

CRD-C 514-92

# Concrete Plant Standards

## of the Concrete Plant Manufacturers Bureau

Ninth Revision - Effective January 1, 1990 1990 Printing  
Adopted by the Concrete Plant Manufacturers Bureau April 27, 1988  
Approved by the Board of Directors of the National Ready Mixed Concrete Association on  
March 2, 1989

### Purpose

These Standards have been prepared for the information of users of concrete plant equipment. They have been established pursuant to Article VI of the By-Laws of the Concrete Plant Manufacturers Bureau to describe and identify the products and combinations of products manufactured or furnished by members of the Bureau and its Control Systems Manufacturers Division and to standardize rated capacities, the basis for determining rated capacities, and certain other features of concrete plant components, and control systems.

### Effective Date

These revised Standards approved by the Board of Directors of the National Ready Mixed Concrete Association shall become effective on January 1, 1990. Members of the Bureau shall attach rating plates to all eligible equipment shipped thereafter and certified by them as complying with these Standards. Equipment shipped prior to January 1, 1990 shall be subject to the Concrete Plant Standards in effect at time of shipment. Equipment shipped prior to March 1, 1960 shall not be entitled to a rating plate.

### Certification

A copyrighted rating plate furnished by the Bureau shall be attached to those eligible items of concrete plant equipment shipped by a member of the Bureau and its Control Systems Division and certified by him as complying with these standards. The rating plate shall define size, capacity or performance. Each member of the Bureau shall execute annually the following stipulation:

**“Our company hereby certifies that rating plates of the Concrete Plant Manufacturers Bureau have been attached during the year just ended and will be attached in the forthcoming year to eligible items of concrete plant equipment which conform to the Standards of the Bureau and only to such eligible items.”**

This stipulation shall be signed by an authorized officer of the member company. Any member company shall furnish the Bureau, upon request, structural drawings, steel design computations and any other information pertinent to determining that items of equipment conform to these standards.

### Scope

These Standards specify requirements for concrete plant equipment eligible to be designated as standard by the Concrete Plant Manufacturers Bureau.



## Part 1 - Plant Mechanical Equipment

## Part 2 - Plant Control Systems

# Part 1- Plant Mechanical Equipment

## Concrete Plant Standards

### Of the Concrete Plant Manufacturers Bureau

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- bins for both aggregate and cement or cementitious materials,
- belt conveyors for aggregates,
- bucket elevators for aggregates,
- bucket elevators for cement or cementitious materials,
- other conveyors for cement or cementitious materials.

Rating plates are not furnished for the following items of equipment covered by these Standards:

- water meters,
- admixture batching equipment.

Items of equipment eligible to be designated as standard shall conform to the applicable requirements set forth hereafter in these Standards.

**1.1. Bins or Silos.** A bin or silo shall consist of a suitable container for storing aggregate or cement and cementitious materials and, in the case of the latter, protecting it from moisture. Bins or silos shall be designed structurally in accordance with the current specifications of the American Institute of Steel Construction.

**1.1.1 Bins, Aggregate.** Aggregate bins shall be structurally designed to contain the rated capacity plus heaping, based on material weighing 110 pounds per cubic foot. Rated capacities, as shown on the rating plate, shall be stated in terms of cubic yards of bin volume at the bin water level. Bin water level shall be the sum of water level volumes of each individual compartment in the bin. In addition, rated capacities may be stated in terms of cubic yards of heaped volume. The heaped volume shall not exceed the lowest bin water level volume plus the volume represented by the frustum of a cone or pyramid above that water level line, sloping from the perimeter of the bin at an angle of 40 degrees from the horizontal, to a vertical height equal to 25 percent of the minimum width of the bin at the lowest water level line. Rated capacities may also be stated in tons based on material weighing 100 pounds per cubic foot.

**1.1.2. Bins or Silos, Cement.** Cement bins or silos shall be designed to contain rated capacity loads of material weighing 94 pounds per cubic foot. Rated capacity as shown on the rating plate shall be stated in terms of cubic feet and cubic yards of Gross Air Volume.

