भारतीय मानक **IS/ISO 15643 : 2020**

Indian Standard

रोड निर्माण एवं अनुरक्षण उपकरण — बिटुमिनस बाइंडर स्प्रेयर और तुल्यकालिक बिटुमिनस बाइंडर स्प्रेयर- चिप स्प्रेडर्स — शब्दावली एवं वाणिज्यिक विशिष्टि

Road Construction and Maintenance Equipment — Bituminous Binder Sprayers and Synchronous Bituminous Binder Sprayers-Chip Spreaders — Terminology and Commercial Specification

ICS 93.80.10

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Construction Plant and Machinery Sectional Committee, MED 18

NATIONAL FOREWORD

This Indian Standard which is identical to ISO 15643 : 2020 ‘Road construction and maintenance equipment — Bituminous binder sprayers and synchronous bituminous binder sprayers-chip spreaders — Terminology and commercial specifications’, issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on recommendation of the Construction Plant and Machinery Sectional Committee and approval of the Mechanical Engineering Division Council.

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminologies and conventions are, however, not identical to those used in Indian Standard. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear, referring to this standard, they should be read as ‘Indian Standard’; and
b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

The Committee has reviewed the provision of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International Standard	*Title*
ISO 15644	Road construction and maintenance equipment — Chippings spreaders — Terminology and commercial specifications

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

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Indian Standard

ROAD CONSTRUCTION AND MAINTENANCE EQUIPMENT — BITUMINOUS BINDER SPRAYERS AND SYNCHRONOUS BITUMINOUS BINDER SPRAYERS-CHIP SPREADERS — TERMINOLOGY AND COMMERCIAL SPECIFICATION

1 Scope

This document establishes the terminology and the content of commercial literature specifications for bituminous binder sprayers and synchronous bituminous binder sprayers-chip spreaders (i.e. synchronised combined units) including their components and their technical characteristics.

This document covers cold and hot bituminous binder sprayers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15644, *Road construction and maintenance equipment — Chippings spreaders — Terminology and commercial specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15644 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
bituminous binder sprayer
machine used to apply a film of bituminous binder on a pavement at a predetermined application rate

Note 1 to entry: The particular sprayer types may be defined by associating the operating principle, the shape of the components, the type of binder, and by specifying the spraying performances.

3.2
synchronised combined unit
synchronous bituminous binder sprayer-chip spreader
machine which consists of a combination of *bituminous binder sprayer* (3.1) and chip spreader, used to make synchronised application of bituminous binder and chips on a pavement at predetermined application rate for a complete road surface treatment

3.3
displacement pump sprayer
bituminous binder sprayer (3.1) in which bituminous binder transfer from the storage tank to the spray bar is provided by a pump

Note 1 to entry: The pump's output is proportional to its rotating speed which may be controlled by the vehicle movement speed.

3.4
constant pressure sprayer
bituminous binder sprayer (3.1) in which bituminous binder transfer from the storage tank to the spray bar is provided by pressurizing the binder

Note 1 to entry: The binder may be pressurized directly by compressed air above the binder, or by a pump and regulating valve maintaining a constant binder pressure in the spray bar feeder circuit.

3.5
heat-insulated sprayer
machine in which the tank is equipped with thermal insulation to avoid heat loss

3.6
directly heated sprayer
machine with heating provided by circulation of hot gases in a tube or by an electrical resistor in contact with the binder

Note 1 to entry: See Figure 4.

3.7
indirectly heated sprayer
machine with heating provided by circulation of a hot liquid supplied by a generator outside or inside the sprayer

Note 1 to entry: See Figure 4.

3.8
hot bituminous binder sprayer
machine which enables application of binder at a temperature greater than 100 °C

3.9
cold bituminous binder sprayer
machine which sprays binders at a temperature lower than 100 °C

3.10
tank volume
internal volume of the tank

Note 1 to entry: It is expressed in cubic metres.

3.11
rated capacity
volume of binder which can be carried

Note 1 to entry: It is expressed in cubic metres, taking into account that the nominal loading of the tank depends on the density of bituminous binder.

3.12
spray bar width
distance between end flow points

Note 1 to entry: It is expressed in metres.

3.13
maximum output of a pumping unit
largest capacity for a binder with a viscosity of 100 mm^2/s

Note 1 to entry: It is expressed in cubic metres per hour.

3.14
nominal application rate
application rate at *maximum output of a pumping unit* (3.13) moving at a speed of 4 km/h with a binder of a density of 1 g/cm^3 and a viscosity of 100 mm^2/s and with maximum *spray bar width* (3.12)

Note 1 to entry: It is expressed in kilograms per square metre.

3.15
binder carrying capacity
difference between the laden and kerb mass of a sprayer or *synchronised combined unit* (3.2)

3.16
spraying height
height measured between the average plane of the pavement and the orifice of the nozzles

Note 1 to entry: It is expressed in millimetres.

Note 2 to entry: See h_2 in Figure 8.

4 Description of sprayer components

4.1 Transport vehicle

The vehicle, in the form of a truck, trailer or semi-trailer, carries all the components and provides movement of the sprayer during spraying and during road transfers.

4.2 Tank

The tank is used to store the binder during work and transport.

It may have a facility to heat the binder and may have a system to prevent loss of heat, e.g. a heat-insulated sprayer.

4.3 Binder transfer device

The binder transfer device provides transfer of the binder from the tank to the spray bar in order to apply a specific quantity to the pavement.

4.4 Spray bar

The spray bar distributes the binder uniformly across the pavement.

4.5 Control station

The control station contains all the control, adjustment, measuring and automatic control equipment. There are two types, as follows.

a) Manual control: the operator adjusts all the operating parameters to obtain the required application rate.

b) Automatic control: using predetermined operating parameters, automation ensures accuracy of the application rate.

