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(JCMA/JSA)

**Concrete mixers—Part 1: Terms
and commercial specifications**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by Japan Construction Mechanization Association (JCMA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

Consequently, **JIS A 8603**:1994 has been withdrawn and partly replaced with this Standard which has been established by dividing a part of the former standard.

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JIS A 8603 series consists of the following 2 parts under the general title “Concrete mixers”:

Part 1: Terms and commercial specifications

Part 2: Procedure for examination of mixing efficiency

Concrete mixers—Part 1: Terms and commercial specifications

Introduction

This Japanese Industrial Standard has been prepared based on the first edition of **ISO 18650-1** published in 2004 without modifying the technical contents except for a part of units but adding some **JIS** original specifications (definitions of terms and notes) that are not given in the said International Standard.

The portions with continuous sidelines or dotted underlines are the matters not given in or modified from the corresponding International Standard. A list of modifications with the explanations is given in Annex JA.

1 Scope

This Standard establishes additional terms and definitions to describe the functioning and the required and optional components for various types of concrete mixers that are specified in **ISO 11375**.

It does not apply to truck mixers.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 18650-1:2004 *Building construction machinery and equipment—Concrete mixers—Part 1: Vocabulary and general specifications* (MOD)

The symbols which denote the degree of correspondence in the contents in the corresponding International Standard and **JIS** are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS A 0203 *Concrete terminology*

JIS A 8613 *Safety requirements for concrete mixers and plants*

ISO 11375 *Building construction machinery and equipment—Terms and definitions*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS A 0203**, **JIS A 8613**, **ISO 11375** and the following apply.

3.1 concrete mixer

a mixing machine for manufacture of concrete and mortar (see **JIS A 8613**)

NOTE : A concrete mixer may be operated intermittently or continuously.

3.2 batch mixer

a mixer for mixing concrete materials for one batch (see **JIS A 0203**)

3.3 gravity type mixer

a mixer of the mixing system in which concrete material is scooped up by the rotation of mixing drum with the mixing blades provided inside and allowed to fall by its weight (see **JIS A 0203**)

3.4 tipping-drum mixer

a type of gravity type mixer which is capable of tipping the mixing drum for discharging concrete or mortar (see figures A.1 to A.3)

NOTE : The tipping-drum mixer which is not more than 2.2 kW in rated output and which can be carried by hands without the support of a machine is called a small-sized tipping-drum (see figure A.1) (see **JIS A 8613**).

3.5 reverse-discharging-drum mixer

a type of gravity type mixer which discharges concrete or mortar by reverse rotation of the mixing drum with the mixing blades inside (see figures A.4 and A.5) (see **JIS A 8613**)

3.6 chute-discharging-drum mixer

a type of gravity type mixer capable of discharging concrete or mortar with a chute without tilting the drum (see figure A.5A) (see **JIS A 8613**)

3.7 compulsory mixer

a mixer of the mixing system to manufacture concrete by mixing concrete material compulsively by power rotated blades

NOTE : Mixers of this type are available in variations such as horizontal single axis type, a horizontal double axis type, or a pan-type (see **JIS A 0203**).

3.8 pan-type mixer

a type of compulsory mixer which performs mixing by a stationary pan or a rotary pan and a rotary blade or a stationary blade that are arranged vertically

The material is supplied from the top (see **JIS A 8613**).

3.9 turbo concrete mixer

a pan type compulsory mixer which performs mixing with the paddles attached perpendicularly in the stationary pan (see figures A.6 to A.8) (see **ISO 11375**)

3.10 planetary mixer

a pan type compulsory mixer which performs mixing with planetary motion of the blades attached perpendicularly in the stationary pan (see figure A.9 and figure A.10) (see **ISO 11375**)

3.11 turbo planetary mixer

a pan type compulsory mixer which performs mixing with rotation of the blades attached perpendicular to the axis in the stationary pan, and at the same time with planetary motion of other blades attached perpendicularly (see **ISO 11375**)

3.12 high speed agitating mixer

a pan type compulsory mixer which performs mixing with rotation of one or several blades including a high speed rotating blade attached perpendicular to the axis in the stationary pan (see **ISO 11375**)