## 1. SPECIFICATIONS FOR EQUIPMENT

The following items of equipment covered by these Standards are eligible to have rating plates attached to them:

- batchers for aggregates,
- batchers for cement or cementitious materials,
- batchers for water,
- bins for aggregates,
- bins or silos for cement or cementitious materials,

In addition, they may be stated in tons, based on one ton, or 2000 pounds, equal to one cubic yard of partially aerated cement, or they may be stated in barrels where:

- (1) **4 cubic feet equal one barrel as a listed maximum figure.**
- (2) **4.8 cubic feet equal one barrel as a listed minimum figure.**

**1.1.3. Multiple Compartment Cement and Fly ash Bin or Silo.** Any multiple compartment bin or silo for storage of fly ash and cement constructed after January, 1989 shall have a fly ash compartment with double walls separating it from other compartments for cementitious materials. Such double walls shall be constructed in a manner which permits detection of leakage of the cementitious materials by manual inspection.

**1.1.4. Bins, Combination.** Bins for the storage of both aggregate and cement shall be designed and their capacities computed and stated on the rating plate separately for aggregate and cement in accordance with the applicable provisions of Paragraphs 1.1.1 and 1.1.2 above.

**1.2. Conveying Equipment.** All conveyor capacities, as shown on the rating plate, shall be based on the equipment being uniformly and continuously fed.

**1.2.1. Belt Conveyors for Aggregates** shall conform to the current Standards of the Conveyor Equipment Manufacturers Association. Rated capacities, as shown on the rating plate, shall be stated in tons per hour, assuming the material to weigh 100 pounds per cubic foot.

**1.2.2. Bucket Elevators for Aggregates** shall have their rated capacities, as shown on the rating plate, stated in terms of tons per hour computed by assuming that the buckets are filled to 75 percent of their actual cubical capacity with material weighing 100 pounds per cubic foot.

**1.2.3. Bucket Elevators for Cement** shall have their rated capacity, as shown on the rating plate stated in terms of cubic feet per hour computed on the assumption that the buckets are filled to 100 percent of their water-level capacity.

**1.2.4. Other Conveyors for Cement,** such as screw conveyors, slides, and pumps shall have their rated capacities as shown on the rating plate stated in terms of cubic feet per hour based on the volumetric capacity rating by the manufacturer of the conveyor.

**1.3. Batching Equipment** shall provide that:

- **cement or cementitious materials shall be batched by weight;**
- **aggregates shall be batched by weight;**
- **water shall be batched by weight or volume;**
- **powdered admixtures shall be batched by weight; and**

- **liquid admixtures shall be batched by weight or volume**

### 1.3. Batching Equipment

**1.3.1. Scales.** Scales for batching shall consist of one of the following:

(1) A lever system suspending the weighing container and, by means of secondary levers, transmitting reduced loads to a beam scale with balance indicator or a full reading springless dial.

(2) A lever system as in (1) above with a single load cell within the lever system as the primary load indicator and the beam scale or dial as secondary load indicators.

(3) A lever system as in (1) above with either the primary or secondary levers transmitting reduced loads to a single load cell and not having a beam scale or dial.

(4) A multiple load cell system directly supporting the weighing container.

The construction shall conform to the applicable sections of the National Bureau of Standards Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices," except as herein specified. Methods other than those specifically described in this paragraph which meet all weighing tolerances and requirements to assure reliability as specified in these standards are acceptable.

**1.3.1.1. Scale Accuracy.** When scales are first installed they shall be accurate to the basic tolerance values specified in NBS Handbook 44 in Sections T.3.7 and T.2.8. The minimum tolerance shall be 0.1% of the capacity of the scale.

**1.3.1.2. Scale Lever Systems** shall be so designed to have a gross carrying capacity sufficient to support the fully loaded weighing container without loss of accuracy or abnormal wear and to have the center of gravity of the gross load on the scale always remain between the load supports. Scale lever pivots shall be hard, tempered, sharpened, and gauged for sustained accuracy. The beating loops shall be constructed with hardened bearing surfaces. Means shall be provided for leveling, aligning, balancing, and calibrating scale systems in the field.

