

**SP-090167
(New)**



**SPECIAL PROVISIONS
FOR
COLORED CONCRETE FINISHING**

**Woodbury County
IM-029-6(42)149--13-97**

**Effective Date
December 20, 2011**

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

PART 1 - GENERAL REQUIREMENTS

1.1 DESCRIPTION

- A. This work includes the finishing and construction of colored concrete pavement to the lines and grades shown on the plan including layout, subgrade preparation, forming, steel reinforcement, dry-shake colored hardener, integral colored concrete with pattern finish, color curing and sealing agents, expansion joint material, color joint sealer, and all other incidental materials. The work shall include all labor, materials, equipment, and transportation required to install colored and tooled PCC pavement.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301 "Specification for Structural Concrete for Buildings".
 - 2. ACI 302 IR "Recommended Practice for Concrete Floor and Slab Construction".
 - 3. ACI 303.1 "Standard Specification for Cast-In-Place Architectural Concrete".
 - 4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete".
 - 5. ACI 305R "Recommended Practice for Hot Weather Concreting".
 - 6. ACI 306R "Recommended Practice for Cold Weather Concreting".
- B. American Society of Testing and Materials (ASTM):
 - 1. ASTM C309 "Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete".
 - 2. ASTM C494 "Standard Specification for Chemical Admixtures for Concrete".
 - 3. ASTM C979 "Standard Specification for Pigments for Integrally Colored Concrete".
- C. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M194 "Chemical Admixtures".
- D. Iowa Department of Transportation (IowaDOT) Standard Specifications for Highway and Bridge Construction, current edition:
 - 1. Article 2301.04 "Portland Cement Concrete Pavement".
- E. National Ready Mixed Concrete Association (NRMCA)
 - 1. CIP 5 "Plastic Shrinkage Cracking".

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's complete technical data sheets for the following:
 - 1. Dry-shake colored hardener.
 - 2. Integral color concrete mixture.
 - 3. Powder antiquing release agent.
 - 4. Imprinting/Texturing tools.
 - 5. Curing and sealing compound for integral colored concrete.
 - 6. Curing compound for dry-shake color hardened concrete.
- B. Design Mixes: For each type of concrete.
- C. Samples for Initial Selection: Manufacturer's color charts showing proposed selection that complies with specified color match.

- D. Qualification Data: For firms indicated in "Quality Assurance" Article, including list of completed projects.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with 10 year's experience in manufacture of specified products.
- B. Installer Qualifications: An installer with 5 year's experience with work of similar scope and quality.
- C. Comply with the requirements of ACI 301.
- D. Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.
- E. Notification of manufacturer's authorized representative shall be given at least 1 week before start of Work.
- F. Colored Concrete Mockups:
 - 1. At location on Project selected by Engineer, place and finish two 10 feet by 10 feet sample areas, one to demonstrate integral colored and stamped/imprinted concrete and one to show dry-shake colored hardened concrete result.
 - 2. Construct mockups 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 shall be produced by the individual workers who will perform the work for the Project.
 - 3. Accepted mockup provides visual standard for work of Section.
 - 4. Mockups shall remain through completion of the work for use as a quality standard for finished work.
 - 5. Remove mockups when directed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration data, as applicable.
- B. Store the product in a location protected from damage, construction activity, and precipitation in strict accordance with the manufacturer's recommendations.

1.6 FIELD CONDITIONS

- A. Contractor shall be aware that dry shake colorant will be applied to slope paving areas, with variable slopes of up to 3:1 ratio.
- B. Schedule placements to minimize exposure to wind and hot sun before curing materials are applied.
- C. Avoid placing concrete if rain, snow, or if frost is forecast within 24 hours. Protect fresh concrete from moisture and freezing.
- D. Comply with professional practices described in ACI 305R and ACI 306R.

- E. Protect surrounding existing surfaces and new improvements with plastic sheeting or other covering during application of dry shake color hardener.
- F. Schedule delivery of integral colored concrete to provide consistent mix times for batching until discharge. Mix times shall meet manufacturer's written recommendations.

