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मानक

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Mazdoor Kisan Shakti Sangathan

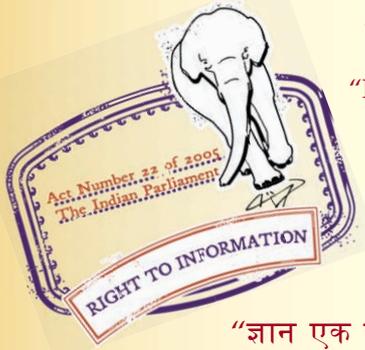
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“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 4925 (2004): Concrete Batching and Mixing Plant [MED 18: Construction Plant and Machinery]



“ज्ञान से एक नये भारत का निर्माण”

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“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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भारतीय मानक

कंक्रीट बैचिंग और मिश्रण संयंत्र — विशिष्टि

( पहला पुनरीक्षण )

*Indian Standard*

CONCRETE BATCHING AND MIXING PLANT —  
SPECIFICATION

( *First Revision* )

ICS 91.220

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Mechanical Engineering Division Council.

At civil construction sites where considerable quantity of concrete is required, central batching plants or batching and mixing plants are generally deployed. These plants are erected at sites to deliver either the mixed concrete or dry mix of concrete.

These plants are usually specially designed to suit the local conditions and the output required. Small plants may have an output of as low as  $10 \text{ m}^3$  of mixed concrete per hour, medium plants may have the output in the range of 30 to  $100 \text{ m}^3$  of mixed concrete per hour and large plants may have an output of over  $100 \text{ m}^3$  of mixed concrete per hour. The plants may be manually controlled, semi-automatic or fully automatic (*see 6.1*). The composition of the plant may also vary depending upon the type and composition of aggregates, cement, admixtures for concrete, and various other requirements, such as temperature control of aggregates, mixing water and concrete and above all the quality of concrete expected from the plant.

This standard was first published in 1968 covering general requirements and guidelines for centralized batching plants of capacities above  $100 \text{ m}^3/\text{h}$  of mixed concrete. This revision has been taken up to incorporate the modifications considered necessary as a result of continuous developments since then in the areas of controls of batching plants, and also to cover plants of lower capacity.

In view of intricate nature of such plants and of the variety of combination of ancillary equipment that may be required under different conditions, information on many aspects may have to be supplied both by the user for the guidance of the manufacturer and by the manufacturer to the prospective user, to obtain a true comparative assessment of different plants available and to ensure that the plant selected is suited to the conditions prevailing. For this reason, the standard contains clauses which call for agreement between the purchaser and the supplier and which permit the purchaser to use his option for selection to suit his requirements. A specimen enquiry format to be supplied by the user for the guidance of manufacturer is given in Annex A.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# CONCRETE BATCHING AND MIXING PLANT — SPECIFICATION

( *First Revision* )

### 1 SCOPE

This standard covers the requirements of concrete batching and mixing plant with manual, semi-automatic and fully automatic controls.

### 2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
1791 : 1985	General requirements for batch type concrete mixers ( <i>second revision</i> )
2062 : 1999	Steel for general structural purposes — Specification ( <i>fifth revision</i> )
2932 : 1993	Enamel synthetic, exterior: a) undercoating, b) finishing — Specification ( <i>second revision</i> )
4634 : 1991	Methods for testing performance of batch type concrete mixers ( <i>first revision</i> )

### 3 CAPACITY

The maximum capacity of the plant shall be calculated using the minimum cycle time of the mixer after the materials to be mixed are fed into the mixer. The capacity of the plant, as calculated above, shall be for concrete with 80 mm slump.

### 4 COMPOSITION OF THE PLANT

**4.1** The plant shall be capable of accurate (*see 6.1.1 and 6.3.1*) batching and mixing of aggregates, sand, cement, additives, ice flakes, etc. It is necessary for the purchaser to specify following details as an aid for manufacturer to select/design the appropriate batch mixing plant:

#### a) *Information Regarding Materials*

- 1) Number of cement and cementitious materials;
- 2) Numbers of coarse and fine aggregates;
- 3) Types of water (chilled water/ice flakes); and
- 4) Desirable dispensing arrangement of additives such as, air entraining agent, water reducing and set retarding agent, etc, in liquid or powder form.

