

Lesson 5: Ordering, Pouring, and Finishing Concrete

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After preparing the forms for a concrete slab, the next step is pouring the concrete. Before the concrete can be poured, however, it must be ordered and mixed.

Calculating the Concrete Quantity Needed

Once the forms are ready, the process of pouring the concrete can begin. In instances where the volume of concrete being poured is larger than one yard, most people will order the concrete from a ready-mix plant and have it delivered to the site. This practice eliminates the need for obtaining the materials and equipment to mix the concrete on site. If the concrete is purchased from a ready-mix contractor, an order for the amount of concrete needed must first be calculated.

Concrete from a ready-mix plant is ordered in cubic yards, which is the standard volume used when working with concrete; one cubic yard is equal to 27 cubic feet. Plants typically sell the concrete at \$50 to \$70 per cubic yard plus a delivery charge. Since concrete is somewhat expensive, care must be taken to accurately determine how much is necessary. Once the concrete arrives, all of it must be used, or it becomes waste.

To calculate the number of cubic yards needed when pouring concrete for a rectangular slab, multiply the length, width, and depth in feet of the slab, and divide this number by 27, as shown in Figure 5.1.

Using this equation, 3.56 cubic yards are required for a slab that is 12 feet by 16 feet by 6 inches ($12 \times 16 \times .5$, divided by 27). If this were the only concrete poured that particular day,

4 yards of concrete would be ordered, since most ready-mix plants sell only whole yards of concrete.

If the slab to be poured is circular, the formula for the volume of a circle is used to calculate the amount of concrete needed, as illustrated in Figure 5.2.

A concrete slab 4 inches thick under a grain silo that is 24 feet in diameter would require 5.53 cubic yards of concrete ($3.14 \times 12 \times 12 \times .33$, divided by 27).

When ordering concrete, the amount ordered will usually be more than the amount calculated by a factor of 10 to 25 percent. The amount needed is multiplied by 1.1 or 1.25 to provide the extra concrete. This additional material will make up for any spilled concrete and differences in soil or fill level, especially for low spots.

Factors to Consider When Ordering Concrete

When deciding to order concrete, several issues need to be addressed. Factors to consider include the weather, conditions affecting the type of concrete needed, labor needs and availability, access to the area by truck, and water needs.

The weather should be considered when ordering concrete. Concrete should preferably not be poured in a rain storm or when temperatures are below 40 degrees or above 85 degrees. These weather conditions will affect the rate of curing, or hardening, of the concrete as well as the overall final strength of the concrete. If concrete must be poured in cold weather, calcium chloride has to be added to the mix.

$$\text{Length (ft.)} \times \text{Width (ft.)} \times \text{Depth (ft.)} \times \frac{\text{yd}^3}{27 \text{ ft}^3} = \text{Cubic yards of concrete}$$

Certain conditions may affect the type of cement

ordered. The concrete mix may include

$$\pi (3.14) \times \text{Radius}^2 (\text{ft}^2) \times \text{Depth (ft.)} \times \frac{\text{yd}^3}{27 \text{ ft}^3} = \text{Cubic yards of concrete}$$

Concrete

different types of portland cement depending on different conditions. For example, if the concrete is to be poured on alkaline soils or in areas where heat may build up, a particular type of concrete mix is used. Other mixes are required if the concrete needs strength in the first two to three days or if the heat generated by the concrete needs to be reduced, as for large water dams.

Labor needs and availability should also be considered. Pouring and finishing concrete is not a one-person job. The arrival of the delivery truck should be timed to occur when sufficient labor will be available to pour and finish the concrete.

Another factor to consider is the access and elevation of the delivery truck. Most ready-mix businesses offer trucks with extension slides to allow the concrete to be poured over greater distances and avoid hauling the concrete in wheelbarrows. Companies generally also have a few trucks that can pump the concrete to a location higher than the tires of the truck.

Water needs are another consideration. Water is important in the process of pouring concrete. The site needs to be sprayed with water if the fill is dry. The concrete is sprinkled with water as it cures to increase the moisture content and improve the strength of the finished concrete. Water will also be used to clean all the equipment.

Pouring a Slab

After the desired amount of concrete has been determined, ordered, and delivered, the concrete is poured. The process of pouring concrete has several steps that need to be followed closely.

Before the concrete can be poured into the forms to cover the reinforcement, the site needs to be moistened. This task needs to be done while the concrete is being delivered or mixed on site.

The concrete should be poured as soon as possible after its arrival at the site or after being mixed. This procedure will maximize the amount of moisture in the concrete, increasing its strength. Pouring it right away will also aid in maintaining the proper slump, or the correct moisture level of the concrete.

An important point to remember is that concrete begins to set 30 to 60 minutes after pouring. If the concrete is moved in any way during the first hour after pouring, its strength is reduced. For this reason, the truck or mixer should be moved as close as possible to the final location of the concrete to avoid having to move the concrete in wheelbarrows.

When unloading the concrete from the truck, the chute or discharge tube should be placed as close to the ground as possible. If the chute is too high, the impact of the concrete hitting the ground will partially separate the aggregate from the cement mixture.

