# Protective Surface Treatment for Concrete – Penetrating Sealers JSP 07-08B

**1.0 Description.** This work shall consist of preparing and treating Portland cement concrete bridge deck and bridge approach slab surfaces with a penetrating sealer meeting this specification. This type of sealer shall be used in lieu of the normal surface sealing for concrete in accordance with Sec 703.

**2.0 Materials.** The protective surface treatment shall meet one of the three classes of penetrating sealers in accordance with this job special provision. The penetrating sealer selected by the contractor shall be submitted to the engineer for approval 30 days before application and shall be listed on MoDOT’s Pre-Qualified Product List. The submittal shall include certified test data from an independent test laboratory and the application rate at which penetrating sealer was tested. The penetrating sealer shall be delivered pre-mixed and ready to use. Mixing/agitation shall be in accordance with the manufacturer's recommended procedures. The penetrating sealer shall be stored in tightly sealed containers in a dry location and as recommended by the manufacturer.

**2.1 Class 2 Penetrating Concrete Sealer.** The sealer shall meet the requirements of this job special provision. The sealer selected by the contractor shall be submitted to the engineer for approval two weeks before application and shall be listed on MoDOT’s Pre-Qualified Product List. If the contractor chooses to submit a new product for MoDOT’s Pre-Qualified Product List, the product shall be submitted to the engineer 30 days prior to application. Either submittal shall include certified test data from an independent test laboratory and the concrete mix design and curing procedure on the test specimens in which sealer was tested.

**2.1.1** The sealer shall be a solvent-free 100% solids isobutyltrialkoxysilane, with low oligomer and polymer compound content. The chemical composition shall meet the following requirements:

|  |  |
| --- | --- |
| **Property** | **Specification** |
| Purity | 98% minimum monomer by weight |
| Solvent | Less than 0.1% by weight |
| Siloxan or polymer Residue | Less than0.1% by weight |
| Chloride Ion Content | Less than 40 PPM |
| Density | ASTM D2111: 7.2 to 7.4 pounds per gallon |
| Flash Point | ASTM D93: greater than 145 degrees F |
| Dry Time | ASTM D7539: less than one hour |

**2.1.2** The sealer shall meet the following performance criteria based on a single application at the manufacturer’s recommended application rate. All test specimens shall be produced using MoDOT Class B-2 concrete in accordance with Section 501.

| **Test** | **Test Method** | **Duration** | **Max Absorption / Cl-** |
| --- | --- | --- | --- |
| Water Immersion | ASTM C 642 | 48 hours | 0.5 percent by weight (mass) |
| Water Immersion | ASTM C 642 | 50 days | 1.5 percent by weight (mass) |
| Salt Water Ponding (based on non-abraded specimen) | AASHTO T 259 | 90 days | 0.50 lbs/cu yd (0.30 kg/m3) Cl-  Depth: (1/2 to 1”) (13 to 25 mm) |

**2.1.3 Absorption.** The absorption of the treated concrete under total immersion shall not exceed 0.5 percent after 48 hours or 1.5 percent after 50 days per ASTM C 642 as modified below for non-air entrained concrete.

**2.1.4** In addition to ASTM C 642 section 4.1, one 4-inch diameter by 4 inch long core shall be retrieved from the surface of a concrete test specimen to which sealer has been applied. No cores shall be taken from the bridge deck. The core shall be oven dried as designated by ASTM C 642 section 5.1. The core shall be sealed with a rapid setting two part epoxy on the sides and bottom. The epoxy shall overlap the top edge of the core 1/8”. The core shall be weighed to determine the oven dry weight of the core and coating. The weight shall be designated as “A”.

**2.1.5** The core, processed in accordance with section 2.1.4 of this job special provision, shall be immersed in a suitable receptacle and covered with tap water. The procedure as designated by ASTM C 642 section 5.2 shall be followed to determine the soaked surface dry weight of the core and coating. This weight shall be designated as “B”.

**2.1.6** The percent moisture absorption of the core shall be determined by ASTM C 642 section 6.1, equation (1). ASTM C 642 sections 5.3, 5.4, 6.1 and equations (2) through (7) shall not apply.

**2.1.7 Salt water ponding.** After 90 days ponding of 3 percent NaCl solution per ASSHTO T 259, the chloride ion content of the concrete shall not exceed 0.5 pounds per cubic yard (0.30 kg/m3) at ½ to 1 inch (13 to 25 mm) depth.

**2.2** The sealer shall not permanently stain, discolor or darken the concrete. Application of the sealer shall not alter the surface texture or form a coating on the concrete surfaces. Treated concrete shall be surface dry within 60 minutes after application.

**2.3** The sealer shall be tinted with a fugitive dye to enable the coating to be visible on the treated concrete surface for at least 4 hours after application. The fugitive dye shall not be conspicuous more than 7 days after application when exposed to direct sunlight.