**1.3.1.3. Beam Scales.** Beams for indicating the load shall include a zero balance beam, a balance indicator, and a weighing beam for each ingredient used in any batch. Beams shall be precision constructed devices with properly hardened pivots and bearings capable of holding positive alignment. All poises shall have

positive and accurate holding devices. All wearing parts of poises shall be hardened and protected against corrosion. The clear interval between beam graduations shall not be less than 0.03 inch. The balance indicator shall be sufficiently sensitive to show movement when a weight equal to 1/10 of 1 percent of the scale capacity is placed in the batch hopper. Pointer travel shall show a minimum of 5 percent of the net rated capacity of the largest weigh beam for underweight and 4 percent for overweight. A readily adjustable mechanism shall be provided for dampening excessive oscillation of the indicator pointer.

**1.3.1.4. Dial Scale.** A dial scale mechanism shall be enclosed so as to be dust-tight. The dial pointer shall indicate the load in the batcher continuously from zero balance to the scale capacity. The chart shall be of durable material to insure good readability. Charts used on the primary dial attached to the scale shall have a minimum of 1000 graduations placed on a circular reading line with a clear interval of not less than 0.03 inch.

**1.3.1.5. Load Cell Systems** shall be so designed to have a gross carrying capacity sufficient to support the fully loaded weighing container without a loss of accuracy or abnormal wear and to have the center of gravity of the gross load on the scale always remain between the load supports. A single load cell may be used with a scale lever system or multiple load cells may be used to support a weighing container. Load cell supports shall be designed to prevent any lateral or other nonaxial forces. Load cells shall be sealed for environmental protection. Load cell systems shall be designed to resist (a) moisture, (b) leakage resistance, (c) overload or shock damage, (d) drift from high voltage or high temperature, (e) line noise or radio frequency interference. A load cell system shall include a convenient means to allow the operator to check the condition and proper functioning of both the load cell circuit and the signal conditioning and load display circuit. A means may be provided to automatically check these circuits on a more frequent basis. Digital weight indicators shall be capable of reading full scale capacity and a maximum weight indication of 1/10 of 1 percent of full scale capacity. Digital indications shall be clear, definite, accurate and easily read under all conditions of normal operation.

**1.3.2. Batchers, General.** A batcher shall consist of a suitable container for weighing an ingredient for concrete. A combination of aggregates or a combination of cements (or cement and other cementitious materials) may each be considered as a single ingredient. Aggregates and cement or cementitious materials shall not be weighed in the same batcher. Each batcher shall be equipped with a scale and also

with the necessary mechanisms for its operation. The charging device shall be capable of stopping the flow of material within the weighing tolerances specified in these Standards. Charging and discharging devices shall not permit loss of materials when closed. The discharge device shall be capable of controlling the rate of flow of the material.

When furnished, vibrators, or other aids to charging and discharging, shall be attached in such a manner that they will not affect accuracy of weighing.

The batcher shall be so designed and of such capacity that it will receive its rated load without the weighed material being in contact with the charging mechanism.

The criteria to qualify batchers for rating plates are based on minimum volumetric capacities.

Volumetric capacities may exceed the minimum requirements. In use, the rated batcher capacity may be exceeded providing the load does not:

- (a) exceed the scale capacity,
- (b) overflow the batcher,
- (c) affect the scale by the closing of the charging device.

The following rated batcher capacities shall be considered standard and shall be required to have rating plates attached:  $\frac{1}{2}$ , 1,  $1\frac{1}{2}$ , 2, 3, 4,  $4\frac{1}{2}$ , 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16 cubic yards in terms of concrete to be produced in a single batch. (See p.8).

**1.3.2.1. Batchers, Aggregate.** Individual batchers shall be rated separately at their maximum single batch capacity rather than indicating the total batch resulting from the use of all batchers.

The minimum volume of the batcher in cubic feet, calculated as described below from dimensioned drawings, shall be equal to its rated batcher capacity multiplied by 38.

The volume of the batcher shall be calculated on two bases, the lesser of which shall govern, as follows:

- (a) based on an angle of repose for the aggregates of 30 degrees from the horizontal measured from the bottom of all charging mechanisms;  
or
- (b) based on actual water level capacity.

There shall be sufficient clearance above aggregate batchers to permit convenient removal of overload.

