systems.

5.2 Means of access

5.2.1 General

Adequate means of access shall be provided to the operator's station and areas where routine maintenance, service (e.g. burner adjustment, emission sampling) and material sampling has to be performed as described in the instruction for use.

Means of access shall take into account the erection and dismantling of the plant, including intermediate states of the process (e.g. transportation, part of the machine on jacks, power connections).

Means of access shall comply with EN ISO 14122-1, EN ISO 14122-2, EN ISO 14122-3 and EN ISO 14122-4.

Exceptions and additional requirements are described in 5.2.2, 5.2.3, 5.16.3.4 and 5.17.2.2.

5.2.2 Mobile plants

5.2.1 applies with the following exceptions and additional requirements:

When means of access cannot remain in place for transportation of the plant, due to e.g. applicable road regulations and dimensions, then they shall meet at least one of the following requirements:

— be completely or partly foldable or retractable;

— be dismountable only by the use of a tool for transportation and be attached to the plant for operation, maintenance, installation and dismantling.

When these means of access are foldable or dismountable, additional means shall be either fitted or provided in order to allow their installation or dismantling.

If personal protective equipment (PPE) is needed, anchor points according to EN 795 shall be fitted.

Other provisions (e.g. movable elevating working platforms) shall be described in the instructions for use.

For the access to maintenance points with a frequency less than a month external means of access (e.g. movable elevating working platforms) may be used instead of fixed access.

In this case the plant shall be designed to allow the use of external means (e.g. by providing enough space).

For emission sampling, the fixed means of access may be replaced by other provisions (e.g. movable elevating working platforms). In this case the plant shall be designed to allow the use of external means (e.g. by providing enough space) and shall be described in the instructions for use.

In case of foldable guardrails, they shall be fitted with a mechanical device which stops the guard in the intended position, e.g. limit stop, in order to prevent the guard-rail going beyond this limit.

If it is necessary to remove or to fold guard-rails in accordance with the working process (e.g. pallet handling), a system shall be implemented to protect the operator from falling (e.g. twin-gate lock, rail lock system).

Under exceptional circumstances the width of fixed walkways and working platforms can be reduced to 500 mm, e.g. to allow for a fixed means of access instead of a dismountable or a foldable one. For a distance less than 2 m, the width of walkways can be reduced to not less than 400 mm.

5.2.3 Openings

5.2.3.1 Dimensions for passage openings

a) Opening for horizontal forward movement in upright posture (doors), according to 4.1 of EN 547-1:1996+A1:2008 with x = 150 mm (basic allowance for body movement 50 mm + shoes or heavy footwear 40 mm + PPE which add height to the person, e.g. helmets 60 mm) and y = 70 mm (basic allowance for body movement 50 mm + working clothes 20 mm) taking into account the 95th percentile of the expected user population (P95);

b) for manhole for vertical entry through which rapid active movement needs to be possible, according to 4.4 of EN 547-1:1996+A1:2008 with x = 120 mm (basic allowance for body movement 100 mm + working clothes 20 mm) or if PPE needed, x = 220 mm (basic allowance for body movement 100 mm + working clothes 20 mm + PPE 100 mm);

c) For opening for entry in kneeling posture, according to 4.5 of EN 547-1:1996+A1:2008 with x = 120 mm (basic allowance for body movement 100 mm + working clothes 20 mm) and y = 120 mm (basic allowance for body movement 100 mm + working clothes 20 mm);

d) for all other passage openings, according to dimensions given in Annex A.

If this passage opening dimension cannot be fulfilled for technical reasons (e.g. small dimension of the machine, or obstacles inside the machine due to functional devices), then all or part of the machine shall be dismantled or folded to allow for the access and the corresponding procedure shall be described in the instructions for use.

NOTE 5.2.3.1 b), c) according to EN 547, as of today, there are no such openings in the plants covered by this standard.

5.2.3.2 Access openings

Applicable dimensions for access openings which are laid down in EN 547-1 and EN 547-2 have to be considered for a person for which h_1 = 1,8 m and a_1 = 0,6 m. If it is not possible to apply these measurements, minimum dimensions for access opening are laid down in normative Annex A.

If these access opening dimensions cannot be fulfilled for technical reasons (e.g. small dimension of the machine, or obstacles inside the machine due to functional devices), then all or part of the machine shall be able to be dismantled or folded to allow the minimum access dimension and the corresponding procedure shall be described in the instructions for use.

The design of the access opening shall take into consideration the need to use special tools, if any.

5.2.3.3 Visual inspection openings

In case of risks of projection (e.g. dust, bitumen, hot aggregates), a warning sign shall be fitted near the visual inspection opening in order to inform users about the need to wear personal protective equipment.

NOTE For flame-viewing, see 5.18.

5.3 Guards

5.3.1 General

If openings allow access to danger zones, they shall be fitted with guards.

Guards shall prevent access to dangerous areas and parts, where the hazard exists. Requirements for safety distances see EN ISO 13857.

Guards shall comply with EN 953.

On the top of the equipment for storages with openings, excluding aggregates cold feeders, a fall protection grid with openings not greater than 250 mm × 250 mm shall be fitted. For aggregates cold feeders, see 5.15.2.3

By the design of fall protection device, the working conditions should be taken into consideration.

5.3.2 Fixed guards

Fixed guards that are used to allow maintenance access shall be identified in the instruction manual.

Their use shall be clearly described in the instruction manual.

Where possible, fixed guards shall automatically come away from their fixed position when the fixings are loosened or opened (see relevant clauses).

If moving parts (e.g. support rollers of the dryers, drum mixers and recycling drums, skips) are reachable from access means, as defined by EN ISO 13857, then moving parts shall be equipped with fixed guards according to EN ISO 12100.

5.3.3 Interlocking devices and interlocking devices with guard locking

The interlocking device shall be in accordance with EN ISO 14119:2013.

Interlocking devices and interlocking devices with guard locking shall:

— Shut down all energies related to the danger zone (e.g. electrical, pneumatics, hydraulics, fuels);

— act on the control and the power (see explanation in 3.31 of EN ISO 14119:2013);

— not allow the energies to be switched on while the guard is open;

— not allow the associated equipment to be started when the guard is open;

— not allow the associated equipment to be automatically re-started when the guard is closed;

— not be easily overridden (see Clause 7 of EN ISO 14119:2013).

In case of hazard for the operator to being trapped in the danger zone, the plant shall be designed in order that the operators can avoid being trapped unexpectedly.

NOTE 1 Compliance with the key transfer systems in B.2 of EN ISO 14119:2013 will meet these requirements.

NOTE 2 For example, shut down pneumatic supply needs to isolate the circuit and to drain it. See EN ISO 4413 and EN ISO 4414.

5.4 Electrical installation

5.4.1 General

The electrical installation shall conform to EN 60204-1:2006.

5.4.2 Electrical cables

Electrical cables supplying power or passing signals or information shall have insulation resistant to hydrocarbons.

The electrical connector housings shall have a certain protection according to EN 60529:1991 which shall be not less than IP 54 if positioned inside a structure and not less than IP 55 if positioned outside.

5.4.3 Earthing

All machines, parts of machines and control stations shall be earth-linked.

5.4.4 Isolation for maintenance purposes

For maintenance purposes all electrically driven machines require control devices ensuring that the power supply remains switched off and an inadvertent reconnection is prevented according to EN 1037 (e.g. multi-pad lockable hasp).

NOTE For the design of switching off the power supply (e.g. interlocking devices), EN ISO 14119:2013, B.2, can be used.

5.5 Pneumatic

5.5.1 General

Pneumatic installations shall comply with EN ISO 4414.

5.5.2 Energy isolation and dissipation

For maintenance purpose, pneumatic devices shall be equipped with devices to isolate and dissipate energy as well as keeping them isolated (e.g. with padlock) in order to avoid inadvertent reconnection according to EN 1037.

The energy isolation and dissipation shall be done simultaneously either by automatic means or by manual operation.

5.6 Hydraulic

5.6.1 General

Hydraulic installations shall comply with EN ISO 4413.

5.6.2 Isolation and energy dissipation

For maintenance purpose, devices shall be installed in order to be able to remove pressure from the circuit. These devices shall remain in this position (e.g. with padlock) in order to avoid inadvertent reconnection according to EN 1037:1995+A1:2008.

5.7 Emergency stops

Emergency stops shall be installed to cut off all kinds of energy unless they are required for safety purposes in accordance with EN ISO 13850:2008.

Each emergency stop shall act on the entire plant.

Emergency stops shall be installed on each subdomain and at least the following machines where applicable:

— Aggregate feeder units, including conveyor belts;

— dryers, drum mixers, recycling drums;

— dust collectors and fans;

— elevators;

— process mixing tower and paddle mixer;

— storage silos and mixed materials systems;

— bitumen tanks and thermal heaters;

— control cabin.

Emergency stops shall be installed in strategic and easy accessible places.

NOTE In some cases it could be helpful to add information signs (e.g. sticker, plates) to find the emergency stop easily.

Restarting of the equipment shall be a voluntary manual action of the control devices after the re-setting of the emergency stops.

5.8 Hot parts

Hot parts shall be designed in such a way that requirements of EN ISO 13732-1 be fulfilled.

5.9 Piping

5.9.1 General

Provisions shall be taken for the positioning of piping to avoid deterioration e.g. through contact with hot surfaces, sharp edges and other damage-causing sources.

NOTE 1 Piping includes rigid and flexible design.

NOTE 2 For burners see 5.18.

5.9.2 Piping for hot liquids

When heating pipes full of bitumen, the expansion of the bitumen inside the pipes shall be managed in order to prevent any over pressure in the pipes (e.g. automatic opening of a valve, overpressure valve).

All temperature sensors for liquids shall be separated from the liquid, e.g. in liquid proof thermometer pockets/thimbles, in order to avoid any burns when removing the sensors (e.g. for maintenance purposes).

Flexible piping shall be in accordance with EN 13482.

Overpressure valves shall be installed in the circuit or in the pumps in order to avoid overpressure (e.g. in case of clogging, valve closed).

5.10 Control stations

5.10.1 General

The control stations shall be designed to have:

— observation windows with safety glass (2B2 according to EN 12600) and easy and safe method of replacement;

— the dimensions of the room and the location of the control panels and consoles shall be such that the access areas (see EN ISO 14122-2) for the staff shall remain when the doors of the panels and consoles are open.

A warning pictogram in accordance with EN 60204-1 shall be placed on the door(s) of every electrical cabinet and control cabins where electrical hazard(s) exist. For electrical requirements see 5.4.

Controls that are not placed at the main control station shall be weather proof or installed in a weather-proof lockable cabinet.

5.10.2 Main control station

A cabin shall be provided and shall be designed to fulfil the following requirements:

— protection of the operator against foreseeable adverse climatic conditions. Provisions shall be made to install a ventilation system and an adjustable heating system;

— at least one door opening outward;

— be lockable.

5.10.3 Starting

It shall be possible to start the mixing plant only by intentional actuation of control devices provided for the purpose.

Where starting and/or stopping of parts of the mixing plant needs to be performed in a specific sequence, there shall be devices which ensure that these operations are performed in the correct order.

5.10.4 Stopping

Mixing plants shall be fitted with stop controls whereby the machinery can be brought safely to a complete stop.

Each control station shall be fitted with control devices to stop the functions of the mixing plant machinery which are controlled from that station. Stop controls shall have priority over the start controls. All normal operational functions, which are sequentially started or stopped, shall be capable of being started and stopped individually for maintenance purposes.

5.10.5 Restarting

It shall be possible to start the mixing plant only by intentional actuation of control devices provided for the purpose (see 5.10.3), when restarting the mixing plant or parts of it after a stoppage, whatever the cause.

5.10.6 Troubleshooting

For specific requirements on troubleshooting see 5.17.2.3; 5.17.3.3 and 7.8.

5.10.7 Maintenance mode

For specific requirements on maintenance mode see 5.4.4, 5.5.2, 5.6.2, 5.16.4.2, 5.16.14 and 5.17.2.3.

