

Concrete in Practice

What, why & how?



CIP 14 - Finishing Concrete Flatwork

WHAT is Finishing?

Finishing is the operation of creating a concrete surface of a desired texture, smoothness and durability. The finish can be strictly functional or decorative.

WHY Finish Concrete?

Finishing makes concrete attractive and serviceable. The final texture, hardness, and joint pattern on slabs, floors, sidewalks, patios, and driveways depend on the concrete's end use. Warehouse or industrial floors usually have greater durability requirements and need to be flat and level, while other interior floors that are covered with floor coverings do not have to be as smooth and durable. Exterior slabs must be sloped to carry away water and must provide a texture that will not be slippery when wet.

HOW to Place Concrete?

Prior to the finishing operation, concrete is placed, consolidated and leveled. These operations should be carefully planned. Skill, knowledge and experience are required to deal with a variety of concrete mixtures and field conditions. Having the proper manpower and equipment available, and timing the operations properly for existing conditions is critical. A slope is necessary to avoid low spots and to drain water away from buildings.

Complete all subgrade excavation and compaction, formwork, and placement of mesh, rebars or other embedments as required prior to concrete delivery. Delays after the concrete arrives create problems and can reduce the final quality of flatwork.

General guidelines for placing and consolidating concrete are:

- a. A successful job depends on selecting the correct concrete mixture for the job. Consult your Ready Mixed Concrete Producer. Deposit concrete as near as possible to its final location, either directly in place from the truck chute or use wheelbarrows, buggies or pumps. Avoid adding excessive water to increase



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the concrete's slump. Start at the far end placing concrete into previously placed concrete and work towards the near end. On a slope, use concrete with a stiffer consistency (lower slump) and work up the slope.

- b. Spread the concrete using a short-handled, square-ended shovel, or a come-along. Never use a garden rake to move concrete horizontally. This type of rake causes segregation.
- c. All concrete should be well consolidated. For small flatwork jobs, pay particular attention to the edges of the forms by tamping the concrete with a spade or piece of wood. For large flatwork jobs, consolidation is usually accomplished by using a vibrating screed or internal vibrator.
- d. When manually striking off and leveling the concrete, use a lumber or metal straightedge (called a screed). Rest the screed on edge on the top of the forms, tilt it forward and draw it across the concrete with a slight sawing motion. Keep a little concrete in front of the screed to fill in any low spots. Do not use a jitterbug or vibrating screed with concrete slump exceeding 3 inches (75mm). Vibrating screeds should be moved rapidly to ensure consolidation but avoid working up an excessive layer of mortar on the surface.

HOW to Finish Concrete?

- 1. LEVEL** the concrete further using a bull float, darby, or highway straightedge as soon as it has been struck-off. This operation should be completed before bleed water appears on the surface. The bull float or darby embeds large aggregate, smoothes the surface, and takes out high and low spots. Keep the bull float as flat as possible to avoid premature sealing of the surface.
- 2. WAIT** for the concrete to stop "bleeding". All other finishing operations **must wait** until the concrete has stopped bleeding and the water sheen has left the surface. Any finishing operations done while the concrete is still bleeding **will result** in later problems, such as dusting, scaling, crazing, delamination and blisters. The waiting period depends on the setting and bleeding characteristics of the concrete and the ambient conditions. During the waiting period, protect against evaporation from the concrete surface if conditions are hot, dry and windy. Cover a small test portion of the slab to evaluate if the concrete is still bleeding. General guidance regarding whether the concrete has sufficiently set for final finishing operations is when a footprint indentation of a person standing on the slab is between 1/8 to 1/4 inch (3 to 6 mm).
- 3. EDGE** the concrete when required. Spade the concrete to break any bond with the form with a small mason's trowel. Use the edging tool to obtain durable rounded edges.
- 4. JOINT** the concrete when required. The jointing tool should have a blade one-fourth the depth of the slab. Use a straight piece of lumber as a guide. A shallow-bit groover should only be used for decorative grooves. When saw-cutting is required, it should be done as soon as the concrete is hard enough not to be torn by the blade. Early entry saw cutting can be done before the concrete has completely hardened. See CIP 6 for jointing practices and spacing.
- 5. FLOAT** the concrete by hand or machine in order to embed the larger aggregates. Floating also levels and prepares the surface for further finishing. Never float the concrete while there is still bleed water on the surface.
- 6. TROWEL** the concrete when required for its end use. For sidewalks, patios, driveways and other exterior applications, troweling is not usually required. Air entrained concrete should not be troweled. If trowel finishing of air-entrained concrete is required by specifications, extreme caution should be exercised when timing the finishing operation. For a smooth floor make successive passes with a smaller steel trowel and increased pressure. Repeated passes with a steel trowel will produce a smooth floor that will be slippery when wet. Excessive troweling may create dark "trowel burns." Improperly tilting the trowel will cause an undesirable "chatter" texture.
- 7. TEXTURE** the concrete surface as required after floating or troweling. For exterior concrete flatwork (sidewalks, patios or driveways) texture the concrete surface after the floating operation with a coarse or fine push-broom to give a non-slip surface. For interior flatwork texture the concrete surface after final troweling. Concrete can be finished with several decorative treatments, such as exposed aggregate, dry shake color, integral color, and stamped or patterned concrete. Decorative finishes need much more care and experience.
- 8. NEVER** sprinkle water or cement on concrete while finishing it. This may cause dusting or scaling.
- 9. CURE** the concrete as soon as all finishing is completed to provide proper conditions for cement hydration, which provides the required strength and durability to the concrete surface. In severe conditions slab protection may be needed even before finishing is complete. See CIP 11 for more information on curing concrete.
- 10. AVOID** concrete burns to skin by following proper safety practices.

References

- Concrete in Practice (CIP) Series*, National Ready Mixed Concrete Association, Silver Spring, Maryland. www.nrmca.org
- Guide for Concrete Floor and Slab Construction*, ACI 302.1R, American Concrete Institute, Farmington Hills, MI. www.concrete.org.
- Slabs on Grade, ACI Concrete Craftsman Series, CCS-1*, American Concrete Institute, Farmington Hills, MI.
- Cement Mason's Guide*, PA122, Portland Cement Association, Skokie, IL. www.cement.org.
- Residential Concrete*, National Association of Home Builders, Washington, D.C.
- Sealing Effects of Finishing Tools*, Bruce Suprenant, Concrete Construction, September 1999. www.concreteconstruction.net.
- Finishing Tool Primer*, Kim Basham, Concrete Construction, July 2000.

Follow These Rules to Finish Concrete

1. Place and move concrete to its final location using procedures that avoid segregation.
2. Strike off and obtain an initial level surface without sealing the surface.
3. Wait until the bleed water disappears from the surface before starting finishing operations.
4. Use the appropriate surface texture as required for the application.
5. Avoid steel troweling air-entrained concrete.
6. Cure the concrete to ensure it achieves the desired strength and durability.

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