The reading face capacity or the sum of weigh-beam capacities of a scale on an aggregate batcher shall be not less than 3,300 pounds per cubic yard of rated batcher capacity.

**1.3.2.2. Batchers, Cement (Cementitious Materials).** The minimum volume of the batcher in cubic feet, calculated from dimensioned drawings, shall be 3 cubic feet to allow for fluffing and variations in filling, plus 9 times the yardage rating.

Cement batchers shall be provided with a dust seal between the charging mechanism and the batcher installed in such a manner that it will not affect the accuracy of weighing. The batcher shall be vented to permit escape of air. It shall be self-cleaning and may be fitted with a vibrator to ensure complete discharge.

The reading face capacity or the sum of weigh-beam capacities of a scale on a cement batcher shall be not less than 660 pounds per cubic yard of rated batcher capacity.

It is recognized that mass concrete work for dams, etc. requires special rating based on a minimum of 350 pounds per cubic yard.

The above volumes and scale capacities are not applicable to individual batchers for Cementitious Materials other than cement.

**1.3.2.3. Batchers, Water.** Scales for measuring the water may be graduated either in pounds or U.S. gallons, or both.

The minimum volume of the batcher tank, calculated from dimensioned drawings, shall be not less than its rated batcher capacity. Any water batcher shall have a volume providing not less than 40 U.S. gallons per cubic yard of concrete to be produced in a single batch.

The reading face capacity or the sum of weigh-beam capacities of a scale on a water batcher shall be not less than 320 pounds or 38 gallons per cubic yard of rated batcher capacities.

**1.3.3. Water Meters** shall not be furnished with a rating plate and shall conform to the Standards of the American Water Works Association, except as herein specified. The metering equipment, in addition to the meter, shall include:

**1.3.3.1.** a cut-off device capable of stopping the flow within the accuracy tolerances specified in these Standards. The cut-off device shall be free from leaks when closed;

**1.3.3.2.** a strainer of a size and porosity as is recommended by the meter manufacturer;

**1.3.3.3.** a register integral with the meter or a separate device to indicate the volume batched, at any point in the metering operation;

**1.3.3.4.** a volume setting device capable of being set to one gallon increments, or a register capable of being read to one gallon, or both;

**1.3.3.5.** capability for field adjustment for purposes of calibration.

**1.3.4. Dispensing Equipment for Admixtures.** Admixture dispensing equipment furnished by the plant manufacturer shall not be furnished with a rating plate but shall be subject to the following specifications: powdered admixtures shall be batched by weight, liquid admixtures may be batched by weight or volume, and the specifications shall be applicable only for dispensing admixtures having a minimum recommended dosage rate of one fluid ounce (or more) per sack of cement; or for concentrated additives that have been reconstituted to the point where the dosage rate is one fluid ounce (or more) per sack of cement.

The batching or dispensing devices shall be capable of repetitively controlling the batching of the admixture to the accuracy tolerances specified in these Standards. Piping for liquid admixtures shall be free from leaks and properly valved to prevent backflow or siphoning.

A separate dispenser is recommended for each admixture, although multiple use of dispensing controls is permitted and compatible admixtures may be stored in the same holding or checking reservoir after batching and prior to introduction into the mixer. If, contrary to this recommendation, the same dispensing equipment is used for non-compatible admixtures, the common device shall be flushed at the end of each cycle.

**1.3.4.1. Admixture Batchers.** Scales for admixture batchers may be graduated by weight or volume, with the minimum graduation being the amount or weight of the admixture required per sack of cement.

Admixtures that are compatible may be cumulatively weighed in the same batcher providing the accuracy of batching of each is equivalent to the accuracy of batching required by these Standards when each is batched individually.

Liquid admixtures that are compatible may be cumulatively weighed with the water providing that the accuracy of batching of each is equivalent to the accuracy of batching required by these Standards when each is batched individually.

**1.3.4.2. Volumetric Admixture Dispenser.** All admixture dispensing equipment other than weigh batchers shall be classified as volumetric dispensers. All volumetric dispensers shall be used only for liquid admixtures and each plant shall be equipped with the necessary calibrated devices that will permit convenient checking of the dispensed volume to the required accuracy of the particular admixture.

