

## **Concrete Mixers**

### **خلاطات الخرسانة**

**Concrete mixers may be classified as:**

**خلاطات الخرسانة يمكن ان تصنف الى:**

1. Construction mixers خلاطات البناء
2. Paving mixers خلاطات الرصف
3. Transit mixer خلاطات النقل

**For construction mixers** with a single-compaction drum the standard sizes are (0.10 S, 0.17 S, 0.31 S, 0.45 S, 0.79 S, 1.59 S, 2.38 S, and 3.17 S). **The number indicates the normal volume of mixed concrete in cubic meters; while the letter (S) designates that the equipment is a construction mixture.** These mixers must be capable of mixing (10%) more than the rated capacities when they are operating in a level position.

**For paving mixers** with single-compartment drums the standard sizes are (0.77 E and 0.96 E). For mixers with two-compartment drums the standard sizes are (0.45 E and 0.96 E). **The number indicates the nominal volume of mixed concrete in cubic meters. While the letter (E) designates that the equipment is a paving mixer.**

These mixers are capable of mixing (20%) more concrete than the rated capacities when they are operating on a level surface.

بالنسبة لخلاطات البناء ذات الأسطوانة أحادية الضغط ، تكون الأحجام القياسية (0.10 S ، 0.17 S ، 0.31 S ، 0.45 S ، 0.79 S ، 1.59 S ، 2.38 S ، و 3.17 S). (S) يشير الرقم إلى الحجم الطبيعي للخرسانة بالمتري المكعب ؛ بينما يشير الحرف (S) إلى أن الجهاز عبارة عن خلاطات بناء. يجب أن تكون هذه الخلاطات قادرة على الخلط (10%) أكثر من السعات المقدرة عندما تعمل في وضع مستوي.

بالنسبة لخلاطات الرصف ذات الأسطوانات المفردة الأحجام ، تكون الأحجام القياسية (0.77 E و 0.96 E). (E) بالنسبة للخلاطات ذات البراميل المكونة من جزئين ، تكون الأحجام القياسية (0.45

E و 0.96. E يشير الرقم إلى الحجم الاسمي للخرسانة بالمتر المكعب. بينما يشير الحرف (E) إلى أن الجهاز عبارة عن خلاط رصف. هذه الخلاطات قادرة على خلط (20%) خرسانة أكثر من السعات المقدرة عندما تعمل على سطح مستو.

### مخرجات خلاطات البناء: Outputs of Construction Mixers

- The output of concrete mixers is usually expressed in cubic meter of concrete per hour ( $m^3/hr$ ).

• The Output of Concrete Mixers = Volume per Batch  $\times$  Number of Batches/Hour

- **The output will vary with:**

- **Size of a mixer.**

- **Conditions under which it is operated.**

• The actual volume of concrete mixed per batch will not equal the rated size of a mixer.

الحجم الفعلي للخرسانة المخلوطة لكل دفعة لن يساوي الحجم الفعلي للخلاط .

• It is desirable to avoid the use of fractional bags of cement; the size of a batch may be more or less than the size of the mixer.

من المستحسن تجنب استخدام أكياس الأسمنت الكسرية ؛ قد يكون حجم الدفعة أكبر أو أقل من حجم الخلاط.

- If a 0.45 S mixer requiring six bags per cubic meter (  $0.45 \times 6 = 2.7$  ), but the batch include 2 bags of cement, this will produce a batch having a volume of ( $\frac{2}{2.7} \times 0.45 = 0.33$  )  $m^3$  instead of ( $0.45$ )  $m^3$  .

- In determining the output of a mixer over an extended period of time, any losses in output resulting from delays should be included by using an appropriate operating factor such as a 45- min hour or 50- min hour.

عند تحديد ناتج الخلاط على مدى فترة زمنية طويلة ، يجب تضمين أي خسائر في الإنتاج ناتجة عن التأخير باستخدام عامل تشغيل مناسب مثل 45 دقيقة في الساعة أو 50 دقيقة في الساعة.