As the concrete fills the forms, a shovel or spade should be pushed through it, especially at the edges of the forms. The aggregate will then be well mixed and moved away from the edges somewhat, resulting in a smoother finish at the edge. Working through the concrete will also remove any air bubbles that may have resulted from pouring, giving the concrete more strength.

If the slab to be poured is wider than 10 feet, pouring the slab in two or more sections should be considered. Slabs wider than 10 feet will be more difficult to finish, since most concrete finishing tools do not have handles long enough to reach the entire area.

Concrete Finishes

Finishing is the process of working the surface of concrete to give it texture. Concrete can be finished using several different methods, which will result in different textures on the exposed surface. The finish selected will depend on the final use of the concrete. One type of finish creates a smooth surface, which is used where ease of cleaning is required, as for floors in a shop, house, or grain bin. Another method of finishing concrete provides a rough surface, which is used for traction on sidewalks, livestock walkways, inclined walks, and steps. A third type of finish is an aggregate finish, which is used for traction and decorative purposes and consists of exposed rocks on the surface of the concrete; it may be used anywhere a decorative surface is desired, such as sidewalks.

Finishing the Concrete

As one crew is pouring concrete, another crew can begin the finishing process after the

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concrete has begun to harden and its surface starts to dry out. The finishing crew will work the concrete to provide a flat, even surface that will be attractive as a finished product. They For a smooth surface finish, the first step is to screed the concrete. Screeding involves moving a board across the concrete along the top of the forms. This process will move concrete into lower spots inside the form and remove excess concrete. Screeding is typically done by moving a straight 2" × 4" board back and forth at a 90-degree angle to the edge of the form.

After the concrete has been screeded, a bull float is used to work the aggregate below the surface. A bull float is a wide board or flat piece of aluminum that is held level with the surface and tipped up slightly along the front edge as it moves across the concrete. The float will force the aggregate below the surface, leaving the concrete relatively smooth. Unfortunately, it also leaves small ridges in the concrete.

These small ridges are then removed using a power trowel, a steel hand trowel, or a magnesium hand float, which is similar to but slightly longer than the steel trowel and gives a smoother final surface. If the person pouring the concrete has access to a power trowel, it should be used. The power trowel is worked in a circular pattern to smooth away any edges, leaving a very smooth surface overall. If a power trowel is not available, a steel hand trowel can be used to achieve the same effect. The hand trowel or a magnesium float should be worked using a curving motion similar to the movement of windshield wipers on a car, with the edge of the tool sloping slightly upward as it is moved across the concrete to help compact the surface. Troweling is illustrated in Figure 5.3.

An edger should be used along the forms as the

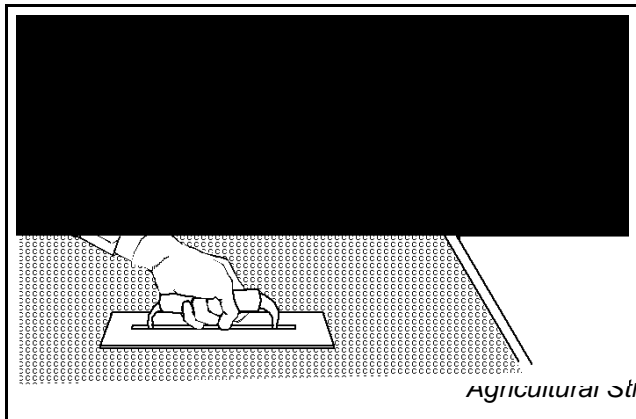
will also give the concrete the proper texture. Each type of finish requires a different procedure.

concrete begins to set to separate it from the forms and leave a slightly rounded edge, as shown in Figure 5.4. At the same time, expansion and control joints should be applied if they are needed.

The process is similar for a rough surface finish. The concrete is screeded to even out the surface of the concrete, and a bull float is used to force the aggregate down. The ridges are removed using a power or hand trowel. The final step in rough surface finishing involves pulling a push broom across the surface of the curing concrete.

The bristles will leave small, even grooves in the concrete that will reduce slippage and increase traction, especially when water freezes on the surface. An edger is used along the forms, and expansion and control joints are then applied.

An exposed aggregate finish creates a pebbly or rocky surface that is not smooth at all. For this type of finish, the concrete is again screeded and worked with a bull float. It is then lightly worked with the power or steel trowel, with less concern for creating a smooth surface. To add the aggregate to the finish, a layer consisting only of aggregate is applied evenly over the surface of the concrete. This layer is embedded using a board similar to the screed to force the aggregate into the concrete to a depth of about one half of its diameter. The aggregate should not be forced too far into the concrete, because the desired finish will be reduced. The concrete is then allowed to dry until surface water disappears. After the water has evaporated and the mixture can support a person's weight, a hose and bristle broom are used to remove any film of concrete on the surface of the exposed aggregate.



Summary

Ordering concrete for a specific job requires accurate calculations to determine the correct amounts needed. Factors such as the weather, conditions affecting the type of concrete needed, labor needs, access to the area, and availability of water should be considered. Once the concrete has arrived, efforts should be made to pour the concrete as soon as possible using the proper process. After the concrete starts to harden, it must be finished to meet the needs of the situation. If the concrete is poured and finished well, the result is high-quality concrete that will last for many years.

Credits

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