

SECTION 09 93 33

SOL-SILICATE MINERAL STAINS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Application of two coats of sol-silicate stain. Specification includes limited surface preparation. Note: Include KEIM Silan 100 for enhanced waterproofing.
- B. Related Sections: Related sections include the following:
PLACE RELATED SECTIONS BELOW. EXAMPLES INCLUDE:
1. Section 03 01 00 – Maintenance of Concrete
 2. Section 04 21 13 – Brick Masonry
 3. Section 04 22 00 – Concrete Unit Masonry
 4. Section 09 25 23 – Stucco Repairs
 5. Section 09 24 00 – Portland Cement Plastering
 6. Section 09 25 23 – Lime Based Plastering
 7. Section 09 25 33 – Lime Cement Based Plastering
- C. Related Products *[DELETE ARTICLE C. IN FINAL SPECIFICATION]*
1. Cleaning Agents
 - a. KEIM Stone Cleaner-N
 - b. KEIM Lime Remover
 - c. KEIM Concrete Cleaner
 2. Paint Remover
 - a. KEIM Bio Stripper
 - b. KEIM Plastic, polyethylene
 3. Primers
 - a. KEIM Fixativ
 - b. KEIM Contact Plus
 - c. KEIM Contact Plus Grob
 4. Stain Blockers
 - a. KEIM I&F Grund
 5. Crack Fillers
 - a. KEIM Contact Plus
 - b. KEIM Contact Plus Grob
 - c. KEIM Concretal Fine Filler
 - d. KEIM Concretal Universal Mortar-S
 - e. KEIM Universalputz Fine Render
 - f. KEIM Universalputz Standard Render

6. Water Repellents/Sealers
 - a. KEIM Sealer
7. Repair Mortars
 - a. KEIM Concretal Fine Filler
 - b. KEIM Concretal Universal Mortar-S
 - c. KEIM Concretal Mortar-R
 - d. KEIM Restauro Basel
 - e. KEIM Restauro Top
 - f. KEIM Restauro Giess
8. Stuccos/Plasters/Renders
 - a. KEIM Universalputz Fine Render
 - b. KEIM Universalputz Standard Render
 - c. KEIM NHL Kalkputz Fine
 - d. KEIM NHL Kalkputz Grob
 - e. KEIM Porosan Equalizer
 - f. KEIM Porosan Top Coat
9. Anti-Graffiti
 - a. KEIM PSS-20

1.2 REFERENCES

- A. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. ASTM (ASTM):
 1. ASTM E 96, "Standard Test Methods for Water Vapor Transmission of Materials."
 2. ASTM E 514, "Standard Test Method for Water Penetration and Leakage Through Masonry."
 3. ASTM G 154, "Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials."
 4. ASTM D 6886-12, "Standard Test Method for Determination of the Individual Volatile Organic Compounds (VOCs) in Air-Dry Coatings by Gas Chromatography."
- C. Deutsches Institute for Normung (DIN), European Standard (EN), and International Organization for Standardization (ISO):
 1. DIN EN 1062, manufacturing standard for sol-silicate coating.
 2. ISO 6504-3, "Paints and varnishes - Determination of hiding power - Part 3: Determination of contrast ratio of light-colored paints at a fixed spreading rate."
 3. ISO 2813, "Paints and varnishes - Determination of specular gloss."
 4. EN 1062-3, "Paints and varnishes - Coating materials and coating systems for exterior masonry and concrete - Part 3: Determination of liquid water permeability."
 5. DIN EN 1504-2, "Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 2: Surface protection systems for concrete."

6. DIN EN ISO 7783-2, "Coating materials and coating systems for exterior masonry and concrete - Part 2: Determination and classification of water-vapor transmission rate (permeability)."
7. DIN 4102-A2, "Fire Behavior of Building Materials and Building Components - Part 2: Building Components; Definitions, Requirements and Tests."

1.3 DEFINITIONS

- A. Primer: A liquid water repellent.
- B. Silicate stain, base coat: The first applied coat of the sol-silicate stain.
- C. Silicate stain, top coat: The second applied coat of the sol-silicate stain.
- D. Dilution: A sol-silicate based diluent.
- E. Application Ratio: A mixture of silicate stain and silicate dilution expressed as a ratio of one to the other to achieve the proper color transparency for the silicate stain.
- F. Approved Application: The application ratio and application steps derived from the approved mock up from Section 1.6, B.6.e. Approved Application.

