



SOLACHROME™ Integral Coloring Treatment for High-SRI Concrete

Designed for use in horizontal or vertical architectural concrete, this multi-component treatment provides Solar Reflectance Index values that conform to LEED® requirements for reducing the urban heat island effect while offering a wide range of color options.

TECH-DATA BULLETIN A-334.03

1 Product Description

SOLACHROME™ Integral Coloring Treatment for High-SRI Concrete provides permanent, fade-resistant, uniform, and streak-free integral color for all types of concrete projects, from hardscapes to cast-in-place or precast walls. The unique, patent-pending formulations are available in a variety of colors that provide Solar Reflectance Index (SRI) values that exceed LEED requirements. SOLACHROME Integral Coloring Treatment is formulated to observe the twelve principles of green chemistry described by the U. S. Environmental Protection Agency wherever possible.

SOLACHROME Integral Coloring Treatment can contribute to earning LEED credits in the Sustainable Sites category 7.1 Heat Island Effect: Non-Roof for New Construction, Existing Buildings, Schools and Core and Shell by having a Solar Reflectance Index value of 29 or greater.

Certain SOLACHROME colors can also provide an “SRI-restoring” characteristic that, over time and in the presence of sunlight and moisture, will break down many organic surface contaminants. These surface contaminants can substantially reduce the solar reflectance and increase the temperature of the concrete surface.

SOLACHROME Integral Coloring Treatment is premeasured and packaged in buckets for the concrete mix design specified. Unlike products that increase the risk of error by requiring weighing, mathematical calculations, or the use of multiple ingredients added separately, only the contents of one or two buckets (depending on color) of SOLACHROME Treatment are added for each cubic yard (cubic meter) of concrete.

2 Limitations

Each aspect of the concrete mix design and the placing and finishing process can produce variations in the final color and SRI value. These include, but are not limited to, the following: (a) variations in cement, pozzolan or aggregate, (b) variations in slump or water content, (c) timing of operations, (d) finished texture, (e) curing or forming methods used, and (f) type and use of release agents or surface treatments. Each can be expected to produce distinct, though in most cases slight, variations in the final appearance, characteristics, and SRI value obtained.

The same brand of cement, source of aggregates, mix design and water/cement ratio should be maintained for each load of concrete of the same color.

The quantity of colored concrete mixed should not be less than one-third of the capacity of the mixing drum (a minimum of three cubic yards in a nine cubic yard load) and should always be in full cubic yard (cubic meter) increments.

The SOLACHROME material must not be added to an empty drum or at the tail end of a load, otherwise streaking, SRI variations or other inconsistencies can be expected.

3 Composition and Materials

The patent-pending SOLACHROME formulations are stable in the alkaline environment typical of concrete and provide excellent color stability in the presence of UV radiation. SOLACHROME Integral Coloring Treatment contains no calcium chloride.

4 Applicable Standards

The pigments in SOLACHROME Integral Coloring Treatment for High-SRI Concrete conform to ASTM C 979 *Pigments for Integrally Colored Concrete*.

5 Colors

SOLACHROME Integral Coloring Treatment is available in a wide variety of colors. The 24 colors shown on Scofield’s Selection Guide A-332 *SOLACHROME Integral Coloring Treatment for High-SRI Concrete* are representative of those that may be expected when using a medium-gray shade of cement. When white cement is used, a cleaner, more vibrant color selection is available. Scofield’s Selection Guide A-332 also depicts 20 colors using white cement. Upon request, Scofield’s laboratories will prepare a concrete sample using cement and aggregates furnished from the job location and determine the SRI value of that sample.

With sufficient prior notification, custom colors can be created that can provide compliant LEED SRI values. In some cases, the colors chosen may qualify for exemplary credits. Note that these require a credit interpretation request and approval. Contact your Scofield representative for material prices, laboratory charges, minimum quantities and availability.

6 Packaging and Dosage

SOLACHROME Integral Coloring Treatment is packaged to eliminate weighing and measuring errors; as such, it is sold based on the amount of cement to be colored rather than by weight.

