

**KANSAS DEPARTMENT OF TRANSPORTATION  
SPECIAL PROVISION TO THE  
STANDARD SPECIFICATIONS, 1990 EDITION**

NOTE: This special provision is generally written in the imperative mood. The subject, "the *Contractor*" is implied. Also implied in this language are "*shall*", "*shall be*", or similar words and phrases. The word "*will*" generally pertains to decisions or actions of the Kansas Department of Transportation.

**Create a new Section in Division 800:**

**UNDERSEALING**

**1.0 DESCRIPTION.**

Provide materials for, and fill existing voids under Portland Cement Concrete Pavement (PCCP) by drilling injection holes and pumping a cement/fly ash grout under the pavement slab at locations shown in the Contract Documents

<b>BID ITEM</b>	<b>UNIT</b>
Fly Ash (Undersealing)	Ton (Mg)
Injection Holes	Each

**2.0 MATERIALS.**

**a.** Provide materials complying with the requirements of the Standard Specifications:

Water	Section 2400
Portland Cement (Type I or II)	90P/M-212 (Latest Revision)
Fly Ash	90P/M-191 (Latest Revision)
Admixtures	90P/M-130 (Latest Revision)

**b.** Mix the water, Portland Cement (not less than 25 percent by volume of solids) and fly ash (not less than 50 percent by volume of solids) into a cement/fly ash grout complying with the following requirements:

Fluidity (efflux time)	ASTM C939	9 to 15 seconds
7-Day Compressive Strength	ASTM C942	600 psi (4.1 MPa) minimum

**c.** Add admixtures only after receiving written permission from the Engineer.

**3.0 CONSTRUCTION REQUIREMENTS.**

**a. Weather and Seasonal Limitations.** Do not underseal the PCCP if the pavement surface temperatures are below 36°F (2°C), or if the subgrade or base course is frozen. Also, do not underseal the PCCP if the subgrade contains an abnormal amount of moisture from recent rainfall, as evidenced by standing water on the pavement or in the joints or cracks.

**b. Equipment.**

(1) Grout Plant: Provide a grout plant consisting of a positive displacement cement injection pump and a high speed colloidal mixing machine. Provide a mixing machine that operates between 800 and 2000 RPM, creating a high-shearing action with a subsequent pressure release to make a homogeneous mixture. Provide a pressure measuring gauge in the grout supply hose.

(2) Drill: Provide an air compressor and rock drills or other devices capable of drilling the injection holes through the PCCP.

**c. Drilling Holes.** Submit a hole pattern and pumping sequence to the Engineer for approval. Do not damage the existing reinforcing steel in the pavement. Before drilling the holes, determine the location of reinforcing steel.

The holes must not be larger than 2 inches (50 mm) in diameter, drilled vertically and round, to a depth sufficient to penetrate the base and into the subgrade material. Holes may be washed to create a small cavity, allowing initial spread of grout. Drill the holes in a manner that prevents breakout at the bottom of the pavement. Do not put downward force on the drill that exceeds 200 lbf (900 N).

**d. Pavement Undersealing.** Prevent the slabs from vertical movements exceeding 1/8 inch (3 mm). Use monitoring equipment capable of accurately measuring 0.001 inch (0.02 mm). Repair by replacement of all slabs raised more than 1/2 inch (10 mm). Repair by grinding all slabs raised more than 1/8 inch (3 mm) and less than 1/2 inch (10 mm). Grade tolerances are applicable to both transverse and longitudinal grades.

Begin the grout injection as soon as practical after mixing the grout. Do not use material held in the mixer or injection sump pump for more than 1 hour after mixing. Adding water after the initial mixing of grout is not allowed.

Connect an expanding rubber packer, or other approved device, to the end of the grout plant discharge hose. Place the expanding rubber packer in the injection hole, being careful not to extend the discharge end of the rubber packer below the lower surface of the PCCP.

Inject the grout in the pre-approved pattern, and in the quantity required to fill voids under the PCCP.

Pump the grout into the holes using an injection pump with a pressure capability of 250 psi to 300 psi (1.7 MPa to 2.1 MPa) when pumping a grout slurry mixed to a 12 second flow cone time.

Cease injection of grout when grout appears at any joint, crack, or adjacent hole, or when monitoring devices indicate slab movement in excess of 1/8 inch (3 mm).

Cease injection at a hole when grout flow does not occur after 7 seconds of sustained 150 psi (1.0 MPa) gauge pressure and there is no indication of slab movement.

Take precautions to prevent grout from being injected into any drainage facility or other open structure.

Prevent excessive loss of grout through cracks, joints, other drilled holes, or back pressure. The State will not pay for wasted material.

Prior to grout drying on the drilled holes, fill the holes with a fast setting sand/cement mixture or other patching material approved by the Engineer

Replace slabs at no additional cost to the State in which cracks emanate radially from the grout injection holes.

Replace slabs at no additional cost to the State in which cracks develop between adjacent grout injection holes. The Engineer may approve cross-stitching of the cracks if he determines that the cracking is minor.

**e. Deflection Testing.** The State may use the Falling Weight Deflectometer (FWD) at sample locations to determine the effectiveness of the undersealing operation. Voids detected under the slabs by this procedure will be filled a second time by the Contractor.

#### **4.0 MEASUREMENT AND PAYMENT.**

Fly ash will be measured by the Ton (Mg) of actual material placed. Injection holes will be measured by the number of holes drilled. Monitoring for pavement lift will not be measured separately, but is subsidiary to the injection holes.

"Fly Ash (Undersealing)" and "Injection Holes" will be paid for at the Contract unit price which is full compensation for the specified work. No adjustment in Contract unit prices will be made regardless of the amount of underruns or overruns.

05-10-05 M&R (AJG)(RB)