1.7 PRE-JOB CONFERENCE

- A. One week prior to placement of concrete, a meeting between Contractor, Engineer and Manufacturer's Representative shall be held to discuss the Project and application methods.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. L.M. SCOFIELD COMPANY, Local contact: Central Division Office, phone (630)377-5959.
- B. BRICKFORM, division of SOLOMON COLORS, INC., 11061 Jersey Blvd, Rancho Cucamonga, CA 91730, phone (800)483-9628.
- C. BUTTERFIELD COLOR, 625 W. Illinois Ave., Aurora, IL., phone (800)282-3388

2.2 MATERIALS

- A. Cast-in-Place Concrete: Comply with requirements of Standard Specifications Article 2301.04.
- B. Colored Admixture for Integrally Colored Concrete:
 - 1. Match Federal Standard No. 595C Color number 33619 as close as possible. Contractor shall submit proposed color for Engineer approval prior to purchasing product.
 - 2. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are lime proof and UV resistant.
 - 3. Colored admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494, and AASHTO M194.
 - 4. Admixture shall be non-fading finely ground synthetic mineral-oxide coloring pigment and water reducing wetting agent.
- C. Dry-shake Colored Hardener:
 - 1. Match Federal Standard No. 595C Color number 33619 as close as possible. Contractor shall submit proposed color for Engineer approval prior to purchasing product.
 - a. LITHOCHROME® Color Hardener; L.M. Scofield company, factory proportioned, mixed, and packaged, ready-to-use surface hardener.
 - b. Brickform® Color Hardener; Brickform
 - c. Perma-cast® Shake-on Color Hardener, Butterfield Color.
- D. Imprinting Tools: Stamp mats to be semi-rigid polyurethane with projected texture and ridged underside capable of imprinting texture and joint patterns to plastic concrete.
- E. Powder Antiquing Release Agent:

1. Release agent to be non-fading finely ground, streak-free, colored powder that facilitates release of stamps and imparts an accent color.
 2. Powder antiquing release agent shall be compatible with integral color additives.
- F. Curing Compound for Dry-Shake Colored Hardener Concrete:
1. Comply with ASTM C309 and be of same manufacturer as colored admixture, for use with dry shake colored hardener.
 - a. Exterior Dry-Shake Colored Hardener Concrete Curing Compound: LITHOCHROME® COLORWAX; L.M.SCOFIELD COMPANY. Use to cure exterior flatwork that will be allowed to weather naturally with no or only occasional maintenance.
 - b. Brickform® Gem Cure & Seal, or as appropriate manufacturer's recommendation for use with their color hardener product.
 - c. Clear Guard® Cure and Seal, Butterfield Color.
- G. Curing and Sealing Compound for Integrally Colored Concrete:
1. Comply with ASTM C309 and ASTM 3315 for use with integrally colored concrete.
 - a. Use to cure exterior flatwork that will be allowed to weather naturally with no or only occasional maintenance.
 - b. Clear, solvent-borne, non-yellowing and VOC-compliant.
- H. 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:
1. Certificate of compliance from material manufacturer stating that proposed products meet or exceed requirements of this Section.
 2. Documented proof that proposed materials have a 10 year proven record of performance confirmed by at least 5 local projects that design professional can examine.

2.3 CONCRETE MIX DESIGN

- A. Comply with requirements of Article 2301.02, B of the Standard Specifications and the following:
1. Minimum Cement Content: Six sacks per cubic yard of concrete.
 2. Slump of concrete shall be consistent throughout project at 4 inches or less. At no time shall slump exceed 5 inches. If super plasticizers or mid-range water reducers are allowed, slump shall not exceed 8 inches.
- B. Air content:
1. For dry-shake color hardener: not to exceed 3%.
 2. For integral colored concrete: 6% ±1%.
- C. Do not add calcium chloride to mix as it causes mottling and surface discoloration.
- D. Supplemental admixtures shall not be used unless approved by manufacturer.
- E. Do not add water to the mix in the field.
- F. Add colored admixture to the mix according to manufacturer's written instructions in pre-measured bags, not by weight or cement content.

