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GENERAL REQUIREMENTS FOR PAN MIXERS FOR CONCRETE

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Indian Standard

GENERAL REQUIREMENTS FOR PAN MIXERS FOR CONCRETE

0. FOREWORD

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 31 July 1987, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Pan type mixer is a closed pan equipped with rotating arms with paddles moving in the opposite direction to arms with lesser speed. These type of mixers are very efficient in working specially with stiff mixes. A typical pan type of mixer is shown in Fig. 1.

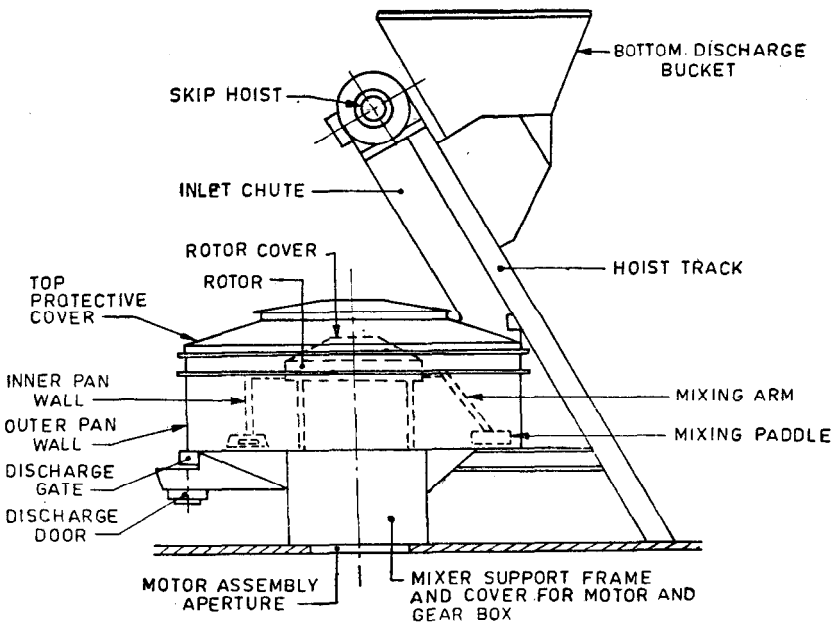

FIG. 1 TYPICAL PAN TYPE CONCRETE MIXER

0.3 In this standard, the nominal sizes adopted are based on the input volume of unmixed materials as against the volume occupied by concrete after mixing, since pan mixer has found wider applications for mixing materials other than concrete also.

0.4 This standard lays down the general requirements for pan mixers with the following objectives:

a) To guide the purchasers with some minimum guaranteed performance;

b) To aid in production by limiting the number of standard sizes; and

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

1. SCOPE

1.1 This standard lays down the requirements for the pan, water feeding arrangements and fittings, skip loader, certain design features for safety, power units requirements for the necessary accessories.

1.2 It does not cover free fall batch type concrete mixers, continuous mixers and truck mounted mixers.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 11386-1985* shall apply.

3. DESIGNATION OF SIZE AND TYPES

3.1 The size of a pan type concrete mixer shall be designated by the number representing its input capacity in litres together with letter 'P' to indicate the pan type concrete mixer. Thus, a mixer having a maximum input of 500 litres of mixed materials, per batch will have the designation of 500 P.

3.2 Pan type concrete mixers shall be of one of the following sizes:

375 P; 500 P; 750 P; 1 000 P; 1 500 P; 2 000 P; 3 000 P; 4 000 P; and 4 500 P.

3.3 Input Capacity — The size of the mixer of a given input batch capacity shall be such that, on level ground, it may accommodate all the unmixed material and thoroughly mix them without spillage so as to produce the given volume of concrete.

*Glossary of terms relating to concrete mixers.

3.4 Mixing Efficiency — The mixing efficiency of the mixer shall be tested under normal working conditions in accordance with the method specified in IS : 4634-1968*.

3.5 Output Capacity — This shall be the minimum volume in cubic metres of fully mixed 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 mixed fresh concrete of medium consistency. Output is generally 15 to 20 percent of input per batch.

