British Standard

BRITISH STANDARD

BS 1305:1974

Specification for

Batch type concrete mixers

UDC 625.7.08:693.542.52

Co-operating organizations

The Road Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Asphalt and Coated Macadam Association
Association of Consulting Engineers
British Quarrying and Slag Federation
British Tar Industry Association
Cement and Concrete Association*
Concrete Society (Design and Development Divisional Committee)*
Contractors' Plant Association*
County Surveyors' Society*
Department of the Environment
Department of the Environment, Transport and Road Research Laboratory*
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Refined Bitumen Association Limited
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Road Surface Dressing Association
Sand and Gravel Association Limited
Society of Chemical Industry
Individual experts

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Ready Mixed Concrete Association
Department of Employment (Factory Inspectorate)
Department of the Environment (Building Research Establishment)
Individual experts

This British Standard, having been approved by the Road Engineering Industry Standards Committee, was published under the authority of the Executive Board on
25 January, 1974

First published March 1946
First revision March 1959
Second revision November 1967
Third revision January 1974

The following BSI references relate to the work on this standard:
Committee reference RDE/23
Draft for comment 69/30982

ISBN 0 580 08013 7

Amendments issued since publication

Amd. No.	Date of issue	Comments

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Foreword

This British Standard for batch type concrete mixers, which was first published in 1946 and revised in 1959 and 1967, was prepared under the authority of the Road Engineering Industry Standards Committee, with the following principal objectives in view.

1) To assure purchasers that the machines meet certain minimum requirements.

2) To aid production by limiting the number of standard sizes.

3) To help manufacturers and purchasers by laying down working limits for capacity and other features of the machines.

The standard has been formulated using metric dimensions as part of the national policy to change to the metric system. Unlike the previous edition, this standard does not specify a mandatory requirement for mixing performance but allows the purchaser to state if he requires the mixing performance to comply with the requirements of BS 3963, "*Method for testing the performance of concrete mixers*".

As new designs and larger sizes of mixers are formulated, it is recommended that they comply as far as possible with the general requirements of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard deals with batch type concrete mixers of the free-fall (drum) and forced action (pan) types as defined below. It does not apply to truck type concrete mixers which are covered by BS 4251.

The standard defines various terms, the designations and sizes of the mixers, and gives requirements for the necessary accessories which go to make a complete unit and specifies the mixing performance which may be required by the purchaser.

NOTE The titles of the British Standards referred to in this standard are listed on the inside back cover.

2 Definitions

NOTE Reference to Figure 1 may be found useful.

For the purposes of this British Standard, the following definitions apply.

2.1
batch type concrete mixers

1) *Free-fall concrete mixer (drum type).* A mixer having a drum which rotates about a horizontal or inclined axis and generally having a series of blades fitted internally.

NOTE The mixing action is achieved by causing a portion of the mix to be lifted as the drum rotates and, at a certain point in each revolution, allowing it to be dropped or directed towards the bottom of the drum, where it combines with other parts of the mix in a continuously changing sequence to form a homogenous mix.

this kind of mixer can be further subdivided into:

a. Tilting drum. The drum has an inclinable axis and is a single compartment.

b. Non-tilting drum. The drum rotates in one direction on a horizontal axis and comprises a single compartment drum having two openings.

c. Reversing drum. The drum rotates on a horizontal axis, the direction being reversed to discharge.

2) *Forced action concrete mixer (pan type).* A mixer with a pan (or trough) having blades (or paddles) moving relatively, one to the other.

NOTE The mixing action is accomplished by the relative movements between the mix, the pan (or trough) and the blades (or paddles).

this kind of mixer can be further subdivided into:

a. Annular trough. Stationary pan with concentrically placed rotating paddles.

b. Stationary pan. Stationary pan with concentrically placed rotating paddles and one or more sets of planetary rotating paddles.

c. Rotating pan. Rotating pan with non-planetary eccentrically placed rotating paddles.

d. Axial trough. Stationary trough with one or more sets of rotating paddles mounted on a horizontal or inclined shaft.

2.2
transportability

1) *Static mixer.* A mixer not provided with wheels and usually built into a mixing plant.

