

August 15, 1994

**SEALING JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT****GENERAL**

The work under this item consists of sealing new joints and resealing of existing joints in Portland Cement Concrete Pavements. The joints consist of transverse and longitudinal joints. The work shall be performed in accordance with Section 501 of the Standard Specifications except as herein outlined.

It will be the responsibility of the Contractor to determine the condition of existing joints and bid accordingly. See the plans for joint details.

In the event that the Engineer determines that the Contractor has insufficient equipment and/or insufficient and/or unskilled labor and supervision to accomplish the desired workmanship, the work will be stopped until the matter is resolved.

**APPLICATION**

Silicones and hot pour sealants shall be used in applications as follows, unless otherwise denoted in these special provisions or the plans.

**NEW CONCRETE PAVEMENT**

For all new concrete pavements, the transverse joints and lane longitudinal joints (not constructed with the plastic strip) shall be sealed with silicone sealant (non-sag or self level).

**OLD CONCRETE PAVEMENT (NO OVERLAY)**

For old concrete pavements that will not be overlaid, the transverse joints and lane longitudinal joints (not constructed with the plastic strip) that are prepared to a uniform width shall be sealed with silicone sealant (non-sag or self level).

When non-uniform width joints are dominant, only non-sag silicone sealant shall be used in the concrete joints (transverse and/or longitudinal).

**OLD CONCRETE PAVEMENTS (TO BE OVERLAID)**

For all old concrete pavements that will be overlaid with asphalt, the transverse and longitudinal joints (not constructed with the plastic strip) shall be resealed with ASTM D 3405 joint sealant.

**SHOULDER JOINTS: (ALL APPLICATIONS ABOVE)**

New or Old Concrete Shoulders: The longitudinal and transverse shoulder joints shall be sealed with non-sag or self level silicone sealant except:

- (1) When non-uniform width joints are dominant, only non-sag silicone sealant shall be used.
- (2) When old concrete shoulders are to be overlaid with Asphalt, ASTM D 3405 sealant without a bond breaker shall be used.

SUPPLEMENTAL SPECIFICATIONS

New Asphalt Shoulders: The longitudinal joint at the pavement edge may be sealed with self level (not non-sag) silicone sealant or ASTM D 3405 Hot Pour Sealant. A bond breaker will not be required for the ASTM D 3405 sealant.

Old Asphalt Shoulders: The longitudinal joint at the pavement edge shall be sealed with ASTM D 3405 sealant. A bond breaker will not be required for the ASTM D 3405 sealant.

**MATERIALS**

Hot-Poured Sealants - shall meet the requirements of ASTM D 3405 and applicable requirements as shown in the addendum entitled "Portland Cement, Portland Cement Concrete For Pavement and Structures" dated March 17, 1994.

Silicone Sealants - shall be low modulus and furnished in a one part silicone formulation. The sealant shall be compatible with the surface to which it is applied. Acid cure sealants are not acceptable for use on Portland Cement Concrete. Bond breakers shall be chemically inert and resistant to oils, gasoline, and solvents. Preparation and installation of silicone and bond breakers shall be in accordance with the Construction Section of this Special Provision.

The low modulus silicone sealant shall be furnished in a one part silicone formula which does not require heat or a primer for bond to the joint walls and shall meet the following requirements:

<u>Physical Properties</u>	<u>Requirements Non-Sag</u>	<u>Self-Level</u>
Tensile Stress at 150% strain (Min-Max PSI) ASTM D 412 Method A Die C or ASTM D 3583 (Section 14 Modified) (See Note 1)	5-45	5-20
Tensile Adhesion - Bond Requirement Minimum Elongation: Concrete Block Specimens Minimum Elongation: Asphalt Block Specimens ASTM D 3583 (Section 14 Modified to 1/2" by 1/2" x 2") (See Note 1)	650% NA	500% 500%
Durometer Hardness Test at: 0° F ± 3° 77° F ± 3° (See Note 1) ASTM D 2240	Shore "A" 10-25 10-25	Shore "00" 20-80 20-80
Skin Over Time (Max. Minutes) GDT 106 or ASTM D 2377 or ASTM C 679 See Note 2	30-75	90
Extrusion Rate (Min./Max. Grams/Minute) GDT 106 or ASTM C 603 or Mil-S-8802	75-250	200-600
Non-Volatile Content (Min. %) GDT 106 or ASTM D 2822 (Paragraph 9.2)	90	90
Specific Gravity (Min./Max.) ASTM D 792(A) or ASTM D 1475	1.0 - 1.5	1.1 - 1.5
Movement Capability & Adhesion GDT 106 or ASTM C 719 @ + 100% to -50% movement for 10 full cycles tested at 0°F See Note 1	No failure Adhesive or Cohesive	No failure Adhesive or Cohesive

SUPPLEMENTAL SPECIFICATIONS
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Ozone and UV Resistance ASTM C 793 or ASTM G 53 for 5000 hr. of exposure See Note 1	No chalking, blistering, cracking, or bond loss	No chalking, blistering, cracking, or bond loss
Shelf Life, Minimum (from date of shipment)	6 months	6 months

Note 1: The cure time for these specimens shall be 28 days. Specimens shall be cured at  $77 \pm 3$  F and  $50 \pm 5\%$  relative humidity.

Note 2: At conditions of  $77 \pm 30$ F and  $50 \pm 5\%$  relative humidity.

### **Silicone Source Approval**

Only materials from sources appearing on the Department's approval list entitled "Silicone Sealants for Portland Cement Concrete Pavements" as of the date the work is bid shall be used in the work. A copy of this approval list of sources may be obtained from the Department's Research and Materials Engineer.