3.13 rotating pan type mixer

a pan type compulsory mixer which performs mixing with rotation of one or several blades attached perpendicularly in the rotating pan which rotates in the same direction or in the opposite direction to the rotation of the blades (see **ISO 11375**)

3.14 paddle mixer

a type of compulsory mixer in which material is charged from the top, mixed by the horizontal single-axis or double-axes rotating paddles in the stationary tank and discharged by opening or closing the gate at the bottom or inclining the tank (see figures A.11 to A.14)

3.15 continuous mixer

equipment in which machines performing measurement, supply and mixing are integrated, and which is capable of continuously manufacturing and discharging concrete (see figures A.15 and A.16) (see **JIS A 0203**)

3.16 charging time t_1

duration of charging the concrete components to the mixer for one batch (s)

3.17 mixing time (batch mixer) t_2

duration from the completion of charging the concrete components to the completion of their mixing (s)

3.18 mixing time (continuous mixer) t_2

duration during which the concrete components are kept in the mixing chamber (s)

NOTE : The mixing time for a continuous mixer is calculated as follows:

$$t_2 = m_c / q_m$$

where, m_c : mass of concrete components in the mixing chamber (kg)

q_m : mass flow rate of the concrete components being charged (kg/s)

3.19 discharging time t_3

duration from the start of discharging to its completion (s)

NOTE : The remainder in the mixer after discharging is expected not exceed 3 %.

3.20 reset time t_4

duration from the completion of the discharging to the start of charging for the next batch (s)

3.21 cycle time t_c

duration from the start of charging concrete components to the completion of preparation to accept the next charge after the reset (s)

NOTE : The cycle is calculated from the following equation:

$$t_c = t_1 + t_2 + t_3 + t_4$$

3.22 number of batches n

quantity of batches of mixing per one hour

NOTE 1 The number of batches per hour is calculated as follows:

$$n = 3\,600/t_c$$

where, t_c : cycle time (s)

NOTE 2 The number of batches expresses the capability of the mixer, and is applicable to the manufacture of the ordinary concrete used in building sites which has a density between 1 800 kg/m³ and 2 500 kg/m³ and is composed of cement, water, fine and coarse mineral aggregates and possibly mineral additives and chemical admixtures. Some other special concrete mixes (e.g. with a low water/cement ratio used in the pre-cast-concrete industry) may require a prolonged mixing time.

3.23 dry-components capacity V_c

volume of dry components (cement + aggregates) for one batch (m³)

3.24 ready-concrete capacity V_u

volume of ready concrete received from one batch (m³)

NOTE : The approximate volume of ready concrete received from one batch may be calculated from the following equation:

$$V_u = V_c \alpha$$

where, V_u : volume of ready concrete (m³)

V_c : volume of dry components (m³)

α : coefficient equal to the ratio V_u/V_c [0.7 in ordinary concrete (see NOTE 2 of 3.22)] (referred to as volume ratio)

3.25 rated capacity V_{umax}

maximum volume of ready concrete capable of being mixed per one batch (m³)

NOTE : Typically, concrete mixer rating capacity refers to the ordinary concrete (see NOTE 2 of 3.22). In the case of special concrete mixes (e.g. heavy

aggregates), it is necessary that the concrete mixer capacity value V_s be checked for its deviation from the rated volume of ordinary concrete, V_{umax} , between the supplier and purchaser.

3.26 theoretical output capacity Q_u

number of cubic metres of ready concrete received from the mixer per hour of operation (m^3/h)

NOTE 1 The theoretical output for a batch concrete mixer is expressed by the equation:

$$Q_u = nV_{\text{umax}}$$

where, n : number of batches per hour

V_{umax} : rated capacity (m^3)

NOTE 2 The theoretical output capacity for a continuous concrete mixer per hour is calculated as follows:

$$Q_u = 3.6q_m/\rho$$

where, q_m : mass flow rate of charging concrete components (kg/s)

ρ : specific gravity of the produced concrete components (kg/m^3)

NOTE 3 In the case of special concrete (e.g. with a low water/cement ratio used in precast-concrete industry), it is necessary that the theoretical output capacity Q_s be checked beforehand for its deviation from that of ordinary concrete, Q_u , between the supplier and purchaser.