2) *Portable mixer.* A mixer fitted with a simple form of wheels.

3) *Trailer mixer.* A mixer fitted with road wheels so that it can travel or be towed efficiently and safely at maximum statutory speed.

2.3
datum ground level

the level on which the road wheels stand or, if rail wheels are fitted, the level of the top of the rail

2.4
discharge point

the point used to establish the discharge height from the datum ground level

1) In a tilting mixer, the lowest point of the drum opening, when the drum is tilted to the highest position at which it will effectively discharge its batch.

2) In a non-tilting mixer, the lowest point of the standard movable discharge chute when in its discharge position, or the lowest point of a standard fixed chute extension, if fitted.

3) In a reversing drum type, the lowest point of the discharge opening, or the lowest point of a standard fixed chute extension, if fitted.

4) In a forced action mixer, the lowest point of the door in the discharge position or the lowest point of the fixed chute guide plates, if fitted.

2.5
loading point

the point used to establish the loading height above the datum ground level; the point above which material has to be raised in order to commence charging the loading skip or mixer itself, as applicable

2.6
water measurement

1) *Automatic tank.* A tank which, on manipulation of a valve, is filled by and discharges a predetermined quantity of water, according to a predetermined setting, without reference to a gauge indicating the water level.

2) *Water meter*. A meter which measures the amount of water entering a mixer where this is controlled by a valve operated either manually or automatically.

2.7
compacted concrete

concrete which has been compacted as described in the test for mass per cubic metre of fresh concrete in BS 1881

3 Designation of type and size

3.1 Type. The batch type concrete mixer shall be designated by a number, representing its nominal batch capacity in litres for sizes up to and including 1 000 litres and in cubic metres for sizes over 1 000 litres, together with a letter or letters indicating the type of mixer as follows.

1) Tilting drum type	T
2) Non-tilting drum type	NT
3) Reversing drum type	R
4) Forced action type	P

The letter shall follow the number in those cases where the number represents the capacity in litres and shall precede it in those cases where the number represents the capacity in cubic metres.

3.2 Size. Mixers shall be of one of the following sizes.

1) Tilting drum type	100T, 150T, 175T and 200T
2) Non-tilting drum type	200NT, 250NT, 350NT, 500NT and 750NT
3) Reversing drum type	200R, 250R, 350R, 500R
4) Forced action type	200P, 250P, 350P, 500P, 750P, 1000P, P1.5 and P2.0

Other sizes of mixer which fall within or outside the above ranges may be supplied by agreement between the supplier and the purchaser provided that they comply with all the general requirements of this standard. Where necessary proportionate changes shall be made to the dimensions to allow for the particular size of mixer produced.

3.3 Nominal batch capacity. The nominal batch capacity shall be the minimum volume in litres (or cubic metres) of fully compacted concrete produced from one batch. The volume of concrete shall be calculated from the sum of the masses of all the added constituents divided by the mass per cubic metre of fully compacted fresh concrete determined in accordance with BS 1881.

The mix used to determine the nominal batch capacity shall be mix 4 of BS 3963:1974.

The size of the mixer of a given nominal batch capacity shall be such that, on level ground, it can accommodate all the unmixed materials and thoroughly mix them without spillage so as to produce the given volume of concrete. The concrete produced shall comply with the requirements of Clause **20** of this standard.

NOTE The volume of unmixed materials may be up to 50 % greater than the volume of the compacted concrete produced.

4 Water system

4.1 General. Unless otherwise specified, each mixer of 200 litre size or larger shall be fitted with either a manually, or an automatically, operated system for delivering a measured volume of water to the mixer.

The system shall comply with the following requirements.

1) The water measurement shall be expressed in litres of water at 20 °C.

2) The quantity of water delivered to the mixer shall not vary from the indicated quantity by more than ± 3 % when measured at 20 ± 5 °C.

3) Any 10 deliveries from automatic tanks or water meters shall not vary by more than ± 2 % of the average value.

4) Provision shall be made to facilitate the checking of the accuracy of the water system.

5) The system shall discharge the quantities specified in Column 2 of Table 1 in less than half the manufacturer's stated minimum mixing time.