SOLACHROME Integral Coloring Treatment is available in buckets that contain the proper dosage for either five sacks or six sacks of cement per cubic yard (275 kg/m³ or 335 kg/m³) of concrete. On special order, they can be packaged for a cubic yard or cubic meter of concrete containing any specified cement content. Note that “cement content” includes flyash, blast-furnace slag or other supplementary cementitious materials (SCMs). The weight of any SCMs used must be added to the cement weight when determining the correct SOLACHROME dosage.

7 Storage and Shelf Life

Under normal conditions when kept dry and moisture free, the shelf life of SOLACHROME Integral Coloring Treatment is at least 2 years from the date of purchase. Inventory must be rotated to maintain product that is within shelf life limits.

8 Jobsite Samples

Producing architectural concrete requires skill and practice. For vertical precast or cast-in-place concrete, tilt-up concrete, and for architectural flatwork, representative jobsite samples should be produced and approved at least 1 month prior to concreting. A separate sample should be cast for each color and mix design. Each sample should be of adequate size to be representative, be made with the job materials, and use the contemplated construction techniques. For accurate color, the minimum quantity of concrete mixed should be as stated in section 2. *Limitations*.



Concrete construction materials and methods must follow established ACI practices and those as described in sections 11, 12, 13, 14 and 15 of this Tech-Data Bulletin. All surfaces should be textured as specified. Prior to the final concrete installation, verify overall safety and approve the adequacy of wet and dry slip resistance.

Portions of the actual cement and aggregates used to cast the jobsite samples should be retained. Cement and aggregates from the same source should be used throughout the job and periodically sampled for comparison of color and gradation with the material used in the approved sample.

9 Cautions

WARNING!

DO NOT TAKE INTERNALLY. KEEP OUT OF THE REACH OF CHILDREN. Use only with adequate ventilation. Do not breathe dust. Wear dust (particulate) respirator (NIOSH TC-84A approved), safety goggles and gloves. Follow respirator manufacturer's directions for respirator use.

First Aid: Eyes—DO NOT RUB EYES. Immediately flush thoroughly with large amounts of water. Skin—Wash thoroughly with soap and water. Remove soiled clothing and wash before reuse. Inhalation—Move to fresh air. If symptoms persist or develop or if ingested, get medical attention.

Wash thoroughly immediately after handling. Close container after each use. Store in a cool, dry, well-ventilated area. Avoid generating dust during recovery or disposal. Disposal of all residual or recovered product must be in accordance with all applicable federal, state, and local regulations. Before using or handling, read the *Material Safety Data Sheet and Warranty*.

10 Test Data

The varying colors of SOLACHROME Integral Coloring Treatment possess different SRI values, and some include the SRI-restoring feature noted in section 1. *Product Description*. The chart shown below provides laboratory test values for each color represented on Scofield's Selection Guide A-332 SOLACHROME Integral Coloring Treatment for High-SRI Concrete, using medium-gray cement or white cement as indicated. Colors with the SRI-restoring characteristic are marked with an asterisk. Note that the color of the cement and other materials can significantly affect both the SRI value and the color of the final concrete.

11 Concrete Mix Design

Irrespective of strength requirements, minimum cement contents are required to assure adequate fines for finishing and texturing architectural concrete. For flatwork, the cement content must be a minimum of five sacks per cubic yard (275 kg/m³) of concrete. The American Concrete Institute (ACI) in ACI 302.1R *Recommended Practice for Concrete Floor and Slab Construction* recommends a minimum of five and one-half sacks per cubic yard (305 kg/m³) for concrete floors and slabs containing 1-inch (25 mm) aggregate. For vertical concrete, the cement content must be a minimum of six sacks per cubic yard (335 kg/m³).

The mix design must not permit segregation of components during pumping, placing or consolidation of the concrete. In the absence of a specific mix design, a 4-inch (100 mm) maximum slump is recommended. No calcium chloride should be added, as it causes mottling and surface discoloration.

Under average conditions, concrete containing SOLACHROME Integral Coloring Treatment will entrain an additional 1–3 percent air. An air-entraining admixture complying with ASTM C 260 *Air-Entraining Admixtures for Concrete* should be used in all concrete flatwork subject to freeze/thaw cycles and as specified or required by the engineer for workability or durability.

