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MaineDOT

Transportation Research Division

Technical Report 13-05

Use of JOINTBOND® as a Center Line Joint Stabilizer
Demonstration on I-95 N.B., Waterville to Clinton, Maine

September 2013

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Project Description

JOINTBOND® is a longitudinal joint stabilizing product produced by Pavement Technology, Inc. of Westlake, Ohio.

"JOINTBOND® was designed to help minimize asphalt maintenance by penetrating newly placed asphalt pavement and stabilizing the critical area surrounding the longitudinal construction joint.

JOINTBOND® is a polymerized maltene emulsion that is spray applied to the joint area, approximately one foot to one and one half to either side of the joint.

A JOINTBOND® application completely penetrates the pavement surface, leaving no surface coating. Paint striping is not compromised by a JOINTBOND® application (Pavement Technology, Inc.)."

A portion of I-95 that runs from Waterville to Clinton was chosen for a test demonstration in Maine. This road was re-paved in 2012, AC-IB-1913(600)E, and already shows some signs of the centerline joint opening up (see FIGURES 4 &5). The original project description: "1-3/4" Mill and fill: Beginning at the Webb Rd. (O.H) bridge extending northerly 17.87 miles to Bridge# 5982, I-95 NB under Johnson Flat Rd.

Objective

The objective of this study is to determine if JOINTBOND® extends the useful life of the construction joint by reducing permeability at the joint.

The manufacturer claims that JOINTBOND® penetrates and fortifies the weakest area in new asphalt pavements: the longitudinal construction joint (Pavement Technology, Inc.).

The product will be evaluated by the Transportation Research Division over a two-year period for effectiveness. ARAN videos will be reviewed and field inspections conducted.

Project Location

The highway selected for the demonstration project is Interstate 95 from Waterville to Clinton, Kennebec County, Maine. The project scope is from the southernmost bridge joint of the Webb Rd. overpass, proceeding northerly to Exit 138 in Clinton. A 1.27 mile long portion of the distance was omitted in Fairfield due to a bridge re-construction project over the Kennebec River.

The project location is shown on the map on the following page.