5.10.8 Alarms and warnings

An automatic acoustic warning signal shall be given in the following cases:

— whole plant is started or restarted in automatic mode;

— parts of the plant are started or restarted from the main control station;

— parts of the plant are started or restarted from other than the control stations with no direct view to the danger zone.

NOTE A visual warning signal can be used as addition to the acoustic warning signal.

The audible warning signal shall comply with EN ISO 7731.

The visible warning signal shall comply with EN 842.

The warning sequence shall be as follows:

— warning signal with a minimum duration of 3 s;

— minimum waiting time of 15 s after the signal turned off, to allow the exposed persons to leave the danger zone or to prevent the plant or part of the plant from starting up.

If parts of the plant are started successively, no additional warning signal is required.

The delay for which the warning sequence is not necessary for starting plant sub-assemblies that are not started yet shall be between 1 min and 5 min.

5.11 Materials sampling

The sampling devices, e.g. gas, hot aggregates, fillers shall be designed and built to avoid unexpected material discharge during their operation and if relevant to avoid burns (e.g. sampling valve).

Bitumen sampling device(s) shall be designed in order to avoid the possibility of a direct bitumen flow between the tank (or pipe) and the outlet of the sampling device (e.g. sampling valve).

5.12 Restricted areas

The following areas shall be designated and have restricted access for personnel during plant operation:

— discharge areas (e.g. mixer, mixed material hopper, filler discharge);

— overflows;

— loading areas;

— scalping screen;

— screen reject.

These areas shall be marked at least with a warning sign (see 5.20).

For areas (e.g. aggregate overflow material discharge) where the overflow material is not collected by e.g. a hopper, the access to this area can contain risks. Access to these areas should be bordered by e.g. peripherical bunds with warning signs allowing, if relevant, regular access for cleaning of this area with a machine (e.g. by a loader). See 7.4.

5.13 Lifting, tie down and transport

5.13.1 General

Parts of the plant which have to be folded or moved for transportation (e.g. articulated conveyors, foldable gangways, telescopic legs) shall be designed in such a way that they can be immobilized in order to avoid unexpected movement during transport or erection.

5.13.2 Design of attachment points for transportation purpose

5.13.2.1 Tying-down and lifting attachment points (for transportable plants)

When necessary for transportation (e.g. direct lashing method according to EN 12195-1) and/or lifting, a machinery unit shall have tying-down and/or lifting attachment points. In case of tying-down attachment points needed, EN 12195-1 standard may be used as a guidance for dimensioning these tying-down attachment points.

If some attachment points are used for lifting and tying-down, they shall be designed for both applications.

NOTE The attachment point can be a hole, a tying-down eye or any specific part of the machine as specified by the manufacturer.

5.13.2.2 Towing attachment points (for mobile plants)

There shall be an appropriate towing attachment point (at the interface of the machine and the carrier-vehicle).

NOTE e.g. ISO 3842, ISO 8716 can be used as guidance.

5.13.3 Location of tying-down and lifting attachment points for transportation purpose

The attachment points shall be so located in such a way that damage of the tying-down/lifting accessories due to sharp edges, etc. is avoided when the machine is tied-down/lifted according to the manufacturer’s instructions. If it is not possible, a specific procedure for tying-down/lifting shall be described in the operator's manual and on the machine (e.g. appropriate edges protectors).

The lifting attachment points shall be designed in such a way that they will prevent any unintended movement of the lifted part of the machine, taking into account the position of the centre of gravity and the lifting procedure.

5.13.4 Identification of tying-down and lifting attachment points for transportation purpose

Lifting attachment points shall be identified adjacent to the points using ISO 6405-1:2004, symbol 7.23:

Figure 1 — Lifting attachment point

Tying-down attachment points shall be identified adjacent to the points using ISO 6405-1:2004, symbol 7.27:

Figure 2 — Tying-down attachment point

Tying-down and/or lifting attachment points can be painted in colour contrasting with the rest of the machinery unit. If some attachment points are used for lifting and tying-down, they shall be marked for both applications (by a combination of the two previous pictograms).

5.13.5 Other lifting attachment points for handling purpose of components or other sub-assemblies

Such lifting points are not necessarily the same as those used for charging/discharging machines for transportation purpose. If they are different, they shall not be identified with the same pictogram as those described above.

5.14 Transportable and mobile machines - Erecting equipment

Jacks shall be located in such a way that the operator does not have to go under the machine to actuate the erecting equipment.

A hydraulic or mechanical device (e.g. bolts, self-closing valves) shall prevent the unexpected collapse of the machine due to a failure (e.g. of the jacks or hydraulic).

5.15 Equipment for storage of constituent materials

5.15.1 Silos

Silos shall be equipped with an overflow sensing device (e.g. maximum level sensor). This device shall either automatically stop the filling process or shall activate an acoustic or visual signal to warn the operator of overfilling.

Discharge opening(s) equipped with operated gates/flaps shall be designed to allow the blocking for maintenance.

The manufacturer should specify the maintenance position (opened and/or closed) depending on the maintenance works.

5.15.2 Tanks

5.15.2.1 General

Tanks, except those filled by hand (e.g. hand-pump, pouring) with a maximum volume of 1 000 litres and visual level supervision, shall be equipped with an overflow prevention device (e.g. maximum level sensor). This device shall either automatically stop the filling process or shall activate an acoustic or visual signal to inform the operator of the filling process in case of overfilling.

In case of a flexible connection (e.g. hose) between the supplying equipment (e.g. truck, train, boat) and the hot (> 60 °C) material storage tank (e.g. bitumen, heavy fuel oil) the risk of leakage under pressure shall be minimized. In this case tanks shall allow filling by gravity or shall be fitted with a suction pump for filling.

If a movable guard is fitted at the top of a tank, the opening shall be equipped with a fixed grid to prevent access.

All temperature sensors for liquids shall be separated from the liquid, e.g. in liquid proof thermometer pockets/thimbles, in order to avoid any burns when removing the sensors (e.g. for maintenance purposes).

It shall be possible to isolate the flow of liquids on all sides of the equipment (e.g. pumps, filters, flow meter) for maintenance reasons.

5.15.2.2 Heated tanks

5.15.2.2.1 General

Specific requirements for burners are detailed in 5.18.

Heated tanks shall be equipped with an overflow prevention device (e.g. maximum level sensor). This device shall automatically stop the filling/transfer process.

Heating devices (e.g. convector tubes for direct heating, and serpentines heating coils for indirect heating, and resistors for electrical heating) shall be able to heat the material (e.g. bitumen, heavy fuel oil) up to the necessary temperature and to keep it at this temperature while avoiding any local overheating.

To avoid the risk of burning or explosion of the material inside the tank, measures shall be taken not to exceed the maximum temperature indicated to the material by a temperature limiting system.

This temperature limiting system shall be designed in that way (e.g. redundancy), that a failure does not create this dangerous situation (burning or explosion of the gas/material).

If heating system temperature can exceed the auto-ignition point, measures shall be taken to maintain the level of material in the tank at least 100 mm above the heating elements or the heating system shall be disabled.

5.15.2.2.2 Direct heat convector tubes

The outlets of exhaust tubes shall discharge outside the tank.

5.15.2.2.3 Indirect heaters

The starting and control system shall be installed in a lockable electrical weather-proof cabinet.

5.15.2.3 Aggregate cold feed hoppers

Virgin or recycled aggregates cold feeders shall be equipped with fixed or movable grating.

NOTE Fixed grating can be static or dynamic, e.g. by shaking or vibrating.

Movable gratings shall comply with Annex D.

The design of the grating shall not allow the passage of bowls with a diameter of more than 150 mm.

The minimum load to take into account for all gratings is 1,5 kN concentrated load applied in the most unfavourable position with a load distributor of 200 mm x 200 mm.

All grids shall withstand the load without any permanent deformation.

Verification shall be done by testing or calculation.

5.16 Equipment for handling of constituent materials

5.16.1 Conveyor belts

Belt conveyors shall comply with EN 620:2002+A1:2010, with the following exceptions and/or complements:

— by exception to 5.1.1.1 to 5.1.1.5, 5.1.4.2 and 5.1.4.3 to 5.1.4.5 of EN 620:2002+A1:2010 and regarding the accumulation of material nip guards shall be considered (see Figure 1 of EN 620:2002+A1:2010);

— in addition to 5.1.6.1 of EN 620:2002+A1:2010, if the height of the axis of the head pulley of the conveyor belt is more than 1,7 m from the ground or platform, a lateral walkway shall be provided from below 1,7 m to the top.

NOTE If the height of the axis of the head pulley is between 1,7 m and 3 m from the ground, a movable working platform or a portable scaffold is acceptable.

— For 5.1.1.4.1, Figure 6 of EN 620:2002+A1:2010, the height of the gap for removal of spillage (see key 13 of Figure 6 in EN 620:2002+A1:2010) shall comply with EN ISO 13857:2008, Tables 4 and 7;

— for applying 5.1.4.3.2 of EN 620:2002+A1:2010, delete the following exemption:

”or the return belt is at a height of less than 0,7 m above the floor of the working and traffic area and fixed guards having the dimensions shown in Figure 10 are fitted.”

— for applying 5.1.6.1 of EN 620:2002+A1:2010 delete “(see Introduction)”;

— 5.1.6.2 “Access under fixed height conveyors” of EN 620:2002+A1:2010 does not apply;

— 5.1.6.3 “Access under variable height conveyors” of EN 620:2002+A1:2010 does not apply;

— for applying 5.1.6.5 of EN 620:2002+A1:2010, the width of all walkways, stairways, steps or platforms shall comply with EN ISO 14122-3;

— for inclinations between 0° and 20°, the footpath is a ramp. For inclinations between 10° and 20°, it shall be provided with a surface that permanently retains slip resistance (e.g. by open grip, see Figure 3).

Provided a surface that permanently retains slip resistance by exception to EN ISO 14122, a ramp is allowed between 20° and 22°.

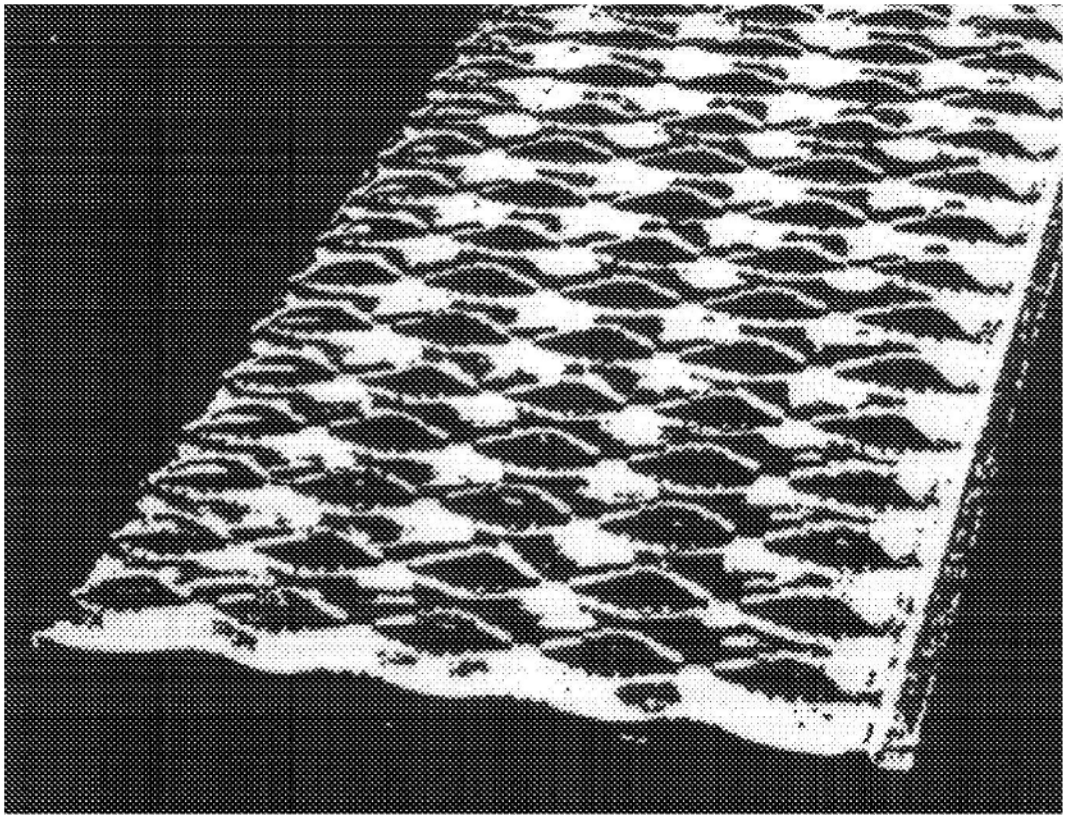


Figure 3 — Example of open grid type of slip resistance surface

— For inclinations > 22° and < = 30°, even if not recommended by EN ISO 14122-1, a stair shall be provided;

— if there is a stair provided instead of a ramp, it can be continuous without intermediate platforms;

— one or more pull cord activated emergency stops (see 5.7), along the full length of the installation including the loading and discharge points, in accordance with EN 620:2002+A1:2010, 5.7.2.8 b), is/are required. 5.7.2.8 a) and c) of EN 620:2002+A1:2010 do not apply;

— for aggregates feeder units it is not necessary to have one pull cord on each dosing belt if there is already at least one along the collecting belt located underneath.

