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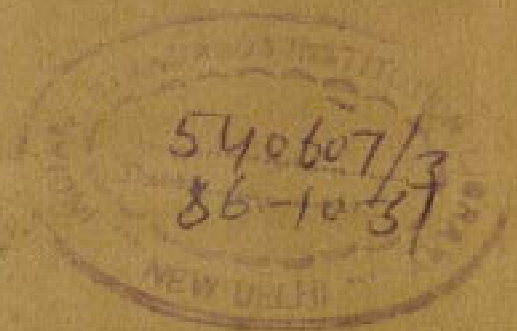


Indian Standard

GENERAL REQUIREMENTS FOR BATCH TYPE CONCRETE MIXERS

(Second Revision)

UDC 666.97.031.3



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

GENERAL REQUIREMENTS FOR BATCH TYPE CONCRETE MIXERS

(Second Revision)

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Indian Standard

**GENERAL REQUIREMENTS FOR
BATCH TYPE CONCRETE MIXERS**

(Second Revision)

0. F O R E W O R D

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 30 September 1985, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 In order to guide the purchaser, in obtaining this machinery with some minimum guaranteed performance and also to lay down working limits for capacity and other features of the machine and to aid in production by limiting the production of standard sizes, this standard has been formulated.

0.3 This standard was first published in 1961 and revised in 1968. The present revision takes into account the experience gained during the course of these years. The revision incorporates number of modifications, the prominent among which are materials for different type of mixers and deletion of clause relating to terminology. The title has been changed to general requirements as some of the provisions given in this standard are not specific.

0.4 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: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard lays down requirements regarding the drum, water tanks and fittings, loaders, hoppers, power units, discharge height, road worthiness, etc, for the free fall (drum) batch type concrete mixers.

*Rules for rounding off numerical values (revised).

1.2 The continuous mixer, forced action (pan) type mixer and truck mounted mixer are not covered in this standard.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in Indian Standard on Glossary of terms relating to concrete mixers (*under preparation*) shall apply.

3. DESIGNATION OF SIZE AND TYPE

3.1 The size of a batch type concrete mixer shall be designated by the number representing its nominal batch capacity in litres together with the letter *T* to indicate the tilting type, the letters *NT* to indicate non-tilting type or the letter *R* for reversing type. Thus a mixer having a nominal batch capacity of 200 litres will have the designation 200 *T* if it is of tilting type, 200 *NT* if it is of the non-tilting types, or 200 *R* if it is of reversing type.

4. SIZES

4.1 Concrete mixers shall be of the following sizes:

- a) *Tilting Type* — 100 *T*, 140 *T* and 200 *T*.
- b) *Non-tilting Type* — 200 *NT*, 280 *NT*, 375 *NT*, 500 *NT* and 1 000 *NT*.
- c) *Reversing Type* — 200 *R*, 280 *R*, 375 *R*, 500 *R* and 1 000 *R*.

4.1.1 *Margin of Capacity* — Mixers, when operating on level, shall be capable of holding and mixing an actual mixing batch 10 percent in excess of the nominal mixed batch capacity laid down in **4.1**.

4.2 Sizes other than those specified in **4.1** may be supplied by mutual agreement between the purchaser and the supplier.

5. DRUM

5.1 The size of the drum shall be such that the ratio of the total interior drum volume (geometric solid) to the nominal size of the mixer is not less than the appropriate value given in Table 1.

5.2 The quality of material used in the construction of mixing drum and minimum thickness of drum for various sizes of concrete mixer shall be

as follows:

Tilting Type Mixer

Size of the Mixer	Minimum Thickness of Shell and Quality of Material			Blade Thickness
	Upper Conical Portion of Mixer Drum	Cylindrical Portion of Mixer Drum	Lower Portion of Mixer Drum	
Litres				
100 }	4 mm thick steel sheet conforming to IS : 226- 1975*	6 mm thick steel sheet conforming to IS : 8500-1977†	12 mm thick cast Iron conforming to grade FG to IS : 226-300 of IS : 210-1978‡ or 8 mm thick steel conforming to IS : 8500- 1977†	8 to 10 mm thick steel conforming to IS : 226- 1975* or IS : 1977- 1975§
140 }				
200 }				