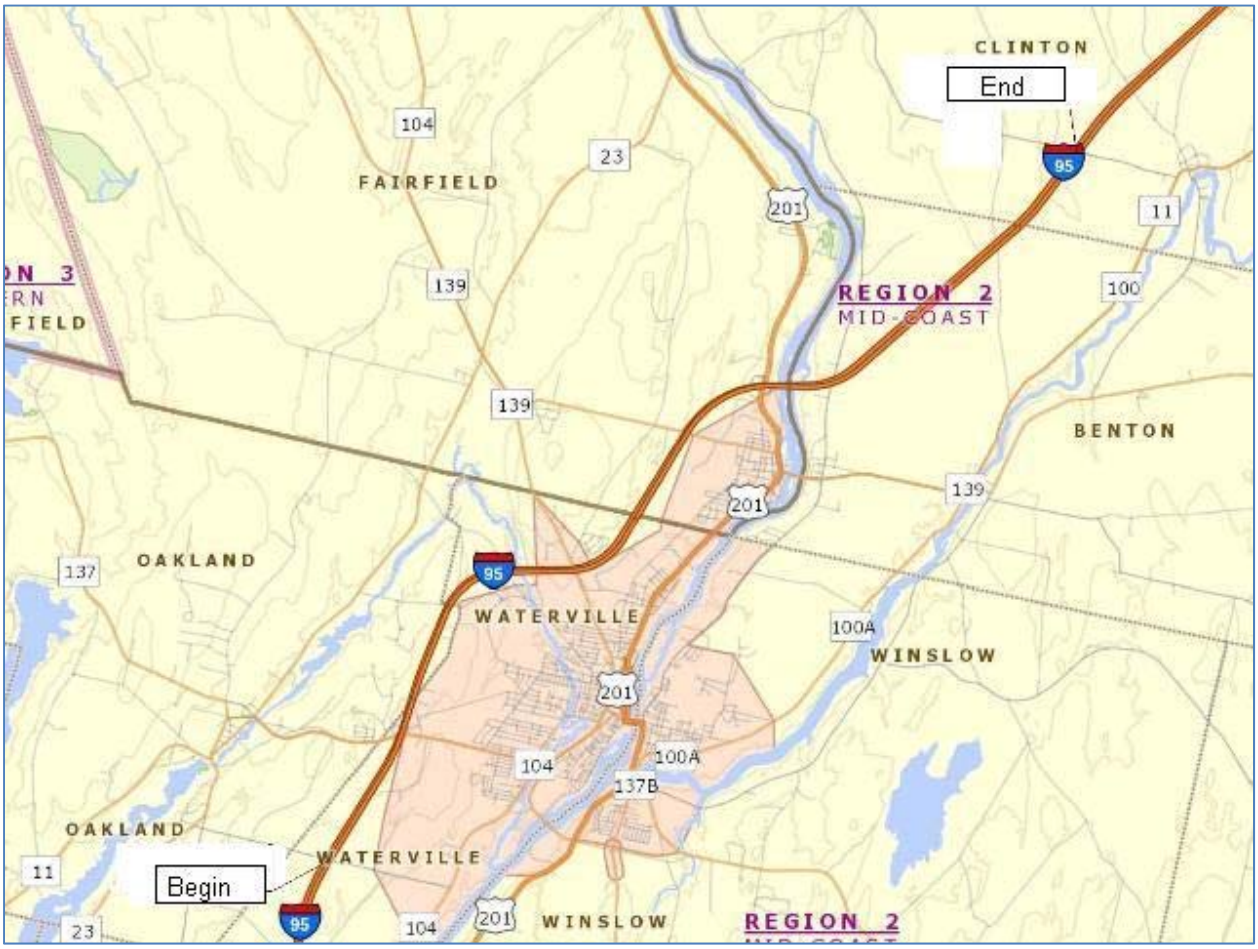

FIGURE 1 Project location map.