1.4 SYSTEM DESCRIPTION

- A. A materials-compatible highly vapor permeable water and weather-resistant decorative stain system.
 1. Primer: A solvent-free liquid silane water repellent applied to a mineral substrate where it is pulled into the open pores by capillary draw to capacity. Curing in a chemical reaction with humidity in the substrate, a micro-thin silica gel lining forms within the pores leaving them open to diffusion. The silica gel lining reduces surface tensions thus breaking the capillary draw of water and salts into the substrate and resisting wind-driven rain.
 2. Silicate stain: An incombustible two coat system comprising a base coat and a top coat.
 - a. Silicate stain penetrates the surface and in a chemical reaction combines with the substrate through chemical and mechanical bonds forming a hard amorphous microporous layer with extremely high vapor permeability.
 - b. Unaffected by acids, UV exposure, or air-borne pollutants.
 - c. Unique alkaline mineral layer structure resists liquid water penetration into the coated substrate and maintains moisture balance through vapor diffusion to keep wall assemblies breathable and dry, thus resisting mold and biological growth.
 - d. Will not reduce substrate vapor permeability.

1.5 SUBMITTALS

- A. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Provide published documentation describing materials, characteristics, and limitations.
- B. Samples: Submit samples for verification purposes, fabrication techniques and workmanship.
- C. Manufacturer's Instructions: Submit manufacturer's instructions including technical data sheets, material safety data sheets, mixing instructions, application requirements, special procedures, and conditions requiring special attention.
- D. LEED Submittals: Submittals that are required to comply with requirements for LEED certification include the following:
 1. Low Emitting Materials: Submit certification by the manufacturer confirming that products (i.e., adhesives, sealants, paints, coatings, etc.) meet or exceed the volatile organic

compound (VOC) limits set by specific agencies or other requirements. Clearly state VOC limits in the submittal.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Provide evidence that Manufacturer is a firm engaged in the manufacture of silicate stains of types required, and whose products have been in satisfactory use in similar service for a minimum of fifteen years.
2. Applicator Qualifications: *(BELOW, KEEP ONE AND DELETE THE OTHER)*
 - a. Provide evidence Applicator is a firm having a minimum of three years of successful application experience with projects similar in type and scope to that required for this Project, and having passed a product certification training course provided by the manufacturer prior to the execution of this unit of work.
 - b. Provide evidence Applicator is a firm having successful application of products within this specification with at least one project in the last 18 months similar in type and scope to that required for this Project, and having passed a product certification training course provided by the manufacturer prior to the execution of this unit of work.

B. Mock ups:

1. Prior to application of the work, fabricate and erect mock ups for each type of finish and application to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution.
2. Build mock ups to comply with the following requirements using materials indicated for final unit of work.
3. Locate mock ups as directed by the Architect.
4. Demonstrate the proposed range of aesthetic effects and workmanship to be expected in the completed work.
5. Obtain the Architect's acceptance of mock ups before start of final unit of work.
6. Determine Application Ratio:
 - a. Locate area(s) to receive the silicate stain mock up samples. Prepare surfaces as directed in Sections 3.1 EXAMINATION, 3.2 PREPARATION, and 3.3 APPLICATION.
 - b. Determine a range of transparency to achieve desired optical equalization in two coats for aesthetic evaluation as directed by KEIM representative.
 - c. Prepare sample material: Provide minimum three transparent examples of silicate stain and dilution mixed in a ratio of one to the other. Maintain a record of prepared stain color and dilution ratio mixtures.
 - d. Stir well for one minute and keep well-stirred thereafter for color consistency. Apply sample material as directed in Section 2.4 FINISHES. Apply the prepared samples in two coats allowing minimum 24 hours between coats. If necessary, adjust ratios to obtain the desired results. Results may be evaluated for approval after final coat has cured minimum 24 hours.
 - e. Approved Application: Maintain a record of the approved mock up stain color, application ratio, and application steps to incorporate into final unit of work to ensure color consistency and appearance aesthetics.

