



**SECTION 03 35 00**  
**CONCRETE FINISHING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. CONTRACTOR shall supply all labor, tools, equipment, and materials to finish properly placed concrete for structures.

1.02 RELATED SECTIONS

- A. The following is a list of SPECIFICATIONS which may be related to this section:
  - 1. Section 03 11 00, Concrete Forming.
  - 2. Section 03 31 00, Structural Concrete.
  - 3. Section 03 60 00, Grouting.
  - 4. Section 32 16 00, Sidewalks, Curbs, and Gutters.

1.03 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. American Concrete Institute (ACI):
    - a. 116, Cement and Concrete Terminology.
    - b. 121, Quality Assurance Systems for Concrete Construction.
    - c. SP-15, ACI 301 Field Reference Manual.
    - d. 309, Identification and Control of Consolidation-Related Surface Defects in Formed Concrete.
    - e. 311, Guide for Inspection of Concrete.
  - 2. ASTM International (ASTM):
    - a. C33, Standard Specification for Concrete Aggregates.
    - b. C150, Standard Specification for Portland Cement.
  - 3. U.S. Department of Interior—Bureau of Reclamation (USBR):
    - a. M-47, Standard Specifications for Repair of Concrete.

1.04 SUBMITTALS

- A. Provide product data on the following:



1. Grout.
2. Bonding agent.
3. Method of repairing defects, unless otherwise called out herein.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver the materials to the PROJECT site in the manufacturer's containers with all labels intact and legible at the time of use. Materials shall be stored in a secure, indoor, dry area. Maintain grouts and aggregates in a dry condition during delivery, storage, and handling.

### **PART 2 PRODUCTS**

#### 2.01 MATERIALS

- A. Premixed Pre-Packaged Grout:
  1. Master Builders; EMACO R320.
  2. Master Builders; EMACO S66-CR.
- B. Epoxy Bonding Agent:
  1. Master Builders; Concsive Liquid (LPL).
  2. Master Builders; Concsive Standard Liquid.
- C. Cement:
  1. ASTM C150, Type to match original concrete surface.
- D. Aggregate:
  1. ASTM C33, one hundred percent (100%) passing the No. 30 mesh sieve.
- E. Bond Coat Mortar:
  1. Mortar used to bond patching mortar shall be made of the same materials and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of one (1) part cement to not more than one (1) part sand by damp loose volume.
- F. Patching Mortar:
  1. Patching mixture shall be made of the same materials and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of one (1) part cement to not more than two and one-half (2-1/2) parts sand by damp loose volume. White Portland cement shall be substituted for a part of the gray Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be



mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that shall permit placing.

G. Water:

1. Only clean potable water shall be used. A calibrated measuring device is required for measuring the proper amount of water to be added to pre-packaged grouts and mortars.

**PART 3 EXECUTION**

3.01 PREPARATION

A. The means and methods of repair of improperly placed or finished concrete shall be reviewed by ENGINEER prior to performing the WORK. Regardless of prior approval of the means and methods of concrete finish repair, no concrete finish shall be repaired until ENGINEER has reviewed the existing finish. This includes defects caused by ineffective and improper vibration such as honeycomb, excessive air voids on formed surfaces, placement “pour” lines (cold joints), and sand streaking. It also includes defects caused by excessive form deflections, form damage, or form failure.

B. Repair of Surface Defects:

1. Surface defects, unless otherwise specified by the CONTRACT DOCUMENTS, shall be repaired immediately after form removal, but not before review by ENGINEER. The surface temperature of the concrete shall be fifty degrees Fahrenheit (50°F) and rising. CONTRACTOR shall measure surface temperatures when requested by ENGINEER. If necessary, CONTRACTOR shall enclose and heat the area to be repaired to bring the surface temperature of the concrete and air temperature to acceptable levels, and to permit proper curing.
2. All honeycombed and other defective concrete shall be removed down to sound concrete. If chipping is necessary, the edges shall be perpendicular to the surface or slightly undercut. Feathered edges shall not be permitted. The area to be patched and an area at least six (6) inches wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared, mixed to the consistency of thick cream, and after surface water has evaporated from the area to be patched, well brushed into the surface.
3. When the bond coat begins to lose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least one (1) hour before being finally finished. The patched area shall be kept damp for seven (7) days. Metal tools shall not be used in finishing a patch in a formed wall that shall be exposed.