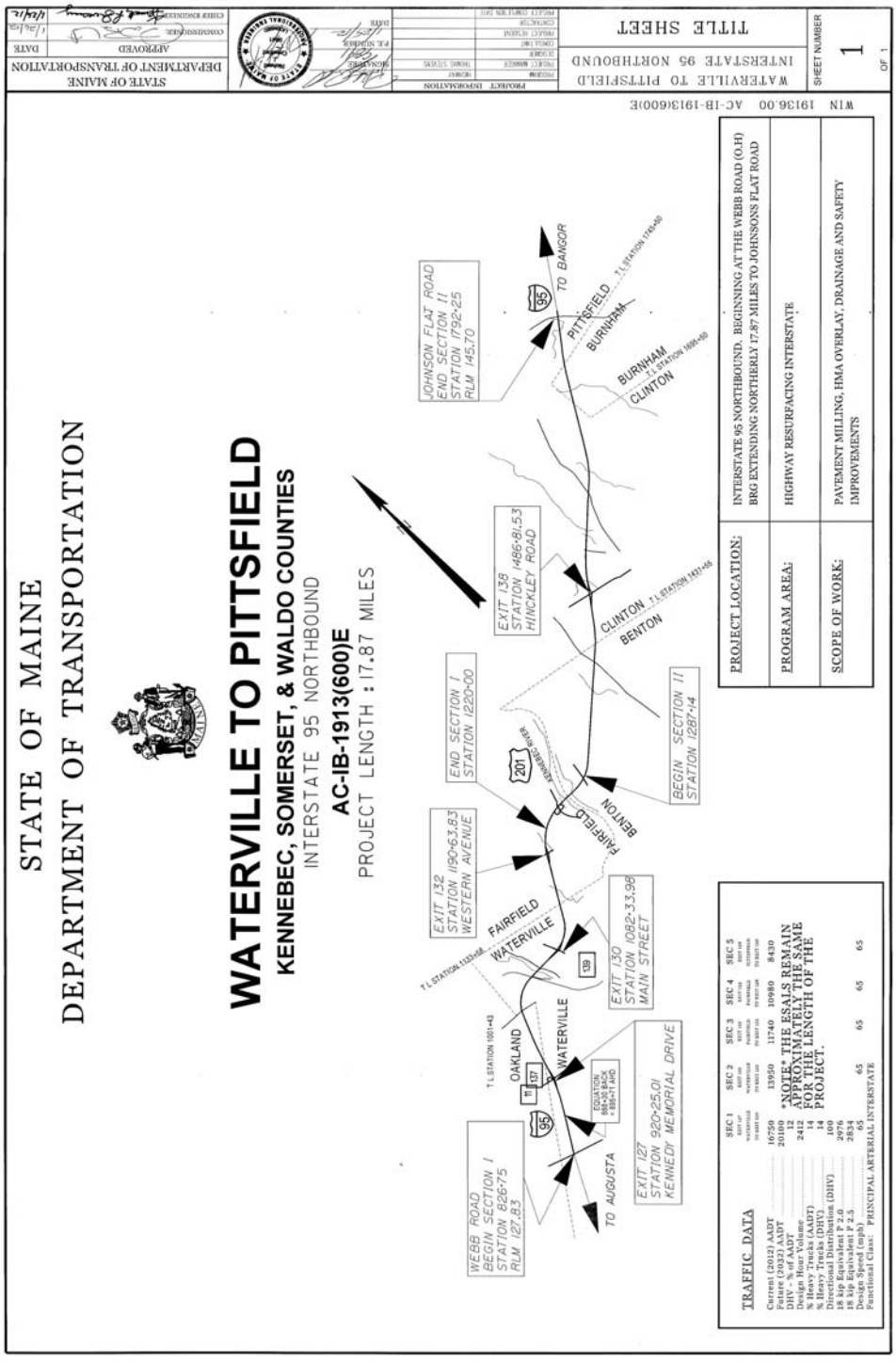

FIGURE 2 Title sheet.