**2.4** The sealer shall be delivered to the project in unopened containers with the manufacturer’s label identifying the product and with the seal(s) intact. Each container shall be clearly marked by the manufacturer with the following information:

• Manufacturer’s name and address

• Product name

• Date of manufacture and expiration date

• Lot identification

• Storage requirements

**2.5 Class 3 Penetrating Sealer – High Molecular Weight Methacrylate.** The material used shall be a low viscosity, non-fuming, and high molecular weight methacrylate resin in accordance with the following:

| **Property** | **Test Method** | **Requirement** |
| --- | --- | --- |
| Viscosity | Brookfield RVT 100 RPM @ 72°F (22°C) | 25 cps maximum |
| Pot Life | Application life before curing begins [@ 68°F (20°C) air temperature] | 15 minutes minimum |
| Curing Time | On site at 50°F (10°C) | 6 hours Maximum |

**3.0 Construction Requirements.**

**3.1 Equipment.** Application equipment shall be as recommended by the manufacturer. The spray equipment, tanks, hoses, brooms, rollers, coaters, squeegees, etc. shall be thoroughly clean, free of foreign matter, oil residue and water prior to applying the treatment.

**3.2 Cleaning and Surface Preparation.** Surfaces, which are to be treated, shall meet the approved product's requirements for surface condition. Sealing shall not be done until all concrete repairs and any corrective actions needed have been completed and cured. The contractor shall furnish the engineer with written instructions for surface preparation requirements and a representative of the manufacturer shall be present to assure that the surface condition meets the manufacturer's requirements.

**3.2.1** Sealing shall be done after the bridge deck and bridge approach slabs have been textured.

**3.2.2** At a minimum, the surface shall be thoroughly cleaned to remove dust, dirt, oil, wax, curing components, efflorescence, laitance, coatings and other foreign materials. The manufacturer or manufacturer's representative shall approve the use of chemicals and other cleaning compounds to facilitate the removal of these foreign materials before use. The treatment shall be applied within 48 hours following surface preparation.

**3.2.3** Cleaning equipment shall be fitted with suitable traps, filters, drip pans and other devices to prevent oil and other foreign material from being deposited on the surface.

**3.3 Test Application.** Prior to final application, the contractor shall treat a measured test coverage area on horizontal and vertical surfaces of the different components of the structure to be treated for the purpose of demonstrating the desired physical and visual effect on an application or of obtaining a visual illustration of the absorption necessary to achieve the specified coverage rate. In the latter case, the applicator shall use at least ½ gallon (1.9 liter) of treatment following the manufacturer's recommended method of application for the total of the test surfaces. Horizontal test surfaces shall be located on the deck and on the curb or sidewalk, and vertical test surfaces shall be located on a parapet or safety barrier curb so that the different textures are displayed.

**3.4 Application.** The concrete treatment shall be applied to concrete surfaces as designated on the plans or per the manufacturer’s specification. The penetrating sealer shall be applied by thoroughly saturating the concrete surfaces at an application rate specified by the manufacturer and as shown in the approved certified test data.

**3.4.1** The concrete surface temperature shall be above 35°F (2°C).

**3.4.2** The treatment shall be spread from puddles to dry areas.

**3.4.3** If the applicator is unable to complete the entire application continuously, the location where the application was stopped shall be noted and clearly marked.

**3.5 Protection of Adjoining Surfaces and the Public.**

**3.5.1** When applying a treatment, the contractor shall protect adjoining surfaces of the structure that are not to be sealed by masking off or by other means. The contractor shall also make provision to protect the public when treating the fascia of a bridge that spans an area used by the public.

**3.5.2** Asphalt and mastic type surfaces shall be protected from spillage and heavy overspray. Joint sealants, traffic paints and asphalt overlays may be applied to the treated surfaces 48 hours after the treatment has been applied. Adjoining and nearby surfaces of aluminum or glass shall be covered where there is possibility of the treatment being deposited on the surfaces. Plants and vegetation shall be protected from overspray by covering with drop cloths. Precautions shall be followed as indicated on the manufacturer's material and safety data sheet.

**3.6 Opening to Traffic.** Traffic shall be allowed on a deck only after a treated area does not track.

**4.0 Method of Measurement.** Measurement will be made to the nearest square yard (m2) measured longitudinally from end of the bridge approach slab to end of the bridge approach slab and transversely from roadway face of curb to roadway face of curb extended to end of the approach slabs. No deduction will be made for gaps to avoid, raised pavement markers, manholes or other obstructions. Material placed on curb faces will not be measured. Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

**5.0 Basis of Payment.** Payment for the above described work, including all material, equipment, labor and any other incidental work necessary to complete this item, will be considered completely covered by the contract unit price for "Penetrating Sealers".