#### b) *Type of Plant*

- 1) Storage arrangement for sand and aggregates:
  - i) Boom scraper plant, that is open storage with retaining walls;
  - ii) Ground storage hopper (for smaller plants);
  - iii) Ground storage hopper with weighing facility at belt conveyor; and
  - iv) Overhead storage hopper indicating total storage capacity required for aggregates and sand and number of aggregate compartments required.
- 2) Storage arrangement for cement: Cement silo, indicating its capacity and number of compartments.

#### c) *Weighing Arrangements*

- 1) Single weighing system for aggregates and cement;
- 2) Independent weighing arrangement for cement as well as for all aggregates together;
- 3) Independent weighing arrangement for each type of aggregate;
- 4) More than one weighing arrangement for cement to cater to the different types of cements;
- 5) Arrangement for measurement of water through flowmeter or through weighing;
- 6) Additional arrangements for weightment of ice flakes; and
- 7) Number of admixtures and whether weighing arrangement is required for any of them.

d) *Type of Mixer*

- 1) Non-tilting reversible drum concrete mixer,
- 2) Double conical tilting mixer,
- 3) Pan mixer,
- 4) Turbo pan mixer, and
- 5) Single shaft/twin shaft compulsory mixer/pug mill.

NOTE — For plants up to 30 m<sup>3</sup>/h capacity, only one mixer is required. For plants beyond 30 m<sup>3</sup>/h, the customers have option for one or more than one mixer.

e) *Controls*

- 1) Manual control through individual levers for opening of gates (recommended for batching plants up to 20 m<sup>3</sup>/h capacity);
- 2) Semi-automatic control through individual push buttons for opening of various gates by electro-pneumatically or hydraulically operated actuators (recommended for batching plants below 30 m<sup>3</sup>/h capacity);
- 3) Fully automatic control through a single push button for batching of all aggregates, cement, water and additives (recommended for batching plants of 30 m<sup>3</sup>/h and above capacity);

f) *Ready Mixed Concrete Plants*

Ready mixed concrete (RMC) plants shall be equipped with computer (containing minimum 15 recipes), monitor and printer. Delivery slips of RMC plants shall contain the following information:

- 1) Name of RMC plant supplier with logo and address,
- 2) Delivery note No.,
- 3) Name of receiving party,
- 4) Ordered quantity in m<sup>3</sup>,
- 5) Recipe number,
- 6) Number of batches,
- 7) Batch size in m<sup>3</sup>,
- 8) Date,
- 9) Starting time,
- 10) Moisture percentage of each material at the time of batching,
- 11) Weighing chart for each type of component with total for each component independently,
- 12) Total quantity delivered in m<sup>3</sup>,
- 13) Remarks column,
- 14) Transit mixer number and capacity,
- 15) Transit mixer driver's name,
- 16) Representative of RMC plant (signature column), and
- 17) Representative of customer (signature column).

NOTE — Besides challan, there are a number of other facilities which can be provided. The necessary software may be designed as per customer requirements.

g) *Additional Facilities*

- 1) Automatic cement /water correction arrangement;
- 2) Mimic display panel showing high and low position of various storage hoppers;
- 3) Material consumption report on annual, monthly and daily basis;
- 4) Customer report;
- 5) Accounting;
- 6) Stock maintenance; and
- 7) Plant scheduling.

**4.1.1** If so desired by the purchaser, plants of 30 m<sup>3</sup>/h capacity and above shall have suitable arrangements for cooling or heating of concrete. The actual details of the cooling or heating arrangements shall be as agreed to between the purchaser and the supplier.

**4.2** Unless otherwise agreed to between the purchaser and the supplier, the plant shall consist of the following components of suitable size related to the capacity of the plant:

- a) Storage arrangement for different types of aggregates and cement;
- b) Batching equipment;
- c) Concrete mixer;
- d) Control panel;
- e) Material feeding and elevating arrangement; and
- f) Hopper for mixed concrete.