Inclined fixed belt conveyors shall be designed in such a way that an unintended reverse movement of the belt shall be avoided (e.g. control device of the direction of winding).

5.16.2 Vibrating scalping screen

Springs shall be covered with a sheath in accordance with EN ISO 13857 to avoid fingers jam.

5.16.3 Rotating drums

5.16.3.1 General

Rotating drums (e.g. dryers, drum mixers and recycling drums) or adjacent equipment shall be equipped with a door permitting access to the interior of the rotating cylinder.

The door shall be fitted with an interlocking device (see 5.3.3).

The following functions shall be stopped when opening the door, and shall not be started as long as the door is open:

— the rotation of the drum;

— the burners as well as auxiliary equipment;

— preceding machinery (e.g. in case of a drum-mixer: supply of filler, bitumen, aggregates, recycling asphalt pavements, etc.);

— the exhaust fan.

A permanent means of access in accordance with 5.2.1 shall be provided.

For maintenance purposes with the access door of the drum opened, it shall be possible to exhaust the air out of the drum, e.g. by the exhaust fan in trouble-shooting mode with a maximum of 15 % of the nominal power or additional devices.

The temperature sensor located at the inlet of the filter shall automatically shut-off the operation of the burner(s) in case of exhaust gas temperature above the allowed temperature for the filters as defined by the manufacturer in any phase of the process.

Specific requirements for burners are detailed in 5.18.

5.16.3.2 Recycling ring

The casing of the recycling ring shall be fitted with an opening for maintenance protected by a guard according to 5.3.

5.16.3.3 Counterflow drum mixer

The feeding system (e.g. conveyor belt, chute) for recycled aggregates into these drums shall be equipped with a system to allow checking of the material flow and the normal dispatch of material into the drum (e.g. level sensor, speed of the belt, weight of the recycled aggregates).

If there is no material flow for a time as defined by the manufacturer, the sensor system shall automatically stop the burner(s) and the binder injection.

See Instructions for use, 7.4.

5.16.3.4 Rollers adjustment

The design shall allow the use of mobile means of access (e.g. working platform according to EN 280, mobile stair see Figure 4). If there is a permanent means of access in accordance with 5.2.1 or the adjustment can be made from ground level, mobile means of access is not required.

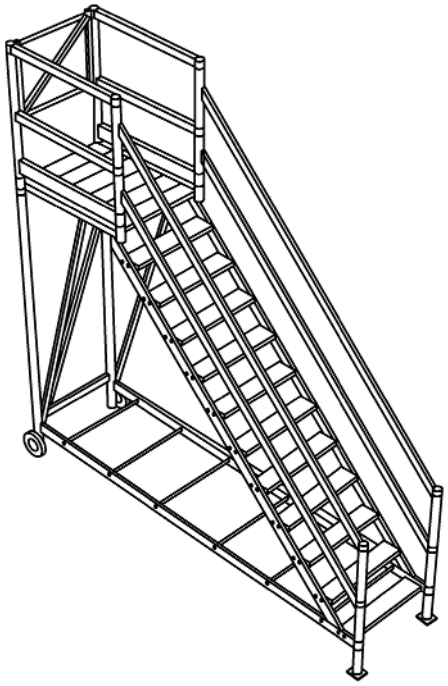


Figure 4 — Mobile stair

5.16.3.5 Maintenance

For maintenance, locking means shall be provided to prevent unintended rotation of the dryer-drum by means of gravity.

NOTE Examples for locking means are mechanical locks, brakes, cut-off transmission, friction-belts.

5.16.4 Bucket elevator

5.16.4.1 General

The casing which encloses the chain(s)/belt(s) and buckets shall have opening/s with guard(s) to allow control and adjustment of tensioning devices as well as to carry out the maintenance, inspection and the removal of the material.

The bottom part of the elevator shall be equipped at least with one movable guard with an interlocking device (see 5.3.3).

The following functions shall be stopped when opening the guard:

— drive of the wheel of the bucket elevator;

— relevant upstream machinery (e.g. drying drum, recycling asphalt belt conveyor, filler screws).

Bucket elevators shall comply with EN 618 with the additional specifications:

For application of 5.1.9, the width of permanent access shall comply with EN ISO 14122-3:2001.

Bucket elevators shall be designed in such a way that an unintended reverse movement of the bucket shall be avoided.

Bucket elevators shall be fitted with:

— Means of access and platforms on maintenance points;

— the head cover shall be designed in such a way that the removable parts of the cover are less than 25 kg or alternative systems shall be provided (e.g. lifting device, foldable cover) and the procedure shall be described in the instruction for use.

5.16.4.2 Maintenance

If for maintenance reasons it is necessary to move the bucket elevator in a motorized way while the door(s) is/are open, then the following requirements apply:

— from the main control panel it shall be possible to activate a maintenance mode;

— in this mode the drive of the hot elevator and the upstream machinery are stopped and the normal function of the control panel for the hot elevator and the upstream machinery is deactivated;

— close to this door(s) of the bucket elevator shall be a maintenance control station;

— this maintenance control station shall have a direct view to the maintenance point;

— from this maintenance control station it shall be possible to activate the bucket elevator;

— this control(s) shall have a hold-to-run function;

— the activated maximum speed of the bucket elevator shall not exceed 30 mm/s.

5.16.5 Screw conveyors

Screw feeders/conveyors shall comply with EN 618.

The casing which encloses the screw shall have opening/s with removable cover(s) to allow calibration as well as to carry out the maintenance, inspection, sampling and the removal of the material.

Behind the removable cover, a fixed guard (e.g. grid) that does not impair the function(s) mentioned above shall be fitted to avoid hazards generated by moving parts.

5.16.6 Rotary valve

Rotary valve shall comply with EN 618.

For application of 5.1.9 of EN 618:2002+A1:2010, the width of permanent access shall comply with EN ISO 14122-3.

5.16.7 Manually introduced additives

When the installation is designed to incorporate manually materials prepacked in bags inside the mixer, the introduction of the material in the mixer shall be made by a device which prevents dust emissions and prevent the upper limbs of the operator being trapped during the feeding operation, see EN ISO 13857.

5.16.8 Screen

The screens shall be enclosed in dustproof housings which have opening/s with guards to permit the replacement of the screen meshes, visual inspection and maintenance.

This/These guard/s for access openings and passage openings shall be equipped with an interlocking device (see 5.3.3).

The following functions shall be stopped when opening/removing these guards:

— drive/s of the screen;

— hot elevator;

— relevant upstream machinery/unit (e.g. bypass-system).

Protection devices shall be equipped if the risk of falling down exists (e.g. changing the mesh) when the guards are open. These protection devices can be either permanently fixed, automatically moved in position or manually activated.

Deviating from 5.3.1, the maximum gap for grids shall be 100 × 100 mm.

The protection device shall be so designed, that wearing through the normal working process shall be minimized.

Warning signs (e.g. temperature, risk of falling) shall be placed close to the relevant areas.

5.16.9 Hot aggregates storage

The passage and access openings shall be fitted with fixed or moveable guards that fulfil the following requirements:

— Movable guard/s shall be equipped with an interlocking device in accordance with 5.3.3.

The following functions shall be stopped when opening the moveable guard, and shall not be able to be started while the moveable guard/s is/are open:

— All relevant upstream machinery (e.g. screen, hot elevator).

While moveable guards are opened or removed, the discharge gate(s) shall be closed automatically. It shall not be possible to open the discharge gate(s) as long as the moveable guard/s is/are open.

5.16.10 Equipment for metering

5.16.10.1 Dosing systems

The binder weigh hoppers shall be fitted with a device which prevents binders from overflowing, e.g. in cases where the metering or the control system fails.

5.16.10.2 Calibration

The plant shall be designed in order to allow all calibrations (e.g. flow, weight, temperature, pressure) and to avoid any dangerous situations during these calibrations.

Dangerous situations during the calibration process of the bitumen flow meter:

— having a hose under pressure during calibration (which may cause bitumen leakage at the connection points if they are damaged or misconnected);

— having a hose full of bitumen at the end of the calibration (which may cause bitumen leakage when the hose is disconnected from the carrier vehicle).

If the calibration process requires calibrated weights, it shall be possible to secure those weights so there is no risk of them falling.

If the calibration process requires a certain amount of material (e.g. filler, bitumen, aggregates, granulates) to be sampled, so that it can be externally weighed, the following requirements shall be fulfilled:

— it shall be possible to interrupt the material flow immediately;

— if the material is sampled from a continuous handling system, the materials sampling shall be according to 5.11;

— if the material is at high temperature (higher than 60°C) protective measures and procedures for material collecting shall be described in the instruction handbook in order to avoid contact of the operator with hot materials. A warning sign close to the sampling point shall inform of the need for PPE.

— exposure of harmful material to the environment shall be prevented by a device (e.g. flexible hose).

5.16.11 Water steam duct

Duct shall be equipped with access opening(s) for maintenance or inspection purposes protected with a guard according to 5.3. A warning sign shall be affixed in the vicinity of each guard to warn the operator about the hazard of steam ejection.

5.16.12 Mixer

The passage and access openings shall be fitted with at least one movable guard and shall fulfil the following requirements:

— Movable guard/s shall be equipped with an interlocking device in accordance with 5.3.

The power supply of the mixer and to all relevant machinery which precedes (e.g. weighing bins, hot elevator, feeding/s) and discharge gate shall be interrupted when opening the movable guard, and shall not be able to be reconnected while the movable guard/s is/are open.

In this case the stored energy in the supply lines (e.g. pneumatic) inside the mixing tower system and all relevant machinery which proceeds shall be released automatically.

5.16.13 Mixing tower exhaustion

For maintenance purposes with open access in the mixing tower, it shall be possible to exhaust the air out of the mixing tower, e.g. by the exhaust fan or additional devices.

5.16.14 Lifting equipment

Lifting equipment for maintenance purposes shall be usable even if the plant is cut from power.

5.17 Equipment for handling of mixed material

5.17.1 Transfer skips

Transfer skips shall be provided with the following devices:

— limit switch actuator with mechanical limit stops;

— all service and maintenance equipment, as far as practicable, shall be located outside the travel area of the transfer skip in order to be accessible safely.

Transfer skips shall be located in an enclosed area by housing or fixed guards.

This enclosed area shall be accessible through a passage opening fitted with a movable guard with interlocking device complying with 5.3.3.

The following functions shall be stopped in case of opening of the movable guard and shall not re-start when it is open:

— transfer skip movement;

— transfer skip feeding;

— transfer skip emptying;

— hot mix storage silos top doors movement (if any).

