



SECTION [03300] [03360]

[INTEGRALLY COLORED ARCHITECTURAL CAST-IN-PLACE CONCRETE]
[INTEGRALLY COLORED CONCRETE FINISHES]

Davis Colors add color to the design of concrete floors, buildings, and structures. Integral colors are economical to use because they are mixed right into the concrete and require little additional labor to finish. In addition, integral colors are permanent and do not require periodic refinishing as can coatings and applied finishes. Davis Colors are made with pure, concentrated pigments specially milled for mixing into concrete. They are light fast, alkali-resistant, weather-resistant, and formulated to give long-lasting appeal to concrete. In general, integrally colored concrete is produced the same way as high-quality uncolored concrete.

This document suggests specification provisions which pertain to coloring concrete. INCORPORATE INFORMATION FROM THIS GUIDE SPECIFICATION INTO A COMPLETE MASTER SPECIFICATION FOR CAST-IN-PLACE CONCRETE. Then edit to meet project requirements. Prepare specification in accordance with ACI recommendations and other applicable industry guidelines. Show locations of colored concrete on Drawings or in Schedules.

This document is available in word processing format on Sweet's CD and from Davis Colors via the Internet. For product literature or technical assistance about color additives, contact Davis Colors at:

- Toll Free: 800-356-4848
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Internet: www.daviscolors.com.

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Integrally colored cast-in-place concrete.

Davis Colors can also be specified in other specification sections. Include the paragraph below if you wish to coordinate cast-in-place concrete colors with colors specified in other sections. Note, however, that an exact color match of cast-in-place concrete and work specified in other sections may not be practical because of the differences in the various manufacturing and construction processes; make final color approvals on the basis of mock-ups.

Guide specifications for other types of colored concrete work are also available from Davis Colors.



- B. Related Sections:
 - 1. Section [02750 - Cement Concrete Paving]: Coordination of sample submittal [and color selection].
 - 2. Section [02780 - Concrete Unit Pavers]: Coordination of sample submittal [and color selection].
 - 3. Section [03400 - Precast Concrete]: Coordination of sample submittal [and color selection].
 - 4. Section [04200 - Masonry Units]: Coordination of sample submittal [and color selection] for [concrete masonry units] [and] [colored mortar].
 - 5. Section [07320 - Concrete Roofing Tiles]: Color coordination.
 - 6. Section [07900 - Joint Sealers]: Colored sealants for joints.

1.02 REFERENCES

Edit references to include standards used in Project Specifications. For a copy of ASTM C979, contact Davis Colors or visit www.daviscolors.com/literature. Other useful publications about colored concrete include:

- ACI 303 - Cast-In-Place Architectural Concrete Practice.
- PCA PA124 - Finishing Concrete Slabs with Color and Texture.
- PCA SP021 - Color and Texture in Architectural Concrete.

- A. American Concrete Institute:
 - 1. ACI 301 - Structural Concrete for Buildings.
 - 2. ACI 305 - Hot Weather Concreting.
 - 3. ACI 306 - Cold Weather Concreting.
- B. American Society for Testing and Materials:
 - 1. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
 - 2. ASTM C979 - Pigments for Integrally Colored Concrete.

1.03 SUBMITTALS

- A. Submit product data and manufacturer's instructions for:
 - 1. Color additives.
 - 2. Curing compounds.
 - 3. Form facing materials.
 - 4. Form release agents.
 - 5. Proprietary cleaning agents.
 - 6. Surface retarders.
 - 7. [_____].]
- B. Samples:



- 1. Samples for Color Selection: Submit color additive manufacturer's [color chart] [sample chip set]; indicate color additive number and required dosage rate. Samples indicate general color and may vary from concrete finished in field according to Specifications.

If color selection has not been made at time specification is issued, include above. If color selection is specified, include below.

- 2. Samples for Color Verification:
 - a. Submit sample chip[s] of specified color[s] indicating color additive number[s] and required dosage rate[s]. Samples indicate general color and may vary from concrete finished in field according to Specifications.
 - b. [Submit samples of [sand,] [select aggregate,] [and] [_____].]