**4.2.1** The various components shall conform to the requirements as specified in this standard.

## 5 STORAGE

**5.1** Storage shall be provided either on the ground or in the bins for different sizes of fine and coarse aggregates and cement. The compartments for each type of aggregates shall approximately be equal or of sizes to suit the requirement as defined by the purchaser for specific job applications. For plants upto 30 m<sup>3</sup>/h capacity, a cement hopper of suitable capacity with screw conveyor/manual arrangement shall be provided. For plants of 30 m<sup>3</sup>/h capacity and above, cement weigh batcher shall be provided separately with independent structure and the cement compartment shall be water-tight and provided with necessary air vent, aeration fittings for proper flow of cement and emergency cement cut off gate. For plants of 30 m<sup>3</sup>/h capacity and above, cement silo may be provided as per agreement between the purchaser and the supplier.

**5.1.1** In case of scrapper type plant, based on the recommendations of the supplier, the purchaser shall provide aggregate storage capacity required for continuous plant operation of one hour duration.

5.2 Wherever a separate cabin is provided for the control panel, the cabin and its door shall be completely sealed to prevent entry of dust/rainwater.

## 6 BATCHING EQUIPMENT

6.1 Batchers shall be manual or semi-automatic or automatic in accordance with the requirements given below:

- a) *Manual batcher*—Manual batcher shall be charged by devices which are actuated manually. In such batching systems, the accuracy of batching operation is dependent on the operator's visual observation of a scale or volumetric indicator. The various elements of the batching plant may be actuated by hand or by pneumatic/hydraulic cylinders.
- b) *Semi-automatic batcher* — Semi-automatic batcher shall be charged by devices which are separately actuated manually to allow the material to be weighed but are actuated automatically when the designated weight of each material has been reached. The weighing accuracy shall be within the tolerances specified in 6.1.1.
- c) *Automatic batcher* — Automatic batcher shall be charged by devices which, when actuated by a single starter switch, will automatically start the weighing operation of each material and stop automatically when the designated weight of each material has been reached. Automatic batcher shall be interlocked in such a manner that:
  - 1) Charging device cannot be actuated until the weighing scale has returned to zero. (within  $\pm 0.3$  of 1 percent of the scale capacity);
  - 2) Charging device cannot be actuated, if the discharge device is open;
  - 3) Discharge device cannot be actuated, if the charging device is open; and
  - 4) The discharge device cannot be actuated until the indicated material is within the applicable tolerance.

Automatic plants of 30 m<sup>3</sup>/h capacity and above shall have electronic display and printer attachment, if specifically agreed to by the purchaser and the supplier.

6.1.1 For individual batcher, the following tolerances shall apply, based on the required weight of material being weighed:

<i>Type of Material</i>	<i>Tolerance in Percentage</i>
Cement and other cementitious materials	$\pm 1$
Sand aggregates	$\pm 2$

### *Type of Material*

### *Tolerance in Percentage*

Water	$\pm 1$
Admixture	$\pm 3$

6.1.2 For cumulative batcher, interlocked sequential controls shall be provided and the above tolerances shall apply to the required cumulative weight of material as batched.

6.1.3 The minimum weight of any material weighed to which the above tolerances shall apply is determined by the following formula:

$$W = \frac{0.3 \times R}{T}$$

where

- $W$  = minimum weight in kg;  
 $R$  = scale capacity in kg; and  
 $T$  = weight tolerance in percent.

6.2 The batching equipment shall be such so as to accurately determine and control the prescribed quantities of various constituent materials of concrete, that is, water, cement, admixtures, sand and aggregates. For plants of capacity 20 m<sup>3</sup>/h and above, cement shall be weighed separately. However for plants of capacity below 20 m<sup>3</sup>/h, cement and aggregate can be weighed in one weigh batcher. In such case, a separate compartment in the weigh batcher shall be provided so that the cement does not come into contact with aggregate or sand. Water can be fed through a water meter of suitable size or by weigh batcher. The quantity of each admixture shall be determined by volumetric measurement/weightment for each batch.

