

500 STRUCTURES

ITEM 564 - SEALING OF CONCRETE SURFACES

- 564.01 Description
- 564.02 General
- 564.03 Materials
- 564.04 Surface Condition
- 564.05 Surface Preparation
- 564.06 Application
- 564.07 Test Application
- 564.08 Coverage
- 564.09 Discoloration
- 564.10 Traffic Control
- 564.11 Precautions
- 564.12 Protection of Adjoining Surfaces and the Public
- 564.13 Environmental Requirements
- 564.14 Equipment
- 564.15 Mixing
- 564.16 Storage
- 564.17 Method of Measurement
- 564.18 Basis of Payment

564.01 Description. This item shall consist of the necessary labor, materials and equipment to prepare and treat portland cement concrete surfaces with an approved sealer in accordance with these specifications. The sealer shall be applied at coverage rates specified under Coverage for the types of surfaces and the type of sealer described herein.

564.02 General. A sealer shall be applied to all exposed existing and new surface areas of structures as designated on the plans. Sealing shall not be done until all concrete repairs to a given structure have been completed and cured, unless otherwise directed by the Engineer. Latex modified concrete shall not be sealed. Concrete bridge deck wearing surfaces shall not be sealed unless such sealing with a non-epoxy sealer is specifically stated in the plans.

The sealer may be an epoxy, a silane, siloxane, gum resin, polyester resin, or a mixture of silanes, siloxanes and gum resins in accordance with the following specifications. When the pay item description designates "epoxy", only an epoxy sealer shall be used. When the pay item description designates "non-epoxy", only a non-epoxy sealer shall be used. The selected sealer shall be one that meets the requirements of the Southern Climate Exposure Test as outlined in NCHRP Report 244, exhibiting a 90 percent reduction in water absorption by concrete, and is on ODOT's approved list which is maintained in the Ohio Department of Transportation's Bureau of Testing at 1600 West Broad Street in Columbus, Ohio.

564.03 Materials. The epoxy sealer shall be a two-component epoxy of at least 50 percent solids content. The performance of the epoxy shall be equal to or surpass the performance of epoxy sample 16-E of NCHRP Report 244.

In the non-epoxy group of sealers, the silane sealer shall consist of a 40 percent minimum solution by weight of alkytrialkoxo in ethyl alcohol or anhydrous isopropanol; the silane sealer shall be a mixture of aromatic hydrocarbon, polymethylhydro siloxane; the gum resin sealer shall be a mixture of gum resin, silanes, and siloxanes consisting of not less than 30 percent active ingredients; the polyester resin sealer shall be a two-component 100 percent reactive wax-free unsaturated diaromatic oxide fumarate polyester resin and its promoter/hardener shall be compatible with Methyl Ethyl Keytone Peroxide (MEKP) in the amount of a minimum of 1 percent and a maximum of 2 percent to provide desired gel times.

Pre-qualification testing shall be the responsibility of the Contractor. Drums or containers of the sealer or sealer components shall be delivered to the job site unopened and with the manufacturer's numbered seal intact.

564.04 Surface Condition. Surfaces to which sealers are to be applied shall be dry and free from dust, dirt, oil, wax, curing compounds, efflorescence, laitance, coatings and other foreign materials and shall be structurally sound. Weak sections and spalled areas shall have been repaired before application of the sealer.

The sealer shall be applied only after new concrete has air dried for at least five days.

Cast-in-place concrete shall have attained design strength prior to application of the non-epoxy sealer. Accelerated cured precast concrete may be treated after it has attained the required 28 day strength, after cavities which require grout filling have been filled, and after grout has cured and air-dried for five days.

564.05 Surface Preparation. The surface shall be thoroughly cleaned to remove dust, dirt, oil, wax, curing compounds, efflorescence, laitance, coatings and other foreign materials. The use of chemicals and other cleaning compounds to facilitate removal of these foreign materials shall be approved by the sealer manufacturer or its representative and the project engineer before its use. The sealer shall be applied within 48 hours following surface preparation.

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

Required cleaning methods for the following categories are:

- A. New exposed concrete surfaces which are water cured.

1. A light sweep sandblast shall be required to remove any foreign substances. The sandblast shall be followed by power sweeping or air brooming.
- B. New exposed concrete surfaces where curing compounds have been used.
1. A water blast with 7000 psi. (48 MPa) minimum cold water or
 2. A sandblast followed by air brooming or power sweeping to remove dust and sand from the surfaces and open pores.
 3. All curing compound shall be removed.
- C. Sides of new exposed prestressed concrete box beams.
1. High pressure hot water or steam jenny cleaning or
 2. Soap scrub with a thorough cold water rinse.
- D. **Existing Concrete Surfaces.**
1. Sandblasting followed by air brooming or power sweeping to remove dust and sand from the surface and opened pores.