5.17.2 Skip Hoists

5.17.2.1 General

Skips shall not discharge unintentionally during operation.

The skip hoist shall be designed for the worst conditions including:

— the maximum capacity of the bucket with the maximum density of the material as specified in the instructions for use;

— the maximum over-speed limit of ascent or descent (10 % above the maximum speed as defined by the manufacturer).

The rails shall be fitted with limit switches to stop movement of the skip at the lowest and highest positions.

Rails shall extend over the limit switches to prevent that the skip can reach their ends on normal operation. The ends shall be equipped with stop elements (e.g. buffers).

A mechanical locking device shall be provided in order to lock the skip for maintenance purposes (e.g. pin or hook).

5.17.2.2 Means of access, passage

5.17.2.2.1 General

Means of access according to EN ISO 14122 shall be provided at the top and/or bottom to allow the skip maintenance (the removal of the cable, the maintenance of the gear motor and its brake, the change of the guide rollers).

Walkway and means of access complying with EN ISO 14122 shall be provided for intervention to devices, intermediate safe position, heads and to feeding and discharging materials means.

When there is a stairway along the rail of the skip it may have a maximum angle of pitch of 50° without the need for resting platforms even if the height exceeds 4 m (see EN ISO 14122-3:2001, 5.8 and 6.8).

5.17.2.2.2 Access to the operating area – passage openings

A fenced enclosure shall prevent access to the area around the skip feed point. The safety distances and dimensions of the fence shall comply with EN ISO 13857:2008, Tables 2 and 4.

Access to the operating area of the skip bucket, including at the top, shall be protected either by fixed guards or movable guards with interlocking device if danger zone is reachable by the operator.

Every access to the bucket enclosure shall have a guard with an interlocking device complying with 5.3.3.

The followings functions shall be stopped in case of opening of the guard:

— movement of the winch of the skip hoist;

— brake of the winch of the skip hoist;

— feeding of the bucket of the skip hoist.

The intervention area around the skip inside the enclosure shall have sufficient clearance to allow the work for the operator. See Annex A “Passage openings”.

5.17.2.2.3 Skip hoist with pit (if any)

The dimensions of the pit have to allow the passage of an operator around the bucket in low position.

5.17.2.2.4 Skip hoist with foldable rails for truck direct loading

5.17.2.2.4.1 General

Access to the area around the skip feed point, as an exception to 5.17.2.2.2 has to be protected by other means (e.g. by light curtains, barriers, gates).

5.17.2.2.4.2 Position of the rail for direct loading mode under mixer

The authorization of the direct passage of trucks shall be allowed, provided each of the following steps is carried out and succeeds one after the other in the following order:

1) Bucket moved to intermediate safe position (checked by a position control).

2) Locking of bucket anti-fall safety device (checked by a position control) preventing the skip hoist operation.

3) Authorization of moving the rail into safe position when the bucket is at safe position.

4) Locking of the rail anti-fall safety device upon the presence of the rail in its safe position (checked by a position control).

5) Authorization of passage of trucks (raising of barriers, green light, etc.).

5.17.2.2.4.3 Repositioning of the movable rail in 'skip hoist' operation mode

The authorization of skip hoist operation shall be allowed, provided each of the following steps is carried out and succeeds one after the other in the following order:

1) Prevent the access to the direct loading area (lowering of barriers, red light, etc.).

2) Unlock the anti-fall safety device of the raised rail upon the presence of the rail in its safe position.

3) Authorization of moving the rail to its operating position (checked by a position control of the rail).

4) Unlocking of the bucket anti-fall safety device allowing the control of the skip hoist operation.

5.17.2.3 Maintenance and troubleshooting

If there is more than one operator's position, the main control station shall be provided with a lockable mode selector to intentionally select the control station and operating mode which will be used. When another control station than the main control station is selected, the operation of other plant parts shall be stopped. Each control station shall be designed in such a way that the use of the other control stations is excluded, except emergency stop.

The braking system of the bucket shall operate in case of failure of electric supply or emergency stop, in all operating conditions, including the worst conditions.

An over-high and over-low limit switch shall initiate the emergency stop of the bucket.

If the bucket remains blocked in its rails or cannot activate the over-low limit switch by obstruction of the rolling path, a device shall activate the emergency stop of the winch, by detection of the winding of the cable outside its normal operating path (e.g. anti-slack device or by detection of the wrong operation of the winch system).

A device that surveys the duration of descent in automatic operation shall be provided in addition to the over limit switches.

5.17.2.4 Winch system

5.17.2.4.1 General

Winches shall be designed in such a way that movements can be decelerated, the load can be held, and that unintended movements are avoided. In addition the rotating masses and the maximum speed, e.g. in the event of a phase failure, shall be taken into account.

The winch drums shall not have any protuberances which can damage the cables.

Their diameter shall be, at least, equal to 20 times the diameter of the cable.

The diameter of the wheel discs of the drum shall be greater than the outer layer of cable by at least twice the cable's diameter.

Under normal working conditions, there shall always be at least three turns of cable on the winch drum.

The maximum load of the rope shall not exceed one-third of the breaking load.

5.17.2.4.2 Slack-rope/rope

A “slack-rope” mechanism which cuts off the energy supply to the electric motor and activates the braking system shall be installed.

If two ropes are provided, two “slack-rope” safety device and/or spreader shall be fitted.

If two ropes are provided, either a single “slack-rope” safety device shall allow the detection of each of the two ropes or each of the two ropes shall be fitted with a “slack-rope” safety device.

A device shall be provided to prevent whirl of ropes on the winch winding drum.

5.17.2.4.3 Mechanical stop

Mechanical locking devices shall be supplied to fix the skip on the track (e.g. for changing the rope). Mechanical stops are over the over limit switch to stop the skip bucket in case of over limit switch malfunction.

The skip track shall extend at least beyond the ultimate skip position and be equipped with a mechanical stop unit.

5.17.2.4.4 Overspeed limiter

A bucket over-speed limiter and a winch rotation direction control shall be provided.

The over-speed limiter shall act at 10 % above the maximum rated speed indicated.

5.17.3 Drag slat conveyor

5.17.3.1 General

The housing which encloses the chain(s) and slats shall have visual inspection opening/s.

The housing shall have an access opening at the foot/inlet area of the drag slat conveyor for maintenance, adjustments and to remove blockages. This opening shall have guards fitted with an interlocking device, see 5.3.

The following functions shall be stopped when opening the guards with interlocking device:

— drive(s) of the drag slat conveyor;

— upstream machinery (e.g. drum mixer, mixer, material supplying systems).

5.17.3.2 Means of access

The stairway along the drag slat conveyor may have a maximum angle of pitch of 50° without the need for resting platforms even if the height exceeds 4 m (see EN ISO 14122-3, 5.8 and 6.8). In addition, anchor points designed according to EN 795 shall be fitted above each idler shaft.

5.17.3.3 Troubleshooting

From the main control panel it shall be possible to activate a troubleshooting mode. In this mode the drive of the drag slat conveyor and the upstream machinery shall be stopped. In troubleshooting mode the operation from the main control panel shall be deactivated.

Close to the foot/inlet area of the slat conveyor shall be a troubleshooting control station with a direct view to the foot/inlet area. From this trouble shooting control station it shall be possible to activate the forward and rearward direction of the slat conveyor only while the guard(s) is/are not closed.

These controls shall have a hold-to-run function.

The normal function of the slat conveyor shall only be able to be activated from the control panel, while the guard(s) is/are closed.

5.18 Burner

The safety requirements which are to be applied shall be those corresponding to the type of burner and to the fuel(s) used. The relevant requirements of EN 746-1 shall be considered.

Burners shall have a guard (see 5.3) at the blower air intake.

Flame-viewing hatches shall be so designed or equipped with a guard assuring the protection of operators against hurting due to reverse flame blow back or radiation.

5.19 Exhaust system

5.19.1 Exhaust fans

A visual inspection opening shall be installed on the casing of exhaust fan's envelope. The guard of this opening shall be in accordance with 5.3.

Safety requirements for fans should be in accordance with EN ISO 12499.

If the inlet and exhaust ducts connected to the exhaust fan are equipped with inspection openings they shall be fitted with guards with interlocking devices in accordance with 5.3.

The following functions shall be stopped when opening the guard(s):

— drive of the wheel of the exhaust fan;

— relevant upstream machinery (e.g. burner).

A drain outlet (in accordance with EN ISO 13857) that can be connected to an emptying pipe shall be installed in the lower part of the fan casing.

5.19.2 Dust collector

The dust collector shall be enclosed in dust-proof housings that shall be equipped with:

— opening/s with guards (see 5.3) for filter(s) maintenance purposes on clean gas side;

NOTE The following devices can create hazards, which need an interlocking device in case of movable guard (see 5.3.3), e.g.

— Cleaning system;

— main exhausting fan;

— throttle valve.

— opening/s with guard(s) with interlocking device on dirty gas side for maintenance purposes. The following functions shall be stopped when opening the guard(s):

  — drive of the wheel of the exhaust fan;

  — drive of the recovered filler conveyor system;

  — cleaning system;

  — upstream machinery.

If the risk of fire exists (e.g. caused by parallel flow drum mixers, RAP drum dryer) the dust collector shall be equipped with a device (e.g. fire-resistant flap between the outlet of the drum and the inlet of the filter), protecting the dust collector in order to avoid the risk of propagation of fire in the filter.

5.20 Safety signs

Warning signs shall be in accordance with EN ISO 7010. The design of warning signs shall be in accordance with ISO 3864-1, ISO 3864-2, ISO 3864-3.

NOTE Specific pictograms for warning signs are defined in Annex E (informative).

5.21 Hazard generated by noise

5.21.1 Noise reduction at source at the design stage

Machinery shall be designed and constructed in such a way that risks resulting from the emission of airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source.

Main noise sources on mixing plants are the exhaust fans, burners, drums, pneumatic exhausts, vibrators, mixers, conveying, screening and diesel generators.

When designing the machine, the available information and technical measures to control noise at source at the design stage shall be taken into account, in particular EN ISO 11688-1:2009.

NOTE EN ISO 11688-2:2000 gives useful information on noise generation mechanisms in machinery.

Noise reduction at source is possible e.g. with

— choice of low-noise components;

— reduction of unintentional vibration transmitted to other parts of construction;

— prevention of intentional vibration from being transmitted to parts that do not have to vibrate;

— design of the construction that prevents the arising of resonance;

— use of silencers.

5.21.2 Noise reduction by protective devices

If noise reduction at the source is not sufficient, noise can be reduced by the manufacturer for example by encapsulation of single parts, e.g. compressors, electric generators or the whole machinery.

5.21.3 Noise reduction by information

Information on residual risk after technical measures to control noise emission at the design stage have been implemented shall be given by the manufacturer, see Clause 7.

6 Verification of safety requirements and/or measures

Safety requirements and/or protective measures of Clauses 5 and 7 of this European Standard shall be verified according to the table below. It includes the following types of verification:

a) measurement: the result of which shows that the required numerical values have been met (e.g. geometric dimensions, safety distances, resistance of insulation of the electric circuits, noise, vibrations);

b) functional tests: the result of which shows that the adequate signals intended to be forwarded to the main control system of the complete machine are available and comply with the requirements and with the technical documentation.

Table 2 — Verification of safety requirements and/or protective measures

Topics	Measurement	Functional Test
Access	X	
Guard	X	
Interlocking device		X
Isolation and energy dissipation		X
Emergency stops		X
Main control station		X
Piping for hot liquid		X
Troubleshooting for maintenance		X
Alarms and warnings		X
Erecting equipment		X
Lifting equipment		X
Silos, Hoppers, tanks safety level		X
Inclined skip system		X

7 Information for use

7.1 General

The information for use shall comply with 6.4 of EN ISO 12100:2010.

Specified fields of use shall be stated, in particular the products which can be handled. The risk incurred, when other materials are used, shall be stated.