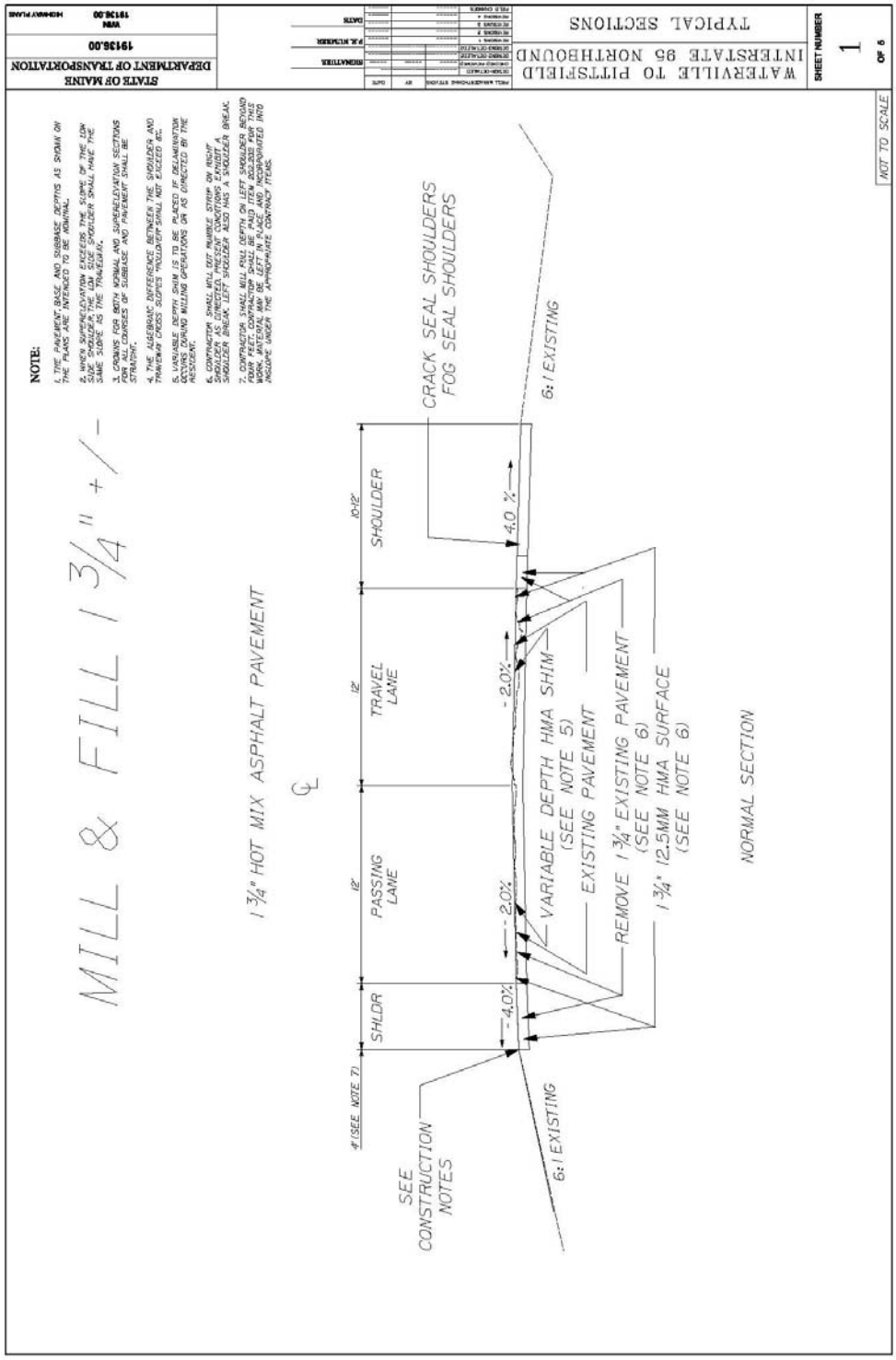

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FIGURE 3 Typical sections.

Construction

The sealing work began on Tuesday, September 10, 2013, around 10:00 am. The sealing began on the southernmost joint of the bridge carrying I-95 over the Webb Rd. in Waterville (FIGURE 6).

Colin Durante and John Calvert of Pavement Technology, Inc. were on site directing the work.

Initially, there were some issues getting the sprayer head aligned with the centerline joint (FIGURES 7-10). Colin explained that typically the spray head was on the driver's side of the truck, which allows the driver to get a better view of the target area. The spray width is typically between 2-3 feet centered on the joint.

For this project, the sprayer was on the opposite side from the driver due to the left hand lane closure, which is really the only practical way to set up a lane closure that will encompass the centerline joint on the Interstate.

The first day's treatment operations were halted at noon due to unfavorable weather conditions; overcast with high humidity causing an unusually slow drying time. Additionally, rain was forecast for the afternoon.

The weather improved on the following day (sunny and hot) and operations continued from where the crew left off, just south of the Kennedy Memorial Drive off ramp (Exit 127) and proceeded northerly to the Clinton Interchange with the Hinckley Rd. (Exit 138).

A total of 11 miles were treated. The northern (untreated) portion of this project will serve as a control section for comparison. As previously mentioned, a portion of highway in Fairfield was skipped over due to an ongoing bridge project commencing at the Exit 133 off ramp, to the Benton side of the Kennebec River.

FIGURE 13 shows a portion of highway in Waterville one day after application. The treated area appears as a darkened stain on the centerline joint at this point. According to the manufacturer, the pavement should show little sign of the treatment and no damage to the pavement markings.

Costs

The cost of JOINTBOND® for this demonstration project was quoted at $2,000 per linear mile, for a 2 foot wide application, for a total of $24,000.

Photos

FIGURE 4
Control area just north of Exit 138

FIGURE 5
Close-up detail of FIGURE 4

FIGURE 6
Start of sealing operations at Webb Rd. overpass bridge.

FIGURE 7
Spray head on opposite side from driver making for difficult alignment.