SOLACHROME Solar Reflectance Index Laboratory Test Values

SOLACHROME colors with a medium-gray cement mix design

SOLACHROME Color	SRI Value	SOLACHROME Color	SRI Value	SOLACHROME Color	SRI Value
HSR 1344 Amazon Spring	37	HSR 2144 Grayfin*	43	HSR 3263 Nazca*	38
HSR 1346 Artesian Well*	50	HSR 2321 Iguana*	46	HSR 3544 Olympus Mons*	39
HSR 1349 Badlands	35	HSR 2333 Ionosphere*	44	HSR 4139 Rainforest	38
HSR 1362 Aura*	37	HSR 2373 Ironside*	34	HSR 4521 Sargasso	38
HSR 1372 Cliff Dwelling	35	HSR 2588 Labyrinth*	38	HSR 4722 Sea Salt*	43
HSR 1572 Dreadnought	30	HSR 2594 Leviathan*	34	HSR 5331 Swordfish	38
HSR 1706 Ember*	30	HSR 2874 Masaman	35	HSR 5455 Tideline*	31
HSR 2002 Geode*	41	HSR 2893 Matterhorn*	45	HSR 5546 Tundra*	37

SOLACHROME colors with a white cement mix design

SOLACHROME Color	SRI Value	SOLACHROME Color	SRI Value	SOLACHROME Color	SRI Value
HSR 1338 Alpine Fog*	92	HSR 2445 Jade Essence*	74	HSR 4680 Scapa Flow*	36
HSR 1352 Bimini Sand*	77	HSR 2676 Lotus*	66	HSR 4784 Serengeti*	64
HSR 1361 Aldebaran*	65	HSR 2889 Magellanic Cloud	45	HSR 4916 Sleet*	50
HSR 1382 Canopus*	82	HSR 3866 Permafrost*	84	HSR 5168 Stele*	75
HSR 1386 Capella*	81	HSR 3917 Pleiades*	77	HSR 5182 Stellar Wind*	69
HSR 2034 Glacier*	79	HSR 4137 Radiant Mesa*	82	HSR 5938 Water Lily*	83
HSR 2308 Iceberg*	87	HSR 4519 Sand Dollar*	103		

* indicates SRI-Restoring formulation



Addition of supplemental admixtures or supplementary cementitious materials (SCMs) may affect the color, SRI value, finishing characteristics, and other qualities of the concrete. Calcium chloride must not be added to the mix. Admixtures and SCMs should only be used after conducting appropriate batch tests and a competent engineering assessment. If any such materials are used, they must be added to all mixes on the project having the same color.

The mix should contain only nonreactive aggregates.

12 Batching and Depositing

Weather conditions should be considered when planning installation. Professional practices as described in ACI standards *305R Hot Weather Concreting* and *306R Cold Weather Concreting* must be followed.

The concrete mix should be controlled to provide good batch-to-batch uniformity. Ready-mix trucks should be in good condition. The cement should be weighed accurately. The same brand of cement, source of sand, and water/cement ratio should be maintained for each load of concrete of the same color. A method is available for wet-checking the approximate color of each load before placing. Scofield should be consulted for details.

Before batching, the drum must be thoroughly clean and wet. The measured starting quantity of mix water for the batch and a portion of the aggregates should be batched into the mixer drum. Then the contents of one or two buckets (depending on color) of the specified SOLACHROME color, correctly packaged for the mix design, should be added for each cubic yard (cubic meter) of concrete. The remaining ingredients should be added, and the load mixed at the specified mixing speed for a minimum of 130 revolutions, before discharging. SOLACHROME Integral Coloring Treatment must never be added to an empty drum or at the tail end of a load.

When pumping, the pump should be capable of handling a low-slump concrete mix containing 1-inch (25 mm) rock and must be primed with an identically colored slurry mix.

When depositing, the concrete should be deposited near its final position to avoid segregation due to rehandling or flowing. If held-back water is added at the jobsite, the concrete should be mixed at mixing speed for a minimum of 30 revolutions after addition of the water and before depositing. The slump of the concrete should be consistent throughout the project. No water should be added after a portion of the load has been discharged. Measuring and adjusting the air content of the load is recommended immediately prior to placement. Concrete that has started to set must not be retempered, but should be discarded.