564.06 Application. Concrete sealer shall be applied as follows:

1. **Epoxy Sealer.** Apply sealer at surface temperature of 45 F (7 C) or above with a brush, squeegee, roller or spraying equipment. Sealer shall not be applied if rain is anticipated within 6 hours following application. After application, a temperature as low as 30° F (-1° C) is permitted. Two coats of epoxy sealer shall be applied. Apply the second coat after the first coat has become tack free, but not earlier than 12 hours after the first coat application. Both coats shall be from the same manufacturer. The second coat only shall be tinted to Federal Color Standard No. 25231. Pigment content shall be limited so as not to reduce sealing effectiveness of the second coat. On sidewalks and other horizontal surfaces such as shoulder areas subject to repetitive foot traffic or vehicular traffic, the surface of the second coat shall incorporate silica sand at a rate of 1 1/2 pounds per square yard (0.8 kg/m²) to produce a non-skid surface satisfactory to the Engineer. At 70° F (21° C) the pot life of one gallon of the mixed components A & B varies from 2 to 8 hours depending upon the product and the manufacturer. Some epoxies must be allowed to age for 30 minutes before using. Do not mix any more at one time than can be applied before the material starts to set. Clean tools and equipment

promptly after use with epoxy solvent thinner, xylene, toluene or methylethyl ketone solvent.

2. **Non-Epoxy Sealer.** A non-epoxy sealer shall be applied according to the manufacturer's recommended mode of application and under the observation of the Engineer. When spray equipment is used, the sealer shall be sprayed onto concrete surfaces in a one-pass operation. On vertical surfaces (sides of prestressed concrete box beams, edges of decks, faces of safety parapets and walls) a second pass may be required immediately (within 10 to 15 minutes) to achieve absorption at the application rate prescribed under Coverage. When a polyester resin sealer is applied to bridge deck shoulder or sidewalk areas the application shall incorporate silica sand at a rate of 1 1/2 pound per square yard (0.8 kg/m²) to produce a non-skid surface as specified for epoxy sealer. Clear non-epoxy sealers shall be tinted with a vanishing dye that does not damage the concrete.

- A. Do not proceed with application of the sealer if the ambient temperature is below 40° F (4° C) or when the ambient temperature is expected to fall below 32° F (0° C) within 12 hours after application.
- B. Do not proceed with application of the sealer in rainy conditions. The sealer shall not be applied if rain is anticipated within two hours after application or in accordance with manufacturers recommendations, whichever is longer.
- C. On horizontal surfaces the sealer shall be uniformly sprayed to saturate/flood the surface. Proper quantities are being applied when the sealer stands for a few seconds before completely penetrating.

A gum resin sealer requires brooming in. On smooth-finished or dense concrete, all excess material shall be squeegeed off after 10 minutes to assure that no excess solids remain which can cause excessive slickness.

- D. On vertical surfaces the sealer shall be uniformly sprayed to saturate/flood the surface. Proper quantities are being applied when excess sealer runs 6 to 12 inches (152 to 305 mm) below the spray pattern. A gum resin sealer and a polyester resin sealer may be applied with a brush or roller.

If the applicator is unable to complete the entire application at one time and stops for lunch, nightfall, a lack of material, an equipment

breakdown, or for some other reason, the place where the application was stopped shall be clearly noted or clearly marked.

564.07 Test Application. Prior to final application, the Contractor shall apply sealer to measured test coverage areas on horizontal and vertical surfaces of the different components of the structure to be sealed for the purpose of demonstrating the desired physical effect of an epoxy application or of obtaining a visual illustration of the absorption necessary to achieve the specified coverage rate for a non-epoxy sealer. In the latter case, the applicator shall use at least 1/2 gallon (2 L) of sealer following the manufacturer's recommended method of application for the total test surfaces. Horizontal test surfaces shall be located on the deck and on the safety curb or sidewalk, and vertical test surfaces shall be located on a parapet, abutment and pier face, etc. so that the different textures are displayed.

564.08 Coverage. Epoxy sealer shall be applied to the concrete surfaces as designated on the plans at the rate of 120 square feet per gallon (3 m²/L) for each coat. This specified coverage shall be obtained regardless of the number of passes per coat.