The dispensing system shall include a device or devices which shall either detect and indicate the presence or absence of flow of the admixture, or detect and indicate the presence or absence of the admixture, or provide a convenient means of visually observing the admixture in process of being batched or discharged.

**1.3.5. Accuracy of Batching** for equipment covered by these Standards shall be as follows:

**1.3.5.1. For Individual Batcher**s, the following tolerances shall apply based on the required scale reading:

**Cement and other Cementitious Materials<sup>(1)</sup>-**

±1% of the required weight of material being weighed OR ±0.3% of scale capacity, whichever is greater

**Aggregates-**

±2% of the required weight of material being weighed OR ±0.3% of scale capacity, whichever is greater

**Water-**

±1% of the required weight of material being weighed OR ±0.3% of scale capacity, whichever is greater

**Admixtures-**

±3% of the required weight of material being weighed OR ±0.3% of scale capacity, OR ± the minimum dosage rate for one sack of cement, whichever is greater.

**1.3.5.2. For Cumulative Batcher**s With Tare Compensated Control (see 2.1.4.), the tolerances of Paragraph 1.3.5.1. shall apply based on the required weight of each material.

**1.3.5.3. For Cumulative Batcher**s Without a Tare Compensated Control (see 2.1.4.), the following tolerances shall apply to the required cumulative weight:

**Cement and other Cementitious**

**Materials or Aggregates-**

±1% of the required cumulative weight of material being weighed OR ±0.3% of scale capacity, whichever is greater

**Admixtures-**

±3% of the required cumulative weight of material being weighed OR ±0.3% of scale capacity, OR ± the minimum dosage rate per sack as it applies to each type of admixture, whichever is greater.

**1.3.5.4. For Volumetric Batching Equipment** the following tolerances shall apply to the required volume of material being batched:

**Water-**

±1% of the required volume of material being hatched OR ±1 gallon, whichever is greater

**Admixtures-**

±3% of the required volume of material being batched OR ± the minimum recommended dosage rate per sack of cement, whichever is greater.

**1.3.5.5. Range of Accuracy.** For ingredients batched by weight the accuracy tolerances required of the batching equipment shall be applicable for batch quantities between 10 and 100% of scale capacity.

For water or admixtures batched by volume, the required accuracy tolerances shall be applicable for all batch sizes from minimum to maximum, as is determined by the associated cement or aggregate batcher rating.

**Standard Volumetric Capacities For Batcher**s (Showing Metric Equivalents) (Ref. 1.3.2)

Cu. Yds.	Metric Equivalent (Cu. Meters)
1/2	.38
1	.76
1 1/2	1.15
2	1.53
3	2.29
4	3.06
4 1/2	3.44
5	3.82
6	4.59
7	5.35
8	6.12
9	6.88
10	7.65
11	8.41
12	9.17
13	9.94
14	10.70
15	11.47
16	12.23

<sup>(1)</sup> Other cementitious materials are considered to include fly ash and other natural or manufactured pozzolans.

# Part 2 - Plant Control Systems

## Concrete Plant Standards Of the Concrete Plant Manufacturers Bureau Control Systems Manufacturers Division

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### 2. SPECIFICATIONS FOR EQUIPMENT

The following items of equipment covered by these Standards are eligible to have rating plates attached to them:

- semi-automatic batching control for an individual batcher,
- semi-automatic interlocked batching control for an individual batcher,
- automatic batching control for an individual batcher,
- partially automatic batching system for multiple batchers and volumetric devices,
- semi-automatic batching system for multiple batchers and volumetric devices,
- automatic batching system for multiple batchers and volumetric devices,
- recorders.

Rating plates are not furnished for the following items of equipment covered by these Standards:

- manual batching controls,
- manual batching systems.

Items of equipment eligible to be designated as standard shall conform to the applicable requirements set forth hereafter in these Standards.

**2.1. Batching Controls and Systems.** Batching controls are that part of the batching equipment that provides the means for controlling the batching device for an individual material. They may be mechanical, hydraulic, pneumatic, electrical, etc. or combinations of these means.