### Ex:1

Determine the quantity of materials required per batch and the probable output for a 0.45 S construction mixer, the quantity of materials per cubic meter are:

Cement 7.3 bags/m<sup>3</sup>

Sand 847 kg/m<sup>3</sup>

Gravel 1087 kg/m<sup>3</sup>

Water 192 liters/m<sup>3</sup>

Operating Factor is 50- min hour

If the mixer discharges the entire batch of concrete into a single bucket, the time per cycle should be about as follow:

|                   |      |     |
|-------------------|------|-----|
| Charging mixer    | 0.25 | min |
| Mixing concrete   | 1    | min |
| Discharging mixer | 0.25 | min |
| Lost time         | 1    | min |

**Solution:**

If the batch is  $0.45\text{m}^3$  the required volume of cement will be:

$$0.45 \times 7.3 = 3.3 \text{ bags.}$$

Instead of mixing  $0.45\text{m}^3$  per batch which required a fractional bag of cement (3.3 bags), reduce the quantity to (3 bags), and the quantity of other materials, in the same proportion.

So the proportion of reduction per batch will be (volume per batch):

$$\frac{3 \left( \frac{\text{batch}}{\text{bags}} \right)}{7.3 \left( \frac{\text{bags}}{1\text{m}^3} \right)} = 0.41 \left( \frac{\text{batch}}{\text{m}^3} \right)$$

So the quantity of material per batch will be as follows:

Cement, 3bags.

$$\text{Sand, } 847 \left( \frac{\text{kg}}{\text{m}^3} \right) \times 0.41 \left( \frac{\text{m}^3}{\text{batch}} \right) = 347.27 \text{ kg/bath}$$

$$\text{Gravel, } 1087 \times 0.41 = 445.67 \text{ kg/Batch}$$

$$\text{Cycle per Time Total} = 0.25 + 1.00 + 0.25 + 1.00 = 2.5 \text{ min.}$$

$$\text{No. of Batches per Hour} = \frac{60}{2.5} = 24 \text{ Batch/hr}$$

The volume per batch will be:

$$\frac{3}{3.3} \times 0.45 = 0.41 \frac{\text{m}^3}{\text{Batch}} < 0.45 \frac{\text{m}^3}{\text{Batch}}$$

$$\text{Output per Hour} = 24 \times 0.41 = 9.84 \text{ m}^3/\text{hr}$$

$$\text{Output per 50 – min Hour} = 9.84 \times \frac{50}{60} = 8.20 \text{ m}^3/\text{hr}$$

or:

$$\frac{50}{2.5} = 20 \text{ Batch/hr}$$

$$\text{Output per 50 – min Hour} = 20 \times 0.41 = 8.2 \text{ m}^3/\text{hr}$$

### Paving mixers: خلاطات الرصف

Paving mixers are used primarily to mix and place concrete for highways, streets, and airport runways.

تستخدم خلاطات الرصف بشكل أساسي لخلط ووضع الخرسانة للطرق السريعة والشوارع ومدارج المطارات.

The standard paving mixers are 0.77 E and 0.96 E single drum and 0.45 E and 0.96 E double-drums. The double-drum mixer has two compartments.

The output of a paving mixer will vary with:

- 1) The size of the mixer.
- 2) The number of compartments.
- 3) The nature of the job.

Under favorable condition a paving mixer can mix a 20% overload of concrete. The batch cycle for a single-drum mixer should run about 1.5-2 min, and for a double-drum mixer about 0.8-1.25 min.

**Ex: 2**

Determine the probable output of a 0.96 E double-drum paving mixer under various conditions.

If the highway is level and job conditions are favorable, it is possible to produce a batch of concrete in 50 sec ( $50/60=0.833\text{min}$ ); Operating Factor is 40- min hour.

$$\text{Maximum size batch} = 0.96 \times 1.2 = 1.152\text{m}^3$$

$$\text{OR: Maximum size batch} = 0.96 + (0.96 \times 0.2) = 1.152\text{m}^3$$

$$\text{Batch per Hour} = \frac{60 \times 60}{50} = 72 \text{ Batch/hr}$$

$$\text{Maximum Output per Hour} = 72 \times 1.152 = 82.944 \text{ m}^3/\text{hr}$$

$$\text{Maximum Output per 40 - min Hour} = 82.944 \times \frac{40}{60} = 55.3 \text{ m}^3/\text{hr}$$