C. Alternative Surface Defect Repairs:



1. Certain types of defects may require the use proprietary compounds for adhesion or as patching ingredients. ENGINEER shall review these defects and request means and methods for these repairs from CONTRACTOR.
2. In lieu of, or in addition to, the foregoing patching procedures using bond coat and patching mortars, epoxy bonding agents and premixed pre-packaged grouts may be used for repair of defective areas. Such compounds shall be used in accordance with the manufacturer's written recommendations and directions. ENGINEER shall review and provide written acceptance of these procedures.

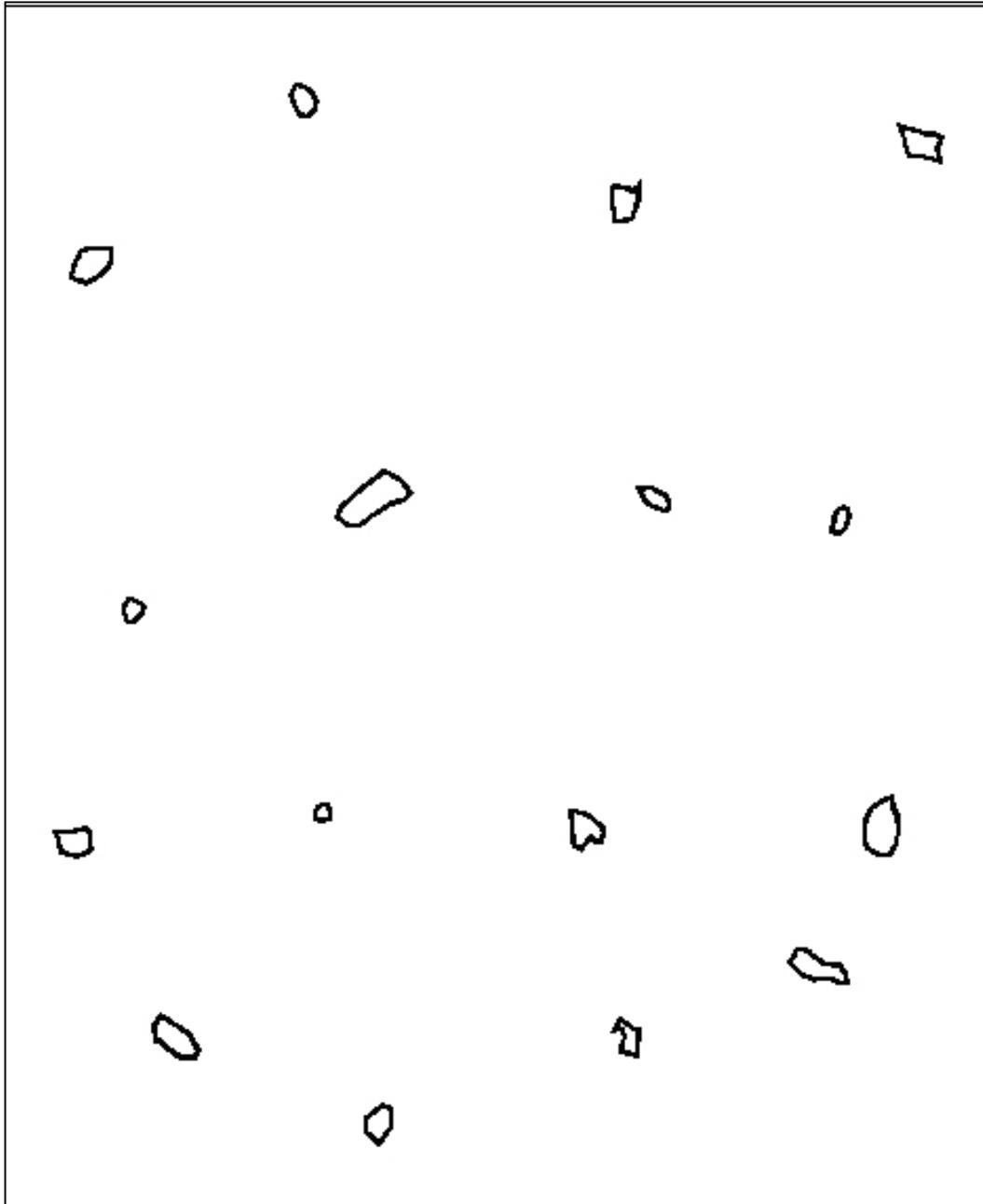
### 3.02 APPLICATION

#### A. Tie Holes:

1. Unless otherwise called out in the DRAWINGS tie holes shall be finished as specified herein.
2. Water Retaining Structures and Below grade Vaults with Breakback Cone Ties: Fill tie holes solid as specified in Section 03 60 00, Grouting.
3. Other Structures: After being cleaned and thoroughly dampened, fill tie holes solid as specified in Section 03 60 00, Grouting.

