

## UNIT IV- CONCRETE

### Lesson 5: Ordering, Pouring, and Finishing Concrete

**Competency/Objective:** Explain the procedure for ordering, pouring, and finishing concrete.

#### **Study Questions**

1. How is the necessary quantity of concrete calculated?
2. What are factors to consider when ordering concrete?
3. What are the procedures for pouring a slab?
4. What are the different types of concrete finishes and their applications?
5. What are the procedures for different finishes?

#### **References**

1. *Agricultural Structures (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, Unit IV, 1999.
2. Job Sheet
  - a) JS 5.1: Pouring a Concrete Curb



## UNIT IV - CONCRETE

### Lesson 5: Ordering, Pouring, and Finishing Concrete

#### TEACHING PROCEDURES

##### B. *Review*

Lesson 4 discussed the procedures for constructing forms and reinforcing a concrete slab. This lesson will examine the calculations needed for ordering concrete, the procedures for pouring and finishing concrete slabs, and the different types of finishes that can be used.

##### C. *Motivation*

Ask students to compare the differences between the concrete in sidewalks around the school and the concrete that forms the floor of the laboratory. Why are the two concrete slabs different?

##### D. *Assignment*

##### E. *Supervised Study*

##### F. *Discussion*

1. When large quantities of concrete are needed, people often order the concrete from a ready-mix business. Ask students how they would order the concrete for a slab the size of the classroom.

#### How is the necessary quantity of concrete calculated?

- a) Concrete is ordered in cubic yards.
- b) One cubic yard is equal to 27 cubic feet.
- c) For a rectangular slab, multiply the length, width, and depth in feet of the slab, and divide this number by 27.

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

- d) 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.

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

- e) When ordering concrete, the amount ordered will usually be more than the amount calculated by a factor of 10 to 25 percent.
    - 1) Multiply the amount needed by 1.1 or 1.25 to provide the extra concrete.
    - 2) The additional material will make up for any spilled concrete and differences in soil or fill level, especially for low spots.
2. When deciding to order concrete, a number of issues should be addressed. Ask the students if the same type of concrete would be ordered for all situations. What other factors should be considered when placing an order for concrete?

#### What are factors to consider when ordering concrete?

- a) Weather

- 1) Concrete should preferably not be poured in a rain storm or when temperatures are below 40 degrees or above 85 degrees.
    - 2) These weather conditions will affect the rate of curing, or hardening, of the concrete as well as the overall final strength of the concrete.
    - 3) Calcium chloride has to be added to the mix for pouring concrete in cold weather.
  - b) Conditions affecting the type of cement needed - The concrete mix may include different types of Portland cement, depending on factors such as whether the concrete is to be poured on alkaline soils or in areas where heat may build up, whether the concrete needs strength in the first two to three days, or whether the heat generated by the concrete needs to be reduced.
  - c) Labor needs and availability - The arrival of the delivery truck should be timed to occur when sufficient labor will be available.
  - d) Access to the area by truck
    - 1) 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.
    - 2) Companies generally also have a few trucks that can pump the concrete to a location higher than the tires of the truck.
  - e) Water needs
    - 1) The site needs to be sprayed with water if the fill is dry.
    - 2) The concrete is sprinkled with water as it cures to increase the moisture content and improve the strength of the finished concrete.
    - 3) Water will be used to clean equipment.
3. After the concrete has been ordered and delivered, it is time to pour the concrete. Ask the students what procedure they would follow in pouring a slab.