A batching system is a combination of batching controls necessary to proportion the ingredients for concrete. A batching system may consist of controls for batching cement and aggregate only, if the mixing water is not added at the batching plant. Volumetric admixture batching controls are included in the scope of these Standards only when they are a part of a batching system.

Batching controls or systems shall be so located with respect to the batching equipment being controlled that visual monitoring for accuracy, calibration of controls and manual batching can be accomplished. If manual batching is not normally done, monitoring devices shall be sufficiently accurate to detect an error equal to the specified tolerance when a batch equal to the rated size of the batcher is batched.

Where batching controls or systems are remotely located with respect to the batching equipment and manual batching is not normally done, monitoring devices shall be sufficiently accurate to detect an error equal to the specified tolerance when a batch equal to the rated size of the batcher is batched.

Where batching controls or systems are remotely located with respect to the batching equipment, follower scales or other remote monitoring devices may be used for manual batching if they repeat the reading of the master scale within  $\pm 0.2\%$  of scale capacity.

**2.1.1. Manual Controls** shall not be furnished with a rating plate. Manual control exists when the batching devices are actuated manually with the accuracy of the batching operation being dependent on the operator's visual observation of a scale or volumetric indicator. The batching devices may be actuated by hand or by pneumatic, hydraulic, or electrical power assists.

**2.1.2. Semi-Automatic Batcher Controls** shall be furnished with rating plates only when ingredients are weighed. This rating plate is to be used only for an individual batcher control. When actuated by one or more starting mechanisms, a semi-automatic batcher control shall start the weighing operation of each material and stop automatically when the designated weight of each material has been reached. No interlocks are required.

**2.1.3. Semi-Automatic Interlocked Batcher Controls** shall be furnished with rating plates only when ingredients are weighed. This rating plate is to be used only for an individual batcher control. When actuated by one or more starting mechanisms, a semi-automatic batcher control shall start the weighing operation of each material and stop automatically when the designated weight of each material has been reached, interlocked in such a manner that the discharge device cannot be actuated until the indicated material is within the applicable tolerances.

**2.1.4. Automatic Batcher Controls** shall be furnished with rating plates only when ingredients are weighed. This rating plate is to be used only for an individual batcher control. When actuated by a single starting signal, an automatic batcher control shall start the weighing operation of each material and stop automatically when the designated weight of each material has been reached, interlocked in such a manner that:

**2.1.4.1. The charging device cannot be actuated until the scale has returned to zero balance within  $\pm 0.3\%$  of the scale capacity;**

**2.1.4.2. the charging device cannot be actuated if the discharge device is open;**

**2.1.4.3. the discharge device cannot be actuated if the charging device is open; and**

**2.1.4.4. the discharge device cannot be actuated until the indicated material is within the applicable tolerances.**

A tare compensated control is one that treats the start of the weighing of each ingredient as zero.

For cumulative batchers with tare compensated controls, interlocked sequential controls shall be provided, and the applicable tolerances shall apply to the required weight of each individual material.

For cumulative batchers without tare compensated controls, interlocked sequential controls shall be provided, and the applicable tolerances shall apply to the required cumulative weight of material as batched.

**2.1.5. Automatic Volumetric Controls** for water or admixtures shall not be furnished with rating plates. When actuated by a single starting signal, automatic volumetric controls shall start the batching operation and stop automatically when the designated volume has been reached. The batching control shall include visual means of observing either the quantity set or the quantity batched, and an indication of the completion of the batching operation.

**2.1.6. A Manual Batching System** shall consist of the required combination of individual manual batcher controls and shall not be furnished with a rating plate.

**2.1.7. A Partially Automatic Batching System** shall consist of the required combination of batching controls, at least one of which shall be for controlling the cement or aggregates, either semi-automatically or automatically. Inclusion of admixture controls is optional. This system shall be furnished with a rating plate. Interlocking in any degree shall be optional.

**2.1.8. A Semi-Automatic Batching System** shall consist of the required combination of semi-automatic interlocked batching controls or of semi-automatic interlocked and automatic batching controls. This system shall be furnished with a rating plate. Inclusion of admixture controls is optional, unless the admixture batching is initiated by the act of batching one of the other ingredients. Interlocking in any degree shall be optional.