Plant characteristics which need to be observed shall be given.

The deactivation of any separate part(s) of the plant (e.g. by safety switch or safety key) shall be clearly described.

All the deactivated functions shall be clearly identified.

The type of fuel(s) to be used with the burners shall be described in the instruction for use.

Procedures in case of blockage shall be described in the information for use. If necessary, special tools for unblocking shall be provided.

The relevant personal protective equipment shall be recommended to the user related to residual risks (e.g. hot parts, falling objects, noise and dust).

7.2 Information for the foundations

Loads and stresses on the foundations shall be given to ensure the stability of machines under load and in operation.

7.3 Erection and transport instructions

7.3.1 Erection

For each part of the relocatable plant shall be indicated:

— the erection sequence as well as, if need be, the disassembly sequence;

— information about lifting points and the maximum mass of components;

— the technical specifications of the energy supply required.

For the installation or dismounting of dismountable means of access, specific procedures shall be described in the instruction manual e.g. use of external equipment such as MEWPs (Mobile Elevating Work Platforms), use and position of anchor points and relevant PPE (Personal Protection Equipment).

7.3.2 Transport

Lifting and tying-down attachment points should be clearly described with text and figures in the information for use.

If a machine structural member is used as a tying down attachment point, the method for fixing the tying-down accessories at the structural member shall be described in the information for use (e.g. edges protectors).

The mass of each disassembled unit intended to be tied-down and/or lifted shall be listed in the information for use.

7.4 Instructions for use

A fault-finding chart shall be provided and the necessary course of action given.

Restricted areas according to 5.12 shall be described. Information shall be given that access for personnel is restricted during operation.

Drums, dust filters, storage tanks for fluid bitumen and thermal oil heaters present certain risks relating to fire. Therefore, recommendations shall be given for the installation of suitable fire-fighting devices.

The manufacturer shall inform the user of areas where access to areas shall be restricted by e.g. a fence or guards. Additional information about allowing access to these areas for cleaning or maintenance (e.g. by a loader) shall be given.

If a fixed access is not provided, a method of safe access for troubleshooting, including example(s) of recommended additional equipment (e.g. working platform in accordance with EN 280 or mobile stairs) shall be described.

Instructions on how to resume operations in case of blockages of the mix in the drum mixer or mixer (e.g. due to power failure) shall be described.

Instruction manual shall indicate that a periodical inspection needs to be carried out to check correct operation of the safety devices, wear of cables, etc.

7.5 Information for maintenance

For each part of the plant recommendations shall be given for skilled personnel when performing maintenance work.

It shall be possible for qualified staff to inspect and examine the controls when the panel doors are open and the plant is operational.

Information for use of personal protective equipment shall be given.

Sufficient lighting shall be installed.

Means or procedure to rotate the drum(s) to the required maintenance positions shall be given.

A specification of the pipes under pressure and the corresponding maximum pressure allowed shall be given.

7.6 Tools and equipment

Reference shall be made to special tools and equipment required to carry out adjustments, inspections and maintenance.

7.7 Spare parts and wear parts

Information for spare parts and wear parts shall be given.

7.8 Troubleshooting

The procedure to solve the problems of material flow blockages at the outlet flap of the asphalt storage shall be described.

The procedure to solve the problems of material flow blockages at the slat conveyor shall be described.

If the drum mixer or mixer stops and cannot be restarted in a short time, the procedure to empty the hot mix asphalt from it shall be described.

The procedure to empty tanks (e.g. wrong material, transport of the tank) shall be described in the information for use. The requirements for the device (e.g. sucking pump) to avoid leakage of material shall be described.

7.9 Procedure in case of fire

In the instructions for use the procedure in case of fire shall be described, e.g. stop of burners, stop of part of the machine, location of extinguishers if relevant.

8 Marking

8.1 Machine plate

The machine shall bear the following minimal information, in a legible and indelible condition:

— the business name and full address of the manufacturer and, where applicable, his authorized representative;

— mandatory marking[1)];

— year of construction, that is the year in which the manufacturing process is completed;

— designation of machinery;

[1)] For machines and their related products intended to be put on the market in the EEA, CE-marking as defined in the applicable European Directive(s), e.g. Machinery.

— designation of series or type if any;

— serial number if any;

— mass of the usual configuration in kilograms (kg) for mobile plants.

8.2 Thermal heaters

On thermal heaters a plate shall be fixed with the following information:

— the quantity of heat supplied;

— the characteristics of the thermal oil;

— the operating temperature;

— the maximum temperature permitted;

— the volume of fluid in the heater;

— the operating pressure (pressure of the safety devices).

8.3 Tanks and vessels

On tanks and vessels a plate visible from the filling point shall be fixed with the following information:

— type and characteristics of the product held;

— the maximum capacity of authorized filling.

Annex A
(normative)

Minimum passage openings

A.1 Passage of the body

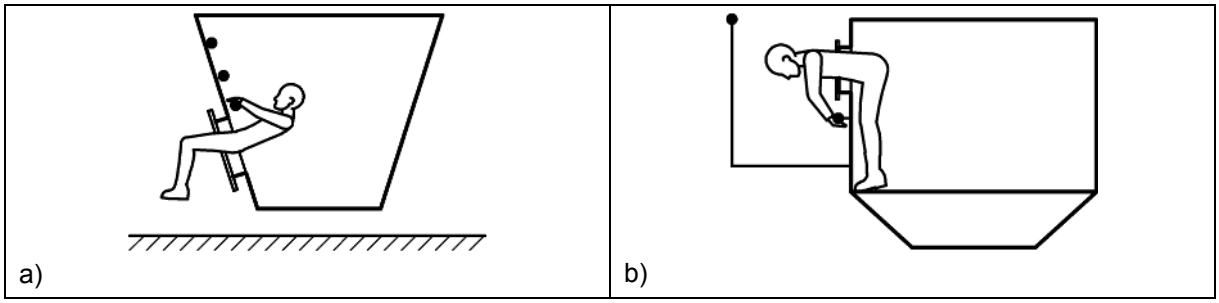
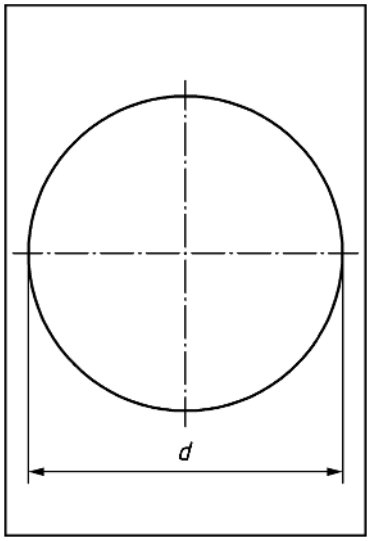


Figure A.1 — Passage of the body



d = 600 mm as a minimum

Figure A.2 — Minimum passage opening

The passage openings shall have a clear body opening with a minimum cross sectional dimension of 600 mm.

NOTE This dimension allows the passage of stretchers.

Annex B
(normative)

Noise test code – Grade 2

B.1 Scope

This noise test code specifies all the information necessary to carry out efficiently and under standardized conditions the determination, declaration and verification of the noise emission characteristics of mixing plants for road construction materials.

Noise emission characteristics include emission sound pressure levels at workstations and the sound power level. In the case of mixing plants, the determination of the sound power level is replaced by that of emission sound pressure levels on a contour.

The determination of these quantities is necessary for:

— manufacturers to declare the noise emitted;

— comparing the noise emitted by machines in the family concerned;

— purposes of noise control at the source at the design stage.

— users to assess the exposure of workers to noise.

The use of this noise test code ensures reproducibility of the determination of the noise emission characteristics within specified limits determined by the grade of accuracy of the basic noise measurement method used and the stability of the noise emission.

B.2 Determination of A-weighted emission sound pressure levels on a contour

B.2.1 Measurement method

Because mixing plants are very large machines, the determination of the A-weighted sound power level shall be replaced by the determination of A-weighted emission sound pressure levels on a contour around the plant.

Measurements shall be carried out according to EN ISO 11201:2010 (grade 2 of accuracy).

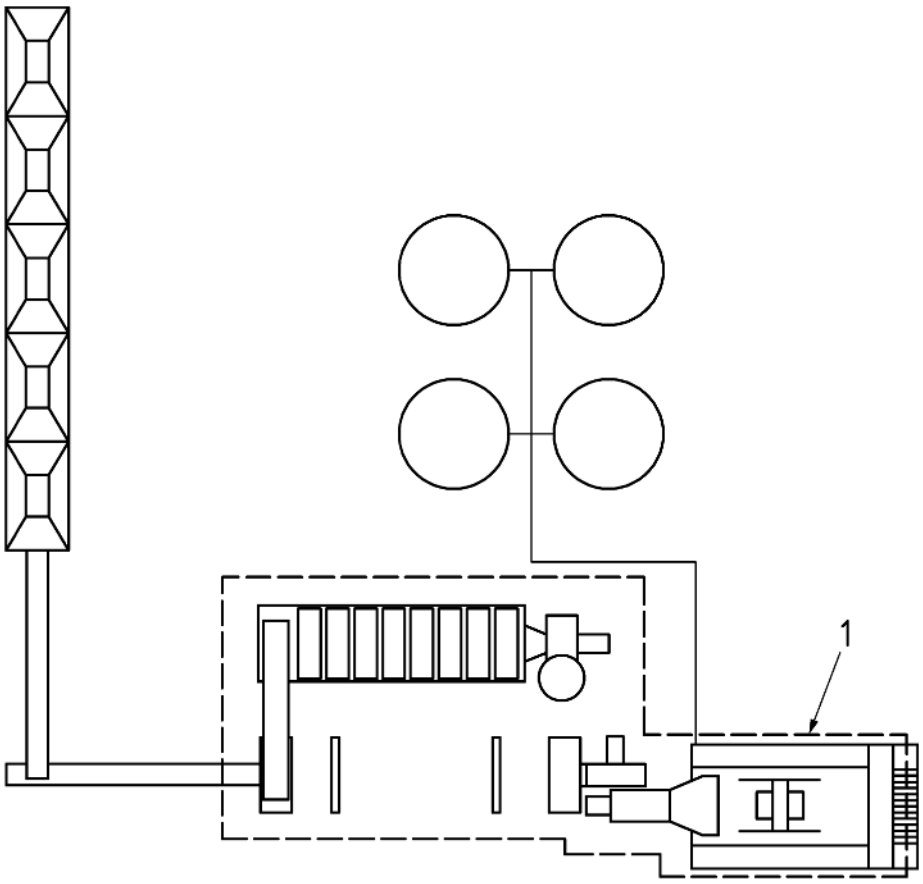
B.2.2 Measurement positions on the contour

A-weighted emission sound pressure levels shall be determined on a contour running along the total length of the plant as shown in Figure B.1 on each side of it, unless it is known that noise emission is symmetrical, in which case measurements can be limited to one side of the plant.

NOTE The cold feeders, belt conveyors, bitumen tanks, filler silos and control cabin are not inside the contour line. The contribution of these components is neglectable to the noise of the plant.

In the frequent cases where conveyors at the entrance and the exit of the plant are not a significant source of noise, the contour shall not include them. Measurements shall start and end at a point located along the conveyor at 2 m from the loading and unloading parts of the plant.

Microphone positions shall be 1,00 m away from the surface of the plant (contour line) and at 1,60 m above the ground or the platform. As an example the contour line for the ground level is shown in Figure B.1. The maximum distance between two consecutive microphone positions shall be 2 m. Unless they coincide with the above measurement positions, additional microphone positions shall be at 1 m from the main noise sources of the plant. These will normally be the drum, screen, mixing unit, burner, exhaust fan, pneumatic actuators and suppressor/blower if one exists.



key

1 contour line

Figure B.1 — Contour for the microphone positions

B.2.3 Measurement procedure

Measurements of the time-averaged A-weighted sound pressure level at each microphone position shall be carried out with the plant in a stabilized operation mode. The total measurement time for each reading in a stabilized operating mode shall be at least 15 s or, for discontinuous production, shall correspond to a complete cycle of one batch.