6) The system, including all fittings, shall operate, in accordance with the requirements given in 2), 3) and 5) above, with any working pressure between the limits of 0.7 bar[1)] and 7 bar.

7) Provision shall be made for drainage of the system.

8) The system shall operate satisfactorily with water at any temperature up to 50 °C or, where specified by the purchaser, up to 90 °C.

[1)] 1 bar = 0.1 MPa

Table 1 — Capacity of tanks, initial discharge and increments of discharge for automatic tanks

1		2	3	4
Size of mixer		Minimum capacity of tank[a]	Automatic tanks only	
			Minimum initial discharge	Increment of discharge
litre	m^3	litre	litre	litre
200		35	7	1
250		50	10	1
350		65	10	1
500		100	15	2
750		150	25	2
1 000		200	35	5
	1.5	300	50	5
	2.0	400	70	7

NOTE For mixers of special sizes, the equivalent volumes to those in Columns 2, 3 and 4 shall be approximately 20 %, 3 % and 0.5 % respectively, of the size of the mixer.

[a] Also the quantity to be discharged in half the manufacturer's stated minimum mixing time.

NOTE It is the user's responsibility to make any adjustments required by the change in density of water with temperature.

4.2 Tanks. Tanks shall comply with the following requirements as appropriate.

1) Tanks shall be capable of holding and delivering at least the quantities of water specified in Column 2 of Table 1. Their fitting shall be such that the total time cycle for feeding the tank with the quantity specified in Column 2 of Table 1 and for discharging this quantity into the mixer shall not exceed 2 minutes for free-fall mixers or 1 minute for forced action mixers.

2) Pressure-type water measuring tanks shall withstand a test pressure of 10 bar[2)].

3) Automatic tanks shall be capable of delivering the minimum quantity of water specified in Column 3 of Table 1, and any quantity between this and the total capacity in increments as specified in Column 4 of Table 1.

4.3 Water meters. The face of the meter shall be protected by a guard or by strong plate glass or transparent plastics sheeting.

4.4 Water supply connections. The sizes of water supply connections to portable and trailer mixers shall be as specified in Table 2.

Table 2 — Sizes of water supply connections

Size of mixer	Size of water supply connections	
	Free-fall type (T, NT or R)	Forced action type (P)
litre	mm	mm
100	19	—
150	19	—
200	19	25
250	19	25
350	25	32
500	25	38

The size of connections to other mixers shall be agreed betwen the purchaser and the supplier.

5 Power loader

As an alternative to the fixed batch hopper (see Clause **6**), mixers of sizes larger than the 100 litre size may, when specified by the purchaser, be fitted with a power loader complying with the following requirements.

1) The hopper shall be of adequate capacity to receive and discharge the nominal batch of unmixed materials without spillage under operating conditions on a level site.

NOTE For the purposes of this clause, the nominal batch of unmixed materials is 50 % greater than the nominal batch capacity (see Clause **3**).

2) The minimum inside width of the feeding edge of the hopper shall be as specified in Column 2 of Table 3 [see Figure 1 (e)].

[2)] 1 bar = 0.1 MPa

Table 3 — Width of loading hopper feeding edges

1	2	
Size of mixer	Minimum inside width of hopper feeding edge	
	T, NT or R	P
litre	mm	mm
150	1 000	750
200	1 100	1 100
250	1 200	1 100
350	1 300	1 200
500	1 600	1 500
750	1 900	1 700

3) Except when a mechanical device to aid discharge is provided it shall be possible to elevate a loading hopper of the pivoting type to such a height that the centre line of the chute plate of the hopper, when in the discharge position, is at an angle of not less than 50° to the horizontal [see Figure 1 (a)].

4) Except when a mechanical device to aid discharge is provided the sides of a bottom discharge hopper when in the discharging position shall be at an angle of not less than 50° to the horizontal.

5) When the means for raising and lowering the loading hopper includes flexible wire ropes winding on to a drum or drums, the method of fastening the wire rope to the drum shall be such as to avoid, as far as possible, any tendency to cut the strands of the rope, and the fastening shall be positioned clear of the barrel of the drum. It shall be possible to replace the wire ropes easily.