6.2.1 Equipment for carrying batched material from the batch hoppers or other suitable arrangement to and into the mixer shall be such that there will be no spillage of the batched materials or overlap of batches. Equipment for handling cement in the batching plant shall be such as to prevent noticeable increase of dust in the plant during measuring and discharge of each batch of material.

6.3 Batching system shall have rated capacity (in terms of concrete in a single batch) to match the maximum rated size of the mixer that could be adopted for use with the plant. Semi-automatic or automatic batcher shall be operated from the central control panel. Respective scales, batcher and dial indicators shall be provided for the aggregates, cement, water, air entraining agent and water reducing agent. Cement batcher shall be complete with dust preventive arrangements. To achieve greater efficiency, the weighing 'cut off' shall be in two stages, that is, 'initial' and 'final' with necessary jogging action for treble feed as the final weight approaches. All the weights shall be indicated on

respective indicator on the central control panel. The scales shall be calibrated in kilograms. If agreed by the purchaser and the supplier, the weighing hoppers or other suitable arrangement shall permit obtaining representative samples of each material. Scale system shall have provision for necessary adjustment, levelling, aligning, balancing and calibration from time to time.

**6.3.1** Each weighing unit shall be equipped with a visible indicator which shall register the load at any stage of the weighing operation. The weighing hoppers shall permit the convenient removal of overweight materials in excess of the prescribed tolerances. The scales shall be interlocked so that a new batch cannot be started until the weighing hoppers have been completely emptied of the last batch and the scales are in balance.

**6.3.2** The equipment shall be capable of controlling the delivery of material for weighing or volumetric measurement so that the combined inaccuracies in feeding the material during normal operation shall not exceed 1 percent for water, 1 percent for cement, 3 percent for admixtures, 2 percent for sand and 3 percent for aggregates.

**6.4** Batching of water shall be by weight but may be by volume in case of plants upto and including 30 m<sup>3</sup>/h capacity. A reservoir tank for storage of water shall be provided with the batching plant and its size shall be as agreed to between the purchaser and the supplier. Reservoir shall be complete with water piping, float valves and other fittings for direct delivery to mixers without coming in contact with cement or the aggregate prior to the mixing operations. Water batcher shall be such that it can measure and discharge full batch of specified quantity of water simultaneously and within the same time as set for the rest of the batch.

**6.4.1** In case of small plants where water batching is provided by volume, water metering arrangement shall be so constructed that the flow may be cut off automatically after a predetermined quantity of water. Suitable arrangements shall be included in water meter system so that variations in the water supply pressure do not affect the rate of delivery and accuracy of the meter.

**6.4.2** The operating mechanism in the water-measuring device shall be such that leakages will not occur when the valves are closed and the water will be discharged quickly and freely into the mixer without objectionable dribble from the end of the discharge pipe. In addition to the water-measuring device, there shall be arrangement for plants above 30 m<sup>3</sup>/h for measuring and introducing small increments of water into mixer when required for final tempering of the concrete.

**6.5** Dispensers (if provided, for air-entraining, water reducing, set-retarding agent) shall be of sufficient capacity to measure at one time the full quantity of properly diluted solution required for each batch and shall be maintained in clean and freely operating conditions. Equipment for measuring shall be designed for convenient confirmation of accuracy of the measurement for each batch and it shall be so constructed that the required quantity can be added only once to each batch.

**6.5.1** Batching system for admixtures (*see* 4.1) shall be volumetric and shall be such that the admixture is automatically added to the mixing water. The quantity may vary up to 400 ml/m<sup>3</sup> of concrete. This system shall include a storage tank of adequate capacity for each admixture solution at the batcher floor for gravity feed, delivery pump from the ground storage, float switch with automatic start and stop control of the pump to maintain fixed levels. The feeding of admixtures shall be interlocked with the mixing water feeding arrangement.

**6.6** The range of each scale shall be as required by the purchaser to suit the capacity of the batching plant (*see* 6.3). The purchaser shall indicate this range in his enquiry or in order.

