

SECTION 413 SEALING CONCRETE STRUCTURE SURFACES

413-1 Description.

Perform surface preparation and application of a alkylalkoxysilane penetrant sealer, with 40 percent solids and active materials dispersed in water to all exposed concrete surfaces as the project plans designate in accordance with the manufacturer's recommendations and these Specifications.

Ensure the penetrant sealer is tinted with a fugitive dye and will be distinguishable on the concrete surface a minimum of four hours after application and becomes invisible within seven days of application.

413-2 Materials.

Meet the following:

Appearance	White, Milky Liquid
VOC content (EPA method 24)	Less than 350 g/l
Flash Point (ASTM 3278)	Greater than 200° F [93° C] SETA
Resistance to Chloride ion penetration AASHTO T259 and T260	Less than 0.52 pounds/yd ³ [0.31 kg/m ³] (criteria of 1.5) at 1/2 inch [13 mm] level Less than 0.00 pounds/yd ³ [0.00 kg/m ³] (criteria of 0.75) at 1 inch [25 mm] level
Water absorption test (ASTM C 642)	0.50 percent maximum / 48 hours; 1.5 percent maximum / 50 days
NCHRP 244	
Series II - cube test	
Water weight gain	85 percent reduction minimum
Absorbed chloride	87 percent reduction minimum
Series IV - Southern climate	
Absorbed chloride	95 percent reduction minimum
Scaling resistance test (ASTM C 672)	(non - air - entrained concrete) 0 rating "No Scaling" (100 cycles)

413-3 Surface Preparation.

413-3.1 General: Prepare concrete surfaces to receive a penetrant sealer in accordance with these Specifications dependent on whether the surfaces are of recently cast concrete (new construction) or of existing concrete.

413-3.2 Surface Preparation for New Construction: Remove substances such as dust, grime, dirt, curing compounds, form oil, debris, etc. by water blasting, light sandblasting, wire brushing, or other methods acceptable to the Engineer, all in accordance with the penetrant sealer manufacturer's recommendations. When using cleaning methods other than water blasting, wash the cleaned surfaces with water meeting the requirements of Section 923, as a final cleaning operation.

413-3.3 Surface Preparation for Existing Concrete:

413-3.3.1 General: Remove substances such as dust, grime, dirt, stains, mineral deposits, oil, bituminous materials, debris, and all other deleterious material by using water blasting equipment of sufficient operating capacity and pressure, all in accordance with the penetrant sealer manufacturer's recommendations.

413-3.3.2 Cleaning Equipment: Use approved water blasting equipment to clean existing concrete surfaces. Use water blasting equipment which is specifically manufactured to clean

concrete surfaces. Use equipment that has a minimum rated nozzle capacity of 6,000 psi [40 MPa] using the spray head proposed for use in the work.

413-3.3.3 Water for Blasting: Use water meeting the requirements of Section 923.

413-3.3.4 Concrete Surface Cleaning Operation: During the cleaning operation, exercise sufficient care to minimize the removal of the concrete matrix. Furnish hand tools, powergrinders, and other similar equipment to remove materials which cannot be removed by water blasting without abrading the concrete matrix beyond acceptable limits. Wash concrete surfaces cleaned by methods other than water blasting with water blasting equipment as the final cleaning operation.

Limit the duration of water blasting to provide a light abraded surface. Do not allow surface abrasion to exceed 0.016 inch [0.4 mm]. The Engineer will not require further cleaning of stains still apparent after abrading to a depth of 0.016 inch [0.4 mm]. Avoid exposure of coarse aggregate by water blasting.

Reclean cleaned concrete surfaces which become contaminated before applying the penetrant sealer at no expense to the Department prior to applying the penetrant sealer.

413-4 Application of Sealant Materials.

413-4.1 General: Apply the penetrant sealer only to surfaces which have been prepared in accordance with these Specifications and approved by the Engineer. For application of the penetrant sealer, meet these Specifications and the penetrant sealer manufacturer's recommendations.

Prior to application of any penetrant sealer, cure concrete for a minimum of 21 days.

Coordinate the application of the penetrant sealer so that concrete surfaces prepared to receive penetrant sealer are sealed with the penetrant sealer within ten days after completion of the surface preparation and prior to contamination of the prepared surfaces.