When the loading hopper is lowered to its normal loading position, there shall be at least $1^1/_2$ turns of the rope on the drum.

6) All control levers shall be so designed as to prevent displacement by vibration or by accidental contact with any person.

7) A safety device shall be provided to secure the hopper in the raised position when not in use.

6 Fixed batch feeding hopper

When specified by the purchaser, a fixed batch feeding hopper with an outlet door for feeding the mixer shall be supplied. The hopper shall be of adequate capacity to receive and discharge the nominal batch of unmixed materials without spillage under normal operating conditions on a level site.

NOTE For the purposes of this clause, the volume of the nominal batch of unmixed materials is 50 % greater than the nominal batch capacity (see Clause **3**).

Except when a mechanical device to aid discharge is provided, the centre line of the chute of the hopper shall be at an angle of not less than 50° to the horizontal [see Figure 1 (a)].

7 Integral weigher

Where a weighing mechanism is fitted integrally with the mixer the weighing mechanism and indicator shall be such that the error does not exceed ± 3 % of the indicated reading or ± 1 % of full scale, whichever is the greater. The indicator shall be in the clear view of the operator

8 Integral drag feeder

A mechanical feeder may be fitted integrally with the mixer to provide power feeding of the aggregate into the mixer hopper. If the feeder is of the rope-hauled scoop type hand guided by an operator other than the mixer operator, the control mechanism shall be of the "fail to-safe" type.

The design of the loading hopper and the drag feeder equipment shall be such that each of the different sizes of aggregate being used in the batch can be delivered to the hopper without undue overlap of the different sizes thereby ensuring accurate weighing of each size.

9 Discharge height

Unless otherwise agreed between the purchaser and the supplier the minimum distance from the discharge point to the datum ground level shall be as specified in Columns 2 and 3 of Table 4 (see Figure 1).

Mixers commonly known as "high discharge" models may be supplied, and the minimum distance from the discharge point of such mixers to the datum ground level shall be as specified in Column 4 of Table 4.

NOTE The horizontal distance from the lip of the chute to the nearest point on the machine should be stated by the manufacturer.

Table 4 — Discharge heights

1		2	3	4
Size of mixer		Minimum height of discharge point		
		Tilting, non-tilting and forced-action types (T, NT or P)	Reversing drum type (R)	High discharge type
litre	m^3	mm	mm	mm
100		600	—	—
150		600	—	1 400
200		700	700	1 400
250		750	750	1 400
350		750	1 200	1 400
500		850	1 200	1 400
750		850	—	1 800
1 000		—	—	1 800
	1.5	—	—	1 800
	2.0	—	—	1 800

10 Prevention of falls

On high discharge machines with platforms more than 2 m above ground level, guard rails and toeboards shall be provided around the platforms.

11 Angle of discharge chutes

Movable discharge chutes on non-tilting type mixers shall be such that the centre line of the chute plate is at an angle of not less than 40° to the horizontal when in the discharge position [see Figure 1 (a)]. This minimum angle shall also apply to standard fixed discharge chute extensions when fitted. The chute shall be self-locking in the mixing and discharge positions.

NOTE It is desirable that the angle should whenever practicable be increased.

12 Travelling wheels

Mixers may be supplied as follows.

1) Fitted with metal or rubber tyred wheels for towing at low speeds.

2) Fitted with flanged metal wheels for travelling on rails.

3) Fitted with pneumatic road wheels complete with ball or roller bearing hubs and brakes, for towing at higher speeds.

If pneumatic tyres are fitted, means shall be provided for relieving them of excessive load and also for stabilizing the machine when in operation.

13 Compliance with Road Traffic Acts

Trailer mixers shall comply with all relevant Road Traffic Acts.

NOTE Portable mixers fitted with road wheels, other than those supplied as "trailer models" are classified for the purpose of the Road Traffic Act as "engineering plant" and the towing speed is therefore limited accordingly.

14 Power units

Integral power units, when supplied, shall comply with the appropriate British Standards. The rating in terms of watts and revolutions per minute shall be stated on a plate affixed to the power unit.