4 Description of basic structures of concrete mixers

4.1 Basic structure of gravity mixers

Gravity mixers (see figures A.1 to A.5A) consist of the following basic units: an electric motor or combustion engine, a mixing drum, a mixing drum transmission, and a tipping drum mechanism and supporting frame, which may be provided with wheels to aid relocation. The bigger machines (with a capacity larger than approximately 0.35 m^3) typically have a skip hoist or charging bucket, a water-dosing unit and a towbar (see figures A.3, A.4 and A.5A).

4.2 Basic structure of compulsory mixer

Compulsory mixers (see figures A.6 to A.14) consist of the following basic units: a pan or trough, mixing blades, an electric motor and transmission for the mixing-blades drive, a discharging gate and its drive. Bigger machines (with a capacity larger than approximately 0.35 m^3) are typically equipped with a charging skip hoist, a cover for the pan or trough and a water-distributing installation (see figures A.7, A.8, A.10 and A.14). For easy relocation, the machines may be provided with wheels.

5 Commercial specifications of concrete mixers

5.1 Basic characteristics of a concrete mixer

5.1.1 General data

- a) Type, e.g. tipping drum, reversing drum, chute discharging, pan type, turbo, planetary, turbo-planetary (counter-current operation, concurrent operation), with high-speed stirrer and paddle concrete mixer
- b) Rated capacity (m^3)
- c) Output per hour for a specified number of cycles (m^3/h)
- d) Maximum size of aggregates:
 - gravel (mm)
 - crushed stone (mm)
- e) Total power installed (kW)
- f) Mass of the base machine (kg)
- g) Mass of the unloaded machine in operating mode (kg)
- h) Overall dimensions:
 - length (mm)
 - width (mm)
 - height (mm)

5.1.2 Detailed data for the concrete-mixer components

5.1.2.1 Motors and engines for mixing mechanisms

- a) Electric motors:
 - number of phases
 - supply voltage (V)
 - power (kW)
 - frequency (Hz)
 - revolutions (min^{-1})
- b) Combustion engines:
 - type:
 - 1) 4-stroke petrol
 - 2) 2-stroke petrol
 - 3) diesel
 - rated power (kW)
 - rated revolutions (min^{-1})

5.1.2.2 Skip hoist or bucket

- a) Skip-hoist or bucket capacity (m^3)
- b) Speed of lifting and descending (m/min)
- c) Time of lifting and descending (for charging bucket) (s)
- d) Mass of the skip hoist or bucket assembly (kg)

5.1.2.3 Hydraulic or pneumatic installation for tilt mechanism

- a) Capacity of the hydraulic pump or compressor (L/min)
- b) Maximum pressure [gauge pressure (MPa)]
- c) Volume of the hydraulic oil tank or air tank (L)

5.1.2.4 Water dosing installation (with optional specifications)

- a) Water-supply pressure (MPa)
- b) Water-pump capacity (L/min)
- c) Internal diameter of water supply line (mm)
- d) Type of water-supply unit:
 - flow type with flow meter
 - volume type with water tank
 - weighing type with scale
- e) Operating capacity of water-supply unit (L)

5.2 Dimensions

The following dimensions, characteristic of concrete mixers and required for their installation and operation, shall be provided (see figures A.1 to A.6 and figures A.8 to A.14):

- a) Overall dimensions (length, width and height) in operating mode and prepared for relocation (the latter pertains to a mixer provided with wheels) (mm)
- b) Maximum angle of inclination of the mixing drum in operation (pertains to tipping-drum concrete mixers) ($^\circ$)
- c) Dimensions and location of charging and discharging holes, including the slewing angle, δ , for the discharging gate (mm)
- d) Dimensions of the skip hoist or charging bucket assembly:
 - width and length of the skip-hoist track (mm)
 - overall dimensions of the skip hoist and bucket (mm)
- e) Location of the charging skip hoist relative to the drum or pan
- f) Dimensions of the pan and its cover (diameter, height) (mm)
- g) Spacing of mounting holes (pertains to stationary mixers) (mm)