All measured A-weighted sound pressure levels shall be recorded, reported and declared.

NOTE The use of a drawing will facilitate the presentation of the data.

B.3 Determination of the A-weighted emission sound pressure level at workstations

B.3.1 Workstations

The A-weighted emission sound pressure level shall be measured according to EN ISO 11201:2010 (grade 2 of accuracy) at the following workstations, where such workstations exist:

— In the cabin or enclosed control station;

— where an operator stands for servicing purposes (e.g. introduction of bags in the mixer);

— positions at 1 m from the main noise sources of the plant;

— maintenance positions for greasing.

In the cabin, as air conditioning is always present, windows shall be closed and air conditioning shall operate at maximum speed during the measurement. The measurement point(s) shall be at a height of 1,55 m ± 0,075 m for a standing operator. If there is a seat at the control station the measurement point shall be at a height of 0,8 m ± 0,05 m above the seat and the operator shall be present during the measurement.

At the other workstations, the A-weighted emission sound pressure level shall be measured at a distance of 1,00 m from the plant at a height of 1,6 m without the operator present. The values and positions where they are measured shall be recorded, reported and declared.

NOTE Some measurement positions may be identical to measurement positions of B.2.

B.3.2 Measurement procedure

Measurements of the time-averaged A-weighted sound pressure level at each microphone position shall be carried out with the plant in a stabilized operation mode. The total measurement time for each reading in a stabilized operating mode shall be at least 15 s or, for discontinuous production, shall correspond to a complete cycle of one batch.

All measured A-weighted sound pressure levels shall be recorded, reported and declared.

NOTE The use of a drawing will facilitate the presentation of the data.

B.4 Measurement uncertainty

No technical data on noise emission are presently available to estimate the standard deviation of reproducibility of the measurement method used for mixing plants. Therefore, the value of the standard deviation of reproducibility for A-weighted levels stated in EN ISO 11201:2010 namely 1,5 dB may be regarded as an interim upper boundary and used for the determination of the uncertainty K when preparing the noise declaration. The measurement uncertainty attached to the measurement method that corresponds to a standard-deviation of reproducibility for A-weighted levels of 1,5 dB is 2,5 dB. See EN ISO 11201:2010, Clause 11 and Annex C for guidance about measurement uncertainty.

Without materials, the noise emission of the mixing plant can be considered as stable so that the value of 2,5 dB can be taken as the total measurement uncertainty. With materials, noise emission may be unstable and the total measurement uncertainty is likely to be higher. Values of up to 5 dB can be expected. From the experience gained at using this noise test code, a manufacturer will get progressively knowledge about the stability of the noise emission of mixing plants he puts on the market and, consequently, be able to give a more precise value of his own measurement uncertainty and state it in his noise declaration.

B.5 Installation conditions

Measurement shall be carried out when the plant is installed according to manufacturer's specifications and user's needs. Installation conditions of the plant shall be indicated in the noise declaration.

B.6 Operating conditions

As mixing plants never fully operate at the manufacturer's place, noise emission measurements can only be made by the manufacturer at the stage of commissioning when the plant is being installed at the user's place.

Measurements as specified in B.2 and B.3 shall be carried out with the:

— full plant in operation without materials and

— full plant in operation with materials. Materials shall be those currently used at commissioning. If the plant is tested with several materials configurations, noise measurements shall be carried out for the configuration that provides the highest noise emission. The plant shall be in normal established production during the measurement in an operation mode that is representative of the future normal operation of the plant.

During the noise test, all parts that are in operation in normal use of the plant shall be in operation. The values of all operating parameters shall be carefully recorded and reported to ensure full traceability of the noise test. They will be part of the noise declaration made by the manufacturer. Acoustic horn shall be deactivated during the noise test.

Operating conditions shall be the same for measurements carried out according to B.2 and B.3.

NOTE Noise emission data will provide:

— the manufacturer with the data necessary for him:

  — to assess his noise reduction achievements at the design stage and

  — to provide future customers with noise emission data as part of the information on the technical performances of a mixing plant, in particular that given in the technical sales literature.

— the user with useful information for him to assess the noise exposure of workers he can expect.

B.7 Information to be recorded

The information to be recorded shall be in accordance with EN ISO 11201:2010 and B.2, B.3, B.5 and B.6 of this annex.

B.8 Information to be reported

The information to be reported shall be in accordance with EN ISO 11201:2010 and B.2, B.3, B.5 and B.6 of this annex.

B.9 Declaration of noise emission values

The noise declaration shall contain the following data for both operating conditions of the plant (with and without materials, see B.5):

— A-weighted emission sound pressure level at the operator position(s) (see B.3);

— values of the A-weighted emission sound pressure level measured on the contour (see B.2) if the A-weighted emission sound pressure levels at, at least, one workstation exceeds 80 dB;

— the value of the associated uncertainty (see B.4);

— positions where the declared values have been obtained;

— detailed description of the installation and operating conditions during measurement (values of the operating parameters of the plant and description of materials used).

NOTE Drawings (one for the operation without materials and one for the operation with materials) showing the plant profile, measurement positions and values measured will facilitate the legibility of the noise declaration.

The noise declaration shall indicate that the values have been obtained according to this noise test code. Deviations to this noise test code, if any, shall be declared.

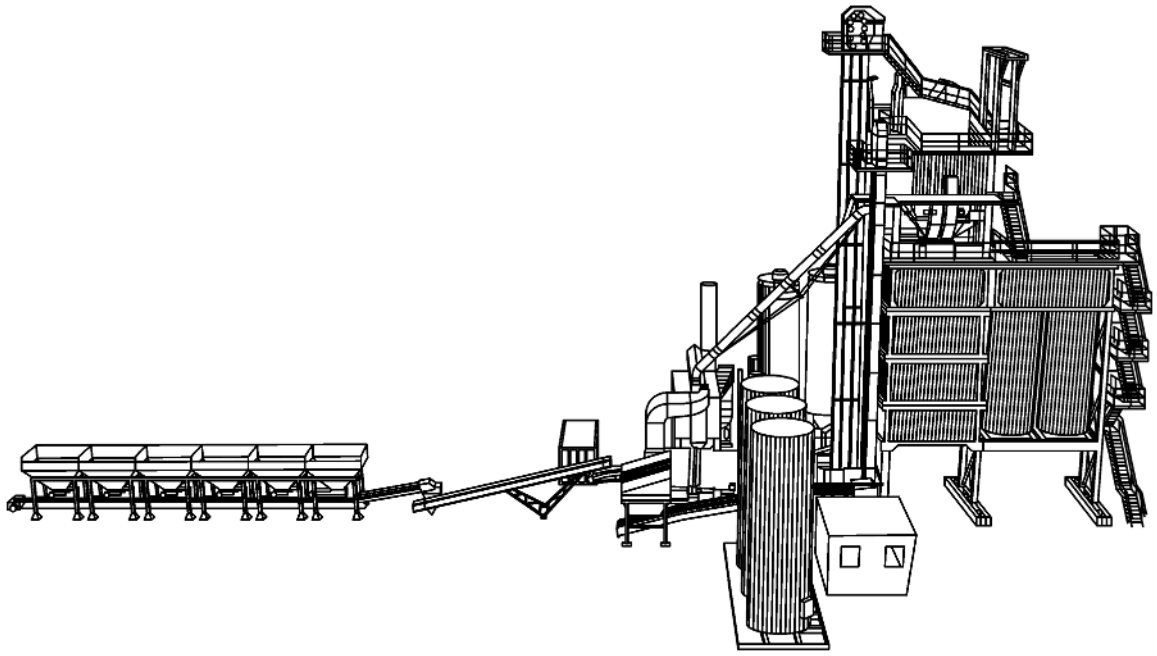
For both the A-weighted emission sound pressure level on the contour and the A-weighted emission sound pressure level at workstations, the format of the noise declaration shall be a dual-number format as defined in EN ISO 4871:2009 i.e. the measured value and the associated uncertainty shall be given separately.

If undertaken, the verification of declared noise emission values shall be conducted using the same installation and operating conditions as those used for the initial determination of noise emission values.

Annex C
(informative)

Examples for asphalt mixing plants and terminology

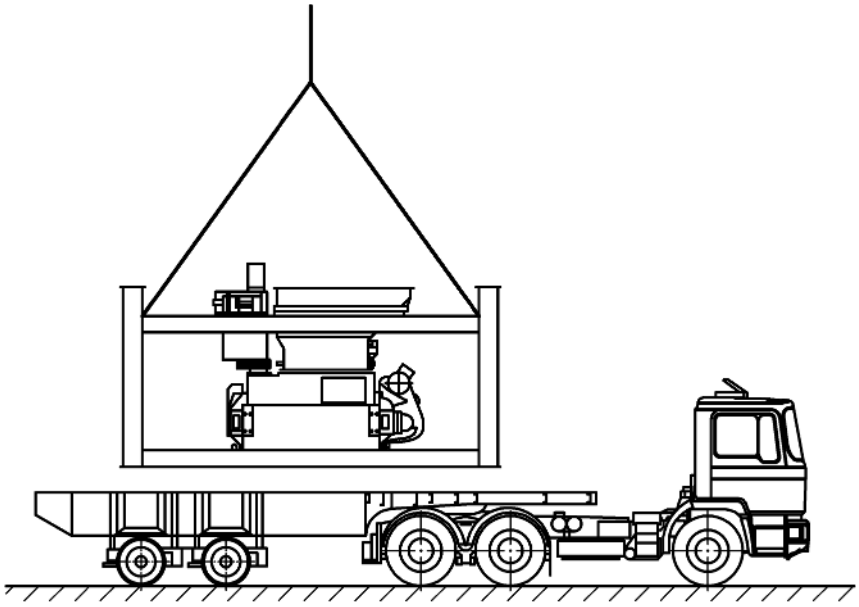
C.1 Stationary plant



NOTE Designed to remain at the same working site.

Figure C.1 — Stationary plant

C.2 Transportable plant



NOTE Designed to be transported easily, e.g. with container-sized parts.