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, Section 6 - Architectural Concrete.
- B. Conform to ACI 305 during hot weather.
- C. Conform to ACI 306 during cold weather.
- D. Obtain each material from same source and maintain high degree of consistency in workmanship throughout Project.
- E. Installer Qualifications: Concrete work shall be by firm with [five] [_____] years experience with work of similar scope and quality.

Sample submittals provide only a general indication of color; color of completed work will differ. Specify a mock-up to demonstrate that proposed materials and workmanship produce acceptable concrete appearance.

- F. Colored Concrete Mock-Up:
 - 1. Provide full-scale mock-up under provisions of Section [01400.] [_____]. Construct at least one month before start of other concrete work to allow concrete to cure before observation.
 - 2. [At location on Project selected by [Architect] [_____], demonstrate methods of obtaining consistent visual appearance, including each forming and finishing condition required on Project using



materials, workmanship, joint treatment, form ties, curing method, and patching techniques to be used throughout Project.

- 3. Retain samples of cements, sands, aggregates, and color additives used in mock-up for comparison with materials used in remaining Work.
4. Accepted mock-up provides visual standard for work of Section.
5. [Mock-up may remain as part of Work.] [Remove when no longer required for comparison with finished work.]

Specify preconstruction conference if job is complex.

- G. Preconstruction Conference:
1. Comply with Section [01200] [_____].
2. Review procedures required to produce specified results.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Color Additives: Comply with manufacturer's instructions. Deliver color additives to job site or batch plant in original, unopened packaging. Store in dry conditions.

1.06 PROJECT CONDITIONS

- A. Schedule delivery of concrete to provide consistent mix times from batching until discharge.

PART 2 PRODUCTS

In general, integrally colored concrete can be specified with the same materials used in high-quality uncolored concrete.

2.01 CONCRETE MATERIALS

- A. Colored Additives for Integrally Colored Concrete:
1. Manufacturer:
a. Davis Colors manufactured by Davis Colors; phone 800-356-4848, internet www.daviscolors.com, or e-mail info@daviscolors.com.
b. Substitutions: [Comply with [Instructions to Bidders] [Section 01600] [_____]] for substitution request procedures.] [Not allowed.]
2. Materials:



- a. Colored additives shall contain pure, concentrated mineral pigments specially processed for mixing into concrete and complying with ASTM C979.

Unlike all other Davis Colors, Supra-Instant Black #8084 and #807 are specially treated carbon blacks. While highest in coloring power and the most economical to install, #8084 and #807 can gradually fade if concrete is not sealed against water penetration. They are also incompatible with most air-entraining admixtures. Do not use carbon black at exterior or wet locations. Where carbon black is not acceptable, black iron oxide pigments should be used to create black or gray concrete.

- b. Color additives containing carbon black [are] [are not] acceptable.

Concrete suppliers use Mix-Ready® disintegrating bags or the Chameleon™ bulk handling system to add color to concrete. Mix-Ready® bags are tossed into the mix without opening or pouring. They disintegrate under mixing action, releasing pigments to disperse uniformly, leaving no bags to throw away in the environment. The Chameleon™ is a computer-controlled automatic color dosing system used by Ready Mix operators to improve color accuracy, availability and handling efficiency.

- 3. Packaging: If color additives are to be added to mix at site, furnish color additives in premeasured Mix-Ready® disintegrating bags to minimize job site waste.

An exposed aggregate finish may require aggregate selected for color or appearance..

B. Select Aggregate: [_____.]

C. Admixtures: Do not use calcium chloride admixtures.

2.02 FORMS

Porous materials like lumber or unfaced plywood can absorb moisture from fresh concrete, causing uneven curing and colors. Decorative form liners provide textured or patterned relief on the concrete surface and increase the design possibilities with colored concrete. Leakage through joints changes the water-to-cement ratio near the joint, leading to a change in color.

