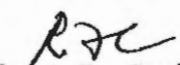


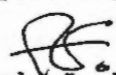
## MATERIALS & RESEARCH DIVISION

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### RESEARCH UPDATE

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Update U95-11

#### MULTIFLEX BRIDGE JOINT SYSTEM

HISTORY AND JOINT DESIGN: I 91 Bridge 14 SB over Sacketts Brook in Putney was constructed in 1961. The three span, 229' deck was damp proofed with tar emulsion and received a 1 1/2" bituminous overlay. Following 28 years of service, the deck was rehabilitated in 1989 under the Putney IR Deck (33) contract. The work included concrete repair, sheet membrane waterproofing and sawed and sealed joints in the new bituminous pavement at the abutments and pier locations. By the following spring, several of the joints revealed deterioration in the form of sealant failure and cracking in the adjacent pavement. As a result of those failures and others on the six bridge contract a number of new sealants and joint systems were tried on I 91 bridges in Maintenance District 2.

One such trial included replacement of the pavement over a 30"  $\pm$  width at abutment joint number 1 on BR 14S in 1994 and construction of a hot applied modified asphalt joint with a center sealant component. That system failed prior to the arrival of cold weather and was replaced again with bituminous concrete pavement. This update describes the latest repair of joint number 1 using the MULTIFLEX joint system.

EXPERIMENTAL JOINT DESCRIPTION: The MULTIFLEX joint system consists of a superplasticized asphalt modified urethane binder which is cold mixed with a high quality crushed stone aggregate. The binder is supplied in 5-gallon units of premix (CIM 1000) which is mixed with 1/2 gallon of activator for five minutes using a power drill and jiffy mixing paddle. The binder to aggregate ratio is approximately 1 to 3 by volume. The aggregate is primarily 1/2" and 3/4" sized material. If quality aggregate is not available locally, a Staley black granite can be furnished by the manufacturer.

The MULTIFLEX system is designed to be used by maintenance personnel on joints with minor movements of approximately 1" or less. The system is ideal for joint replacements since it is field molded to conform to existing pavement and joint conditions, and thus can provide a smooth ride for vehicular traffic. The urethane binder will bond to either Portland Cement concrete or bituminous pavement. The binder is manufactured by Chevron Asphalt Co. The joint materials are available from Bridgesaver, Inc. 1-801 A Willis Road, Richmond, VA 23237. Phone: (800) 448-3636, Fax: (804) 271-3074.

INSTALLATION: The installation was completed on August 1, 1995 by District 2 maintenance forces with technical assistance provided by Bridgesaver personnel. Weather conditions were good with the ambient temperature ranging from 70 to 95 °F.

The existing pavement and membrane were saw cut and removed for an average width 7 1/2 inches. The depth of the removal ranged from 3" on the deck slab to 4 1/2" over approach slab which had settled over time. The preparation did not include sand blasting or any other significant effort to obtain a perfect substrate.

The urethane base component and activator were mixed with a power drill and a heavy coating of the liquid was applied over the bottom and sides of the cut-out. The binder was then added to the graded granite aggregate in a construction wheelbarrow and the two components were mixed with shovels until all particles were coated. The binder to aggregate ratio was controlled by eye with additional liquid added when the mix appeared dry. The material was then dumped into the cut-out and leveled using the back of a shovel. Two strips of duct tape placed on the pavement along both sides of the cut-out limited overlap of the liquid binder to approximately 1 1/2". Placement of the joint material across the 15' wide travel lane and shoulder took about 20 minutes. Fine aggregate was placed on the surface and traffic was switched onto the new joint about 1 1/2 hours later.

The portion of the joint extending across the passing lane and shoulder was prepared and constructed in the afternoon using the same materials and procedures described for the travel lane.

COST: The materials and technical assistance were furnished by Bridgesaver, Inc. for demonstration purpose without charge to the Agency.

Current materials costs are \$31.00 per gallon FOB, Richmond, Virginia for the urethane binder components. Assuming the purchase of local aggregate at \$9.00 per ton a typical joint dimension of 10" by 2 1/2", the material cost for the MULTIFLEX joint would be approximately \$12.00 per lineal foot. If the movement gap was sufficient to require the use of a backer rod and 1/8" by 4" steel plate, the cost would increase to \$13.00 per lineal foot.

PERFORMANCE: Inspection of the joint on August 9, 1995, eight days after construction, revealed a loss of bond to the bituminous pavement in the wheel path areas on the travel lane. The material in the passing lane was performing satisfactorily. Since laboratory tests have shown that the binder develops adequate bond to bituminous surfaces, the loss of bond on the travel lane may relate to the amount of cure time allowed prior to receiving traffic. The joint is providing a satisfactory ride and shows no sign of breaking up.

PRELIMINARY CONCLUSION: The joint design described appears well suited for the replacement of deteriorated sawed and sealed bituminous joints on many of the state's bridges. If the problem with the joint adhesion to the bituminous pavement can be overcome, consideration should be give to the purchase and use of the materials by state maintenance forces.

FOLLOWUP: The MULTIFLEX joint system will be inspected at least annually to determine its effectiveness and service life.