## 7 MIXERS

**7.1** The mixers shall be non-tilting reversible drum type/double conical tilting type/pan type/single shaft/twin shaft compulsory type/pug mill type conforming to the performance requirements of IS 1791. The number and sizes of the mixers shall be commensurate with the rated output of the plant based on the mixing time indicated in 7.1.1. The mixer drum and blades shall be made of high manganese/abrasion resistant steel. Alternatively, these items may be carbon steel with replaceable liners of cast iron or abrasion resistant steel.

**7.1.1** Minimum mixing time for each batch (after all materials, except the full quantity of water have been added in the mixer drum) shall be as follows provided that all the mixing water shall be introduced before one-fourth of the mixing time has elapsed:

Capacity of Mixer litre	Type	Minimum Mixing Time s
375, 500, 750, 1 000, 1 500, 2 000	Non-tilting reversible drum type	40
1 000, 2 000, 3 000, 4 000, 5 000	Double conical tilting type	30
375, 500, 750, 1 000, 1 500, 2 000, 3 000	Pan type	30
500, 750, 1 000, 1 250, 1 500, 2 000, 2 500, 3 000	Single shaft/twin shaft compulsory type/pug mill type	30

NOTE — Capacity of the mixer indicated above is for wet mix concrete.

7.1.2 The minimum mixing periods specified above are based on standard speed of rotation of the mixer. Mixing time shall be increased if and when the charging and mixing operations fail to produce a concrete batch which conforms throughout with the foregoing requirements with respect to adequacy of mixing.

7.2 The concrete as discharged from the mixer shall be uniform in composition and consistency throughout the mixed batch and from batch to batch, except where changes in composition or consistency are required.

7.3 Mixer shall be so located in the plant that its operation can be observed conveniently by the batching plant operator.

7.4 Each mixer shall be equipped with a mechanically or electrically operated timing and signalling (or locking) device which shall indicate and assure the completion of the required mixing period.

7.5 Each mixer shall be complete with electric drive motor and starter, air or hydraulic operated controls, consistency indicators, etc. The operation of the mixer shall be controlled from the central control panel of the plant having necessary indication lights for the entire operation and adjustable mixing timers for each mixer. The arrangement for feeding the mixers shall not have any spillage or leakage of water or cement. Each mixer shall hold a full capacity batch concrete of the required consistency without undue spilling during rotation. The height of discharge as required by the purchaser shall be provided.

7.6 In case wet concrete hopper is provided, it shall have an arrangement for concrete sampling device for taking samples of wet concrete for the laboratory tests.

## 8 CONTROL PANEL

8.1 Fully automatic plant shall have desk type, single operator, push-button operated control panel completely inter-wired and having the following provisions:

- a) Panel mounted digital weight indicator/front located weight dials — for each material, or as required.
- b) Push buttons and indication lights for complete range of batching, master batch push-button, mixing and discharge push-buttons, etc. The operation of batching will be so designed that with a single master batch switch, all the constituents of the batch, that is aggregates, cement, water, admixtures, ice, etc., shall be automatically batched and shall be discharged into the mixer in the desired sequence. Overriding manual control shall be

provided with necessary individual switches for manual batching and discharge of each material.

- c) Quick mix selector-unit shall comprise of at least 6 pre-set selections. Pre-setting of various mix constituents shall be simple and easy.
- d) Admixtures batch controls.
- e) Batch counters.
- f) *Truck dump light (if required)* — The light shall be turned on from ground when a truck is in position and will automatically go off when the mix has been dumped. The discharge of the mixer shall be interlocked with the dump light for this arrangement.
- g) *Complete range of push buttons and indicator light for the mixers* — The mixer shall automatically stop and give a ready light when it has taken the pre-set mixing time.
- h) *Separate mixing time* — Timers having a range of 0 to 3 min minimum for each mixer.
- j) *Mixer charging chute control push buttons and position indicator light* — for each mixer if the plant has more than one mixer.
- k) Necessary interlocks for automatic and safe operation of the plant — All relays, electronic components and Programmable Logic Controller (PLC) used shall be enclosed in a dust proof cabinet. All the weighing scales, dials and linkages shall have strong vibration free connection at the panel. The control panel and other controls shall be centralized in one control room for the plant.
- m) Any other control or fittings as per latest design and practice for mass concrete plants.