C. Tracking Job Progress with Daily Logs

1. Maintain a daily record of the weather conditions, of material ordered and delivered, material used, inspections, areas of work that began, areas of work that were completed, and questions raised and answers received.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with manufacturer's name, material and product brand name, and lot number, if any.
- B. Store materials in their original undamaged packages and containers inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements:
 1. Do not apply in freezing conditions, when rain is expected, or in high winds.

1.9 WARRANTY

- A. Provide manufacturer's written product warranty.
 1. Warranty period from date of Substantial Completion is 10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design:
 1. Items specified are to establish a standard of quality for design, function, materials, compatibility, performance, warranty, and appearance.
 2. Equivalent products by listed manufacturers are acceptable.
 3. The Architect is the sole judge of the basis of what is equivalent.
- B. Listed Manufacturers
 1. KEIM Mineral Coatings of America, Inc., 10615 Texland Blvd. #600, Charlotte, North Carolina 28273. Telephone 704-588-4811. Email keim-info@keim.com.

2.2 MATERIALS

- A. Primer: Provide a water repellent meeting or conforming to:
 1. Silane technology with 100% active ingredient.
 2. Highly vapor permeable. Leaves pores open to diffusion.
 3. Will not change appearance of treated surfaces.
 4. Will not yellow over time.
 5. Solvent-free.
 6. Very low VOC, less than 10 grams per liter VOC.
 7. Basis of Design: "KEIM Silan 100", KEIM Mineral Coatings of America, Inc.
- B. Silicate stain, base and top coat: Provide sol-silicate based mineral stain meeting or conforming to:
 1. DIN EN 1062, manufacturing standard for sol-silicate coating.

2. DIN EN 1504-2/2.2, Products and systems for the protection and repair of concrete structures/Surface protection systems for concrete (when applied together with KEIM Silan 100)
 3. DIN 4102-A2, non-flammable standard – will not burn.
 4. ASTM E 96 Vapor Permeability – 75 to 85 perms.
 5. ASTM G 154 Accelerated Weathering – no fading, cracking, peeling.
 6. ASTM E 514 62-MPH Wind-Driven Rain Test – no water penetration.
 7. ASTM D 6886-12 Standard Test Method for Individual Volatile Organic Compounds (VOCs) – Less than 1 gram per liter VOC (Volatile Organic Content).
 8. Tinted to the desired finish color.
 9. Basis of Design: “KEIM Design-Lasur”, KEIM Mineral Coatings of America, Inc.
- C. Dilution for Silicate stain: Provide sol-silicate dilution meeting or conforming to:
1. DIN 4102-A2, non-flammable standard – will not burn.
 2. ASTM E 96 Vapor Permeability – 75 to 85 perms.
 3. ASTM D 6886-12 Standard Test Method for Individual Volatile Organic Compounds (VOCs) – Less than 1 gram per liter VOC (Volatile Organic Content).
 4. Basis of Design: “KEIM Design-Dilution”, KEIM Mineral Coatings of America, Inc.

2.3 EQUIPMENT

A. Tools:

1. Primer: Apply by natural bristle brush, roller, or low pressure sprayer.
2. Silicate stain, base and top coats: Apply by natural bristle façade brush, professional roller, or professional airless spray equipment and back-roll as required for even distribution.

2.4 FINISHES

A. Primer: Apply wet coats sponging off material that is not absorbed.

B. Silicate stain, base and top coats:

1. Apply in full coverage evenly distributed coats to a smooth mineral matte finish without lap lines, voids, “holidays”, or drips. Compare manufacturer-verified mock up consumption data with application consumption data to ensure enough product is applied.
2. Maintain a wet edge to prevent sight lines and textural differences.
3. Apply enough product to prevent shading and textural differences that contribute to striping, especially with the base coat. Applying inadequate amount of product can produce unexpected results.
4. When rolling product, quickly coat the surface and then gently even it up with the roller. Roll off in same direction across façade to prevent shading differences that affect appearance of color.
5. When spraying product:
 - a. Do not strain silicate stain.
 - b. Remove paint filters from spray gun and spray pump.
 - c. Use only new hoses. Used hoses may contain paint thinners or solvents.
 - d. Paint thinners and cleaning solvents are not compatible with silicate stain.

