



GUIDE SPECIFICATION
SECTION 02750 092760 (3360)
INTEGRALLY COLORED CONCRETE

This guide specification is for a qualified concrete contractor, and may be used by both architects and engineers for reference in specifications. It is not to be used as a project specification without appropriate modifications.

Contractors should be certified through ACI flatwork finisher program or local union programs.

SUMMARY

1. Drawings and general provisions of Contract, which would include General and Supplementary conditions and Division I Specification sections.
2. Section includes:
 - A. Integrally colored concrete (slabs-on-grade, sidewalks, driveways, patios, roads, parking lots, and other exterior concrete pavements)
 - B. Stamping & texturing of concrete
 - C. Curing of integrally colored and/or stamped concrete

SUBMITTALS

- Product Data: Submit manufacturer's complete technical data sheets for the following:
 1. Colored admixture
 2. Curing compound & sealing
 - Design Mixes: for each type of integrally colored concrete
 - Samples for Initial Selections: manufacturer's color charges showing a full range of colors available
 - Qualification data: For firms indication in Quality Assurance Article, including list of complete projects

QUALITY ASSURANCE

1. Manufacturer Qualifications: Manufacturer with 10-years experience in production of specified products
2. Installer Qualifications: An installer with () years experience with work of similar scope and quality
3. Consider contractors with ACI flatwork certification (640 & 601-D)
4. Comply with the requirements of ACI 310
5. Obtain each specified material from same source and maintain high degree of consistence in workmanship throughout Project

6. Notification of manufacturer's authorized representative shall be given at least 1 week before start of work
7. Hold pre-job meeting to review details contractor should provide a check list
8. Provide job site field testing by ACI certified personal
9. Specify water to cement ratios

Color charts and small sample submittals provide only a general indication of color: color and appearance of completed work may differ. On large or critical projects, specify a mockup or field sample to demonstrate that proposed materials and workmanship produce acceptable concrete appearance.

Integrally Colored Concrete (Mockups/Field Samples)

- Provide under provisions of Division I Section (Quality Control)_____
- At location on Project selected by Architect, Landscape Architect, or Engineer_____ place and finish. Example: 10 feet by 10 feet,___ area
- For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic yards (or not less than 1/3 the capacity of the mixing drum on the ready mix truck) and should always be in full cubic yard increments. Excess material should be discarded according to local regulations.
- Construct (mockup/sample panel) using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in sample panels. (Mockup/Field sample) shall be produced by the individual workers who will perform the work for the project.
- Retain samples of cements, sands, aggregates and color additives used in mockup for comparison with materials used in remaining work.
- Accepted (mockup/field sample) provides visual standard for work of Section.
- (Mockup/Field sample) shall remain through completion of the work for use as a quality standard for finished work.
- Provide 2 mockups when possible one can then be used if any repairs are needed, mock-up workers and job site workers should be the same whenever possible.
- Remove (mockup/field sample) when directed.
- If allowable take Field Grade I samples at mock-up

DELIVERY, STORAGE AND HANDLING

- Colored admixture: Comply with manufacturer's instructions. Deliver colored admixtures in original, unopened packaging. Store in dry conditions.
- Avoid freezing temperatures

Reference ACI 304 Measuring, Mixing, Transportation & Placement

PROJECT CONDITIONS

- Integrally Colored Concrete Environmental Requirement:
 1. Schedule placement of concrete to minimize exposure to wind and hot sun before curing materials is applied.

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2. Consider use of evaporation retardants in adverse weather.
3. Avoid placing concrete if rain, snow, or frost is forecast within 24 hours. Protect fresh concrete from moisture and freezing.
4. Pour colored concrete on well compacted firm sub bases-be sure these are well drained.
5. Never pour on frozen subgrade (keeping subgrade temperatures and concrete temperatures within 25 F of each other will give better results.
6. Comply with professional practices described in ACI 305R and ACI 306R.
 - Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturer's written recommendation.

PRE-JOB CONFERENCE

- At least one week prior to placement of integrally colored concrete, a meeting shall be held to discuss the Project and application methods.

It is suggested that the

Architect_____

Landscape Architect_____

Engineer_____

General Contractor_____

Construction Manager_____

Subcontractor_____

Ready Mix Representative_____ be present.

PART 2- PRODUCTS

- Acceptable Manufacturer, ChemSystems, 10101 Genard Road, Houston TX, 77041 1-800-545-9827 or the appropriate local contact, Decorative Concrete Supply, Shawnee, Kansas 913-422-4443.

MATERIALS

- Colored Admixture for Integrally Colored Concrete: ChemSystems
 1. No calcium chloride with coloring agents that are lime proof and UV resistant. Non-chloride admixtures may be considered BEFORE job begins.
 2. Colored admixture shall conform to the requirements of ACI 310, ACI 303.1, ASTM C979, ASTM C494, and AASHTO M194.
- Curing Compound for Integrally Colored Concrete:
 1. Curing compound shall comply with ASTM C309 and some may contain colors.
 2. Curing Compounds meeting ASTM C 1315 may also be used and a 2nd coat applied after 30 days of air dry time (this ASTM is for curing compounds having special properties).
 - Select a curing compound that has a proven record with colored concrete.

2. Substitutions: The use of products other than those specified will be considered providing that the Contractor requests its use in writing within 14 days prior to bid date. This request shall be accompanied by the following:
- A Certificate of compliance from the material manufacturer stating that proposed products meet or exceed requirements of this Section, including standards ACI 310, ACI303.1, ASTM C979, ASTM C494 and AASHTO M194.
 - Documented proof that proposed materials have a 5 year proven record of performance for coloring concrete, confirmed at least 5 local projects that the Architects, Landscape Architects, and/or Engineer can examine.