**2.1.9. An Automatic Batching System** shall consist of the required combination of automatic batching controls and shall be furnished with a rating plate only when meeting the following requirements:

**2.1.9.1.** All batching equipment in the system for batching ingredients by weight must be activated by a single starting mechanism. A separate starting mechanism is permitted for volumetric batching of water and/or admixtures not batched at the time of weighing.

**2.1.9.2.** Each automatic batcher must return to zero tolerance, and each volumetric device must reset to start or signal empty before it may be charged.

**2.1.9.3.** The discharge of any ingredient in the system may not start unless all batching controls have been cleared of the previous batch with scales returning to zero tolerance and volumetric devices resetting to start or signaling empty. The discharge of any weighed ingredient may not start until all weighed ingredients have been batched.

**2.1.9.4.** Provisions shall be made for adjusting the sequential discharge of the batchers or measuring devices and the rate of discharge of materials.



**2.2. Batching Recorders, General.** A batching recorder may be either graphic or digital as described in the following paragraphs. All batching recorders shall produce a record of the batch weights or volume of each material requiring recodation, a batch identification or a batch count, day, month, year, time of day to the nearest minute, and shall register empty balance. Any automatically produced permanent record, including the above minimum information, shall be considered an acceptable batching record. Target weights, simulated weights, or any other weights other than actual batch weights shall be clearly identified as to their representation.

**2.2.1. A Graphic Recorder** is an instrument which scribes a line on a graphic chart simultaneously with the indication of the scale as the materials are being weighed. Each scale may have its own recorder, or a series of scales may simultaneously record on a single graphic chart. The housing shall be capable of being locked and the batch weights or volumes observed without unlocking. The chart for each scale to be recorded shall not be less than 4 inches wide and shall have at least one line for each 2 percent of scale capacity, but not more than 25 lines per inch. The graphic record shall correspond to the reading on the scale within  $\pm$  one graduation of the recorder.

**2.2.2. A Digital Recorder** is an instrument which prints the weight or volume of a material or materials. The recording of each material may be done after each material is properly batched or after the total batch has been properly batched. Each measuring device may have its own recorder or a series of measuring devices may record on the same tape or ticket. A digital recorder shall reproduce the reading of the scale being recorded within  $\pm$  0.1 percent of scale capacity and  $\pm$  one increment of any volumetric batching device.

**2.2.2.1. A Digital Batch Documentation Recorder** shall record the required information for each material in the total batch, identifying each material used along with a mix formula identification, the size of the total batch or load in commercial units, and an identification of the production facilities. Where certain required information is unchanged from batch to batch, it may be preprinted, stamped or written on the record. The load may be identified by a batch count number or a ticket serial number, or both. The recorder shall be capable of producing at least two documents. If the recorder is interlocked to an "Automatic Batching System" as defined in these Standards, a single indication of all batching devices meeting the zero or empty balance interlocks shall be sufficient.

**2.2.2.2. A Digital Concrete Certification Recorder** shall produce at least two tickets of the batch or load, which in addition to the information required in the preceding paragraphs shall include the percent of sand moisture compensation, identification of the purchaser, his job or project, and/or the particular placement location of the concrete. Space shall be provided for the identification of the delivery vehicle (truck number), the driver's signature, the signature of the purchaser or his representative receiving the concrete, and the amount of water added on the job.

**NEED HELP??**

It is the policy of the Bureau to make its services available to all specifying agencies on problems involving those specifications allied with concrete plant equipment. Requests for assistance can be made by contacting any Bureau member or the Executive Secretary of the Bureau at Bureau Headquarters in Silver Spring, MD. All problems involving specifications are then directed to the Chairman of the Bureau. If immediate action is not required, the Chairman includes the problem on the agenda of the next regularly scheduled Annual Bureau meeting. If the Chairman determines that immediate action is required, he designates two or more representatives from member companies to act in behalf of the Bureau and notifies all other member companies. Each member company has the right to send one representative to meetings or conferences.

**Single Copies of the following CPMB Publications are Available Without Cost**

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- Publication No. 102, "Recommended Guide Specifications for Batching Equipment and Control Systems in Concrete Batch Plants"
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