

GUIDE SPECIFICATION
SECTION 02750 092760) (3360)
INTEGRALLY COLORED CONCRETE

(STAMPED/IMPRINTED CONCRETE PAVEMENT)

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.

Notes for review by the contractor are put into brackets for items needing specific details. \ (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.
3. Related Sections:
 - A. Division 3 Section “Cast-in-Place Concrete” for general applications of concrete and coordination of sample submittal (and color selections)
 - B. Division 7 Section “Joint Sealants” for colored sealants for joints.

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
- 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

SUBMITTALS

- Product Data: Submit manufacturer’s complete technical data sheets for the following:
 1. Colored admixture
 2. Powder antiquing release agent
 3. Stamping/imprinting tools
 4. Curing compound & sealing (if needed)
- 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 301.
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_____, Engineer_____place and finish. Example: 10 feet by 10 feet, (3 by 3 m) (4 by 4 feet, (1.2 by 1.2 m)_____ 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 when ever 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.
 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 subbases, 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 Concrete Representative _____ and a manufacturer's representative _____ be present.

PART 2- PRODUCTS

- Acceptable Manufacturer, Prism Pigments St Paul, Minnesota 888 440 4250 or the appropriate local contact, Decorative Concrete Supply, Shawnee, Kansas 877-924-4443.

MATERIALS

- Colored Admixture for Integrally Colored Concrete: Prism Pigments
 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 303.1, ASTM C979, ASTM C494, and AASHTO M194.
 3. Refer to SRI chart if necessary (Solar Reflective Index)
- Stamping/Imprinting Tools and Materials. Matcrete Precision Stamped Concrete Tools.
- Powder Antiquing Release Agent: Matcrete DUSTONE Release Agents.
 1. Powder Antiquing release agent shall be compatible with integral color additives.
 2. Liquid release Matcrete Liquid Release agent
- 1. Curing Compound for Integrally Colored Concrete: 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 property's)

- Exterior Integrally Colored Concrete:

Use to cure exterior flatwork that will be allowed to cure naturally with only occasional maintenance.

- Interior Integrally Colored Concrete:
- Use air-entraining admixtures in all freeze-thaw areas

Use to cure interior flatwork that will receive regular maintenance.

Select a curing compound that has a proven record with colored concrete

3. Curing and sealing Compound:
4. 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 303.1, ASTM C979, ASTM C494 and AASHTO M194. ACI 310
 - Documented proof that proposed materials have a 5 year proven record of performance for coloring concrete , confirmed at least 5 local projects that Architects _____Landscape Architects _____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. Match Architect's Landscape Architect's and Engineer's sample.
 - C. Aggregate: Concrete producers standard aggregate complying with specifications_____
 - D. Colored Admixture: As selected by Architect_____Landscape Architect_____Engineer from Prism Color Chart.
 - E. Stamping Patterns from Matcrete as selected by Architect, Landscape Architect, and Engineer from Matcrete pattern sheets.
 - F. Powder Antiquing Release Agent: As selected by Architect, Landscape Architect, Engineer from Matcrete's Dustone standard colors.----
- Concrete Colors: Provide cement, sand, aggregate and colored admixture as required to match (existing building)_____Architect's_____Landscape Architect_____Engineer's_____sammple_____
 - Curing Compound: Clear non yellowing

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 impurity's
- 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:

- A. Surfaces shall be finished uniformly with the following finish:
- 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 over-trowel 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

- A. Integrally Colored Concrete: Apply curing. 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
- B. Curing compound
(With colored dyes) shall be same color as the colored concrete admixture.
- C. 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.

- D. Do not cover concrete with plastic sheeting.
- E. Take care with any curing paper and provide mock-ups before concrete is placed curing papers should be pre-planned
- F. Never over apply cures (use of a small rope with the approximate SF to check coverage)
- G. Use experienced finishers to cure decorative concrete

Reference

ACI 305

ACI 306

ACI 308

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) “note pre-job conference

F/N final sealing of concrete will darken its 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

F/N

ACI has committees 601-D this committee works with 640 craftsman certification to institute a certification program for decorative concrete contractors

ACI also has committee 310 which is a guideline for decorative concrete