

CONSTRUCTION SPECIFICATIONS

Bio-based Modified Sodium Silicate Gel for Waterproofing Concrete

Horizontal Deck Slab Treatments

1. DESCRIPTION

This work consists of spraying the Bio-based Modified Sodium Silicate solution on clean, dry concrete bridge deck to form a barrier 1/2" to 3/4" thick measured from the surface of the concrete. The solution penetrates the concrete, bonds with the concrete, and reacts with the calcium contained in the concrete and when water is present forms a gel that fills the pores, cracks, and voids in the concrete matrix. The vapor permeable gel creates a long-term barrier to water infiltration. The barrier slows or prevents corrosion of concrete and mild reinforcement by preventing water and contaminant infiltration such as chlorides from entering the concrete matrix below the surface of the deck slab.

The liquid Bio-based Modified Sodium Silicate solution is sprayed onto the clean, dry concrete deck. Once the solution has dried to the touch, excess material is washed from the surface. As the solution reacts with the existing calcium in the concrete the gel forms creating the barrier to water and contaminants. The basic product gives up to 15 years of protection. Longer term protection is achieved with products that receive an additional spray of Accelerating Agent which introduces more calcium into the concrete to speed the reaction of the solution to gel. When these products are used, the service life of the protection is up to 25 years. The Accelerating Agent is spray applied. Once the Accelerating Agent has dried to the touch, excess material is then washed from the surface.

The liquid Bio-based Modified Sodium Silicate solution and the Accelerating Agent are packaged in waterproof containers and are ready for immediate application on the jobsite. The Bio-based Modified Sodium Silicate solution and Accelerating Agent can be applied using a low-pressure backpack sprayer or spray bar mounted to the back of a truck.

The Bio-based Modified Sodium Silicate solution does not outgas and is free of VOC (Volatile Organic Compounds). Any water source may be used to wash the excess materials from the surface of the concrete.

Bio-based Modified Sodium Silicate solution dries quickly, depending on the temperature and humidity, typically 2 -5 hours. Once the solution has dried and excess material has been washed from the surface of the concrete, the deck is ready for traffic. If Accelerating Agent is applied, once it is dry it, excess material can be washed from the surface. Once debris, and equipment are removed, the deck is ready for traffic.

The Bio-based Modified Sodium Silicate densifies the concrete and once reactive with the calcium, becomes gelatinous, to allow concrete hydration within the concrete matrix making the gel compatible with the freeze thaw air entrainment.

The Bio-based Modified Sodium Silicate solution and Accelerating Agent are quick, easy, and inexpensive to apply. The short setup time reduces the cost of traffic control and user costs to the public. Subsequent applications of Bio-based Modified Sodium Silicate solutions can achieve the additional service life of the new application regardless of the service life of the previous application.

Bio-based Modified Sodium Silicate solution and Accelerating Agent can be installed in ambient temperatures of 40°F and rising or 100°F and falling.

2. MATERIALS

2.A. Performance Properties of Bio-based Modified Sodium Silicate Gel

Performance properties for Bio-based Modified Sodium Silicate Gel, with 40 percent solids and active materials dispersed in water are shown below in Table 2.A.

Table 2.A	
Physical Properties of Penetrant Sealers	
Appearance	White, or light gray color or fugitive dye
VOC content (EPA method 24)	Less than 350 g/l
Flash Point (ASTM 3278)	Greater than 200°F SETA
Resistance to Chloride ion penetration AASHTO T 259 and T 260	Less than 0.52 pounds/yd ³ (criteria of 1.5) at 1/2 inch level; 0.00 pounds/yd ³ (criteria of 0.75) at 1 inch level
Water absorption test (ASTM C642)	0.50% maximum/48 hours; 1.5% maximum/50 days
NCHRP 244	
Series II - cube test	
Water weight gain	85% reduction minimum
Absorbed chloride	87% reduction minimum
Series IV - Southern climate	
Series IV - Northern climate	
Absorbed chloride	95% reduction minimum
Scaling resistance (ASTM C672)	(Non - air - entrained concrete) 0 rating “No Scaling” (100 cycles)

2.B Safety Information

- Low VOC (Volatile Organic Compounds)
- Colorless and clear to slightly opaque
- Non-toxic and biodegradable
- Requires no PPE (Personal Protective Equipment)
- NSF (National Sanitation Foundation) 61 approved for water potability
- Vapor permeable (does not trap moisture within the slab)
- No concern for overspray into waterways or land

2.C. Product Data

Confirm compliance with Table 2.A.

Provide the Engineer with a copy of the Safety Data Sheet (SDS) for Bio-based Modified Sodium Silicate components to be used on site.

Provide certifications stating the conformity of the material with local, state, federal, environmental and worker safety laws and regulations, as requested.

Use manufacturers Technical Data Sheet (TDS) for Bio-based Modified Sodium Silicate to determine coverage requirements.

Use TDS instructions to install Bio-based Modified Sodium Silicate solution, Accelerating Agent, and other material components, including storage, handling, surface preparation (concrete cleaning, etching, removal of paint, etc.), placement, washing, and clean-up.

3. EQUIPMENT AND TOOLS

Use equipment and tools as recommended by the manufacturer.

Clean tools with water. Be sure to wipe off excess water between batches to prevent introduction of water during next application.

Refer to the TDS and SDS for application details and safety precautions.

4. APPLICATION METHOD

Provide a technical representative from Supplier at the start of work for a minimum of one full working day. Alternatively, provide a written statement from Supplier assuring that the Contractor is qualified to install Bio-based Modified Sodium Silicate solution and Accelerating Agent as specified.

The written statement must be dated within the last twelve (12) months. It must include the names of key personnel who will perform and supervise the actual installation of the Bio-based Modified Sodium Silicate solution, Accelerating Agent, and other material components. The Engineer may suspend work if unauthorized personnel are substituted for authorized personnel during construction.

4.A. Delivery, Storage and Disposal

Deliver the material in original, unopened, undamaged, factory-sealed package.

Verify Manufacturer's labels are intact and legible. Labels must include brand, product name, weight, system identification number, and batch number, with verification of date of manufacture and shelf life.

Store the material's components in a clean, dry location, out of direct sunlight. Maintain storage temperature required by the Manufacturer. Avoid contact with moisture.

Do not use components that have exceeded their shelf life.

Dispose of expired material in accordance with Manufacturer's recommendations and local environmental regulations.

4.B. Installation

4.B.1. Surface Preparation

Prepare concrete surfaces in accordance with the manufacturer's specifications.

Ensure the area of application is clean, dry and free of debris. Remove existing stains on concrete prior to application. For new or existing pavement joints, remove existing joint fillers and debris buildup.

4.B.2. Application

Apply Bio-based Modified Sodium Silicate solution, Accelerating Agent, and other material components, as specified in accordance with the TDS.

Traffic can be placed on riding surfaces as soon as final cleanup and washing has been completed.

5. METHOD OF MEASUREMENT

Payment will include the cost of all materials, equipment, labor, and incidentals necessary to complete the application of the Bio-based Modified Sodium Silicate solution, Accelerating Agent, and other material components as specified.

The area of application will be computed based on the plan dimensions of concrete surface sealed in square feet.

6. BASIS OF PAYMENT

Payment for this work will be made as follows:

<i>Bio-based Modified Sodium Silicate Gel</i>	<i>Square Feet</i>
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