413-4.2 Application Equipment: Apply the penetrant sealer using any suitable air or airless sprayer with an operating pressure of approximately 20 psi [140 kPa].

413-4.3 Application Limitations: Apply the penetrant sealer material only when the ambient air temperature is between 50 and 90° F [10 and 32°C]. Apply the penetrant sealer only to concrete surfaces which have dried a minimum of 48 hours after water last contacted the concrete surfaces. Do not apply the penetrant sealer when winds are blowing 25 mph [40 km/h] or more, during rainfall, or when water spray or mist is present.

413-4.4 Application: Apply the penetrant sealer only to concrete surfaces that have been prepared in accordance with the requirements and limitations set forth in these Specifications. Determine the actual coverage rate in square feet per gallon [square meters per liter] on the basis of field trials. Conduct a field trial to determine coverage rate at the beginning of any penetrant sealer application operation. Conduct additional confirmation field trials at a frequency of once for every 5,000 ft² [465 m²] applied, each production day of application, or when the character of the work changes, whichever is sooner. For each field trial, determine the optimum coverage rate for 500 ft² [46 m²] of surface area. Maintain the penetrant sealer application rate between 155 and 225 ft² covered per gallon [4 and 5.5 m² covered per liter] of penetrant sealer used. Apply the penetrant sealer in a uniform manner without puddling and skips. Redistribute any penetrant sealer which is applied and subsequently puddles in low areas over the concrete surfaces by use of a squeegee.

Generally, begin the application of the penetrant at the lowest elevation and proceed upward toward higher elevations.

Maintain operating pressures in the sprayers used for application of the penetrant sealer material sufficiently low so that atomization or misting of the material does not occur.

413-5 Control of Materials.

413-5.1 Packaging and Identification: Deliver the penetrant sealer to the project in the unopened, sealed containers with the manufacturer's label identifying the product and with numbered

seals intact. Ensure that each container is clearly marked by the manufacturer with the following information:

- a. Manufacturer's name and address.
- b. Product name.
- c. Date of manufacture.
- d. Expiration date.
- e. LOT identification number.
- f. Container serial number.

413-5.2 Manufacturer's Certification: Provide the Engineer a certification conforming to the requirements of Section 6 from the manufacturer, confirming that the penetrant sealer meets the requirements of this Section. Do not incorporate these materials into the project until the Engineer has accepted certification for this material. Submit such certification for each LOT of material delivered to the project. In each certification, identify the serial numbers of the containers certified.

413-5.3 Materials Sampling for Tests: The Engineer may require samples from each LOT or container of materials delivered to the project or from containers at the point of use. When samples are required, furnish samples in accordance with the Engineer's instructions.

413-5.4 Storage of Materials: Store materials delivered to the job site in original unopened containers within an appropriate storage facility. Use a storage facility that provides protection from the elements, and safe and secure storage of the materials.

413-5.5 Unused Material in Opened Containers: Do not return unused material in opened containers to storage for later use. The Contractor may either apply such material to appropriate areas on concrete surfaces or remove and dispose of it at locations off site that the Contractor provides.

413-6 Acceptance.

The Engineer will accept penetrant sealer application when it is determined that the Contractor has properly cleaned all surface areas to be sealed and has applied the penetrant sealer within the required rates of application.

413-7 Method of Measurement.

Prestressed precast items designated in the plans to be sealed will not be measured for separate payment. The Contractor shall include the cost of cleaning, sealing, and applying Penetrant Sealer with the cost of the prestressed precast items. For cast-in-place surfaces to be sealed, the quantities to be paid for will be (1) the volume, in gallons [liters], of Penetrant Sealer as determined by use of the field measured area satisfactorily sealed divided by the approved application rate based on field trials, and (2) the area, in square feet [square meters], of Cleaning and Sealing Concrete Surfaces as determined by field measurement, completed and accepted.

413-8 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including cleaning, applying penetrant, and furnishing penetrant required to satisfactorily clean and seal the areas designated.

No additional compensation will be made for areas which must be resealed due to Contractor error.

Payment will be made under:

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| Item No. 400-149- | Penetrant Sealer - per gallon. |
| Item No. 2400-149- | Penetrant Sealer - per liter. |
| Item No. 400-154- | Cleaning and Sealing Concrete Surfaces - per square foot. |
| Item No. 2400-154- | Cleaning and Sealing Concrete Surfaces - per square meter. |