Figure C.2 — Transportable plant

C.3 Mobile plant

C.3.1 Mobile plant assembled

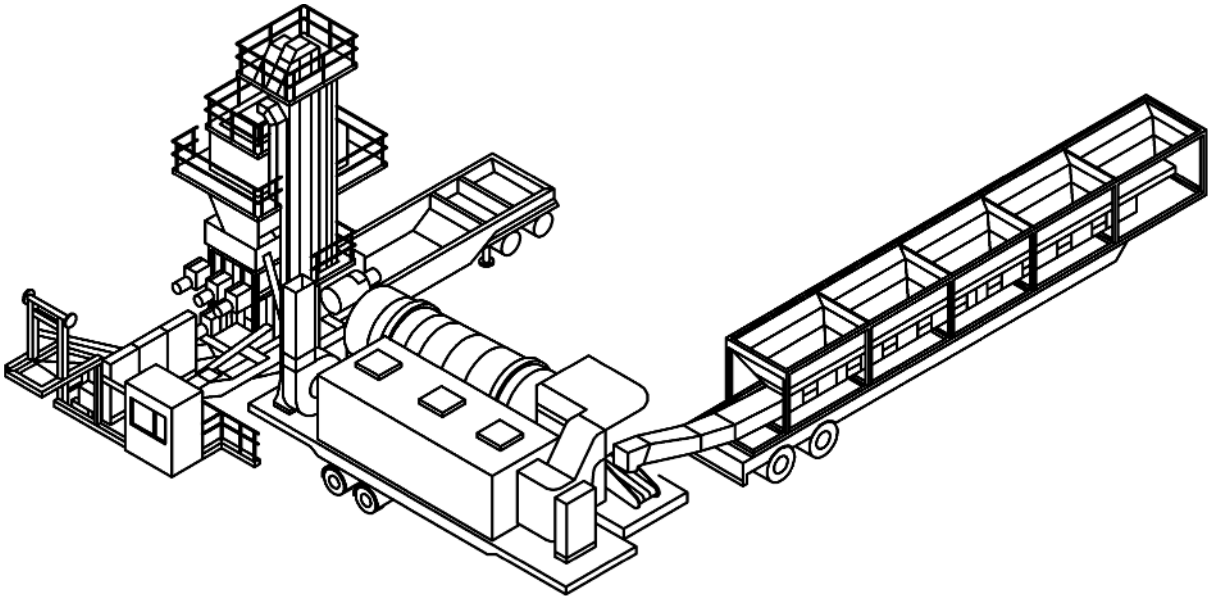
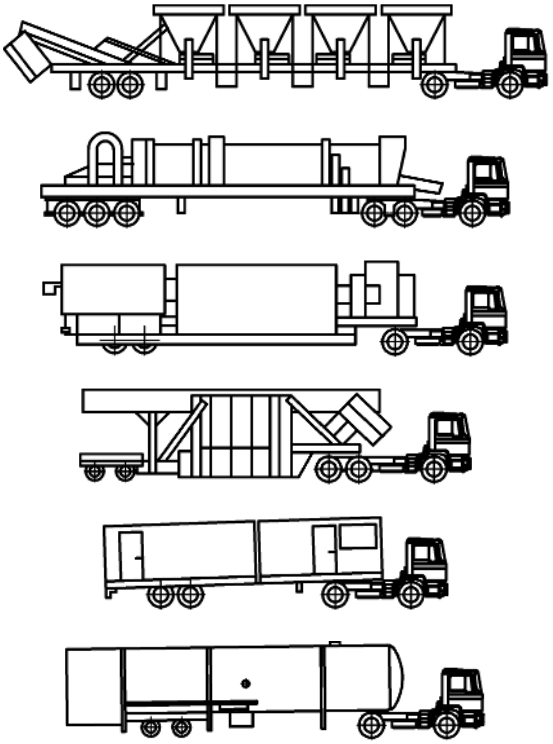


Figure C.3 — Mobile plant assembled

C.3.2 Mobile plant during transportation



NOTE Equipped with wheels or other tools for easy moving.

Figure C.4 — Mobile plant during transportation

C.4 Batch plant

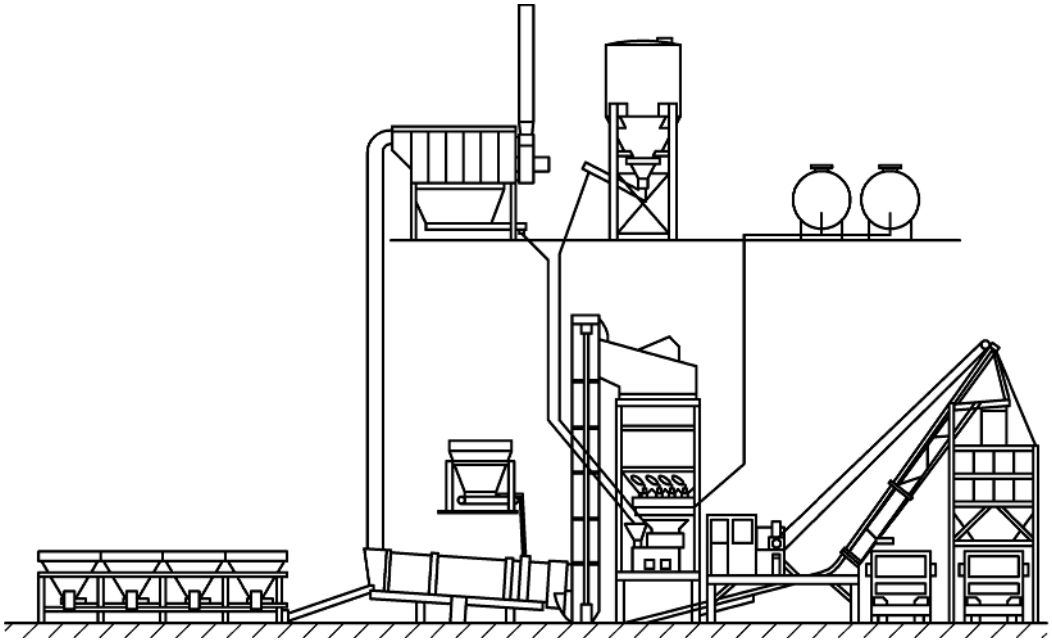
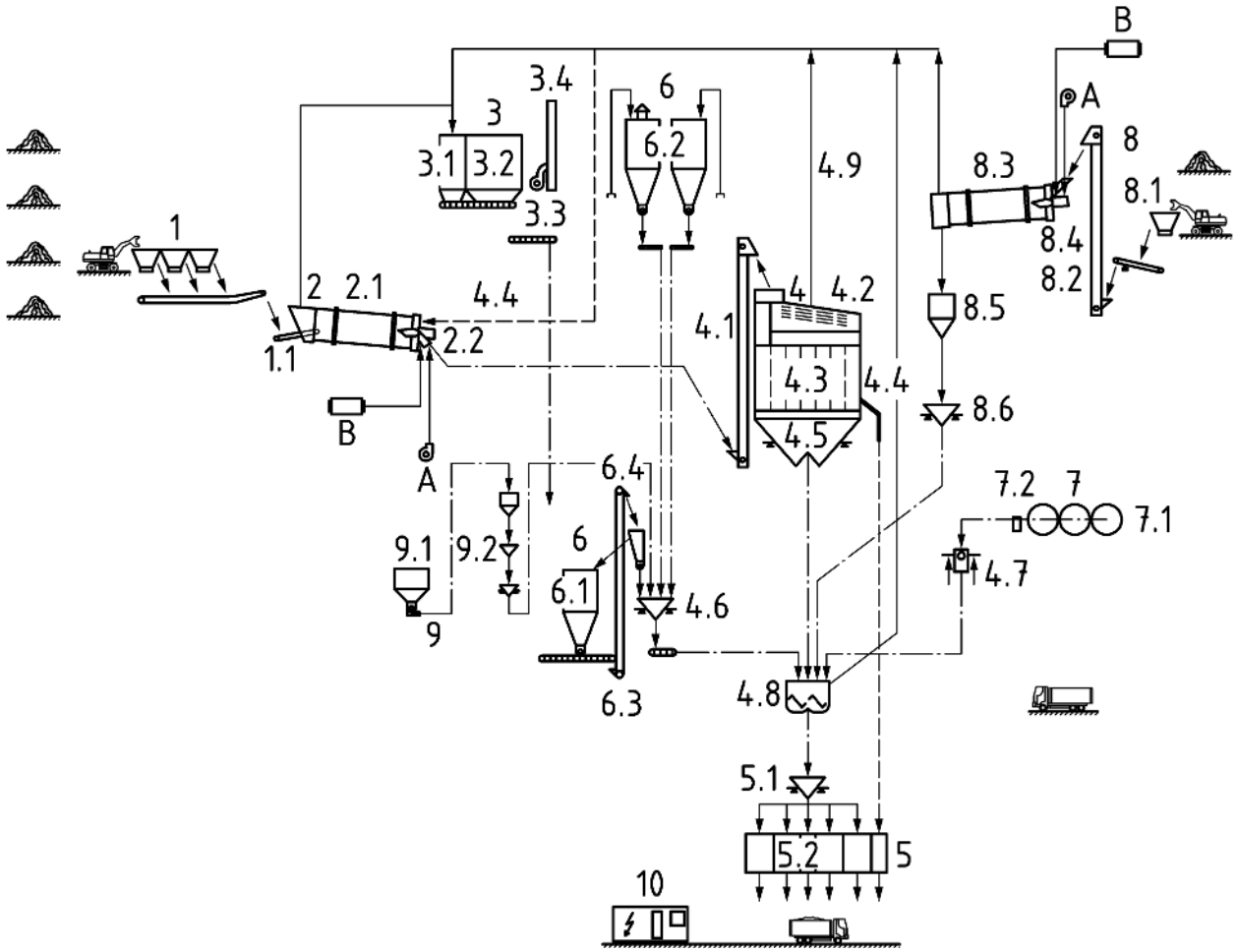


Figure C.5 — Batch plant during process (global picture)



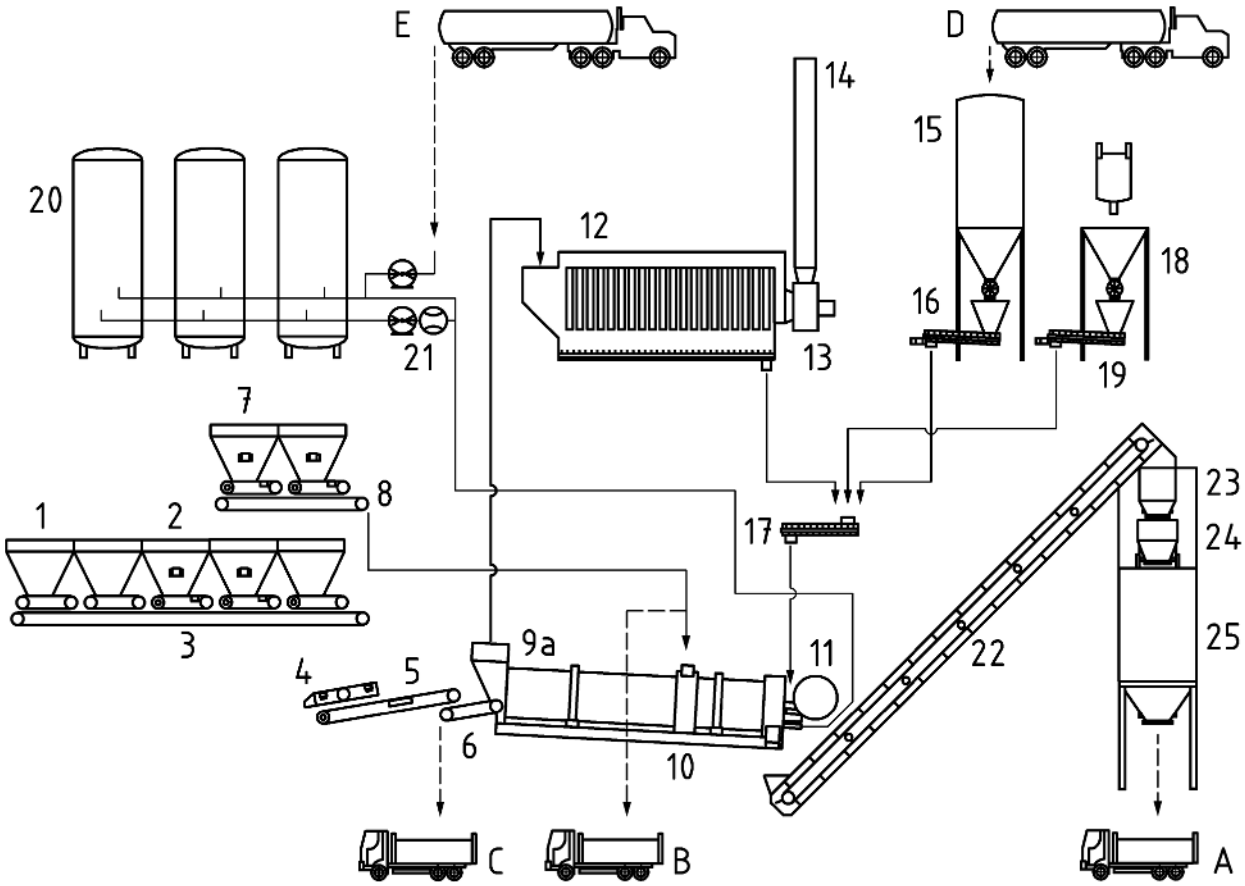
A - Air blower B - Fuel tank

Key

1.	cold feed hopper, dosing and collecting belts	4.4	oversize rejects	7.	binder storage assembly
1.1	scalping screen	4.5	aggregates weighing hopper	7.1	heated binder tank
2.	drying and heating system	4.6	filler weighing hopper	7.2	binder pump
2.1	drying drum with feed conveyor	4.7	binder weighing hopper	8.	system for RAP addition
2.2	burner(s)	4.8	mixer	8.1	RAP cold feed hopper
3.	dedusting system	4.9	mixing tower dust extraction system	8.2	RAP belt conveyor
3.1	pre-separator	5.	mixed material storage assembly	8.3	RAP Drying drum
3.2	dust filter	5.1	skip system and/or shuttle system	8.4	burner
3.3	exhaust fan	5.2	mixed material storage silos	8.5	RAP buffer hopper
3.4	stack	6.	filler distribution assembly	8.6	RAP weighing hopper
4.	mixing tower	6.1	reclaimed filler silo	9.	system for adding solid additives
4.1	hot aggregates elevator	6.2	imported filler silo	9.1	solid additives silo
4.2	screen	6.3	filler elevator	9.2	solid additives dosing devices
4.3	hot aggregates silo	6.4	filler buffer hopper	10.	control cabin