#### B. Finishing of Formed Surfaces:

1. Finishes shall be performed as called out on the DRAWINGS and in referenced SPECIFICATIONS.
2. Smooth Form Finish: The form facing material shall produce a smooth, hard, uniform texture on the concrete. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. Surface textures that result from forms with raised grain, torn surfaces, worn edges, patches, dents, or other defects shall be ground smooth or otherwise repaired.
  - a. Air Voids on Formed Surfaces: Air voids on formed surfaces deeper than one-quarter ( $\frac{1}{4}$ ) inch shall be filled with patching mortar. The frequency and size of air voids shall be equal to or better than shown in Figure 1. The total void area is one percent (1%) of the surface area, or thirty-six hundredths (0.36) square inches. This six-inch (6") by six-inch (6") figure shall be the visual standard for acceptance of the finish that does not require filling of air voids.



**FIGURE 1**

- b. Tie Holes: Tie holes shall be filled as specified in Section 03 60 00, Grouting.
  - c. Form Fins: Chip or rub off form fins exceeding one-sixteenth (1/16) inch in height.
  - d. Rock Pockets: Poorly consolidated concrete shall be removed to sound concrete and the defect repaired. ENGINEER shall outline the area to be repaired.
3. As-Cast Finish: For as-cast concrete finish form materials shall produced a sound surface.



- a. Air Voids: Fill air voids deeper than one-quarter ( $1/4$ ) inch and larger than one-half ( $1/2$ ) square inch. The total area of acceptable air voids is seventy-two hundredths (0.72) square inch in a six-inch (6") by six-inch (6") square.
  - b. Tie Holes: Tie holes shall be filled as specified in Section 03 60 00, Grouting.
  - c. Form Fins: Chip or rub off form fins exceeding one-eighth ( $1/8$ ) inch in height.
4. Rubbed Finish: Immediately after removing the forms, form ties shall be broken back a minimum of three-quarters ( $3/4$ ) inch from the surface, honeycomb, voids, and other surface defects grouted. The surfaces shall then be thoroughly dampened and rubbed with a No. 16 carborundum stone or equal abrasive to create a uniform surface paste. The rubbing shall be continued to remove all form marks and surface irregularities producing a smooth, dense surface. After setting, the surface shall then be rubbed with a No. 30 carborundum stone until the surface is smooth in texture and uniform in color. Unless otherwise shown in the DRAWINGS only exposed surfaces shall have a rubbed finish.
  5. Grout Finish: Prepare surface as described in "Rubbed Finishes" above. Mix one (1) part Portland cement and one-half ( $1/2$ ) part fine sand with sufficient water to produce a grout with the consistency of thick paint. Wet surface of concrete to prevent absorption of water from grout, and apply grout uniformly with brushes. Immediately after applying grout mix, scrub the surface with a cork float or stone to coat surface and fill remaining air voids and other remaining surface defects. Remove excess grout by working the surface with rubber float. After the surface whitens from drying, rub with clean burlap. Cure surface for a period of seventy two (72) hours.
- C. Finishing of Unformed Surfaces: Unless otherwise shown on the DRAWINGS unformed surfaces shall be finished as follows:
1. Slabs: Screed with straightedge to remove low and high spots bringing the surface to the required finish elevation of slope and float with a steel float at least three (3) feet in width. When the concrete has reached its initial set, finish with a steel trowel. Use a steel power trowel for large areas. Leave finish essentially free of trowel marks, uniform in texture and appearance and plane to the correct tolerance. Dusting the surface with dry cement, sand, or sprinkling with water is prohibited.
  2. No wetting of concrete surfaces during slab finishing operations shall be permitted. Further, no concrete finishing operation shall be permitted while there is water on the surface of slabs and other flatwork.
  3. Finishes that are exposed and subject to foot traffic shall receive a broom finish with a texture of plus or minus one-sixteenth ( $\pm 1/16$ ) inch or as designated on the DRAWINGS.
  4. Tops of Walls with Bearings: Strike smooth tops of walls and similar unformed surfaces that shall have bearings or bearing pads, and finish with a steel trowel.



5. Stairways and Sidewalks: Strike smooth tops of stairs and sidewalks and finish with a light broom providing a texture of plus or minus one-sixteenth ( $\pm 1/16$ ) inch.
6. Slabs with Waterproofing Membranes: Strike smooth and float finish.
7. Construction Joint Surfaces: Surface shall be broom or raked finished. Surface shall be water or grit blasted prior to placing additional concrete, such as columns on column footings and column footings on reservoir slabs.

**END OF SECTION**



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