A. Form Facing Material:

- 1. Provide non-porous surface such as steel, plastic, or high-density overlaid plywood with watertight joint seals to prevent leakage.
- 2. [Decorative Form Liners: [_____].]]



Conventional metal form ties can rust if not properly recessed and plugged. Colored fiberglass ties blend with concrete when ground flush to surface and do not rust.

B. Form Ties: Fiberglass rods tinted to match concrete.

Specify a form release agent that is non-staining and minimizes formation of "bug-holes" in surface of concrete.

C. Form Release: [_____].]

2.03 ACCESSORIES

Use only curing compounds specifically recommended for use with colored concrete. W-1000 Clear Cure & Seal allows the natural appearance of concrete to show. Color Seal II covers concrete with a thin colored coating, creating a more uniform appearance.

A. Curing Compound for Colored Concrete: Curing compound shall comply with ASTM C309 and be approved by color additive manufacturer for use with colored concrete. Provide [W-1000 Clear Cure & Seal] [Color Seal II tinted to match colored concrete and] manufactured by **Davis Colors**.

Surface retarder can be used with exposed-aggregate finishes.

B. Surface Retarder: [_____].]

C. Sealants: Joint sealers shall be [type specified in Section 07900.] [_____].] Provide in color to match colored concrete.

Use corrosion-resistant chairs and supports to prevent rust stain on face of concrete.

D. Supports for Reinforcing Bars: Use corrosion-resistant types at locations in contact with exposed surfaces.

E. Cleaning Agents: Use products known to be compatible with colored concrete.

2.04 MIXES



A 4" slump is recommended. If greater workability is required, redesign mix to use water-reducing or super-plasticizing admixture instead of adding water. Variations in water-cement ratio affect final appearance of concrete. Low water-cement ratio promotes richer, darker concrete colors.

- A. Color Additives: Mix in accordance with manufacturer's instructions. Mix until color additives are uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.
- B. Do not retemper mix by adding water in field.

2.05 CONCRETE COLORS

Select one of the following three paragraphs. The first specifies the materials to be used. The second uses an existing item of colored concrete as a standard. The third allows colors to be selected from the Davis Color Selector. The Davis Color Selector groups colors into three categories to allow more accurate cost estimating and bidding.

Typical color additive dosage rates range from 1 to 5 percent. Color of cement, sand, and aggregates also affect final appearance of colored concrete.

- A. Concrete Color[s]:
 - 1. Cement: Color shall be [gray] [white].
 - 2. Sand: Color shall be [locally available natural sand.] [Manufactured white sand.] [Match sample in [Architect's] [_____] office.]
 - 3. Aggregate: [Concrete producer's standard aggregate complying with specifications.] [_____].
 - 4. Color Additives: [_____] percent dosage rate of Davis Colors color additive No. [_____]. Dosage rate shall be based on weight of portland cement, fly ash, silica fume, lime and other cementitious materials but not aggregate or sand.
- B. Concrete Color[s]: [Provide cement, sand, aggregate and color additive as required to match [existing building] [sample in [Architect's] [_____] office.] [_____].]
- C. Concrete Color[s]: Match colors selected by [Architect] [_____] from color additive manufacturer's [subtle] [standard] [and] [premium] color line[s]. [Allow for up to [two] [_____] colors on Project.]



- D. Dosage rate of color additive shall not exceed 10 percent of weight of cementitious materials in mix.

PART 3 EXECUTION

3.01 FINISHES ON FORMED SURFACES

 See ACI 301 and PCA *Color and Texture in Architectural Concrete* for more information about formed finishes.

- A. Provide the following finishes in accordance with ACI 301:
 1. As-cast, rough form finish.
 2. As-cast, smooth form finish, smooth rubbed.

 The finishes below will have more uniform color than as-cast finishes.