4. MIXING PAN

4.1 Mixing pan shall be of welded steel construction. The mixer pan base and the mixing pan walls shall be lined with wear resistant interchangeable wear plates and mixed by means of countersunk screws. Below the mixing pan should be the frame work of the mixer consisting of a welded plate steel construction and welded to the pan mixer and the pan mixer should be anchord to the mixer platform or other supporting structure at this point.

4.2 The quality of material used in construction of the pan mixer and minimum thickness of the pan for various sizes of concrete mixers shall be as given in Table 1. The wear plates shall be 10 mm thick conforming to 45C8 of IS : 1570 (Part 2)-1979†.

TABLE 1 MINIMUM THICKNESS OF PAN FOR DIFFERENT SIZES OF MIXERS

Size of Mixer	Minimum Thickness of Steel Plate Conforming to IS : 8500-1977*
Litres	mm
375 P	6-18
500 P, 750 P, 1 000 P, 1 500 P	10-12
2 000 P, 3 000 P, 4 000 P, 4 500 P	12-14

*Weldable structural steel (medium and high strength quality).

5. ROTOR

5.1 Rotor consists of a housing for the fixing of the mixing arm and shall conform to grade FG 200 of IS : 210-1978‡. The rotor shall be concentrically mounted in the pan mixer. The attachment for fixing of the mixing arms shall be such that adjustments or shifting of the mixing arm is easy and simple. The adjusting device in the rotor housing shall be suitably covered. The optimum speed of the mixer shall be indicated.

*Method for testing performance of batch type concrete mixers.
†Schedules for wrought steels: Part 2 Carbon steels (unalloyed steel) (*first revision*).
‡Specification for grey iron castings (*third revision*).

5.2 Mixing Arms — The mixing arms shall be of carbon steel bars conforming to grade 27C 15 of IS : 1570 (Part 2)-1979* and the bars shall be stress relieved, if hot bending is done. Wear sleeves should be fitted to the arms, if it is in contact with the material in the mixer.

5.3 Mixing Paddles — The mixing paddles shall be of wear resistant castings. They should be fixed to the mixing arms in such a manner that replacement is easy. An inner and outer scraper should be provided for complete cleaning of the pan walls.

5.4 The minimum number of mixing paddles shall be as follows:

Size of Mixer (litres)	*Number of Mixing Paddles*
375 P	4
500 P, 750 P	5
1 000 P	6
1 500 P, 2 000 P	8
3 000 P	13
4 000 P, 4 500 P	15

5.5 Protective Cover — The protective cover shall be 5 mm thick steel conforming to IS : 226-1975† to provide an upper cover for the mixer pan. The cover shall be dust proof. It is usually in a conical shape and consisting of several segments which shall be bolted together. The proof cover shall be provided with a cleaning segment and an inspection flat.

5.5.1 A hand hoist for pan mixer above 750 litres with cable winch and guide roller shall be provided to facilitate the opening of the cleaning segment.

5.5.2 Safety limit switches shall be provided to the segment and cleaning flaps so that; when the flaps are open for cleaning or maintenance, the mixer is switched off.

5.6 Mixer Drive

5.6.1 The mixers may have suitable integral power units fitted centrally to the gear speed reducer to form a self-contained unit. The normal power units envisaged are petrol, diesel engine or gas or electric motors.

*Schedules for wrought steels: Part 2 Carbon steels (unalloyed steel) (*first revision*).
†Specification structural steel (standard quality) (*fifth revision*).

Integral and normal power units shall comply with relevant Indian Standards. The rating in terms of kilowatts and revolutions per minute shall not be less than the ratings given below:

Size of Mixer (litres)	*Rating in* kW/RPM
375 P	11/1 500
500 P	15/1 500
750 P	22/1 500
1 000 P	30/1 500
1 500 P	37/1 500
2 000 P	45/1 500
3 000 P	75/1 500
4 000 P	90/1 500
4 500 P	110/1 500

The rating in terms of kilowatts and RPM shall be stated on a plate affixed to the power unit.

5.6.2 *Control Box* — The starting device for the mixer may be fitted to the outside wall of the mixer or may be erected independently. Within the control device, a suitable lockable safety switch shall be provided to prevent the mixer being made operative during its maintenance.