15 Guarding

Effective guards shall be provided for gear wheels, chain drives, revolving shafts, couplings, set screws or similar moving parts unless these parts are made safe, by design or position, or are effectively guarded by parts of the concrete mixer framework.

NOTE In Appendix A reference is made to the requirements of the Factories Acts, and the Regulations made thereunder, which affect the construction and sale of new concrete mixers and the use of all concrete mixers in the United Kingdom. The appendix also contains recommendations for guarding.

16 Provision for lifting

Each mixer shall be fitted with eyes, shackles or other means for lifting.

17 Operating instructions and tools

Operating instructions, including recommended mixing times, and maintenance instructions, incorporating the appropriate safety warnings, and a list of spare parts shall be provided. When required by the purchaser, a strong box, or compartment with lock and key, containing the appropriate tools for normal running adjustments and lubrication, together with an inventory of the tools shall be provided with each machine.

NOTE Mixing times will vary according to the method of loading employed.

18 Standards for materials and dimensions of component parts

The materials and dimensions of all component parts of the mixers shall comply with the appropriate British Standards.

19 Rating plate

Each mixer shall have a rating plate, with embossed letters giving the following information, attached to some easily visible point on the frame.

1) Manufacturer's name.

2) Machine reference number.

3) Drum or pan speed: rev/min.

4) Motor or engine speed: rev/min.

5) Year of manufacture.

6) Size of mixer: shown as litres or cubic metres (see Clause **3**).

7) Total dry mass (in full working order).

8) The number of this British Standard, i.e. BS 1305.

A typical rating plate is shown in Figure 2.

NOTE The mark BS 1305 on or in relation to the product is a claim by the manufacturer that it complies with the requirements of this standard.

Attention is drawn to certification facilities offered by BSI; see the inside back cover of this standard.

20 Mixing performance

When required by the purchaser, the mixer unit shall be capable of complying with the requirements of Table 5 of this standard when tested in accordance with BS 3963. When required by the purchaser, the mixer shall be tested in accordance with BS 3963, using the concrete mixes specified therein. The variability shall be not greater than the appropriate values given in Table 5 of this standard. Where a particular model of mixer has been tested in accordance with BS 3963 and has complied with the appropriate requirements of Table 5 of this standard, other mixers of the same basic design and of the same dimensions to within reasonable manufacturing tolerances shall be deemed to comply with the requirements of this clause. Changes in design which cannot influence the mixing performance (e.g. a change of power unit for one of essentially the same characteristics or a change in the arrangements for the height of discharge) shall not be considered as changes in the basic design for the purposes of this clause. Where required by the purchaser, the manufacturer shall provide a certificate of compliance with the requirements of this clause, giving details required in the report referred to in BS 3963.

Table 5 — Mixing performance

Size of mixer (Litres or cubic metres)	Mix no.[a]	Percentage water content[a]		Percentage of fine aggregate[a]		Percentage cement content[a]	
		Nominal value	Maximum permitted variability	Nominal value	Maximum permitted variability	Nominal value	Maximum permitted variability
100	1	—	1.0	45 40 35 30	4.0 3.5 3.0 2.5	16.7	1.3
150 to 200	2	—	0.8	45 40 35 30	4.0 3.5 3.0 2.5	12.5	1.0
250 to 350	3	—	0.9	45 40 35 30	4.0 3.5 3.0 2.5	22.2	1.7
500 to 750	2	—	0.8	45 40 35 30	4.0 3.5 3.0 2.5	12.5	1.0
1 000 to 1.5	3	—	0.9	45 40 35 30	4.0 3.5 3.0 2.5	22.2	1.7
1.5 to 2.0	4	6.0	0.8	45 40 35 30	4.0 3.5 3.0 2.5	5.0	0.5

[a] As defined in BS 3963,

percentage water content $= [M_w/(M_a + M_s + M_c)] \times 100$

percentage of fine aggregate $= [M_s/(M_a + M_s)] \times 100$

percentage of cement content $= [M_c/(M_a + M_s)] \times 100$

where M_a is the mass of coarse aggregate,

M_s is the mass of fine aggregate,

M_c is the mass of cement,

M_w is the mass of water.

