## SECTION 102 –CONCRETE ROAD-MAKING PLANT

### Transportable Mixers

2329. Size:-* Capacities range from 2 ½ to 112 cu ft. of mixed material. Unless weight bat. Hing is used, mixes are usually based on one or more complete bags of cement, and the mixer cannot be fully loaded.

2330. Types.

a. Revolving drum mixers. May be either tilting or non-tilting. Size may be designated either by two Figures, indicating respectively dram capacity (Dry mate rails). And mixed batch capacity, eg, 14/10 or by a single Figure (mixed batch capacity) followed by T or NT (tilling or non-tilling).

b. Paddle (open pan Mixers). Blades revolve on a vertical shaft inside a horizontally mounted stationary drum with an open top. Discharge is through the bottom of the drum.

Figure 23-19: Concrete Mixer

2331. Loading. Transportable mixers are normally designed to be charged by hand from gauge boxes, but a small swing weight batcher may be used.

2332. Output. Theoretical lout put Figures given in Table 23.8 should be used only as a guide, since actual output depends upon:-

a. Loading, mixing, and discharging time.
b. Incidental time loss resulting from site layout and organization.
c. Size, proportions and water/cement ratio of mix.

**Weigh Batching**

2333. Principle. Cement and aggregate are discharged, from separate containers into a weigh hopper. Weights of each ingredient, and of the whole dry mix, are recorded before discharge into the mixer.

2334. Application.- Proprietary machines are of various sizes. They may either provide a proportioned dry mix for subsequent wet mixing, or deliver mixed concrete ready for placing Improvised methods are also used, eg a barrow weighing scale.

Figure 23-20: Weigh Batch

**Continuous Mixing plant**

2335. Principle. Aggregates, cement, and water are fed into a mixing drum by a worm drive. Materials are, in effect, proportioned by volume.

2336. Application. Continuous mixing gives a high output rate, but proportions may be inaccurate. They greater wear on aggregate conveyors results in increasingly richer mixes.

**Mobile mixers**

2337. Truck-mounted mixer.-Common sizes are 5NT, 7NT, and 10NT.

Figure 23-21: Truck-Mounted Mixer

**Concrete Paver**

2338. A concrete paver typically use a "slip form" process to pave roadways. First spreading fluid concrete placed on the grade with an auger, then removing excess material with a strike-off plate. Hydraulic vibrators consolidate the concrete, and tamper bars push the large aggregate below the surface. The paver's profiling plans then set the finished elevation and provide an initial finishing of the slab.


Figure 23-22 (a): Concrete Paver

Figure 23-22 (b): Concrete Paver

**TABLE 23.8- THEORETICAL OUTPUT OF TRANSPORT ABLE CONCRETE MIXERS**

| Serial No | Time per batch (total charging, mixing, and dis-charging time)(secs) | Approximate theoretical output (cu yds per hr) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Standard sizes (mix batch capacity in cu ft) | | | | | | | |
| (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (I) | (j) |
| | Tilting mixers (based on mixing time 60 to 120 secs, charging and discharging time 30 to 60 secs) | | | | | | | | |
| 1. | 90 | 7 ½ | 10½ | | | | | | |
| 2. | 105 | 6½ | 9 | | | | | | |
| 3. | 120 | 5½ | 8 | | | | | | |
| 4. | 135 | 5 | 7 | | | | | | |
| 5. | 150 | 4½ | 6 | | | | | | |
| 6. | 180 | 3½ | 5 | | | | | | |
| | Open plan mixer (based on mixing time 30 to 90 sec , charging and discharging time 60 to 90 sec) | | | | | | | | |
| 7. | 90 | 7 ½ | 10½ | 15 | 20 ½ | | | | |
| 8. | 105 | 6½ | 9 | 12½ | 18 | | | | |
| 9. | 120 | 5½ | 8 | 11 | 15 ½ | | | | |
| 10. | 135 | 5 | 7 | 10 | 14 | | | | |
| 11. | 150 | 4½ | 6 | 9 | 12 ½ | | | | |
| 12. | 180 | 3½ | 5 | 7 ½ | 10 ½ | | | | |
| | Non–tilting mixers (based on mixing time 75 to 120 sec , charging and discharging time 45 to 120 sec) | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13. | 120 | 5 ½ | 8 | 11 | 15 ½ | 31 | 62 | 93 | 124 |
| 14. | 135 | 5 | 7 | 10 | 14 | 27 ½ | 55 | 83 | 110½ |
| 15. | 150 | 4½ | 6 | 9 | 12½ | 25 | 49 ½ | 74½ | 99 ½ |
| 16. | 165 | 4 | 5 ½ | 8 | 11 ½ | 22 ½ | 45 ½ | 68 | 90 ½ |
| 17. | 180 | 3½ | 5 | 7 ½ | 10½ | 20 ½ | 41 ½ | 62 | 83 |
| 18. | 240 | 2½ | 4 | 5 ½ | 7½ | 15 ½ | 31 | 46½ | 62 |