5 Commercial specifications of bituminous binder sprayers and spraying part of synchronised combined unit

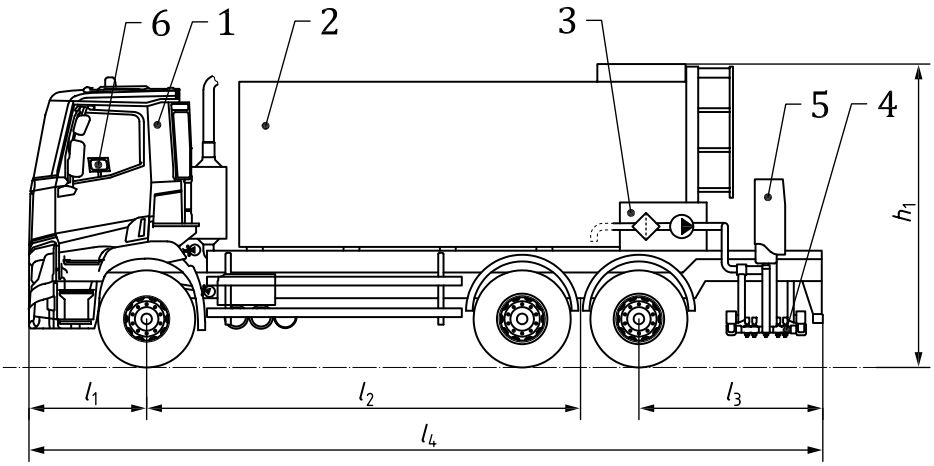
5.1 General

The components and dimensions of a bituminous binder sprayer and spraying part of a synchronised combined unit shall be specified according to Clause 4 and 5.

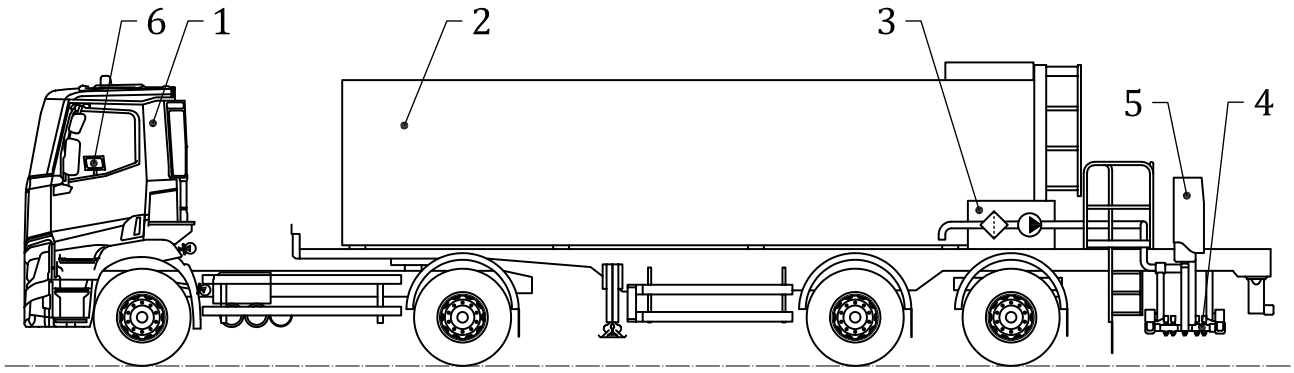
The spreading part of a synchronised combined unit shall be specified according to Clause 6.

5.2 Binder sprayer components list

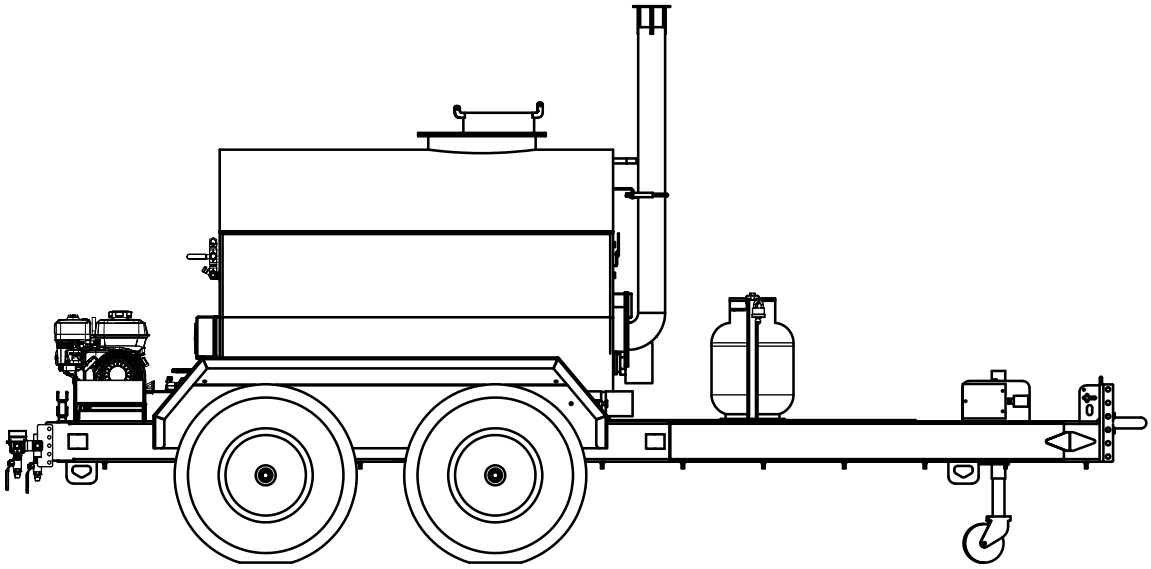
Examples of sprayer component lists are shown in Figures 1 a), b), c) and Figure 2 a) and b).