8.2 In case of manual or semi-automatic plants, the purchaser shall specifically indicate as to which of the items given in 8.1 would be required for the plant.

## 9 ICE FLAKES FEEDING ARRANGEMENT

When it is proposed to feed ice flakes, the necessary ice flaking machine complete with screw conveyor, bucket elevator, weighing machine and all other auxiliaries shall be provided in the plant.

## 10 MATERIAL FEEDING AND ELEVATING ARRANGEMENT

Suitable arrangements shall be provided for elevating cement to the cement silo/mixer of the batching plant and aggregates to the respective compartment bins of the batching plant.

## 11 GENERAL REQUIREMENTS

11.1 Irrespective of the foregoing specifications for the plant, which are broad-based and generalized, the manufacturer or supplier shall ensure that the plant shall be complete with all the fixtures, steel structures, platforms, ladders/stairs, railings, fittings, accessories and any other material required for proper

running of the plant though not specifically detailed in the standards. The manufacturer or supplier shall not be entitled for any extra amount in respect of such accessories required for the efficient operation of the plant, even though these have not been included in the standards of the purchase order.

The mixer and all structural members shall be thoroughly cleaned/sand blasted prior to application of two coats of primer and one coat of synthetic enamel paint of agreed shade conforming to IS 2932 at the works of manufacturer.

**11.2** The electrical equipment shall be complete with starters for various motors. All internal wiring and cables shall conform to the requirements of relevant Indian Standards. All motors shall be totally enclosed fan cooled, squirrel cage or slip ring induction type. The electric motors shall have adequate protection against dust ingress and shall be able to perform to its specifications at an atmospheric temperatures up to 50°C. Entire equipment shall be capable of satisfactory operation in tropical conditions. All solenoid and air valves of the plant shall be provided with automatic oiler unit and filters in the air lines.

**11.3** All steel structure for the plant shall be fabricated with the material conforming to IS 2062. Such structures shall generally comprise of the following:

- a) Complete bin structure of the plant with the supporting columns;
- b) Supporting columns and supporting structure for the mixers;
- c) Concrete dump hopper (if provided);
- d) All stairs, ladders, platforms and railings;
- e) Feeding and weighing arrangement of ice flakes (if required); and
- f) Any other item the manufacturer may propose to complete.

**11.3.1** Notwithstanding the provision of 11.3, the manufacturer shall ensure that the plant forms a complete working unit for achieving the desired efficiency by using the items supplied by the manufacturer as well as those items specifically agreed for manufacture/supply by the customer.

**11.3.2** Partition walls, supporting structures of bins (including hardwares) and foundation bolts shall be provided by the customer. However, the sizes and type thereof shall be intimated in advance by the manufacturer.

**11.4** The manufacturer shall furnish a complete set in triplicate of operation and maintenance manuals, spare parts catalogue and any other relevant literature required for the plant. The manufacturer

shall also supply duplicate set of drawings and erection details, foundation plan, control wiring diagrams, etc for the complete installation.

**11.5** The manufacturer shall supply one set of complete specifications of the plant and equipment and also supply complete illustrations and technical literature thereof.

**11.6** The manufacturer/supplier shall furnish price list of recommended spare parts for normal 2 year operation (5 000 working hours).

**11.7** When erection of the plant and all civil engineering works including foundations of the plant are to be done by the purchaser, the manufacturer shall provide technical guidance for the same. The manufacturer shall also provide technical advice to the customer during erection, commissioning and trial runs of the plant.

**11.8** The customer shall indicate in advance to the manufacturer/supplier, the characteristics of the available electric supply at the project. The customer shall also indicate the pressure at which air would be available at the project, in case air compressor is not in the supply scope of manufacturer/supplier.

## 12 MIXING EFFICIENCY

**12.1** The mixed concrete from the batching and mixing plant can be tested in accordance with the method specified in IS 4634 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.