Appendix A Safety of batch type concrete mixers in the United Kingdom

A.1 Provision of guards

A.1.1 Non-tilting mixers. Fixed guards should be provided for the drum driving gear, projections on the drum and the drum rollers.

A.1.2 Tilting mixers. Fixed guards should be provided for the drum base (unless it is designed to eliminate varying clearances with the cradle or trunnions); projections on the outside of the drum (this does not include cup-shaped boltheads); the drum ring gear; the drum tilting gear.

A.1.3 All mixers. Fixed guards should be provided for the power unit and the drive from the power unit (where necessary, arrangements should be made to allow for starting, control and operation by the incorporation of hinged or sliding sections in the casing; such movable sections should not expose any dangerous parts of machinery when open); the rope pulleys of the mechanical loading gear; the drive for the mechanical loaders when fitted.

A.1.4 Forced action mixers. An enclosure incorporating a gate interlocked with the mixer drive motors and discharge door actuating gear should be provided to prevent access to dangerous moving parts in the mixer pan. Where the discharge door is accessible from below, a bi-manual or dead-man's control should be provided. Fixed guarding should be provided for the door and its actuating gear where accessible from any other point.

A.1.5 Power loaders at forced action mixers Enclosure of the hoistway should be provided sufficient to prevent contact with the moving skip. Access at the loading point should be by means of a gate interlocked with the hoist motor. The hoist motor should also be interlocked with the pan mixer gate specified in **A.1.4**.

A.2 Construction of guards

Guards should be made from sheet metal, perforated metal, metal mesh or equivalent material and should completely encase the parts concerned. They should be sufficiently strong and rigid to resist distortion and should allow for normal routine inspection and maintenance work without removal.

A.3 Statutory requirements

The principal statutory provisions affecting machines operated in the United Kingdom are as follows.

1) The Factories Act 1961,
Sections 12, 13, 14, 17, 26, and 27.

2) The Construction (General Provisions) Regulations 1961, SI 1580:1961,
Regulations 42, 43 and 57.

3) The Construction (Lifting Operations) Regulations 1961, SI 1581,
Regulations 10, 28, 34, 35, 36, 39 and 40.

4) The Construction (Working Places) Regulations 1966, SI 1966:No. 94,
Regulations 6, 26 and 28

5) The Electricity (Factories Act) Special Regulations 1908 and 1944: SR & O No. 1312 of 1908 and No. 739 of 1944.

It should not be assumed that this list is complete.

Copies of the above may be obtained from: H M Stationery Office, 49 High Holborn, London WC1 V6HB.