2339. Truck-mounted mixers. Designed for loading a dry mix at a weigh-batching plant. Wet mixing can be done while travelling or at the working site. Drums may be tilting or no tilting.

2340. Dual drum mixers on tracks. Two non-tilting drums, of equal capacity, are used. Total capacity is up to 4 cu yds. One drum loads while the other mixes.

**Transporting**

2341. Selection of method: - The governing factors are:-

a. Concrete must be transported, placed, and compacted before initial set occurs.
b. Water must not be lost from the mix during transit.
c. Segregation must be avoided.
d. If require add small amount of retarder gypsum (Calcium sulfate).

2342. Methods.

a. Wheelbarrows hold about 2 cu ft. of concrete. Unsprang iron-typed barrows very quickly cause segregation. Runways should be used over rough ground.

b. Concrete carts and dobbin barrows are designed for easy pushing, maneuvering, are designed capacity varies from 7 to 14 cu ft.

c. Small self-propelled dumpers are particularly suited to hauls of about 250 yds. They are very handy and have a quick turn-round. Suitable sizes are ½ and ¾ cu yd.

d. Jubilee skips and Deauville track are useful for large works, especially on straight and level alignments. Skips are side-tipping. Chutes or barrows are used for placing the mix across the width of the road slab.

e. Crane skips are of particular value for elevated road sections where the space at road level is limited.

f. Trucks should have steel bodies and should be tippers. A funnel chute at the rear facilitates placing. Over long distances segregation may occur and remixing may be necessary.

g. Agitator Lorries are specially designed for carrying mixed concrete over long distances.

h. Mobile mixers: See paras 576 to 578

j. Concrete pumps have a constant high delivery rate up to a distance of about 2000 feet. Very careful control of mix quality is necessary (see para 582).

k. Belt conveyors are very economical for large scale works on restricted sites.

l. Monorail skips have high output and they can negotiate bad ground and slopes up to 1 in 12.

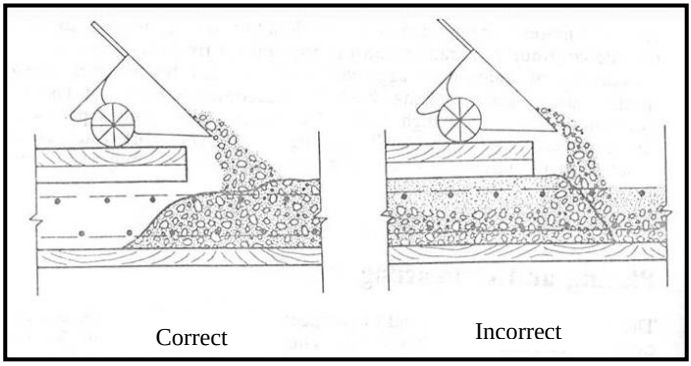


Figure 23-23: Method of concrete cast

**Distributors**

2343. Travelling distributors.

a. Boom and skip. The normally combined with a mixer which is moved on flat bottom rails. The skip travels along the boom to deposit concrete where required.

b. Mechanical hoppers. A power driven carriage runs either on the side forms or on fiat bottom rails. The hopper is fed directly from the mixer and has bottom discharge mechanism. Its height is adjustable and it can move either transverse or longitudinally.