Professional concreting standards and practices, including those published by the American Concrete Institute (ACI), the Portland Cement Association (PCA), the Tilt-Up Concrete Association (TCA), the National Precast Concrete Association (NPCA), and the National Ready Mixed Concrete Association (NRMCA) should be followed.

13 Flatwork Installation and Curing

Only uniformly slip-resistant textures, such as broom, swirl, sponge float, exposed-aggregate, or sandblasted should be considered for concrete flatwork. Exposed aggregate and sandblasted surfaces may have significantly different SRI values than other finishes using the same colors.

The subgrade should be well drained and have adequate and uniform load-bearing characteristics. It must be moist, completely consolidated, and free of frost at the time of concreting. If necessary, the subgrade may be dampened with water in advance of concreting, but concrete should not be placed over freestanding water or over soft, muddy or frozen ground.

The concrete should be placed and consolidated so that it completely fills all space inside the forms and provides a suitable surface for finishing. Concrete adjacent to the forms should be spaded.

Hard steel troweling of architectural concrete should be minimized to avoid trowel burns. For uniformity of appearance, consistent finishing practices should be used when applying the specified texture. The edges should be finished first. All surfaces should be finished within reasonably the same time after placing. Water must not be sprinkled or otherwise added to the surface of the slab while finishing. All final hand-finishing should be done in the same direction.

When concrete is placed and finished in hot windy weather, precautions must be taken to prevent plastic cracking resulting from excessively rapid drying at the surface as described in *CIP 5 Plastic Shrinkage Cracking* published by the National Ready Mixed Concrete Association.

Concrete containing SOLACHROME Integral Coloring Treatment must be cured in accordance with ACI guidelines. New, unwrinkled, nonstaining, reinforced kraft curing paper is preferred. The curing paper should conform to ASTM *C 171 Sheet Materials for Curing Concrete*. The use of a membrane-forming curing compound will reduce the SRI values immediately after application, but those values will gradually rise as the curing compound breaks down due to weathering. When a membrane cure is desired, SCOFIELD® Cureseal-W™ should be used. Refer to Scofield's Tech-Data Bulletin *B-204 SCOFIELD Cureseal-W* for additional information. Curing with water is detrimental to color uniformity. Curing with burlap, other wet coverings, or plastic sheeting is not recommended, as mottling, streaking or staining normally occurs. Until it is completely cured, the color of concrete is normally less uniform and appears darker than the final color.

All surfaces must be thoroughly inspected to verify and approve installation and safety, including wet and dry slip resistance, before opening the area to traffic.

14 Tilt-Up Concrete Construction

Prior to the start of construction, a representative sample panel should be cast as described in section *8. Jobsite Samples*. Follow the procedures set forth in ACI *551 Tilt-Up Concrete Structures*. The casting slab should be flat, level, and of adequate strength to support the panels. Avoid casting over joints to minimize variations in the down face of the panel.

All concrete surfaces that are to serve as casting beds must be finished to a flat, level surface. All casting surfaces must receive the same bond breaking system, one that prevents the passage of any moisture into the casting bed. Otherwise, curing of the down faces will be uneven, creating discolorations that cannot be removed by sandblasting. Stacked panels generally do not exhibit as uniform a color as panels poured directly on casting beds. The placement for each panel must be continuous; any interruptions in the process are likely to cause visible differences in the color.

15 Vertical Concrete Installation

Prior to commencement of construction, a representative jobsite sample should be cast as described in section *8. Jobsite Samples*.

Formwork for architectural concrete must be of the highest quality to obtain smooth, straight, nonyielding surfaces. Unless a form liner has been specified, a resin, high-density overlay or epoxy- or urethane-coated plywood should be used. Alternatively, all plywood plugs (boats) must be filled and the forms coated with a material such as polyurethane that is sufficiently heavy to prevent unwanted grain transfer. If the grain pattern is meant to transfer and a natural wood-grain form is to be used, the forms should be seasoned prior to their first use with a cement slurry containing the specified SOLACHROME color so that the same color is achieved with new forms as with forms that have been repeatedly used. For color uniformity, procedures and materials used



in preparing the forms must not be varied during the job. All forms should be cleaned thoroughly prior to use or reuse. Release agents must be nonstaining.