Non-Tilting Type Mixers or Reversing Drum Mixers

Size of Mixer	Minimum Thickness of Shell and Quality Material		Blade Thickness
Litres			
200	5 mm thick steel sheet conforming to IS : 226-1975*	5 mm thick steel sheet conforming to IS : 226-1975*	
280 }	8 mm thick steel sheet conforming to IS : 226-1975* or IS : 1977-1975§ or 6 mm thick steel conforming to IS : 8500-1977†	8 mm thick steel sheet conforming to IS : 226-1975* or IS : 1977-1975§ or 6 mm thick steel conforming to IS : 8500-1977†	
375 }			
500 }			
1000	12 mm thick steel sheet conforming to IS : 226-1975* or IS : 1977-1975§ or 8 mm thick structural steel conforming to IS : 8500-1977†	12 mm thick steel sheet conforming to IS : 226-1975* or IS : 1977-1975§ or 8 mm thick structural steel conforming to IS : 8500-1977†	

*Specification for structural steel (*fifth revision*).

†Specification for weldable structural steel (*medium and high strength quality*).

‡Specification for grey iron castings (*third revision*).

§Specification for structural steel (*ordinary quality*) (*second revision*).

TABLE 1 MINIMUM RATIO OF DRUM VOLUME TO NOMINAL SIZES FOR THE PREFERRED SIZES OF FREE-FALL MIXER

(Clause 5.1)

NOMINAL SIZE OF MIXER (T, NT OR R) LITRES	MINIMUM RATIO OF DRUM VOLUME OF SIZE		
	Tilting Type	Non-Tilting Type	Reversing Type
	2.5	—	—
100	2.5	—	—
140	2.5	—	—
200	2.5	4.0	4.5
280	—	4.0	4.5
375	—	4.0	4.4
500	—	3.9	4.3
1 000	—	3.8	4.2

5.3 Drum Speed — The manufacturer shall indicate the drum speed at which the mixer should normally be operated to give optimum performance (*see 18*).

5.3.1 If required, a revolution counter may also be provided for guiding the operator.

5.4 In case of tilting drum type mixers, the angle at which the drum operates shall vary from 20° to 30°.

6. WATER SYSTEM

6.0 One of the types of water measuring devices described in 6.1 and 6.2 with the fittings shall be fixed with each mixer only of 200 litres size or larger. Where required, the system and all associated equipment shall operate satisfactorily with water of any temperature up to 90°C. The system shall be manually operated or automatic as specified. The water measurement shall be expressed in litres. Provision shall be made to facilitate the checking of the accuracy of water system.

6.1 Water Tanks

6.1.1 The tanks shall be capable of holding and delivering at least the quantities of water specified in col 2 of Table 2. The gauge or other device for indicating the quantity of water in or leaving the tank shall be accurate to within ± 2 percent of the indicated quantity above the minimum quantity of water shown in col 3 of Table 2.

TABLE 2 CAPACITY OF TANKS AND INCREMENTS OF DISCHARGE*(Clauses 6.1.1, 6.1.2 and 9.1)*

SIZE OF THE MIXER (T, NT OR R) LITRES	MINIMUM CAPACITY OF TANKS LITRES	AUTOMATIC TANKS ONLY	
		Minimum Initial Discharge litres	Increment of Discharge litres
(1)	(2)	(3)	(4)
200	35	7	1
280	55	10	1
375	65	10	1
500	75	15	1
1 000	150	25	2

6.1.2 Automatic tanks shall be capable of delivering the minimum quantity of water shown in col 3 of Table 2, and any quantity between this and the total capacity in increments as shown in col 4 of Table 2. The scale should be graduated in increments as shown in col 4 of Table 2. The quantity delivered shall not vary from the predetermined quantity by more than ± 2 percent of the indicated quantity above the minimum quantity of water shown in col 3 of Table 2. The gauge or other device shall be so positioned that it can be conveniently read by the operator.

6.1.3 Measuring tanks, whether automatic or non-automatic and their fittings shall be such that the total time cycle for feeding the tank under the lowest pressure specified in 7.1 with the quantities specified in col 2 of Table 2 and for discharging these quantities into the mixer, does not exceed two minutes and the time for discharging these quantities shall not exceed half of the minimum mixing time.

6.2 Water Meters

6.2.1 The water meters shall conform to IS : 779-1978* or IS : 2373-1981†.

6.2.2 Plants with capacity of 1 000 litres may be provided with automatic cut-off arrangement after predetermined water has been added to the mixer.