Non-epoxy sealers shall be applied at a coverage rate not to exceed 100 square feet per gallon to all surfaces subject to abrasive wear (bridge decks, bridge deck shoulders and sidewalks), at a rate not to exceed 125 square feet per gallon (3 m²/L) to curbs and vertical surfaces of beams and deck slabs subject to direct roadway drainage and at a rate not to exceed 150 square feet per gallon (3.7 m²/L) for surfaces not subject to abrasive wear or direct roadway drainage (for example parapets, abutments, pier caps, walls and median dividers). Exception: Polyester resin sealer shall not be applied to a bridge deck (excluding shoulders) because it offers very little skid resistance.

Each gallon (liter) of sealer shall not be spread over more square feet (square meter) than specified.

564.09 Discoloration. The sealer shall not produce a mottled coloration of the concrete or noticeably discolor it permanently.

564.10 Traffic Control. Traffic may be allowed on deck shoulder areas which have been sealed with an epoxy sealer after 12 to 16 hours. Traffic may be allowed on a deck only after a non-epoxy sealer appears totally dry. Silanes and siloxanes usually dry within 1/2 to 1 hour after they have been applied, however, traffic is not allowed for a minimum of two hours.

564.11 Precautions. The sealers (except polyester resin) are flammable and shall not be used near heat, sparks or an open flame. No smoking shall be allowed in the vicinity where sealers are being applied. Follow normal precautions as with any type solvent material.

Direct epoxy contact with the skin should be avoided since it can cause skin irritation. In case of contact, wash the skin with soap and water. Protective clothing,

goggles and gloves are recommended. In case of accidental contact with the eyes flush immediately with plenty of water and report to a doctor. It is fatal if epoxy is taken internally.

564.12 Protective of Adjoining Surfaces and the Public. When applying a sealer, the Contractor shall protect by masking off or by other means adjoining surfaces of the structure which are not to be sealed. The Contractor shall also make provisions to protect the public when applying the sealer to the fascia of a bridge and/or portions of the underside of the deck of a bridge that spans an area used by the public.

Asphalt and mastic type surfaces shall be protected from spillage and heavy overspray of the non-epoxy sealers. These sealers shall not come in contact with joint sealants which have not been allowed to cure according to the manufacturer's instructions. Joint sealants, traffic paints and asphalt overlays may be applied to the treated surfaces 24 hours after the sealer has been applied. When a siloxane sealer is applied, the adjoining and nearby surfaces of steel, aluminum or glass shall be covered where there is a possibility of a sealer being deposited on the surfaces. Silane requires no such protection.

564.13 Environmental Requirements. Protect plants and vegetation from overspray and subsequent browning by covering with drop cloths.

564.14 Equipment. Application equipment shall be that which is recommended by the sealer manufacturer. Silanes and siloxanes shall be sprayed onto concrete surfaces using a low pressure airless apparatus (15-30 psi. (103-206 kPa) nozzle pressure with a coarse fan-spray nozzle) such as a garden, form oil, horticulture or other low pressure sprayer. Polyester resin sealer can be applied using rollers, brushes or spray equipment. A gum resin sealer can be applied with a low pressure airless spray but must be broomed into the surface. 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 concrete sealer.

564.15 Mixing. Epoxy and polyester resin sealers are supplied in two-component systems. Mixing shall be according to the manufacturer's recommended procedures. Material shall be mixed to a uniform consistency which shall be maintained during application.

564.16 Storage. Epoxy components shall be stored in tightly sealed containers in a dry location and at normal room temperature (65 to 85° F (18-29° C)). Abnormal storage conditions shall be approved by the manufacturer and the Engineer. Non-epoxy sealers shall be stored in unopened drum or containers with the manufacturer's numbered seal intact.

564.17 Method of Measurement. The quantity shall be the actual area in square yards (square meters) of surfaces sealed and shall include surface preparation, material, application, and pre-qualification testing cost.

564.18 Basis of Payment. Payment will be made at the contract price for:

Item	Unit	Description
564	Square Yard (Square Meter)	Sealing of Concrete Surfaces
564	Square Yard (Square Meter)	Sealing of Concrete Surfaces (epoxy)
564	Square Yard (Square Meter)	Sealing of Concrete Surfaces (non epoxy)
564	Square Yard (Square Meters)	Sealing of Concrete Surfaces with (_*_)

* A particular non-epoxy sealer may be specified on an approved experimental project.