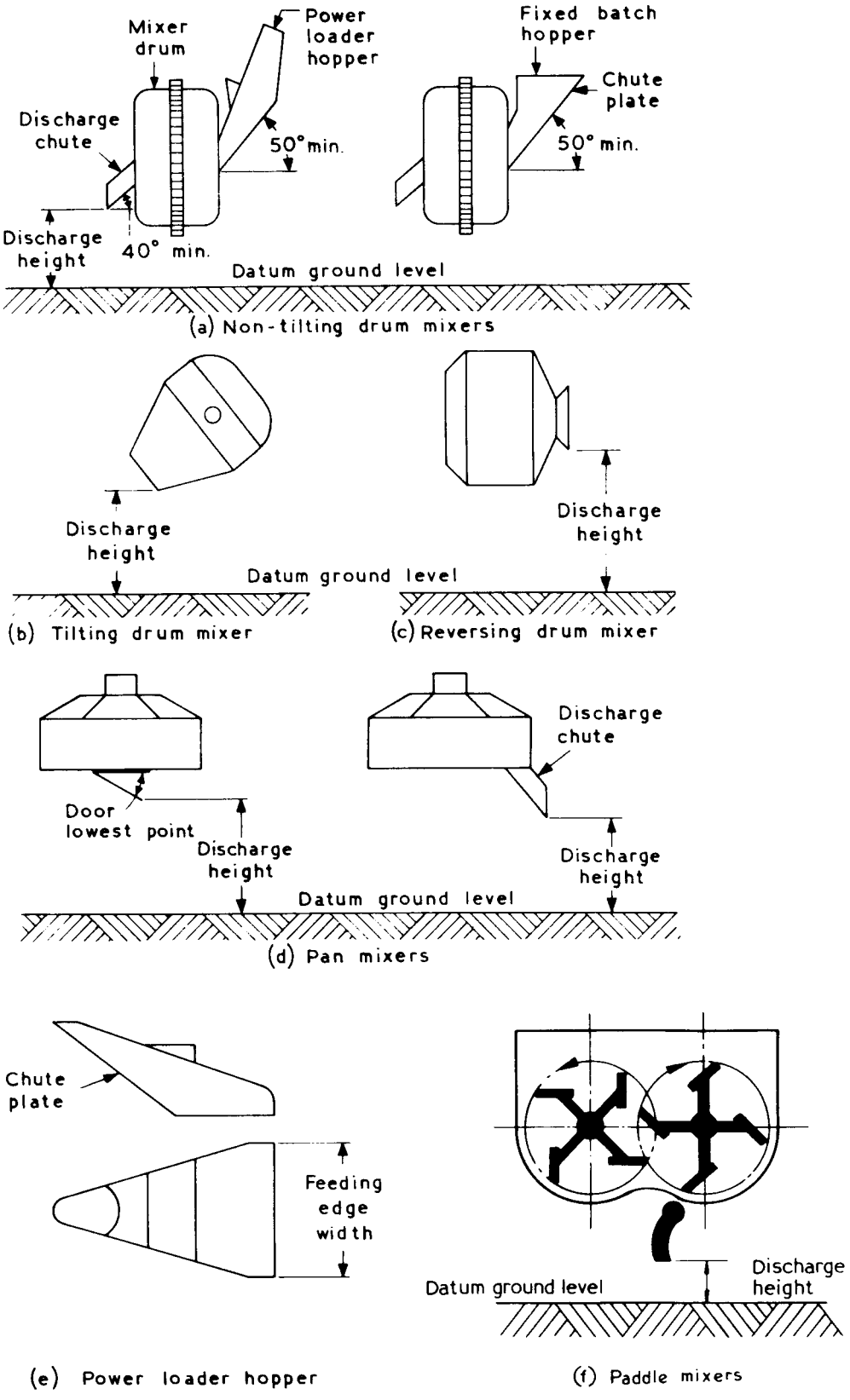

Figure 1 — Nomenclature of concrete mixers

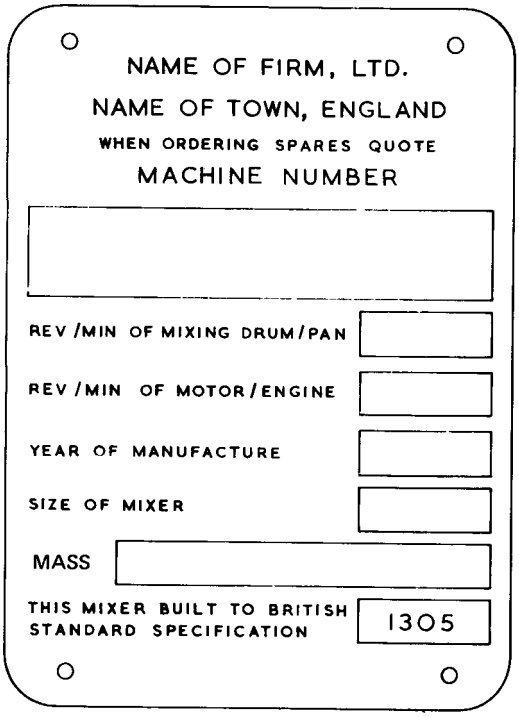

Figure 2 — Suggested typical layout of rating plate

Publications referred to

This standard makes reference to the following British Standards:
BS 1881, *Methods of testing concrete.*
BS 3963, *Method for testing the performance of concrete mixers.*
BS 4251, *Truck type concrete mixers.*

BSI — British Standards Institution

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British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

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