6. DISCHARGE

6.1 The discharge door of the pan mixer shall be fitted circumferencially at the bottom of the pan in such a way as to achieve as large a discharge aperture as possible for a rapid discharge. Usually the discharge point is diametrically opposite the feeding point. The pivoted discharge gate shall be operated by means of hydraulic or electro-hydraulic system which should be protected from dirt ingress and should be easily accessible for removal and maintenance. An auxiliary system to open the discharge gate manually in case of power failure shall also be provided. The discharge height shall be stated.

6.2 Safety Guards — A suitable safety guard shall be provided to cover the mixer discharge door and shall be so designed that it is easy to remove.

7. THE MIXER INLET

7.1 The pan mixer inlet chute should be provided in the top protective cover and shall be designed in such a way as to prevent spillage of unmixed materials discharged by the skip bucket. In case of tilting type

skip bucket, the angle of inclination of the centre line of the chute plate of the skip bucket when in discharge position shall not be less than 50 degrees to the horizontal to ensure complete discharge.

7.2 A separate material inlet for aggregate and cement may be provided in the dust-proof cover. A common inlet may also be used for aggregate and cement. The material inlet dimensions should be such that the mixing pan is not suddenly overfilled. The inlet chute provided on the cover should be of bolted construction so that it may be dismantled, if required. In case separate inlets are provided then the cement inlet will be placed immediately after the aggregate inlet. The most suitable position for the cement inlet shall be in the front of the inlet for aggregate. Both the inlets may be at the centre of the mixing chamber and in the direction of rotation of the rotor.

8. WATER FEEDING AND BATCHING

8.1 Water feeding shall generally be through a water meter. A water spray device shall be provided at one point in the mixer so that water may be added uniformly and quickly in the centre of the mixing chamber so that it may also result in a cleaning effect for the mixer arms and the pan walls. The water spray device shall be a complete attachment which may be fitted to the upper edge of the mixer pan.

8.2 Water meter shall be of dial type and shall work on a pressure of about 4 to 5 bars and shall indicate the quantity of water flowing. A quick action valve and a dirt trap shall be provided in the water circuit. The valve may be operated manually or electrically.

9. SKIP HOIST

9.1 The pan mixer shall be fitted with a skip hoist complying with the following requirements:

a) The skip bucket may be of the tilting type or bottom discharge type.

b) The skip bucket shall be of adequate capacity to receive and discharge the maximum nominal batch of umixed materials without spillage under normal operating conditions on a level site.

c) The hoist shall consist of a multilayer cable drum driven by a suitable geared motor or motor with a gear box. The lifting speed shall normally be 0·33 m/s but may be increased, if desired, by the purchaser.

d) A suitable guard must be provided on the hoist track when it is in an accessible area. The method of fastening the wire rope to the drum shall be such as to avoid, any tendency to cut the

strands of the rope and the fastening should be positioned clear of the barrel of the drum, for example, outside the drum flange. When the skip bucket is lowered to its normal loading position, there should be at least one and a half turn of rope on the drum. If required, a slack cable limit switch shall be fitted under the winch to constantly monitor the cable from fraying.

c) Limit switches, either electrical or mechanical shall be provided to limit the hoist travel so as to ensure exact discharge and loading position.

10. MIXING CYCLE TIME

10.1 The pan mixers shall have mixing cycle time for concrete as follows:

a) Charging time of 10 seconds.

b) Mixing time of 30 to 60 seconds.

c) Discharge time of approximately 20 seconds.

NOTE — The above timings enables the users to evolve the output per hour based on the mixing cycle suggested by the manufacturer.

11. INTEGRAL WEIGHER

11.1 The weighing mechanism may be fitted integrally with the 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 one percent under normal working conditions.

12. INTEGRAL DRAG FEEDER

12.1 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 scoop type, hand guided by an operator other than the mixer operator, the control mechanism shall be of the 'Fail-to-safe' type.

13. LIFTING ARRANGEMENTS

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

14. TOOLS AND OPERATING INSTRUCTIONS

14.1 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.

15. MARKING

15.1 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 informations:

a) Manufacturer's name;

b) Machine reference No.;

c) Size of mixer in litres;

d) Total mass in kg;

e) Motor or engine speed, revolutions/minute;

f) Power input required to run the mixer under normal working conditions; and

g) Year of manufacture.

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