Any leakage causes the water/cement ratio of the cement paste to vary near the leakage points and discoloration of the finished concrete will result. This staining will be permanent and not subject to removal by sandblasting or other mechanical means. All plastic snap-tie cones should be of the non-leaking type. After cleaning, joints in the forms should be sealed with a 2-inch (50 mm) wide vinyl or polyester tape. Alternatively, the joints may be sealed with a silicone sealant applied to the edges during assembly.

To prevent staining of the finished concrete surface, form ties should leave no metal closer to the surface of the concrete than 1 1/2 inches (38 mm). The location of tie holes is normally selected so as not to detract from the overall appearance of the structure, since it is virtually impossible to conceal them completely.

All walls should be cast to their full height between engineered horizontal joints.

All concrete should be placed carefully so that surface grinding can be avoided and a minimum of patching will be required. When possible, both external and internal vibrators should be used. Over-vibration should be avoided, and internal vibrators must not be used to move the concrete.

To produce more uniform color, all forms should be stripped when the concrete is the same age.

16 Availability

SOLACHROME Integral Coloring Treatment for High-SRI Concrete is marketed nationwide and internationally through leading ready-mix firms, dealers, and representatives. Contact Scofield for its nearest representative.

Scofield offers a complete line of engineered systems for coloring, texturing, and improving performance in architectural concrete. Scofield Systems address specialized requirements for interior, exterior and vertical uses with compatible systems of complementary products including coloring admixtures, color hardeners, colored cementitious toppings, stains, curing compounds, sealers, coatings, repair products and texturing tools. Visit the Scofield website at www.scofield.com for further information.

17 Limited Warranty

Since no control is exercised over product use, L. M. Scofield Company (Scofield) represents and warrants only that its products are of consistent quality within manufacturing tolerances. NO OTHER ORAL OR WRITTEN REPRESENTATION OR STATEMENT OF ANY KIND, EXPRESS OR IMPLIED, NOW OR HEREAFTER MADE IS AUTHORIZED OR WARRANTED BY SCOFIELD, INCLUDING THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Liability for breach of contract, negligence, or on any other legal basis is limited to the lesser of refund or replacement of defective materials. SCOFIELD WILL NOT BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING FOR DELAYS OR LOST PROFITS. Communication of this warranty and its limitations to end users is not the responsibility of Scofield, but should be communicated by those in direct contract with the end user. Any claim regarding product defect must be received in writing within one year from the date of manufacture. No claim will be considered without such written notice or after the specified time interval. The end user shall determine the suitability of the products for the intended use and assumes all risks and liability in connection therewith.

Suggested Short Form Specification for Coloring Concrete Flatwork:

All concrete designated as colored and possessing a high Solar Reflectance Index (SRI) value in the plans and specifications shall contain the proper proportion of SOLACHROME™ Integral Coloring Treatment for High-SRI Concrete in _____ color(s), available from L. M. Scofield Company, (800) 800 9900, Los Angeles, CA, (323) 720 3000 and Atlanta, GA, (770) 920 6000. The treatment shall be a colored, water-reducing admixture, factory formulated and packaged in cubic yard dosage increments, not multiple additives and pigments added separately into the mix. The pigments shall meet the requirements of ASTM Standard Specification C 979. The concrete shall contain _____ sacks of cement per cubic yard. No calcium chloride shall be used. The slump shall be consistent throughout the project. All surfaces shall be finished uniformly. The concrete shall never be covered with plastic sheeting. All mix design, batching, placing, finishing, and curing shall be in accordance with Scofield's Tech-Data Bulletin A-334 SOLACHROME™ Integral Coloring Treatment for High-SRI Concrete.



1 800 800 9900 or www.scofield.com

SCOFIELD PRODUCTS ARE INTENDED FOR PROFESSIONAL USE ONLY

L. M. Scofield Company customer service: 1 800 800 9900

Western Headquarters: 6533 Bandini Blvd., Los Angeles, CA 90040 voice: 323 720 3000 fax: 323 720 3030

Eastern Headquarters: 4155 Scofield Road, Douglasville, GA 30134 voice: 770 920 6000 fax: 770 920 6060

www.scofield.com