**What are the procedures for pouring a slab?**

- a) The site needs to be moistened while the concrete is being delivered or mixed on site.
  - b) The concrete should be poured as soon as possible after its arrival at the site or after being mixed.
    - 1) Maximizes the amount of moisture in the concrete, increasing its strength
    - 2) Aids in maintaining the proper slump
  - c) An important point to remember is that concrete will begin to set 30 to 60 minutes after pouring.
    - 1) Results in reduced strength if the concrete is moved in any way during the first hour after pouring
    - 2) Should move the truck or mixer as close as possible to the final location of the concrete to avoid having to move it in wheelbarrows
  - d) The chute, or discharge tube, should be placed as close to the ground as possible when unloading the concrete; if the chute is too high, the impact will partially separate the aggregate from the cement mixture.
  - e) As the concrete fills the forms, a shovel or spade should be pushed through it, especially at the edges.
    - 1) Will mix the aggregate well and move it away from the edge somewhat, resulting in a smoother finish at the edges
    - 2) Removes any air bubbles that may have resulted from pouring, giving the concrete more strength
  - f) If the slab to be poured is wider than 10 feet, pouring the slab in two or more sections should be considered because slabs wider than 10 feet will be more difficult to finish.
4. The surface of the concrete can be worked to create finishes with several different textures. Ask the students to describe the different finishes they have seen and where they were used. Why was that particular type of surface chosen for that area?

**What are the different types of concrete finishes and their applications?**

- a) Smooth - used where ease of cleaning is desired, as for floors in a shop, house, or grain bin
- b) Rough - for traction on sidewalks, livestock walkways, inclined walks, and steps
- c) Aggregate - consists of exposed rocks on the surface of the concrete; used for traction and decorative purposes anywhere a decorative surface is desired, such as sidewalks

5. The processes for creating each of these different types of finishes are somewhat different. However, they all must be done carefully to produce the desired surface. Have students describe the process they would follow for each of the finishes. Have students complete JS 5.1.

**What are the procedures for the different finishes?**

- a) Smooth
  - 1) Screed the concrete.
    - (a) Screeding the concrete involves moving a board across the concrete along the top of the forms.
    - (b) This process will move concrete into lower spots inside the form and remove excess concrete.
    - (c) 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.
  - 2) Use a bull float to work the aggregate below the surface.
    - (a) 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.
    - (b) The float will force the aggregate below the surface, leaving the concrete relatively smooth.
  - 3) Remove the ridges left by the bull float using a power trowel, steel hand trowel, or magnesium hand float.
    - (a) If the person pouring the concrete has access to a power trowel, it should be used; the power trowel works in a circular pattern to smooth away any edges, leaving a very smooth surface overall.
    - (b) If a power trowel is not available, a steel hand trowel can be used to achieve the same effect.
    - (c) The hand trowel or magnesium float should be worked in curving motions, with the front edge sloped slightly upward to help compact the surface.
  - 4) An edger should be used along the forms as the concrete begins to set to separate it from the forms and leave a slightly rounded edge.
  - 5) At the same time, control or expansion joints should be applied if they are needed.
- b) Rough
  - 1) Screed the surface.
  - 2) Use a bull float to force the aggregate down.
  - 3) Remove the ridges using a power trowel or hand trowel.
  - 4) Pull a push broom across the surface of the curing concrete to leave small, even grooves in the concrete that will reduce slippage and increase traction, especially if water freezes on the surface.
  - 5) An edger is used along the forms.
  - 6) Expansion and control joints are then applied.
- c) Exposed aggregate
  - 1) Screed the concrete.
  - 2) Work it with a bull float.
  - 3) Lightly work the concrete with a power or hand trowel, with less concern for creating a smooth surface.
  - 4) To add the aggregate to the finish, evenly apply a layer consisting only of aggregate over the surface.
    - (a) This layer of aggregate 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.
    - (b) The aggregate should not be forced too far into the concrete, because the desired finish will be reduced
  - 5) Allow the concrete to dry until surface water disappears.
  - 6) After the water has evaporated and the mixture can support a person's weight, use a hose and bristle broom to remove any film of concrete on the surface of the exposed aggregate.

**G. Other Activities**

Tour a local ready-mix facility to learn the steps involved in mixing, delivering, and pouring concrete.

**H. Conclusion**

Ordering the concrete required for a specific job is the first step in preparing to pour a concrete slab. Once the concrete arrives, it is carefully poured and finished to meet the needs of the construction project. If the procedures described in this lesson are followed, the slab poured will consist of high quality, lasting concrete.