a) Bituminous binder sprayer on 3-axle truck



b) Bituminous binder sprayer on semi-trailer

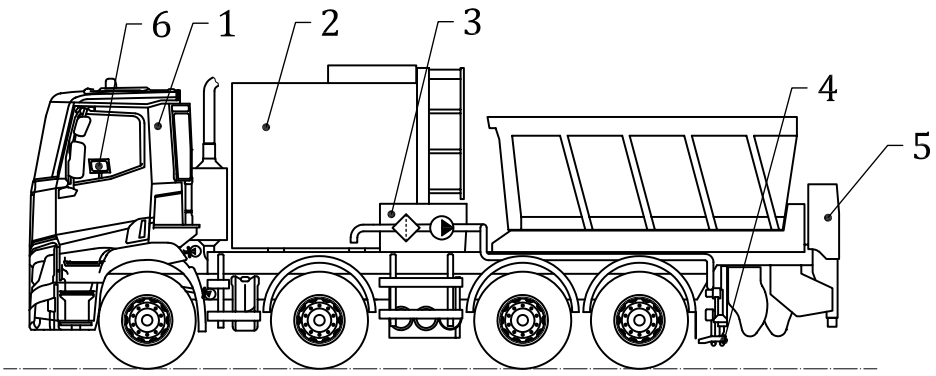


c) Trailed bituminous binder sprayer

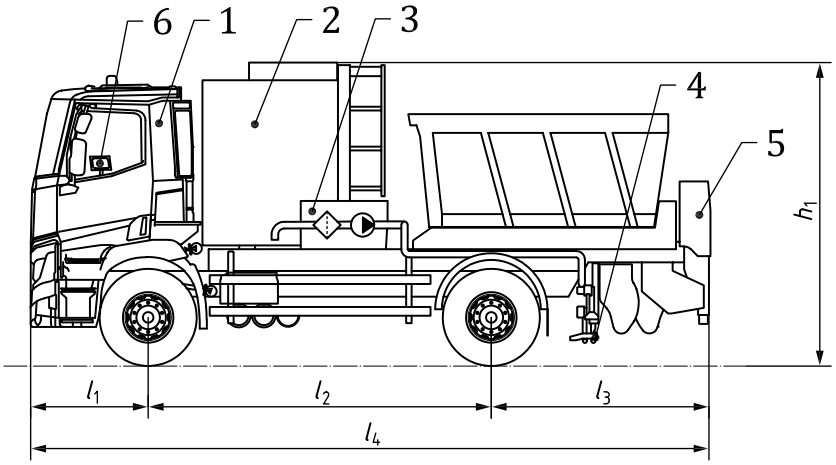
Key

1	vehicle	5	measuring instruments placed in driver's cab or on the rear part of the vehicle platform
2	tank		
3	binder transfer unit	6	measuring instruments placed in driver's cab or on the rear part of the vehicle platform
4	spray bar		
l_1	front overhang	l_2	wheel base
l_3	rear overhang	l_4	length
h_1	height		

Figure 1 — Bituminous binder sprayer



a) Synchronised combined unit on 4-axle truck



b) Synchronised combined unit on 2-axle truck

Key

1	vehicle	5	measuring instruments placed in driver's cab or on the rear part of the vehicle platform
2	tank	6	measuring instruments placed in driver's cab or on the rear part of the vehicle platform
3	binder transfer unit	l_2	wheel base
4	spray bar	l_4	length
l_1	front overhang		
l_3	rear overhang		
h_1	height		

Figure 2 — Synchronised combined unit

5.3 Vehicle characteristics

The following characteristics shall be specified:

— laden mass, kg;

— kerb mass, kg;

— binder carrying capacity, kg;

— minimum spreading speed, km/h;

— overall dimensions:
  — length, l_4, mm;
  — width, mm;
  — height, h_1, mm;
— front overhang, l_1, mm;
— wheel base, l_2, mm;
— rear overhang, l_3, mm;
— external turning radius, m;
— internal turning radius, m;
— maximum axle load, daN;
— engine rating power, kW;
— maximum travel speed, km/h.

5.4 Tank: performance and characteristics

5.4.1 General characteristics

The following characteristics shall be specified:

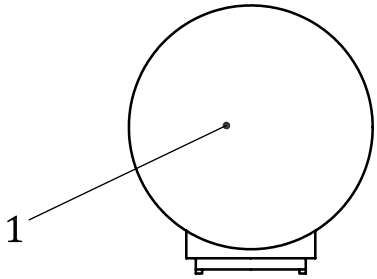
— tank volume, m^3;
— rated capacity, m^3;
— working pressure, MPa.

5.4.2 Binder tank performance

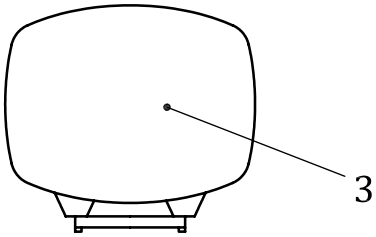
The following units of the binder tank shall be specified (see Figures 3 and 4):

— tank itself, of the following geometrical shapes:
  — circular (see key 1 in Figure 3);
  — elliptical (see key 2 in Figure 3);
  — prismatic with rounded corners (see key 3 in Figure 3);
— wash plate partition (see key 4 in Figure 3);
— inspection hole (see key 5 in Figure 3);
— cleaning orifice (see key 6 in Figure 3);
— level indicator (see key 7 in Figure 3);
— insulation of heat-insulated sprayer: type and thickness (see key 8 in Figure 3);
— insulation protective coating of heat-insulated sprayer (see key 9 in Figure 3);
— access equipment:
  — platform (see key 10 in Figure 3);

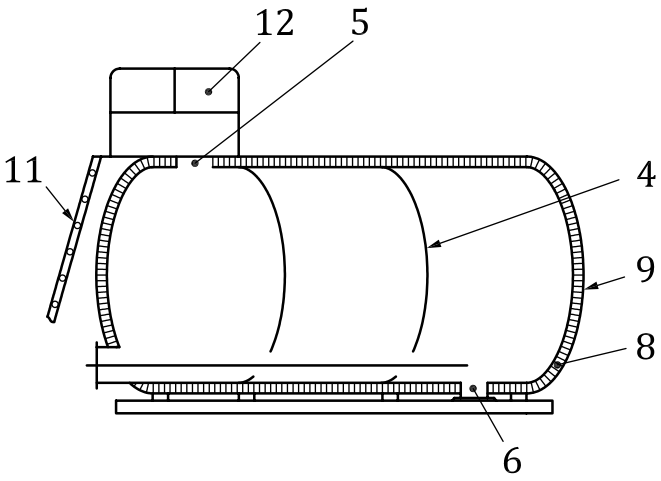
  - access ladder to inspection hole (see key 11 in Figure 3);
  - guard rail (see key 12 in Figure 3);
- heating device (see key 13 in Figure 3):
  - direct heating:
    - by open flame (see key 1 in Figure 4);
    - by electricity (see key 2 in Figure 4);
  - indirect heating by thermal oil (see key 3 in Figure 4).