- e. Clear gun and spray equipment with warm soapy water and rinse well with clean water to remove residual paint thinners and solvents.
 - f. Never use tips with smaller orifices than recommended. Smaller tips clog and prevent proper stain application. Improper application voids warranty and shortens longevity of the stain.
 - g. Prevent overspray drift or misting onto glass objects.
6. When working from scaffolding, work as a team moving across façade maximum eight (8) vertical feet per applicator to ensure complete coverage and wet edge left to right and top to bottom of each section.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Confirm by examination the areas and conditions under which the work is to be applied for compliance with manufacturer's instructions. Do not proceed with the work until unsatisfactory conditions have been corrected.
- 1. Verify substrate is secure, sound, dry, and absorbent, and free of dirt, grease, salts, oil-based paints, release agents, curing agents, and other bond breakers.
 - 2. Verify substrate has no pretreatments or priming materials applied unless such conditions are approved by manufacturer.
 - 3. Verify surfaces or materials to be coated are fully cured to manufacturer recommendations.
 - 4. Confirm coating surfaces are less than 40 percent relative humidity as measured by a masonry moisture meter prior to application of silicate stain.
 - 5. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Applicator.

3.2 PREPARATION

- A. Protection:
- 1. Lay ground cloths and take measures as necessary to protect surfaces subject to contact by products specified by this Section.
 - 2. Primer may bond to glass.
 - 3. Silicate stain or dilution may etch or bond to glass, metal, and concrete.

3.3 APPLICATION

- A. Conform to reviewed product data, manufacturer's written instructions, and provisions of the Contract Documents.
- B. Plan the work properly.
- 1. Maintain temperature during and after application. Substrate and ambient air temperature must be between 41 °F (5 °C) and 86 °F (30 °C).
 - 2. Work ahead of the sun on shaded façades to avoid working on hot substrates.
 - 3. Work to logical stopping points (corners, seams, architectural features, etc.).
 - 4. Apply silicate stains as directed by 2.4 FINISHES.
 - 5. Protect from wind and rain prior to, during, and for a minimum 24 hours after application.
 - 6. Obtain manufacturer's written instructions for application outside of the above parameters.

C. Primer:

1. Apply in multiple flooding coats over surface allowing 10 to 15 minutes penetration time between coats until substrate will not absorb more. Blot unabsorbed material from substrate.
2. Allow water repellent 4 hours to penetrate and before 24 hours lapse, apply the Silicate stain base coat. The Primer develops its repellency over the 24 hour period.
3. If 24 hours lapse before the Silicate stain base coat can be applied, reapply the Primer, wait 4 hours, and continue with the Silicate stain base coat application.

D. Silicate stain:

1. Recall approved product application ratio from Section 1.6 Quality Assurance, B.6.e. Approved Application.
2. Base coat:
 - a. Prepare base coat material using approved Application Ratio to determine mixing quantities of silicate stain and dilution.
 - b. Stir well by hand or 600-800 RPM mixing equipment to ensure color is uniform throughout the material. Keep mixture continuously stirred during application.
 - c. Apply base coat of prepared silicate stain.
 - d. Allow minimum 24 hours drying time.
3. Top coat:
 - a. Prepare top coat material using approved Application Ratio to determine mixing quantities of silicate stain and dilution.
 - b. Stir well by hand or 600-800 RPM mixing equipment to ensure color is uniform throughout the material. Keep mixture continuously stirred during application.
 - c. Apply top coat of prepared silicate stain.
4. Touch up:
 - a. Transparent stains are difficult to touch up. Some diluted colors touch up well, some do not. Always perform a test and allow the touch up to cure minimum 12 hours before evaluation. Colors become lighter upon drying.
 - b. When possible, use the same tools and techniques from the application for best results.
 - c. Articulate the application confining the touch up to the borders of the repair.

3.4 CLEANING

- A. Clean tools, spills, and accidental drips immediately with plenty of water.
- B. Leave applications clean and premises free from residue and debris from work of this Section.

END OF SECTION