PART 3- EXECUTION

3.1 INSTALLATION

- A. Examine subgrade and sub-base for compliance. Notify Engineer if conditions are non-compliant.
- B. Steel reinforcement: Install in locations shown on the Plans. Elevate bar to achieve placement in middle (top to bottom) of concrete paving.
- C. Move concrete into place with square-tipped shovels or concrete rakes.
- D. Vibrators, when used, shall be inserted and withdrawn vertically.
- E. Concrete shall be struck to specified level with wood or magnesium straight edge or mechanical vibrating screed.
- F. Concrete surface shall be further leveled and consolidated with highway magnesium straight edge and/or magnesium bull float.
- G. Mechanically float concrete surfaces as soon as concrete surface has taken its initial set and will support weight of a power float machine equipped with float shoes or combination blades and operator.

3.2 INSTALLATION – DRY-SHAKE COLORED HARDENER

- A. Apply 2/3 of specified application rate to freshly floated concrete surface. Bleed water shall not be present during or following application of first and second shake.
- B. Do not throw dry-shake; distribute evenly by hand or mechanical spreader designed to apply floor hardeners. Consult color hardener manufacturer for recommended manufacturers of mechanical spreaders.
- C. Allow enough 'wet out' time, as recommended by manufacturer, for proper amount of moisture to wick up from concrete and be absorbed by the color hardener before trying to float surface
- D. As soon as dry-shake material has absorbed moisture, indicated by uniform darkening of surface, mechanically float concrete surface a second time, just enough to bring moisture from base slab through dry-shake color hardener. Use a wood or resin float rather than magnesium or aluminum float to incorporate color hardener into the concrete.
- E. Immediately following second floating, apply remaining 1/3 of specified application rate. If applied by hand, broadcast in opposite direction of first application for a more uniform coverage. If a mechanical spreader is used, apply the same manner as previously described.
- F. As soon as dry-shake material has absorbed moisture, mechanically float concrete surface a third time.
- G. As surface further stiffens, remove float blades to expose the power finishing blades or raise combination blades slightly. Flat trowel surface to remove marks and pinholes.

- H. Further troweling operations can be done, each time raising blades, until desired texture or finish is obtained.
- I. Do not burnish trowel colored surface pavement hardeners.

3.3 INTEGRAL COLORED CONCRETE PAVING

- A. Apply color release agent in accordance with manufacturer's recommendations.
- B. Stamped/Imprinted: Apply pattern according to tool manufacturer's instructions.
 - 1. While concrete is plastic, accurately align mats or stamping tools and uniformly press into concrete to produce imprint pattern, texture and depth of imprint as recommended by manufacturer.
 - 2. Touch up pattern and finish edges with hand tools as necessary.
- C. Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of uncolored concrete, are acceptable.

3.3 CURING AND SEALING

- A. Protect concrete from prematurely drying and from excessive cold or hot temperatures that would alter normal curing process.
- B. Integral Colored Concrete Paving:
 - 1. Apply clear curing and sealing compound for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques.
 - 2. Apply curing and sealing compound at consistent time for each pour to maintain close color consistency.
- C. Dry-shake Color Hardener:
 - 1. Cure pavement with liquid membrane curing compound as recommended by manufacturer.
 - 2. Apply immediately after pavement surface has hardened sufficiently so that application of curing compound will not mar surface. Apply uniformly over entire surface at coverage rate recommended by manufacturer and meeting or exceeding the moisture retention requirements of ASTM C309.
- D. Take precautions in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in NRMCA CIP 5.
- E. Do not cover concrete with plastic sheeting.
- F. There shall be no free water on surface at time of application.

3.4 PROTECTION OF FINISHED WORK

- A. Prohibit foot or vehicular traffic on paving surface for the time specified by manufacturer, or until paving is properly protected from damage.
- B. Barricade area to protect paving.
- C. Protect paving surface from damage until final inspection and acceptance by Engineer.
- D. Repair damaged colored concrete in accordance with manufacturer's instructions.