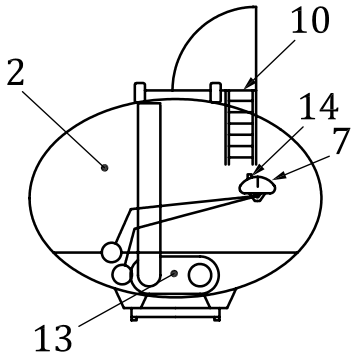
a) Rear view of a circular tank



b) Rear view of prismatic with rounded corners tank



c) Side view of an elliptical tank

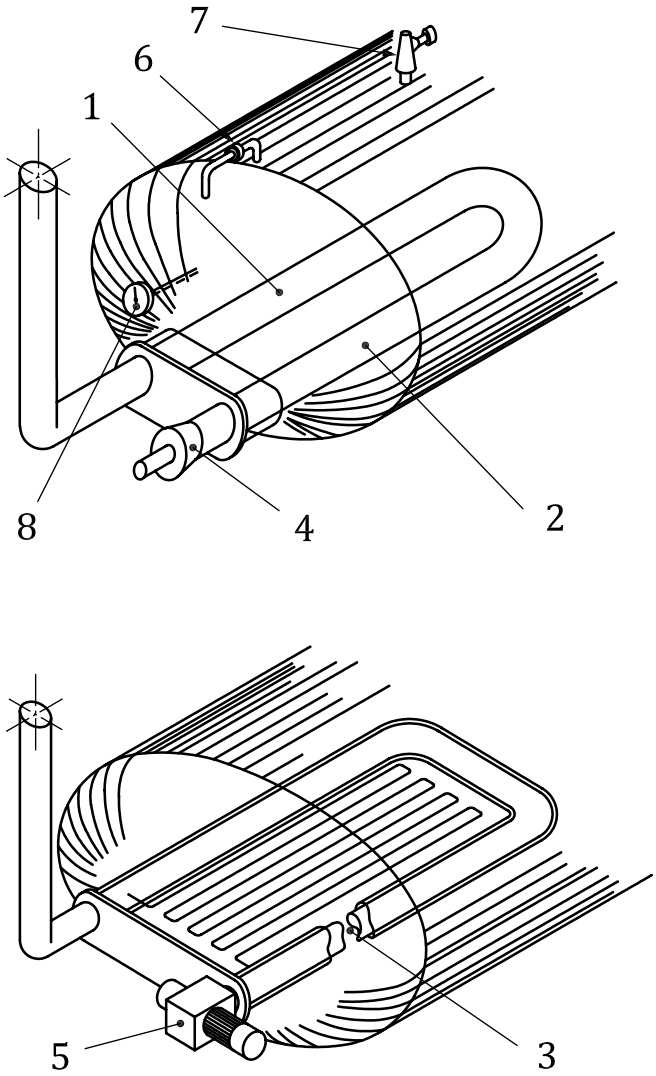


d) Rear view of an elliptical tank

Key

1	circular tank	8	thickness of thermal insulation
2	elliptical tank	9	thermal insulation
3	prismatic tank with round corners	10	access platform
4	wash plate partition	11	ladder for access to inspection hole
5	inspection hole	12	guard rail
6	cleaning orifice	13	heating device
7	level indicator	14	detector for minimum/maximum level of binder

Figure 3 — Bituminous binder tank performance



Key

1	direct heating by open flame	5	heating with automatic burner
2	direct electric heating	6	venting device
3	indirect heating installation by thermal oil	7	pressure and vacuum relief valve
4	heating with manual burner	8	thermostat

Figure 4 — Heating installation for directly or indirectly heated sprayer

5.5 Burner

The following characteristics shall be specified:

— manual burner control (see key 4 in Figure 4);

— automatic burner control (see key 5 in Figure 4);

— detector for minimum binder level (see key 14 in Figure 3);

— detector for maximum binder level (see key 14 in Figure 3);

— venting device (see key 6 in Figure 4);

— pressure and vacuum relief valve (see key 7 in Figure 4);

— thermometer;

— thermostat (see key 8 in Figure 4).

5.6 Binder transfer unit: bitumen pumping and transmission characteristics

The following characteristics shall be specified:

— displacement pump (see key 1 in Figure 5):

  — rotation speed, min^{-1},

  — output, dm^3/min;

— pump heating;

— filter (see key 2 in Figure 5);

— transmission:

  — mechanical (see key 3 in Figure 5);

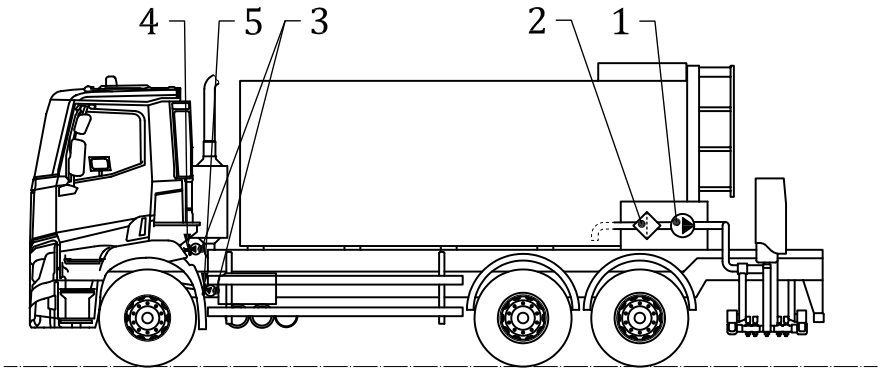
  — hydrostatic (alternatively);

— power take-off on engine (see key 4 in Figure 5);

— power take-off on gearbox (see key 5 in Figure 5);

— auxiliary engine (see key 2 in Figure 6);

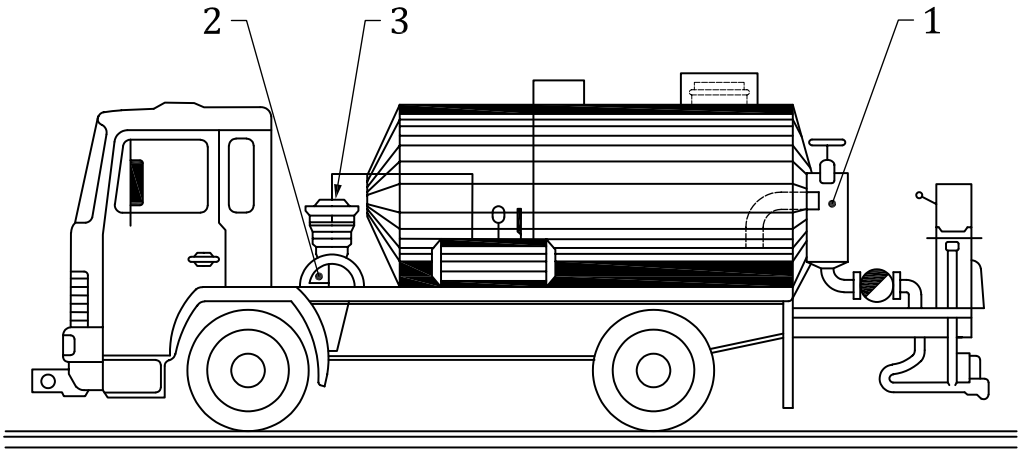
— compressor (see key 3 in Figure 6).