A manufacturer may request to be included on the approval list by furnishing certified test results from an independent laboratory verifying that the proposed silicone is in full compliance with all the requirements of this specification.

The submission shall be organized and clear as to addressing each of the physical properties of this specification. The test results presented shall show the lot number of material tested and shall not be older the three (3) years. The test results furnished shall be substantially descriptive of materials to be furnished in the work.

The manufacturer shall furnish a certification with the submission stating that materials to be furnished will be equivalent to those tested and will not change without notification to the Department's Research and Materials Engineer.

The manufacturer will furnish complete instructions as to installation along with technical data sheets and materials safety data sheets with the submission.

The approval process will require a demonstration of installation procedures and installation of demonstration joints to be evaluated through two winters without failure before the source will be approved. In lieu of this, products evaluated by other Departments of Transportation and found acceptable in their programs will be considered. The manufacturer shall describe in detail the demonstration project location, the type of material installed, the date of installation, and a DOT contact (name and phone number) who can be contacted to verify the status and results of the demonstration.

Approved products found to perform inadequately in actual use shall be rejected at the job site and the source removed from the approval sheet.

### **Silicone Shipment Approval**

After source approval, the manufacturer shall furnish with each shipment of materials a certification showing brand name, South Carolina file number for the project, the shipping date and to whom it is shipped and the quantity represented in the shipment. The certificate shall contain a statement that the material meets the South Carolina Department of Transportation's specifications and is essentially the same as that approved by the Department. The shipped containers shall be plainly marked with the manufacturer's name, lot number, trademark, type of silicone and end of shelf life date. A materials safety data sheet and installation instructions shall be furnished with each shipment.

### **Silicone Bond Breakers**

## SUPPLEMENTAL SPECIFICATIONS

Silicone sealants must be installed over a bond breaker to prevent the sealant from bonding to the bottom of the joint. Bond breakers shall be chemically inert and resistant to oil, gasoline, and solvents. The bond breaker must not stain or adhere to the sealant. Bond breakers shall be a backer rod or tape identified and used in accordance with the plans.

The backer rod shall be of circular cross-section and consist of closed cell polyethylene foam. Generally it will be 25% greater diameter than the saw cut width.

Bond breaker tape shall be 0.005" minimum thickness made from extruded polyethylene and shall have a pressure sensitive adhesive on one side.

A certification shall be furnished by the manufacturer of backer rod stating that it complies with the South Carolina Department of Transportation specifications for closed cell polyethylene foam and that the tape is the polyethylene type.

### CONSTRUCTION

All joints to be sealed must be sound, clean, dry and frost free. The following guidelines must be followed unless otherwise provided in writing by the Engineer.

- 1 Freshly sawed joints shall be washed with water immediately after sawing to remove any loose material from the joint faces. Joint washing shall be in one direction to prevent recontamination.
- 2 Once the joint is dry and before final cleaning begins, it shall be sand blasted to remove contaminants. Sand-blasting shall be done in two (2) passes, one for each face, with the nozzle held at an angle to the joint face and within 1 to 2 inches of the pavement. Sandblasting shall be done the same day as the sealing operation and repeated if rain showers occur between initial sandblasting and sealing.
- 3 The blast material as well as dust and dirt deposited by wind and traffic, must be blown out of the joint and away from the area around it using a high-pressure air blast. As with the water, the air blast shall be in only one direction to prevent recontamination of the joint.
- 4 Solvents shall not be used to remove oils, because they generally carry the materials further into the porous concrete or spread them on the surface. Just before placing of the backer rod, rub a finger across the dry joint face to determine that residual cement and/or asphalt dust has been removed. Joints that still contain dust or have become dirty or contaminated must be recleaned.
- 5 Final cleaning, placing of the backer rod and sealing of the joints shall, in general, be one operation when sealing is being done. This will assure clean faces, properly placed backer rod, and proper joint configuration. Just prior to placing the backer rod, the joint faces shall be thoroughly clean and dry. Final cleaning shall be by means of compressed air at least 90 PSI with compressors equipped to remove moisture and oil from the air.
- 6 A roller with a flange slightly narrower than the narrowest joint width and a depth a little deeper than the recess depth desired at the top of the backer rod shall be used to install the backer rod. The backer rod shall then be made leak proof where required by caulking with a silicone product compatible with the sealer to be used. This may be applied from tubes with a caulking gun device.

The sealant shall then be placed in the joint in accordance with the plan configuration by means of an appropriate pump equipped with a nozzle that is narrow enough to place the material from the bottom up in the joint. The material shall then be properly placed to establish a surface profile the desired depth below the surface of the pavement. All equipment for placing the seal and methods of placement shall be in accordance with the sealant manufacturer's recommendations. The sealed joints may not be opened to traffic for 2 hours.

Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer prior to installation of sealant.

SUPPLEMENTAL SPECIFICATIONS
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Prior to work of any kind pertaining to the Joint Sealing Operation, The Contractor, in combination with the Engineer and Sealant Manufacturer/Representative, shall meet and discuss the method of installation. The Contractor and Manufacturer of the sealant must assure the Engineer that the applicator persons are properly trained to install the selected sealant prior to beginning work.

All joints to be sealed with ASTM D 3405 hot pour sealant shall be sealed in accordance with Subsection 501.27 of the Standard Specification Edition 1986 except that the continuous temperature recorders will not be required on new technology pump systems that reasonably assure that low temperature material cannot be applied. The Engineer shall make that determination.