FIGURE 8

FIGURE 9

FIGURE 10

FIGURE 11

FIGURE 12
JOINTBOND over white center line pavement marking.

FIGURE 13
Application area one day later.

Testing

MaineDOT's Transportation Research Division will monitor this installation for signs of joint degradation and permeability at the centerline joint for at least two years. The treated portion will be compared with the untreated portion of the project, from Clinton to Pittsfield, and will be documented in a brief report.

Initial Observations

The JOINTBOND® product has seemed to yellow the white skip lines somewhat; at least initially. The manufacturer states in the "road striping remains visible after treatment" in their application video (www.pavetechinc.com). The treated area appears darkened, as if stained, the day after treatment.

Credits

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Special thanks to MaineDOT Maintenance forces for their efforts in setting up the lane closure for this demonstration.

References

Pavement Technology, Inc. - http://www.pavetechinc.com/

Appendix A – Sample Standard Specifications

STANDARD SPECIFICATIONS
FOR

Application
Of

LONGITUDINAL JOINT STABILIZER

2013 WV DSR

ASPHALT PAVEMENT
LONGITUDINAL JOINT STABILIZATION

I. Scope:

This work shall consist of furnishing all labor, material, and equipment necessary to perform all operations for the application of an in-depth longitudinal joint stabilization system to provide Longitudinal Joint Stabilization on asphaltic concrete pavements. The stabilization of joints shall be by spray application of a cationic maltene emulsion composed of petroleum oils and resins with polymer emulsified with water. All work shall be in accordance with the specifications, the applicable drawings, and subject to the terms and conditions of this contract.

II. Material Specifications:

The longitudinal joint stabilizer shall be a polymerized maltene emulsion composed of a petroleum resin oil base and SBR copolymer uniformly emulsified with water. Each bidder must submit with his bid a certified statement from the manufacturer showing that the in-depth longitudinal joint stabilizer conforms to the required physical and chemical requirements.

SPECIFICATIONS

Tests	Test Method ASTM	Requirements Max.	
Tests on Emulsion:			
Residue, % W[1]	D-244(Mod.)	39	44
Miscibility Test[2]	D-244(Mod.)	No Coagulation	
Particle Charge Test	D-244	Positive	
Tests on Residue from Distillation:			
Flash Point, COC, °C	D-92	200	-
Viscosity @ 60°C, cSt	D-445	100	200
Particle Size[4]	Light Transmittance/DDE	-	30
Asphaltenes, %w	D-2006-70	-	1.00
Maltene Dist. Ratio	D-2006-70	0.2	0.8
$\frac{PC + A_1}{S + A_2}$[5]			
PC/S Ratio[5]	D-2006-70	0.5	-
Saturated Hydrocarbons,S[5]	D-2006-70	21	28
Polymer:			
Charge		Positive	
Monomer Ratio, Butadiene/Styrene		76/24	
Solids Content, percent by weight		63	
Coagulum on 80 mesh screen, Maximum percent by weight		0.1	
Mooney Viscosity of Polymer (ML 4 @ 212°F) minimum		100	
pH of Polymer		5.0	
Weight per gallon, Wet pounds @ 63% solids content		7.94	

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[1] ASTM D-244 Evaporation Test for percent of residue is made by heating 100 gram sample to 149 C (300 F) until foaming ceases, then cool immediately and calculate results.

[2] Test procedure identical with ASTM D-244-60 except that .02 Normal Calcium Chloride solution shall be used in place of distilled water.

[3] Test procedure identical with ASTM D-244 except that distilled water shall be used in place of two percent sodium oleate solution.

[4] Test procedure is attached.

[5] Chemical composition by ASTM Method D-2006-70:
PC = Polar Compounds, A_1 = First Acidaffins
A_2 = Second Acidaffins, S = Saturated Hydrocarbons

PROCEDURE FOR DETERMINING PERCENT LIGHT TRANSMITTANCE ON LONGITUDINAL JOINT STABLIZATION EMULSION

A. **SCOPE**

This procedure covers the determination of percent light transmittance of the longitudinal joint stabilization emulsion.