Key

1 bitumen displacement pump
2 bitumen filter
3 bitumen pump drive
4 power take-off on engine
5 power take-off on gearbox

Figure 5 — Displacement pump sprayer



Key

1 bitumen filter
2 auxiliary engine for driving compressor
3 air compressor

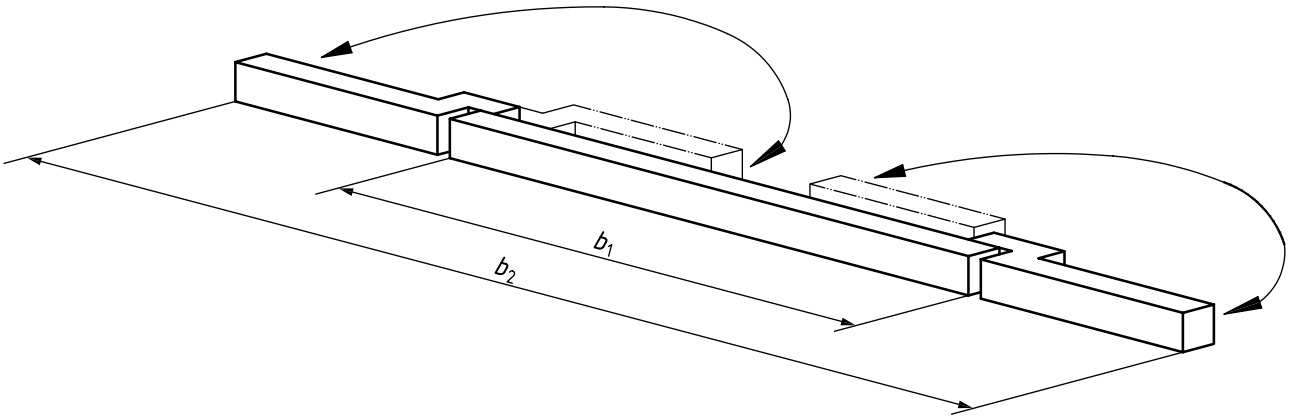
Figure 6 — Constant pressure sprayer with air compressor for bitumen feeding

5.7 Spray bar: performance and characteristics

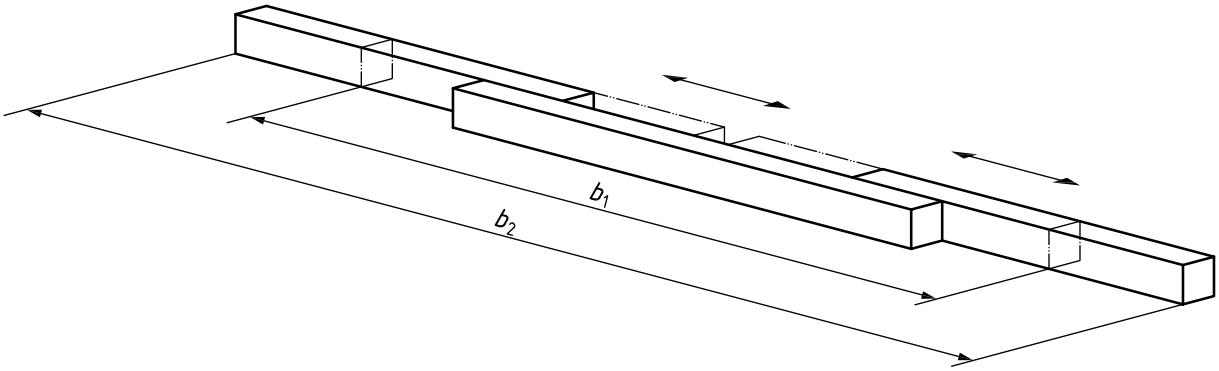
The following characteristics shall be specified:

— design type of spray bar set-up (see Figure 7);
— bar raising method:
  — mechanical;
  — pneumatic;
  — hydraulic;
— spraying height (see Figure 8), h_2, mm;
— height of spray bar in transport, mm;
— minimum width of bar in transport position, b_1, mm;
— maximum width of bar in working position, b_2, mm;
— bar width (see Figure 8), b_3, mm;
— automatic correction of spray bar height during spraying, or without correction;
— pressure in the bar during operation, MPa;
— bar heated by:
  — circulation of binder;
  — thermal oil;
  — electric resistor;
— spraying width:
  — full portion width (see Figure 8), b_4, mm;

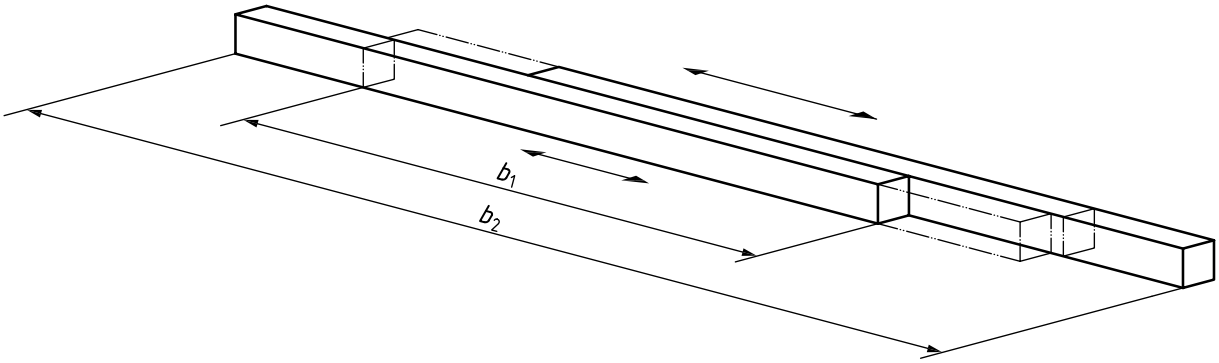
  - medium width (see Figure 8), b_5, mm;
  - covered width (see Figure 8), b_6, mm;
- nozzles (see key 1 in Figure 8):
  - number of nozzles;
  - nozzles control (see key 2 in Figure 8);
  - type of diffuser (individual or collective for two nozzles or more):
    - mechanical;
    - pneumatic;
    - hydraulic;
  - spacing of nozzles (Figure 8), b_7, mm;
  - binder jet shape: coniform or flat (see key 3 in Figure 8);
  - end flow correcting nozzle (see key 4 in Figure 8);
  - position of nozzles:
    - embedded in the spray bar;
    - outside the spray bar;
  - orientation of nozzles (Figure 8), $\alpha°$.