*Specification for water meters (domestic type) (fifth revision).

†Specification for water meters (bulk type) (third revision).

6.2.3 The face of the meter shall be suitably protected.

6.3 Working Pressures

6.3.1 Pressure type water measuring tanks and their fittings shall be able to operate satisfactorily with any working pressure between the limits of 0.1 and 0.7 Mpa. The tank itself shall satisfactorily withstand a test pressure of 1.05 Mpa.

6.3.2 Fittings other than those for closed tanks which have to operate under mains pressure shall be suitable for working between the limits of 0.1 and 0.7 Mpa.

6.3.3 Water meters and their fittings shall be able to operate satisfactorily with any working pressure between the limits 0.07 and 0.7 Mpa or at such lower pressure as may be stated.

6.4 Water Supply Connections — The sizes of water supply connections shall be as specified in Table 3.

TABLE 3 SIZE OF WATER SUPPLY CONNECTIONS

(Clauses 6.4 and 6.5.1)

NOMINAL SIZE OF MIXER (T, NT OR R) LITERS	SIZE OF WATER SUPPLY CONNECTION mm
100	20
140	20
200	20
280	20
375	25
500	25
1 000	30

6.5 Water Supply Pump — Hand or power pumps, when fitted, shall be of sufficient capacity to ensure that the time taken for feeding the water tank with the quantities specified in col 2 of Table 3 is less than one minute.

7. POWER LOADER

7.1 As an alternative to the fixed batch hopper (*see 8*) mixers of 140 T and 140 NT size and larger may, when required, be fitted with a power loader complying with the following requirements:

- a) The hopper shall be of adequate capacity to receive and discharge the maximum nominal batch of unmixed materials

without spillage under normal operating conditions on a level site.

NOTE — For the purpose of this clause, the volume of the maximum nominal batch of unmixed materials is 50 percent greater than the nominal mixed batch capacity (see 2, 3 and 4).

- b) The minimum inside width of the feeding edge of the hopper shall be as specified in Table 4 (see Fig. 1D).
- c) The design of the loader shall allow the loading hopper to be elevated to such a height that the centre line of the chute plate of the hopper, when in discharge position, is at an angle of not less than 50° to the horizontal (see Fig. 1A). A mechanical device to aid discharge of the contents as quickly as possible, from the hopper to the drum may also be provided. Even when a mechanical device is provided, it is recommended that the angle of centre line of the chute plate of the hopper, when in discharge position, should be as large as practicable, preferably not less than 40° to the horizontal.
- d) 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 should preferably be positioned clear of the barrel of the drum, for example, outside the drum flange. When the loading hopper is lowered to its normal loading position, there should be at least one and a half turns of rope on the drum.
- e) Clutch, brake and hydraulic control lever shall be designed so as to prevent displacement by vibration or by accidental contact with any person.
- f) The clutch and brake control arrangement shall also be so designed that the operator can control the falling speed of the loader.
- g) A safety device shall be provided to secure the hopper in the raised position when not in use.

8. FIXED BATCH HOPPER

8.1 When required a fixed batch hopper with an outlet door for feeding the drum shall be fixed. The hopper shall be of adequate capacity to receive and discharge the maximum nominal batch of unmixed materials without spillage under normal operating on a level site.

NOTE — For the purpose of this clause, the volume of the maximum nominal batch of unmixed materials is 50 percent greater than the nominal mixed batch capacity (see 2, 3 and 4).

TABLE 4 WIDTH OF HOPPER FEEDING EDGES

[Clause 7.1 (b)]

NOMINAL SIZE OF MIXER (N, NT OR R) LITRES	MINIMUM INSIDE WIDTH OF HOPPER FEEDING EDGE mm
140	1.0
200	1.1
280	1.2
375	1.4
500	1.5
1 000	2.0

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

8.3 The inside of the hopper shall be free from internal projections, such as rivet heads and the like.

9. INTEGRAL WEIGHER

9.1 The weighing mechanism may be fitted integrally with mixer to enable the ingredients of mix to be weighed while being loaded into the mixer hopper. The weighing mechanism and indicator shall be such that the error in excess or deficiency in all stages of loading shall be not more than two percent under normal working conditions.

9.1.1 For the purposes of weighing, the mixer shall be levelled properly.

10. INTEGRAL DRAG FEEDER

10.1 The 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-handled scope type, hand guided by an operator other than the mixer operator, the control mechanism shall be of the 'fail-to-safe' type.