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B. **APPARATUS**

1) Container may be either glass, plastic or metal having a capacity of 6,000 ml.
2) Graduated cylinder, 1,000 ml, or greater
3) Light transmittance measuring apparatus, such as Bausch and Lomb or Lumetron spectrophotometer
4) Graduated pipette having 1 ml capacity to 0.01 ml accuracy
5) Suction bulb for use with pipette
6) Test tubes compatible with spectrophotometer, 3/4" X 6, Bausch and Lomb, Catolog No. 33-17- 81, (B&L)

C. **CALIBRATION OF SPECTROPHOTOMETER**

1) Calibrate spectrophotometer as follows: (a) Set wavelength at 580 mu, (b) Allow spectrophotometer to warm-up thirty minutes, (c) Zero percent light transmittance (%LT) scale, (d) Rinse test tube three times with tap water and fill to top of circle marking on B&L test tube or approximately 2/3 full, (e) Place tube in spectrophotometer and set %LT scale at 100, and (f) repeat steps (c) and (e) two times or until no further adjustments are necessary.

D. **PROCEDURE**

1) Shake, stir or otherwise thoroughly mix emulsion to be tested. Place sample of emulsion in beaker and allow to stand one minute.
2) Place 2,000 ml tap water in container.
3) Suck 1.00 ml emulsion into pipette using suction bulb. Wipe off outside of pipette.
4) Using suction bulb, blow emulsion into container.
5) Rinse pipette by sucking in diluted emulsion solution and blowing out.
6) Clean pipette with soap or solvent and water. Rinse with acetone.
7) Stir diluted emulsion thoroughly.
8) Rinse out tube to be used with the diluted emulsion three times and fill to top of circle.
9) Calibrate spectrophotometer.
10) Place diluted emulsion sample tube in spectrophotometer, cover and read %LT to nearest tenth.
11) Repeat steps 9 and 10 until three identical consecutive readings are achieved.
12) The elapsed time between addition of emulsion to dilution of water and final %LT reading should not exceed 5 minutes.

III. Material Performance:

The longitudinal joint stabilizer shall have the capability to fully penetrate the asphalt pavement surface in the area around the construction joint to be treated. The in-depth joint stabilizer shall be absorbed and incorporated into the asphalt binder. Verification that said incorporation of the joint stabilizer into the asphalt binder has been effected shall be by analysis of the chemical properties of said asphalt binder i.e. viscosity shall be improved to the following extent. The viscosity shall be reduced by a minimum of thirty, (30%) percent as determined by dynamic shear rheometer (DSR) method for asphalt testing in accord with AASHTO T315-05. This analysis shall apply to extracted asphalt binder, taken from cores extracted thirty days following application in the upper ½" of pavement. The contractor shall submit with his bid performance testing by government agencies as to the foregoing requirement as a method of verification. In addition the treated areas, twelve, (12") inches on either side of the construction joint as a minimum, shall be sealed in-depth to the intrusion of air and water as compared to adjacent pavement areas.

JOINTBOND®, manufactured by D&D Emulsion, Inc., Mansfield, Ohio, and distributed by Pavement Technology Inc. Westlake, Ohio is a product of know quality and accepted performance.

IV. APPLICATION TEMPERATURE/WEATHER LIMITATIONS:

The temperature of the longitudinal joint stabilizer at the time of application shall be as recommended by the manufacturer. The longitudinal joint stabilizer shall be applied only when the existing surface to be treated is thoroughly dry and when it is not threatening to rain. The longitudinal joint stabilizer shall not be applied when the ambient temperature is below 40°F degrees or may reach less than 40 F within the next twelve hours.

V. APPLICATING EQUIPMENT:

The distributor truck or other approved applicator for spreading the longitudinal joint stabilizer shall be self-propelled, and shall have pneumatic tires. The distributor truck or applicator shall be designed and equipped to distribute the in-depth joint stabilizer uniformly on variable widths of surface at readily determined and controlled rates from 0.07to 0.25 gallons per square yard of surface, and with an allowable variation from any specified rate not to exceed 5 percent of the specified rate.