**12.2** 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

## 13 GUARANTEE AND WORKMANSHIP

Notwithstanding any qualification by the customer, the ultimate responsibility for supply of the complete plant and its satisfactory performance and output shall rest with the supplier. He shall guarantee against any defect in the plant, either in design, material or workmanship. The plant and equipment supplied shall be a complete unit and shall conform to the highest standards of engineering design and workmanship.

**ANNEX A***( Foreword )***SPECIMEN ENQUIRY FORMAT**

<p><b>A-1 CAPACITY OF THE PLANT REQUIRED</b></p> <p>The indenter should work out his requirement assuming 75 percent efficiency of the plant</p>
<p><b>A-2 TYPE OF PLANT REQUIRED</b></p> <p>The indenter must indicate any of the following type based on site requirement:</p> <ol style="list-style-type: none"> <li>a) Central batching and mixing with overhead storage (indicate storage capacity).</li> <li>b) In line hoppers on ground with weighing arrangement on belt conveyor.</li> <li>c) Boom scraper plant with ground storage.</li> <li>d) Storage hopper above weigh batcher (plant up to 20 m<sup>3</sup>/h).</li> </ol>
<p><b>A-3 TYPE OF MIXER REQUIRED</b></p> <p>The indenter must indicate any of the following type of mixer required based on site requirement:</p> <ol style="list-style-type: none"> <li>a) Non-tilting reversible drum type,</li> <li>b) Double conical tilting type,</li> <li>c) Pan type,</li> <li>d) Single shaft/twin shaft compulsory type/Pug mill type, and</li> <li>e) Any other type.</li> </ol>
<p><b>A-4 NUMBER OF AGGREGATES</b></p> <p>Indicate number and sizes of aggregates to be used in addition to sand.</p>
<p><b>A-5 WEIGH BATCHERS</b></p> <p>Whether common weigh batcher for aggregates and cement or separate weigh batcher for each material is required.</p>
<p><b>A-6 TYPES OF CEMENTS/CEMENTITIOUS MATERIALS USED</b></p> <p>Indicate whether one or more grade of cement to be used.</p>
<p><b>A-7 NUMBER AND SIZE OF SILO(S)</b></p> <p>Available sizes are 20, 30, 45, 60, 75 t (bigger sizes of silos available for central storage of cement on ground level).</p>
<p><b>A-8 FEEDING OF CEMENT</b></p> <p>Feeding of cement can be done through bucket elevator, screw conveyor, pneumatic system.</p>

<p><b>A-9 FILTER FOR SILO</b></p> <p>Indicate whether filter on top of silo to avoid dust is required.</p>
<p><b>A-10 ADDITIVES REQUIRED</b></p> <p>Indicate number of additives required. Also indicate whether these are in liquid form or powder form.</p>
<p><b>A-11 WATER BATCHING (ANY OF THE FOLLOWING)</b></p> <ul style="list-style-type: none"><li>a) Water meter (mechanical type),</li><li>b) Water meter (electronic type), and</li><li>c) Water weigh batcher.</li></ul>
<p><b>A-12 CAPACITY OF WEIGH BATCHERS</b></p> <p>Indentor must indicate the capacity of each weigh batcher required.</p>
<p><b>A-13 COOLING OF AGGREGATE</b></p> <p>In case the indentor wants aggregate cooling arrangement the same may be indicated.</p>
<p><b>A-14 NUMBER OF MIXERS</b></p> <p>For plant up to 30 m<sup>3</sup>/h capacity, one mixer is enough. Indentors can have more than one mixer in a central batching and mixing plant.</p>
<p><b>A-15 OPERATION</b></p> <p>Indentor to indicate type of controls required as per 4.1 (e) and 8.1.</p>
<p><b>A-16 DISCHARGE HEIGHT</b></p> <p>Depending upon transportation of mixed concrete by dumper or transit mixer, the indentor must indicate the height of discharge required.</p>

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This Indian Standard has been developed from Doc : No. **MED 18 (0074)**.

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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