a) Spray bar with central unit and two folding extensions



b) Spray bar with central unit and two pull-out extensions



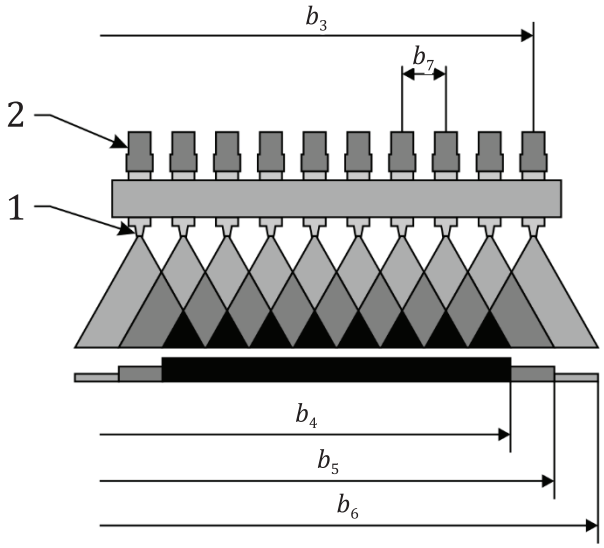
c) Spray bar with two pull-out extensions

Key

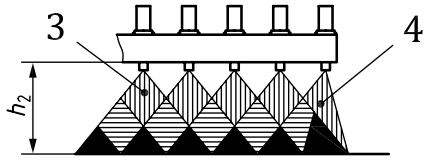
b_1 minimum width of bar in transport position

b_2 maximum width of bar in working position

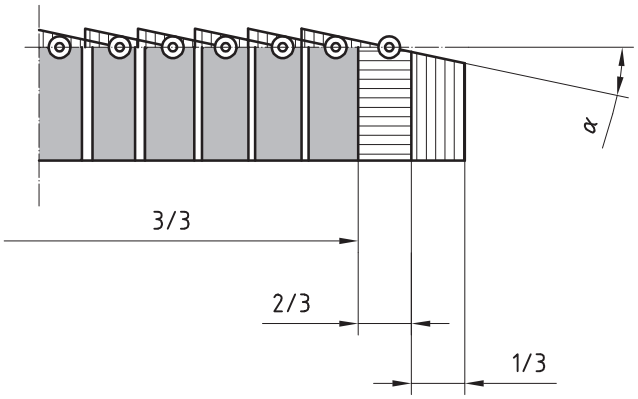
Figure 7 — Different designs of spray bar set-up



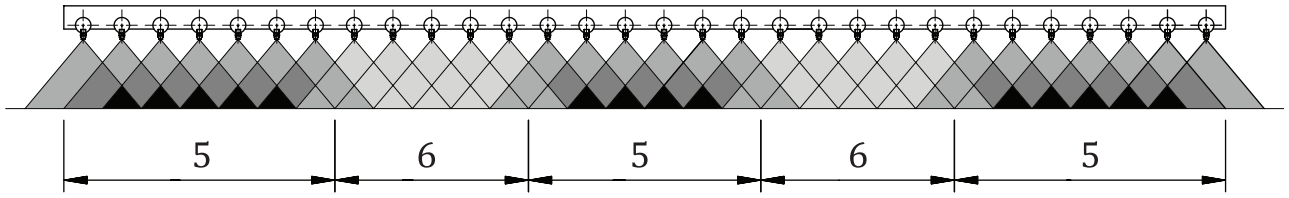
a) Spray bar composed of central unit and two extensions



b) Extension bar with correcting nozzle



c) Spray bar with the width of the pavement covered with three (3/3), two (2/3) and one (1/3) nozzle(s)



d) Example of spray bar for various dosages for bleeding application

Key

1	nozzle	b_3	bar width
2	nozzle control	b_4	full portion spraying width
3	flat binder jet shape	b_5	medium spraying width
4	end flow correcting nozzle	b_6	covered spraying width
5	nominal dosage (e.g. 1,5 kg/m^2)	b_7	spacing of nozzles
6	complementary dosage (e.g. 1,3 kg/m^2)	h_2	spraying height
α	angle of nozzle placing in top view		

Figure 8 — Spacing of nozzles and binder jet shape

5.8 Control station performance

5.8.1 Positioning, control and adjustment equipment

The type of equipment shall be specified for adjustment of:

— spray bar height;

— opening of nozzles;

— general control;

— individual control;

— transverse movement of the spray bar;

— spraying width.