I. *Answers to Activity Sheet*

J. *Answers to Evaluation*

1. a
2. c
3. d
4. b
5. c
6. d
7. b
8.  $(120 \times 4 \times .33) / 27 = 5.87$  cubic yards
9.  $5.87 \times 1.1 = 6.46$  cubic yards
10. Answers may include any three of the following: weather, conditions affecting the type of cement needed, labor needs and availability, access to the area by truck, and water needs.

## EVALUATION

Circle the letter that corresponds to the best answer.

1. The process of leveling the concrete with the top of the forms is called:
  - a. Screeding.
  - b. Floating.
  - c. Finishing.
  - d. Smoothing.
2. What is the preferred maximum width of forms for a slab?
  - a. None
  - b. 5 feet
  - c. 10 feet
  - d. 15 feet
3. The type of concrete finish where the rocks are exposed is called:
  - a. Smooth.
  - b. Rough.
  - c. Hard.
  - d. Aggregate.
4. The concrete finish that should be used on ramps leading into livestock barns is:
  - a. Smooth.
  - b. Rough.
  - c. Rocky.
  - d. Aggregate.
5. Which tool is used to work the aggregate below the surface of the concrete during finishing?
  - a. Trowel
  - b. Screed
  - c. Bull float
  - d. Shovels
6. Which tool would be used for the final step on a smooth finish?
  - a. Bull float
  - b. Darby
  - c. Screed
  - d. Magnesium hand float
7. Control joints can be made in newly formed concrete:

- a. Immediately after the concrete is poured.
- b. At the end of the finishing process.
- c. Between screeding and floating.
- d. At any time.

**Complete the following short answer questions.**

8. How much concrete would be needed for a sidewalk that is 120 feet long, 4 feet wide, and 4 inches thick?

9. Overestimating the amount needed for question 8 by 10 percent, how much concrete should be ordered?

10. What are three factors that are important to consider when ordering concrete?

- a.
- b.
- c.



**Pouring a Concrete Curb**

**Objective:** Pour concrete to make a curb.

**Materials and Equipment:**

Wood and duplex nails for forms

Tape measure

Concrete

2 1" pipes, 1' long

Wire

Rebar

Wire for rebar supports

Shovel or spade

Oil

Hand trowel

Board for screed

Latex gloves

Eye protection

**Procedure:**

1. The purpose of this exercise is to build curbs like those found in a parking lot. Since the size of concrete curbs varies, measurements should be taken of the curbs already in place to duplicate their size.
2. Construct a form using the materials provided by your instructor. Build the form so that the curb is upside down, leaving a larger opening for pouring the concrete. Be sure to use duplex nails so the form can be removed more easily after the concrete has set.
3. Once the form is finished, insert rebar reinforcement into it using wire supports to hold it in place. Since the form is upside down, the rebar will now be at the top of the form.
4. Approximately two feet from each end of the form, insert an oil-covered pipe vertically into the form. The pipes will be removed after the concrete has set, leaving anchor holes through the curb. Support the pipe with wire wrapped around the form.
5. If the concrete is being mixed by the class, mix the concrete. If the concrete is being ordered, the next step depends on the arrival of the truck.
6. When the concrete is ready, begin pouring the concrete into the forms. Pour until the form is filled halfway and then use a spade or shovel to work up and down through the concrete, especially around the edges. This will remove air bubbles and move the aggregate away from the edges, creating a smoother finish.
7. Pour the concrete to the top of the form. Using a spade or shovel, work the concrete that was added to the form to remove air pockets.
8. Using a straight board as a screed, work the top until the entire surface is level and even.
9. Allow the concrete to begin to set.

10. Once the surface of the concrete starts to dry and no water is standing on top of the poured concrete, take a small hand trowel and smooth the surface of the curb.
11. Allow the curb to cure for at least three to four days or preferably up to one week for maximum strength. If the curing is done outside, sprinkle water on the surface of the concrete once or twice a day for the first two to three days.
12. After the concrete has set completely, remove the pipes and turn the form over to remove the curb. If necessary, remove the ends of the form to separate the curb from the form.