An asphalt rubber membrane was used as a stress absorbing membrane (SAM) and as a stress absorbing membrane interlayer (SAMI) over a jointed concrete pavement. This project is located on Interstate 30 in Little Rock. Approximately 5 years after the asphalt rubber membrane was placed, the project was surveyed with the following results:

1. The control section showed 25% of the joints had reflected through.
2. The SAM section averaged 25% joint reflection.
3. The SAMI section averaged 20% joint reflection.

The results indicate that the use of a SAM and/or a SAMI was not effective in retarding joint reflection cracking.
EXPERIMENTAL PROJECT USING RUBBER-ASPHALT MEMBRANE
TO RETARD REFLECTION CRACKING
POST CONSTRUCTION REPORT

INTRODUCTION

This experimental project consists of the construction and subsequent evaluation of a rubber-asphalt membrane as a stress absorbing bituminous interlayer system. The asphalt rubber membrane material and application equipment was provided and operated by the Sahuaro Petroleum and Asphalt Company. A copy of the material, equipment and operation requirements, is included in this report.

The project is located on Interstate 30, section 23 at the South Terminal Interchange area in Little Rock, Arkansas and is identified by Federal Aid Project numbers MM-051-1(28) and I-30-2(152) 13B, and state job number 60137. State job number 60137 consisted of the reconstruction of a T type interchange at the intersection of I-30 and U.S. 65, and converting this interchange into a multi directional interchange joining I-30, U.S. 65 and I-440. The experimental sections of this project are shown in heavy black in Figure 1.

BACKGROUND

The asphalt-rubber stress absorbing membrane was applied over the concrete pavement of the original interchange that was incorporated into Job 60137. The typical section of improvement is shown in the Appendix.
The total area of asphalt-rubber membrane application was approximately 15 lane miles or 105,000 yd². The original interchange was constructed in 1964. Since that time, the ADT in this area has increased from 27,000 to 64,000 on I-30 and 8,400 to 20,000 on U.S. 65 in 1980.

CONSTRUCTION

Sahuaro Petroleum and Asphalt Company moved their equipment into the local area to begin construction of the stress absorbing membrane (SAM) on August 25, 1980. Construction began the following day on the NW road (see Figure 1). The temperature that day exceeded 100°F. Problems were encountered from the start with the asphalt-rubber material foaming. In addition, the membrane remained tender throughout the day (see Figure 2). The application rate was maintained close to specifications. However, the precoated aggregate was changed from a class 7 to a smaller size (class 8) in an effort to keep windshield breakage to a minimum. Blotter material was applied where necessary. No deviation from the specifications were noted.

The problem with the "tenderness" continued for the next two days. The membrane was applied adjacent to a 200 foot control section on the "WS" road during this time. The resident engineer informed the contractor that the tenderness problem must be cleared up after it was realized that the first day's application of the SAM was still tender and the membrane had shown no sign of improvement in two days. Sahuaro representatives felt that the problem could be caused by contamination of the asphalt cement used in the asphalt-rubber mix. Therefore, the type and source of asphalt cement was changed and work resumed the next day. Some of the membrane was
removed and replaced on the EW acceleration lane adjacent to the NW Ramp.

After the change in the asphalt-cement, the previously observed tenderness of the SAM disappeared. The membrane looked excellent for this and the following day. Another problem was realized, however. The SAM was placed over construction and sawed joints in the concrete pavement that were not previously sealed. The SAM was unable to bridge these joints. It was decided that the SAM should be placed between the binder course and surface course (thus becoming an interlayer or SAMI) to eliminate this bridging problem (see Appendix). Sahuarro left the area on August 30, with the intent of returning after the binder course was applied. Sahuarro had placed 29,660 yd² of SAM during this visit directly on top of the JRCP.

The construction of the SAMI began on November 3, 1980. Because of the poor performance of some of the previously placed SAM during Sahuarro's first few days in August, most of the sections would have a SAMI placed between the binder and surface also. This meant that almost 20,000 yd² of roadway would have a typical section of JRCP - SAM - Binder - SAMI - surface.

The placing of the membrane continued through November 6, with seemingly good results (see Figure 3). The surface course was applied 1 week later. After this construction phase, the only section left on the project to be completed was the I-30 section, north of the railroad overpass (see Figure 1).
This last section of SAMI was constructed from May 13 through May 15, 1981. Most of the SAMI application proceeded smoothly. However, considerable problems were encountered on one distributor load of asphalt-rubber. The distributor spray bar kept clogging, causing the operations to stop several times so the spray bar could be cleaned. Sahuaro had to heat the load and further thin the asphalt-rubber with additional diluent in an effort to produce a flowable mix of asphalt-rubber. However, after the membrane was placed on the pavement it did not appear or perform any differently than the previously placed membranes. Physical test results pinpointed the reason for the problems encountered with reaching a flowable asphalt-rubber mix. The base asphalt cement used was very hard (penetration = 8). Unfortunately, the area had been overlayed by the time the physical test results were known. This problem caused considerable discussion concerning the effect of a hard base asphalt cement in an asphalt-rubber membrane. It was generally conceded that this section of membrane would perform as a water barrier, but would be a poor stress absorbing layer.
POST CONSTRUCTION EVALUATION

The performance of the stress absorbing membrane was monitored periodically from construction completion in 1981 thru 1985. Within two years after completion, reflection cracks were evident in all sections along the project. The cracks all appeared in such regular intervals that it was evident that almost all of the cracks appearing at the surface were reflected from the concrete pavement joints underneath. By December, 1985 it was found that all sections had from 20 to 33% of the pavement joints reflecting through the pavement. The control section exhibited cracking at 25% of the joints. The SAM-Binder-Surface sections also averaged approximately 25% joint reflection cracking. The sections with both a SAM and a SAMI actually averaged the highest percentage of joint reflection cracking (33%). The best performing section was the Binder-SAMI-Surface section with approximately 20% of the joints reflecting through to the surface.

CONCLUSIONS

The results of this study indicate that the use of the asphalt rubber stress absorbing membrane was not effective in retarding the reflection cracking of the underlying pavement joints on this project. The use of the stress absorbing membrane as an interlayer was more effective than the use of the stress absorbing membrane directly on the concrete pavement. A comparison between the control and test section indicates that the performance of the control section approximately equaled that of the test section. However, no definite conclusions can be drawn from this comparison because of the relatively short length of the control section (200 ft) as compared to the test sections.