5.8.2 Automatic measuring and control equipment

The following equipment shall be specified:

— nominal application rate, kg/m^2;

— pump speed indicator, min^{-1};

— truck speed indicator, km/h;

— spray bar pressure gauge, MPa;

— binder temperature in tank, °C;

— binder density, g/cm^3;

— binder viscosity, mm^2/s;

— automatic correction device for spray bar height, mm;

— automatic proportioning control and adjustment box;

— control to move the vehicle forward at regular speed;

— means of displaying, printing and storing parameters during adjustment and spraying;

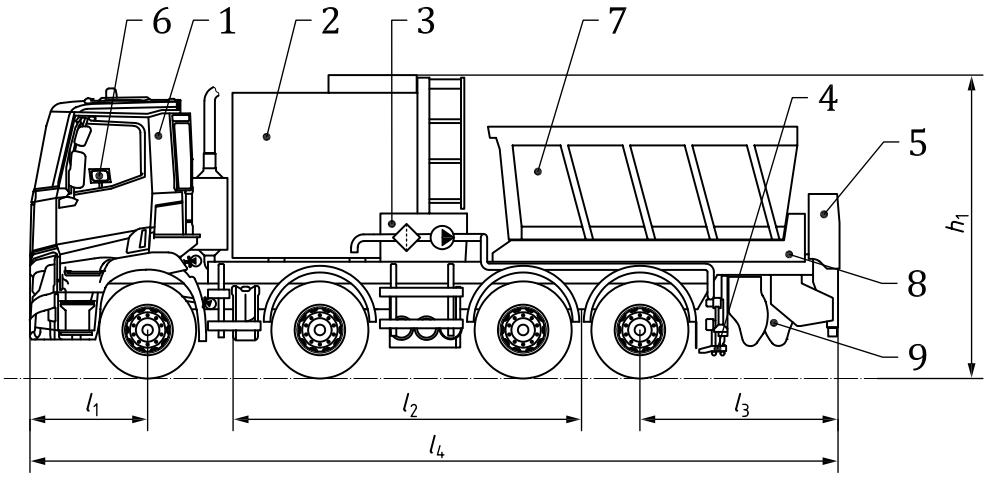
— remote control box.

6 Commercial specifications of spreading part of synchronised combined units

6.1 Components list of spreading part of combined units

The components of the spreading part of synchronised combined units and their dimensions shall be specified according to 6.2 and 6.3.

Examples of synchronised combined units are shown in Figures 9, 10 and 11.



Key

1	vehicle	7	chip hopper
2	tank	8	receiving hopper
3	binder transfer unit	9	chip spreader
4	spray bar	h_1	overall height
5	measuring instruments placed in driver's cab or on the rear part of the vehicle platform	l_1	front overhang
		l_2	wheel base
6	measuring instruments placed in driver's cab or on the rear part of the vehicle platform	l_3	rear overhang,
		l_4	overall length

Figure 9 — Truck-mounted synchronised combined unit

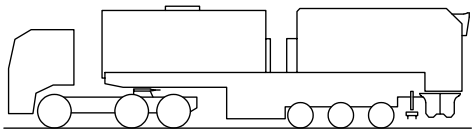


Figure 10 — Semi-trailer synchronised combined unit

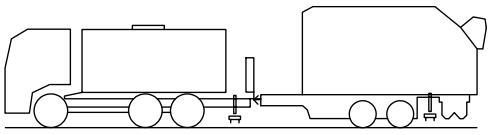


Figure 11 — Bituminous binder sprayer and towed spreader

6.2 Control station performance

6.2.1 Positioning, control and adjustment equipment

In addition to 5.8.1, the following equipment related to aggregates shall be specified for adjustment of:

— opening of gates;

— general control;

— individual control.

6.2.2 Automatic measuring and control equipment

In addition to 5.8.2, the following parameters related to aggregates shall be specified:

— nominal application rate, l/m^2 or kg/m^2;

— truck speed indicator, km/h;

— size of aggregates, mm;

— shape of aggregates.

6.3 Chip hopper: performance and characteristics

The chip hopper shall be specified by the type of aggregate distribution system:

— inclined hopper bottom (see Figure 12), or

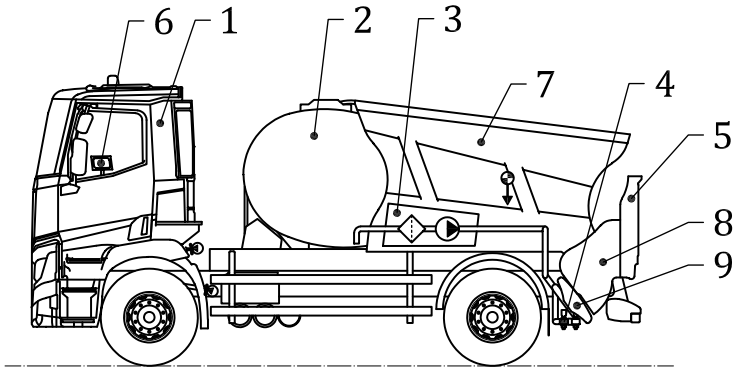
— tipping hopper (see Figure 13), or

— horizontal hopper with extracting system (see Figure 14),

and shall be specified by the additional specifications:

— hopper capacity, m^3;

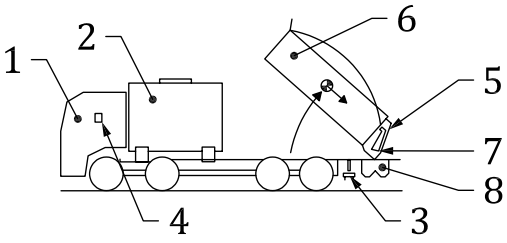
— centre of gravity.



Key

1 vehicle
2 tank
3 binder transfer unit
4 spray bar
5 measuring instruments placed on the rear part of the vehicle platform
6 measuring instruments placed in driver's cab
7 chip hopper
8 receiving hopper
9 chip spreader

Figure 12 — Chip discharge by inclined hopper bottom



Key

1 vehicle
2 tank
3 spray bar
4 measuring instruments placed in driver's cab
5 measuring instruments placed on the rear part of the vehicle platform
6 chip hopper
7 receiving hopper
8 chip spreader

Figure 13 — Chip discharge by tipping hopper

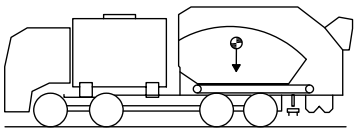


Figure 14 — Chip discharge by extracting system

6.4 Chip spreader: performance and characteristics

The chip spreader shall be specified by the following types of spreading system:

— telescopic spreading hopper (see Figure 15);

— receiving hopper (see key 9 of Figure 13 or 14);

— foldable (see Figure 16);

— roller or not;

— aggregates quantity adjustment;

— computerized or not;