3. Textured form liner finish.
4. Exposed aggregate, [scrubbed] [blasted] [tooled] finish [with select aggregate]. [Allow concrete to cure to sufficient strength that it will not be damaged by [blasting] [tooling] and not less than seven days.]
5. Sandblasted: Allow concrete to cure to sufficient strength that it will not be damaged by blasting and not less than seven days.

 Removing forms when concrete is at various ages can result in color variations due to differences in drying and curing.

- B. Stripping: Leave forms in place as long as practical. Remove forms when concrete has reached a consistent age to maintain uniformity of curing conditions throughout Project.

3.02 FLOOR FINISHES

 The following paragraphs describe just two of many possible finishes with integrally colored concrete. *Finishing Concrete Slabs with Color and Texture* published by Portland Cement Association is a useful guide and includes photographs of these and other finishes. Brooming provides an attractive, slip-resistant surface. Applying broomed finish to floated concrete saves the extra step of troweling and can produce a more uniformly colored surface. The smooth, dense surface produced by troweling may not provide adequate slip resistance outdoors or in wet areas. Over-troweling or starting troweling late may produce discolored burns or dark spots.



- A. Broomed: Pull broom across freshly [floated] [troweled] concrete to produce [fine] [medium] [coarse] texture in [straight] [wavy] lines perpendicular to main line of traffic. Do not dampen brooms.
- C. Trowel: Use steel trowel to produce smooth dense surface. Do not over-trowel or start troweling late.

3.03 PATCHING

- A. Fill holes and defects in concrete surface within 48 hours of form removal.
- B. Use the same patching materials and techniques that were approved on mock-up.
- C. Make patches with a stiff mortar made with materials from the same sources as the concrete. Adjust mortar mix proportions so dry patch matches dry adjacent concrete. Add white cement to mortar mix if necessary to lighten it. [With exposed aggregate finishes, add aggregate to mortar mix so patches will have the same texture and appearance as adjacent concrete.]

3.04 CURING

- A. Maintain concrete between 65° and 85°F (18° to 29°C) during curing.

 Curing with an approved curing compound is recommended whenever possible. Curing with steam or water can change the water-cement ratio of the concrete, causing a change in the concrete's color. Curing with plastic sheets or non-approved compounds can also discolor concrete.

- B. Colored Concrete: Apply curing compound in accordance with manufacturer's instructions. Apply curing compound at consistent time for each pour to maintain close color consistency.

3.05 TOLERANCES

 As with any natural material, some variation in appearance is a normal design feature of concrete, whether colored or not. It is normal for the color of concrete to lighten as it cures; allow up to 28 days for process to occur.



- A. Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of uncolored concrete, are acceptable.

3.06 CLEANING

Efflorescence occurs when soluble salts in concrete are carried to the surface where they are deposited by evaporation. Since the powdery efflorescence deposits are white, they are more visible on dark colored concrete than on light, uncolored concrete. If not removed while still fresh, efflorescence converts to calcium carbonate deposits which are permanent.

- A. Efflorescence: Remove efflorescence [as soon as practical after it appears] [as part of final cleaning of building].
- B. Use least aggressive cleaning techniques possible
- C. Wear protective eye wear, gloves, and clothing suitable to work and as required by cleaner manufacturer.
- D. If proprietary cleaning agents are used, pre-wet wall, test cleaning agent on a small, inconspicuous area, and check effects prior to proceeding. Begin cleaning at the top and work down. Thoroughly rinse wall afterwards with clean water. Follow cleaner manufacturer's instructions.
- E. Do not use muriatic (hydrochloric) acid on colored concrete.

3.07 SCHEDULE

If locations of colored concrete are not shown on Drawings, include schedule here. Examples are given below.

| LOCATION | COLOR ADDITIVE | DOSAGE | FINISH |
|-----------------|-------------------|--------|--------------|
| Lobby Floor | 61078 | 5% | Troweled. |
| Retaining Walls | 160 | 1% | Sandblasted. |
| Exterior Walls | 160 | 4% | Sandblasted. |
| Accent Wall | 160 | 4% | Form liner. |

END OF SECTION

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