Figure C.6 — Batch asphalt plant (detailed picture)

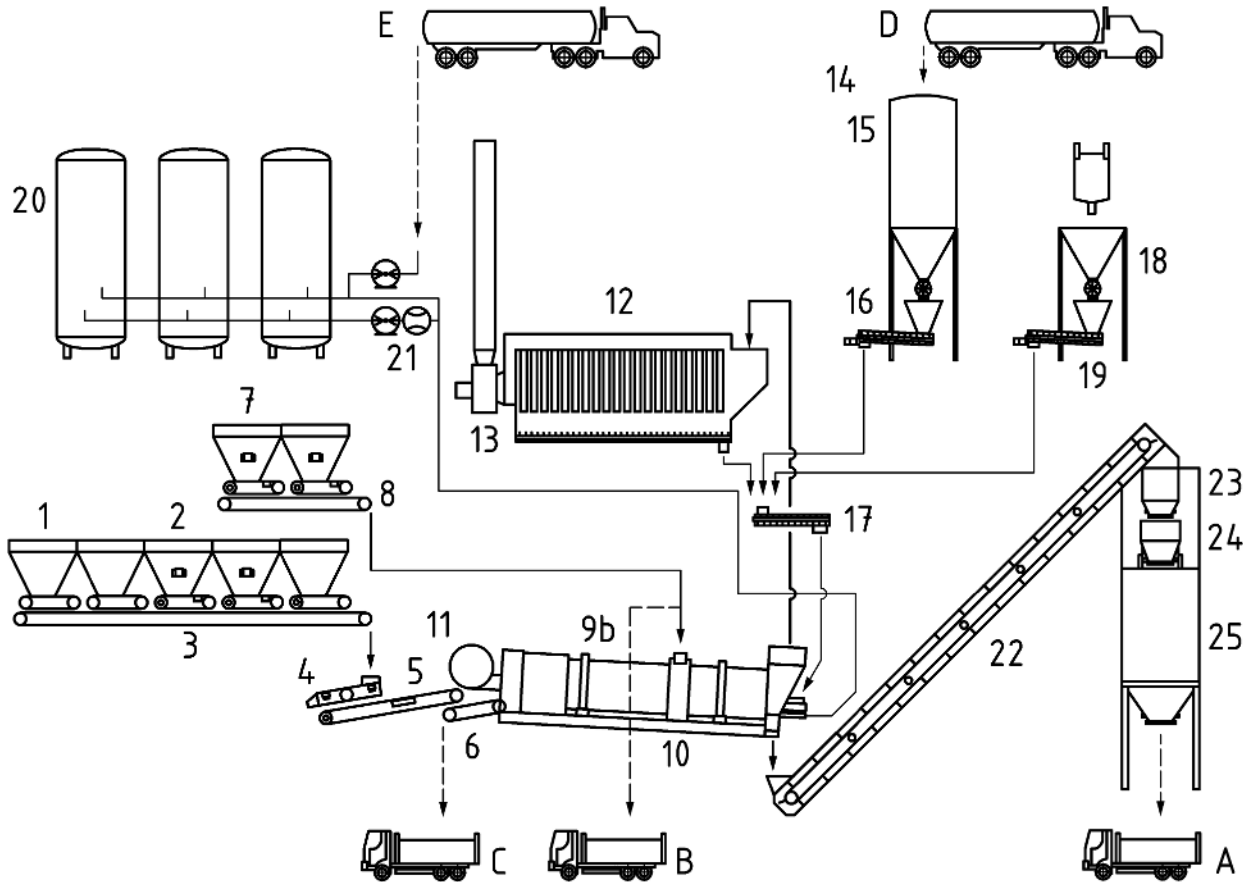
C.5 Continuous plant



Key

1	aggregates volumetric cold feeders	19	fines/additives transfer screw
2	aggregates weighing cold feeders	20	fines/additives injection screw
3	aggregates collecting belt	21	bitumen storage tanks
4	aggregates scalping screen	22	bitumen weighing dosing unit
5	aggregates weighing belt	23	bitumen injection piping
6	reversible feeding conveyor	24	liquid additives dosing unit
7	RAP weighing feeders	25	foam process water dosing unit
8	RAP collecting belt		
9a	counter flow drum mixer	A	HMA truck loading
		B	RAP feeders calibration
10	recycling ring	C	aggregates feeders calibration
11	burner	D	imported fines delivery
12	bag filter	E	binder delivery
13	exhaust fan		
14	stack		
15	imported fines silo		
16	imported fines weighing dosing unit		
17	additives hopper (Big bag)		
18	additives weighing dosing unit		

Figure C.7 — Continuous plant – drum mixer – counter flow (global picture)



Key

1	aggregates volumetric cold feeders	19	fines/additives transfer screw
2	aggregates weighing cold feeders	20	fines/additives injection screw
3	aggregates collecting belt	21	bitumen storage tanks
4	aggregates scalping screen	22	bitumen weighing dosing unit
5	aggregates weighing belt	23	bitumen injection piping
6	reversible feeding conveyor	24	liquid additives dosing unit
7	RAP weighing feeders	25	foam process water dosing unit
8	RAP collecting belt		
		A	HMA truck loading
9b	parallel flow drum mixer	B	RAP feeders calibration
10	recycling ring	C	aggregates feeders calibration
11	burner	D	imported fines delivery
12	bag filter	E	binder delivery
13	exhaust fan		
14	stack		
15	imported fines silo		
16	imported fines weighing dosing unit		
17	additives hopper (Big bag)		
18	additives weighing dosing unit		

Figure C.8 — Continuous plant - drum mixer - parallel flow (global picture)

Annex D
(normative)

Movable gratings

D.1 General

This normative annex provides examples of movable gratings for cleaning measures avoiding blockages of e.g. cold feeders, see Figure D.1.

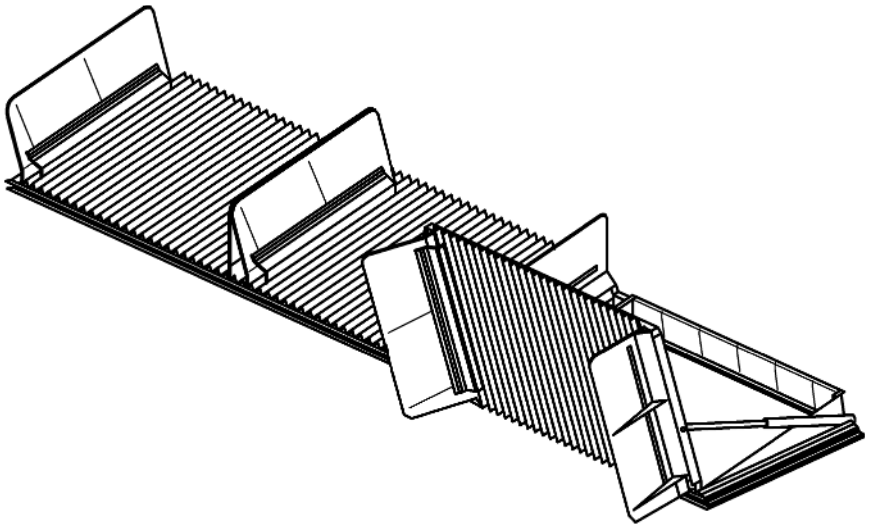


Figure D.1 — Example of a movable grating

D.2 Safety requirements

D.2.1 General

The gratings shall comply with the requirements of 5.3.1 (3rd paragraph) if they are fixed or shall comply with the following if they are movable:

D.2.2 Access

Access to the gratings shall be prevented by fixed rear and lateral guards according to 5.3.3 in order to avoid the hazards of crushing and of falling into the hopper when walkways are installed.

D.2.3 Controls

Activating the movement of the gratings shall only be possible when no person is in the hazard zone.

There shall be direct view from the controls to the hazard zone.

D.2.4 Maintenance

The moving system, e.g. hydraulic, pneumatic, electric shall be designed to allow for isolation and energy dissipation, whether the grid is in its upper or lower position, according to EN 1037. This isolation and energy dissipation shall not hinder the plant functioning.

By design, the grating shall be maintained in open position and not fall in case of failure, e.g. by a locking device such as a safety valve, mechanical locking device or gravity, e.g. opening more than 90 ° to the closed position.

For vibrating foldable gratings, mechanical means (e.g. chains or ropes) shall be provided to maintain the vibrating gratings in case of failure of theirs supports (e.g. springs, rubber supports).

Annex E
(informative)

Pictorials

E.1 Examples

	To be used where fixed guards are installed around conveyors, such as cold feed feeders and collectors. Hazard – Hand trapped in conveyor pinch point. Avoidance – Put guards in place and disable machine before maintenance. Read the manual.
	To be used where adjustable feet are used under portable plants. Hazard – Crushed foot. Avoidance –Stay safe distance away from area.

	To be used where gates are located. Hazard – body trapped in gates. Avoidance –Disable machine before maintenance. Read the manual. Follow lockout procedures.

Annex F
(normative)

Performance levels of the safety related parts of control system

The required performance levels PL_r according to EN ISO 13849-1 for the parts of the control system relative to the safety of the various zones of the installation shall be:

Table F.1 — Performance levels

Subclause	Safety function	Required performance levels according to EN ISO 13849-1
5.11	Devices for materials sampling	b
5.15.1, 5.15.2	Monitoring of overfull silos and tanks	a
5.15.2.2	Device for detection of overfull heated tanks	c
5.16.3.1	Interlocking of the guards for access to the rotating drum	d
5.16.3.1	Monitoring of temperature in the filter inlet of the rotating drum	a
5.16.3.2	Protection device of the maintenance opening	c
5.16.3.3	materials flow sensing system	a
5.16.4.1	Interlocking of the guards of chain / belt and buckets	c
5.16.8	Interlocking of the guards of the screens.	a
5.16.9	Interlocking of the guards of the storage area of hot aggregates	c
5.16.10.1	Anti-overflowing device of the dosing systems	b
5.16.12	Interlocking of the guards of the mixer	d
5.17.2.2.2	Interlocking of the guards on the bottom of the enclosure of the bucket of the skip hoist	c
5.17.2.2.4.2	Prevent movement of the bucket in intermediate safety position	c
5.17.2.4.2	Stop movement of slack rope	a
5.17.2.4.4	Limitation of travelling speed	a
5.19.1	Interlocking of the guards of exhaust fans	c
5.19.2	interlocking of the guards of dust collector	c

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

In this bibliography are listed standards which have a bearing on specifications of this European Standard but to which normative reference has not been made.

[1] EN 12195-1, *Load restraining on road vehicles — Safety — Part 1: Calculation of securing forces*

[2] EN ISO 11688-2:2000, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2:1998)*

[3] EN ISO 12499:2008, *Industrial fans - Mechanical safety of fans - Guarding (ISO 12499:1999)*

[4] ISO 3842:2006, *Road vehicles — Fifth wheels — Interchangeability*

[5] ISO 8716:2001, *Road vehicles — Fifth wheel kingpins — Strength test*

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™