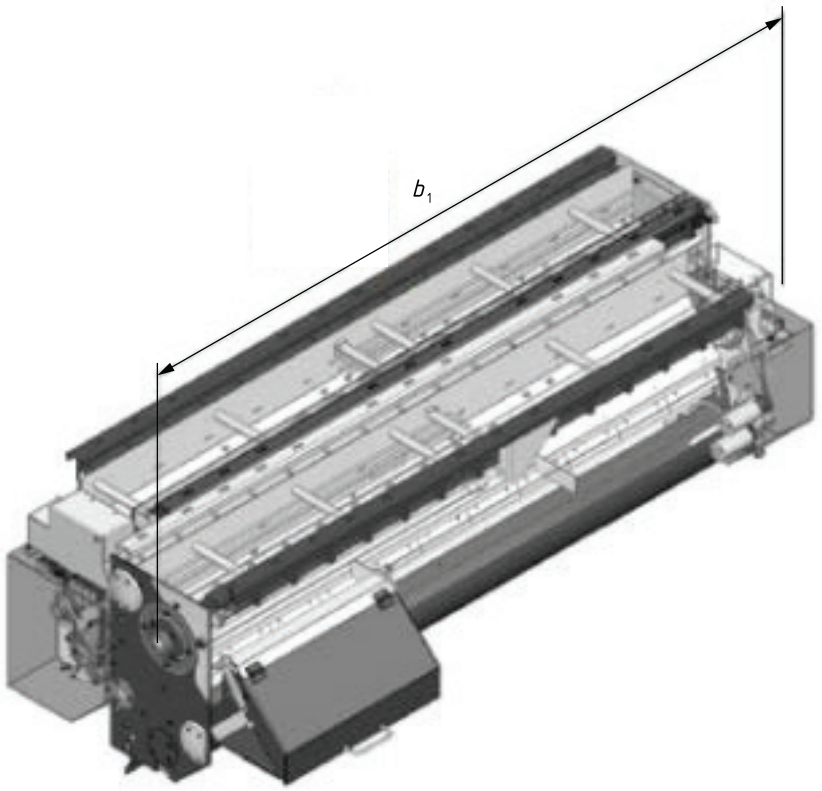
and specified by the following specifications:

— hopper capacity, m^3;

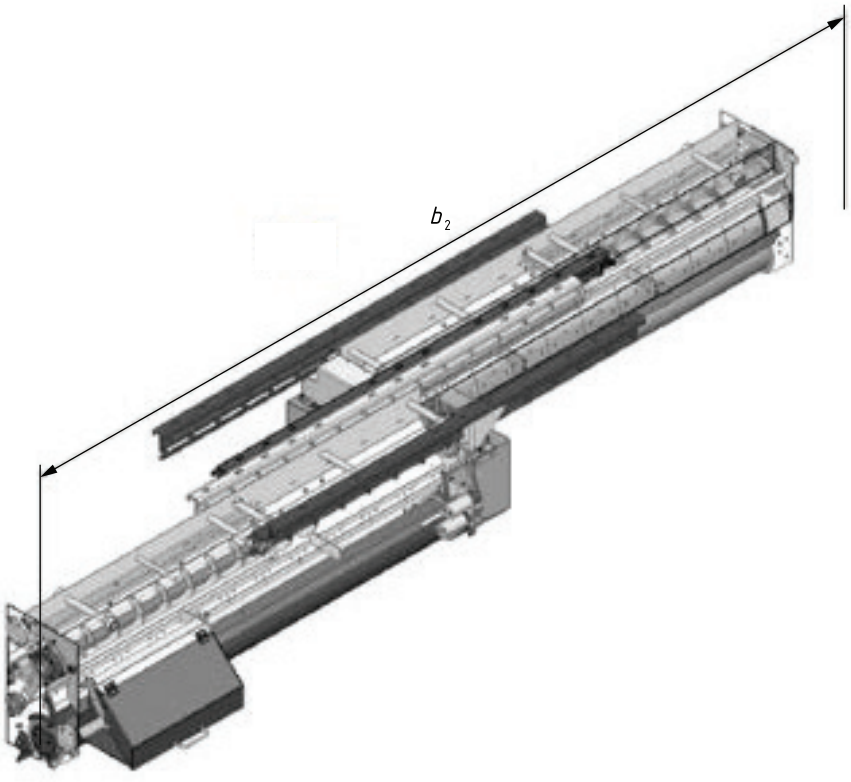
— gate width, mm;

— minimum width of bar in transport position, m;

— maximum width of bar in working position, m.



a) Transport position



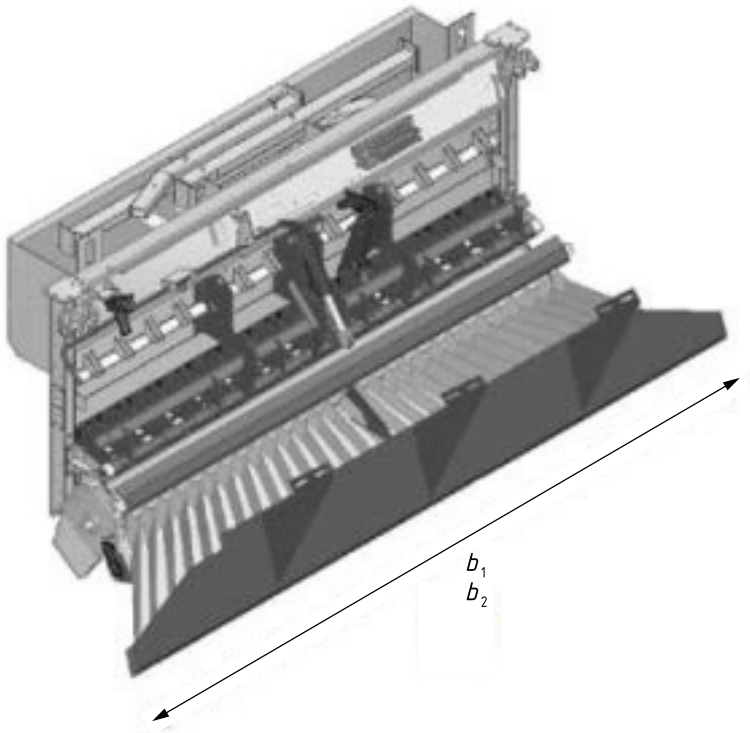
b) Working position

Key

b_1 minimum width of bar in transport position

b_2 maximum width of bar in working position

Figure 15 — Telescopic chip spreader



Key

b_1 minimum width of bar in transport position

b_2 maximum width of bar in working position

Figure 16 — Foldable chip spreader

Bibliography

[1] EN 13020:2016, *Road surface treatment machines — Safety requirements*

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