11. DISCHARGE HEIGHT

11.1 The minimum distance from discharge point of any mixer to the datum ground level shall be as specified in Table 5 (*see* Fig. 1).

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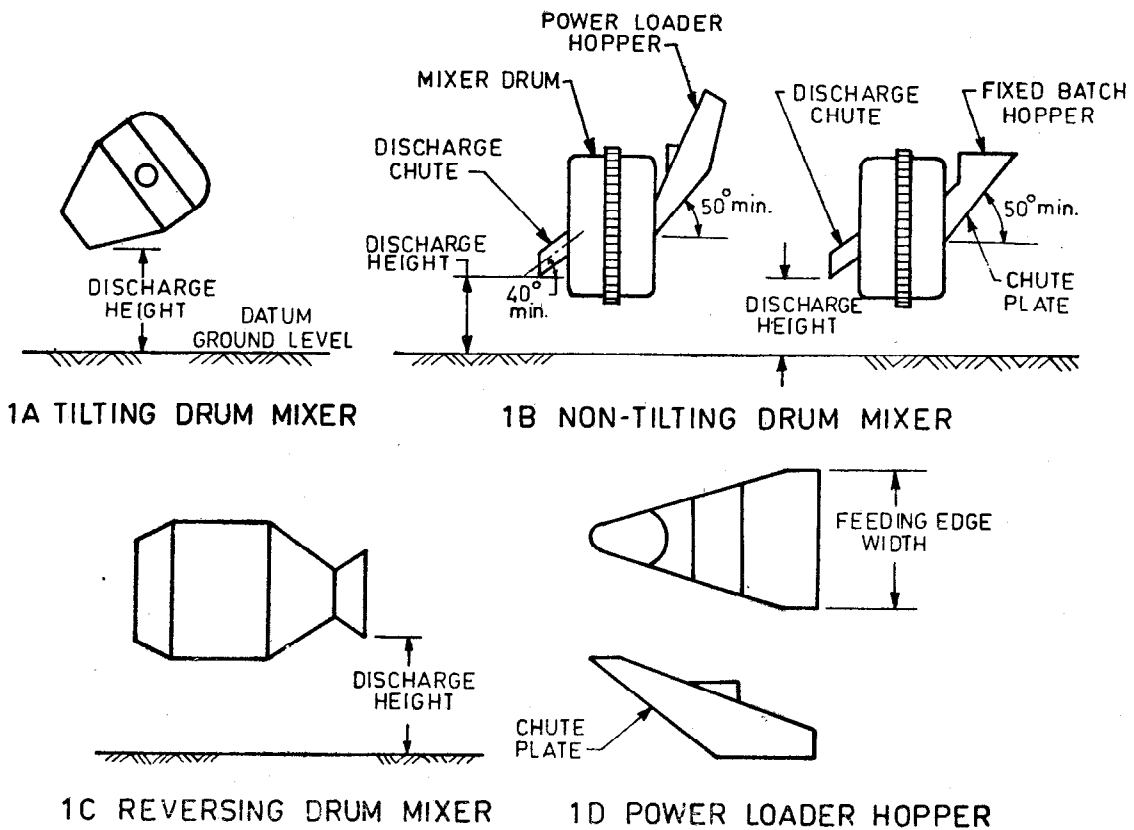


FIG. 1 DIAGRAM INDICATING NOMENCLATURE OF CONCRETE MIXER

TABLE 5 DISCHARGE HEIGHTS(*Clauses 11.1 and 11.2*)

SIZE OF MIXER (T, NT or R) LITRES	MINIMUM HEIGHT OF DISCHARGE POINT		
	Tilting and Non-tilting Type (T and NT) cm	Reversing Drum Type (R) cm	High Discharge Type cm
(1)	(2)	(3)	(4)
85	60	—	—
100	60	—	—
140	60	—	150
200	70	70	150
280	75	75	150
375	75	120	150
500	85	120	150
1 000	85	—	180

11.2 Portable mixers commonly known as 'High Discharge' models may be supplied, and the minimum distance of the discharge point of such mixers to the datum ground level shall be as specified in col 4 of Table 5.

NOTE — The horizontal distance from the lip of the chute to the nearest point on the machine shall be mentioned by the manufacturer.