COLORS AND PATTERNS

- A. Cement: Color shall be gray or white.
- B. Sand: Color shall be locally available, natural sand or manufactured white sand.
- C. Aggregate: Concrete producers standard aggregate complying with specifications.
- D. Colored Admixture: As selected by Architect, Landscape Architect, Engineer from ChemSystems Color Chart.

CONCRETE MIX DESIGN

- Minimum Cement Content: (6) _____ sacks per cubic yard of concrete.
- Slump of concrete shall be consistent throughout Project at 4 inches or less. At no time shall slump exceed 5 inches (If super plasticizers are allowed, slump shall not exceed 8 inches.
- Aggregates should be carefully selected for hardness, soundness, cleanliness and be free of any impurities.
- Do not add calcium chloride to mix as it causes mottling and surface discoloration.
- Supplemental admixtures shall not be used unless approved by manufacturer.
- Do not add water to the mix in the field.
- Add colored admixture to the mix according to manufacturer's written instructions in pre-measured bags, by weight of cement content.
- Use of fiber-mesh is recommended in these applications.
- Use of SCM such as fly-ash or slag should be addressed before placement begins no substitutions of SCM will be allowed after construction begins.

EXECUTION

Installation

- Install concrete according to requirements of Division 3 Section "Cast-In-Place Concrete"
 - Do not add water to the mix in the field (unless pre-planned).
 - Do not apply water to the concrete surface
 - Surfaces shall be finished uniformly with the following finish:
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- 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.
- Swirl: Float concrete. Work float flat on surface using pressure in swirling manner to produce series of uniform arcs and twists. Use aluminum or magnesium float to produce medium texture. Use wood float to provide coarse texture.
- Trowel: Precautions should be taken to ensure that surface is uniformly troweled so that it will not be slippery. Do not overtrowel or burnish surface.
- Rock Salt: Float, trowel, and broom concrete. Then sprinkle salt on concrete and press into surface leaving only tops of salt grains exposed. After 24 hours, wash salt away with water and brush. Allow surface and impressions to dry before applying curing compound.
- Sandblast: Allow concrete to cure to sufficient strength so that it will not be damaged by blasting but not less than seven days. Use light, medium, heavy sandblasting to remove cement mortar from surface and expose aggregate to match originally approved mockup, field sample.
- Exposed Aggregate: Finish concrete and apply chemical surface retarders according to manufacturer's written instructions. Wash surface to match originally approved mockup field sample. Apply curing compounds after washing and when surface is dry.
- Stamped/Imprinted: Apply pattern according to tool manufacturer's instructions. Touch-up pattern and finish edges with hand tools as necessary. Use stamps that are easy to fit and use "flex mats" along edges and walls for easier imprinting, carefully lift each stamp as you move.

CURING

1. Use curing and sealing compound for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques. Apply curing, curing and sealing compound at consistent time for each pour to maintain close color consistently. Always provide even applications of product.
2. Colored Curing Compound shall be same color as the colored concrete admixture.
3. Precautions shall be taken in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in CIP 5 Plastic Shrinkage Cracking published by the National Ready Mix Concrete Association.
4. Do not cover concrete with plastic sheeting.
5. Take care with any curing paper and provide mock-ups before concrete is placed curing papers should be preplanned
6. Never over apply cures. The use of a small rope with the approximate SF to check coverage is recommended.
7. Use experienced finishers to cure decorative concrete

Reference

ACI 305

ACI 306

ACI 308

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ACI 310

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.

- Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of uncolored concrete are acceptable.
 - Reference ACI 116 Terminology “concrete architectural--- concrete that will be permanently exposed to view and therefore requires special care in selection of the concrete materials, forming, placing, and finishing obtaining the desired architectural appearance.”
 - Final topical sealing of concrete will darken appearance.

APPLICATORS

For a list of qualified contractors, check job references, ACI certified flatwork finishers or contact your local:

ACI Chapter

Kansas City - Concrete Promotional Group of Kansas City

Missouri- Missouri concrete association & Concrete Promotional Group of the Ozarks

Kansas – Kansas Ready Mixed Concrete Association

MCIB Midwest Concrete Industry Board

ASCC Decorative Concrete Council

1.2 REFERENCES

Other useful publications about colored concrete include:

1. PCA PA124 – Finishing Concrete Slabs with Color and Texture
2. PCA SP021 – Color and Texture in Architectural Concrete
3. ASCC Guidelines for Colored Concrete
4. ACI 310 Guideline for Decorative Concrete

American Concrete Institute (ACI)

- ACI 301 “Specifications for Structural Concrete for Buildings”
- ACI 302IR “Recommended Practice for Concrete Floor and Slab Construction.
- ACI 303.1 Standard Specification for Cast-In-Place Architectural Concrete
- ACI 304 Recommended Practices for Measuring, Mixing, Transporting and Placing of Concrete.
- ACI 305R Recommended Practice for Hot Weather Concreting
- ACI 306R Recommended Practice for Cold Weather Concreting
- ACI 360 Design of slabs
- ACI E 703 Slabs on Ground

American Society for Testing and Materials (ASTM)

- ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete

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- ASTM C 1315
- ASTM C494 Standard Specification for Chemical Admixtures for Concrete
- ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete
- ASTM C 31 Standard test for making cylinders
- ASTM C 231 Standard test for air content/pressure
- ASTM C 143 Standard test for slump of concrete
- ASTM C 1064 Standard test for temperature of concrete
- ASTM C 138 Standard test for unit weight

American Association of State Highway and Transportation Officials (AASHTO)

- AASHTO M194 Chemical Admixtures