2344. Concrete pumps. Distribution by pumping has many advantages on large scale work, but it is unsuitable for low workability concretes used with mechanical compactors. Maximum aggregate size is 2 ins and rich mixes are necessary if the water/ cement ration is to remain low. Grading and batching must be meticulously controlled and mixing must be consistent. Typical performance Figures are:


Figure 23-24: Concrete Pump

a. Range. Varies from 1000 to 2000 ft horizontally or 100 to 135 ft vertically.

b. Capacity.

4 inch pipe – 8 to 10 cu yds hr
6 inch pipe – 15 to 20 cu yds hr
8 inch pipe- 20 to 24 cu yds hr

**Compacting and Finishing Machines**

2345. Mechanical compactors can deal satisfactorily with concrete of low water/cement ratio, which is potentially stronger than a wet mix.

2346. Mechanical tampers. These are mounted on a power driven carriage running on the side forms.

a. Beam type. The ramping beam delivers 60 to 80 blows per minute. A screening plate is usually mounted about 3 ft in front of it.

b. Hammer type. These machines often incorporate four successive treatments:

(1) An oscillating screed.
(2) A series of hammers, giving 60 to 70 blows per minute.
(3) A heavy beam tamping the full slab width at 150 strokes per minute.
(4) A 'finishing plate, vibrating at about 600 vibrations per minute.

2347. Surface vibrating machines.

a. Hand operated. The beam, of iron shod timber or preferably of steel, is manipulated by two men. Vibration of the beam may be induced by:

(1) Vibratory electric motors driven by a transportable generator.
(2) Gasoline driven vibrators.
(3) Pneumatic hammers driven from a small air compressor (30-35 cu ft fapm).

b. Self- propelled. Machines are usually mounted on a steel bridge, forming a power driven carriage spanning the slab. Speed is adjustable, the normal rate of advance being 8 ft per min. Various patterns exist, a typical arrangement being:

(1) A front screed and preliminary compactor. Oscillating horizontally at about 40 cycles per minute.

(2) A high frequency vibrating plate, giving from 3.500 to 4,000 vertical vibrations per minute.

(3) A smoothing place, oscillating horizontally at about 40 cycles per minute.

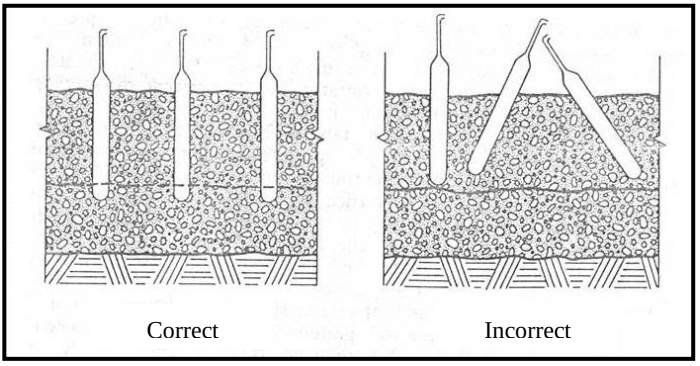


Figure 23-25: Use of Vibrator

c. Vibrators should not be used laterally against the side forms. This practice gives a false impression and makes it impossible to check the effectiveness of compaction when the side forms are removed.

2348. Internal vibrating machines.

a. Hand operated vibratory pokers are useful for ensuring good compaction in corners, near side forms and round reinforcement. They should be used in advance of the main compacting machinery.

b. Self-propelled machines sometimes incorporate a row of spade vibrators, projecting into the soft concrete to a depth of 2 to 3 ins and vibrating at a frequency of about 4,000 per minute.