12. ANGLE OF DISCHARGE CHUTES

12.1 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. This minimum angle shall also apply to fixed discharge chute extensions when fitted. The chute shall be self-locking in both the extreme positions.

NOTE — It is desirable that the angle should, wherever practical, be increased.

13. TRAVELLING WHEELS

13.1 Mixers may be:

- fitted with metal or rubber tyred wheels for towing at slow speeds; or

- b) fitted with flanged metal wheels for travelling on rails; or
- c) fitted with pneumatic road wheels, complete with ball or roller bearings and hubs, for towing at higher speeds.

The design of mixer shall be such as to facilitate stable parking of the mixer during mixing operation in the field. Where so required, parking brakes may be provided for the mixers fitted with any of the three types of wheels. Suitable braking arrangement for reducing the speed shall be provided for mixers fitted with wheels of type (b) and (c). When the mixer is fitted with pneumatic tyred road wheels, means shall be provided for relieving the wheels of excessive load and also for stabilizing the machine when in operation.

13.1.1 If so required, the mixer may also be provided with ACKERMAN steering device or any other equally suitable device to ensure free steering of the front wheel/wheels of the mixer.

14. POWER UNITS

14.1 Mixers may have suitable integral power units or means of connection to an external power unit. The normal power units envisaged are internal combustion engines (petrol, diesel and gas), electric motors, hydraulic motors and air motors. Integral power units and normal power units shall comply with relevant Indian Standards. The rating in terms of kilowatts and revolutions per minute shall be stated on a plate affixed to the power unit. The power unit shall be fixed on shock-free frame. The power unit shall be mounted in such a way as to be easily removable and adjustable.

15. TOWING BARS

15.1 The mixer shall be provided with towing bar having circular eyes and suitable for motorized towing.

16. LIFTING ARRANGEMENTS

16.1 Each mixer shall be fitted with eyes, shackles or other suitable means for lifting by a slinging chain or chains.

17. TOOLS AND OPERATING INSTRUCTIONS

17.1 A strong tool box, with lock and key, containing the necessary tools for normal running adjustments and lubrication together with an inventory of the tools, shall be provided with each machine. Operating and maintenance instructions and a spare parts list shall also be provided.

18. RATING PLATE

18.1 Each mixer shall have a rating plate firmly attached to some part not easily removable. The rating plate shall have clearly marked on it the following information:

- a) Manufacturer's name;
- b) Machine reference No;
- c) Size of mixer in litres;
- d) Total mass in kg;
- e) Drum speed, revolutions/minute;
- f) Motor or engine speed, revolutions/minute;
- g) Power input required to run the mixer under the normal working conditions; and
- h) Maximum towing speed;
- j) Year of manufacture;
- k) The horizontal distance from tip of the chute to the nearest point on the machine in case of portable mixer.

19. MIXING EFFICIENCY

19.1 The mixer shall be tested under normal working conditions (*see* 5.3) in accordance with the method specified in IS : 4634-1968* with a view to checking its ability to mix the ingredients to obtain a concrete having uniformity within the prescribed limits. The uniformity of mixed concrete shall be evaluated by finding the percentage variation in quantity (mass in water) of cement, fine aggregate and coarse aggregate in a freshly mixed batch of concrete.

19.1.1 The percentage variation between the quantities of cement, fine aggregates and coarse aggregates (as found by weighing in water) in the two halves of a batch and the average of the two halves of the batch shall not be more than the following limits:

Cement	8 percent
Fine aggregate	6 percent
Coarse aggregate	5 percent

*Method for testing the performance of batch type concrete mixers.

(Continued from page 2)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1 \text{ N} = 1 \text{ kg.m/s}^2$
Energy	joule	J	$1 \text{ J} = 1 \text{ N.m}$
Power	watt	W	$1 \text{ W} = 1 \text{ J/s}$
Flux	weber	Wb	$1 \text{ Wb} = 1 \text{ V.s}$
Flux density	tesla	T	$1 \text{ T} = 1 \text{ Wb/m}^2$
Frequency	hertz	Hz	$1 \text{ Hz} = 1 \text{ c/s (s}^{-1}\text{)}$
Electric conductance	siemens	S	$1 \text{ S} = 1 \text{ A/V}$
Electromotive force	volt	V	$1 \text{ V} = 1 \text{ W/A}$
Pressure, stress,	pascal	Pa	$1 \text{ Pa} = 1 \text{ N/m}^2$