The distributor or applicator equipment shall be computerized so as to control the rate of application selected regardless of forward speed of the applicator vehicle and shall include full circulation spray bars, pump tachometer, volume measuring device and a hand hose attachment suitable for application of the in-depth joint stabilizer manually to cover areas inaccessible to the distributor. The distributor or applicator shall be equipped to circulate and agitate the joint stabilizer within the tank.

A check of distributor or applicator equipment as well as application rate accuracy and uniformity of distribution shall be made when directed by the Engineer.

In the event that blotting of a misapplication of in-depth joint stabilizer is required sand shall be applied. The truck used for applying sand shall be equipped with a spreader that allows the sand to be uniformly distributed onto the pavement. The spreader shall be adjustable so as to accommodate various treatment widths. Applied sand will be swept and removed prior to opening the area to traffic.

VI. APPLICATION of Longitudinal Joint Stabilizer:

Whenever practical, the longitudinal joint stabilizer shall be applied within 24 hours of completion of the pavement section and before said pavement is opened to traffic.

The longitudinal joint stabilizer shall be applied by a distributor truck or approved applicator at the temperature recommended by the manufacturer and at the pressure required for the proper distribution. The in-depth joint stabilizer shall be so applied that uniform distribution is obtained at all points of the areas to be treated. Distribution shall be commenced with a running start to insure full rate of spread over the entire area to be treated. Areas inadvertently missed shall receive additional treatment as may be required by hand sprayer application.

Unless otherwise directed by the Engineer, the standard application width shall be (12") on either side of the construction joint as a minimum.
The in-depth joint sealer shall be spread at the rate of 0.07 to 0.25 gallons per square yard, or as approved by the Engineer following field testing. Test strips shall be applied at various rates of application for the purpose of selecting the rate of application that will be absorbed within a twenty minute period.

Where more than one application is to be made, succeeding applications shall be made as soon as penetration of the preceding application has been completed and the Engineer grants approval for additional applications.

Grades or super elevations of surfaces that may cause excessive runoff, in the opinion of the Engineer, shall have the required amounts of in-depth joint stabilizer applied in two applications as directed.

After the in-depth joint stabilizer has been aloud to penetrate for a period of approximately thirty minutes and a significant residue remains on the surface of the treated area a light coating of dry sand shall be applied to the surface. The sand shall be swept and removed from the pavement and properly disposed of at the Contractor's expense.

The Contractor shall furnish a quality inspection report showing the source, manufacturer, and the date shipped, for each load of in-depth joint stabilizer. When directed by the Engineer, the Contractor shall take representative samples of material for testing.

VII. TRAFFIC CONTROL:

The Contractor shall schedule his operations and carry out the work in a manner to cause the least disturbance and/or interference with the normal flow of traffic over the areas to be treated. Treated portions of the pavement surfaces shall be kept closed and free from traffic until penetration, in the opinion of the Engineer, has become complete and the area is suitable for traffic. Every effort shall be made to apply the in-depth joint sealer while a new pavement is closed to traffic.

The Contractor shall be responsible for all traffic control and signing required to permit safe travel.
If, in the opinion of the Engineer, proper signing is not being used, the Contractor shall stop all operations until safe signing and barricading is achieved.

VIII. METHOD OF MEASUREMENT:

Application of Longitudinal Joint Stabilizer will be measured by the square foot as provided for in the Contract Documents. Material used will be measured by the gallon as provided for in the contract documents

IX. BASIS FOR PAYMENT:

The accepted quantities, measured as provided for above, will be paid for at the contract unit price for longitudinal joint stabilizer application and material applied.

The Longitudinal Joint Stabilizer application shall be paid for PER SQUARE FOOT, which shall be full compensation for furnishing all equipment, labor and incidentals to complete the application as specified and required.

The Longitudinal Joint Stabilizer material shall be paid for PER GALLON which shall be full compensation for the actual quantity of material used during application.