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POST CONSTRUCTION EVALUATION

OF

U.S. 77 KENEDY COUNTY SULFUR-ASPHALT-SAND

PAVEMENT TEST SECTIONS

Interim Report No. 1

Project RF 3644

by

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Prepared for

The Sulfur Institute and The U. S. Bureau of Mines

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Purpose:

To conduct post-construction testing and evaluation of a sand-asphalt-sulfur experimental test section located on U.S. 77 in Kenedy County, Texas, in District 21 of the Texas State Department of Highways and Public Transportation.

Background:

During the month of April 1977, a 3000 lineal foot section of road way being constructed on U.S. 77 in Kenedy County, Texas was set aside for a demonstration test of sand-asphalt-sulfur pavement sections. The experimental sections were placed on the two N-S lanes in conjunction with Project TQF 913(13) under the jurisdiction of District 21, Texas State Department of Highways and Public Transportation. The pavement was constructed in accordance with technology developed and patented by Shell Canada, Ltd. and involves the use of sulfur as a structuring agent with poorly graded sands. Such sands are found in many areas of the United States and specifically along beaches and inland regions of the Gulf Coast States.

Through efforts initiated by the Sulfur Institute, and co-sponsored by the U.S. Bureau of Mines, The Texas Transportation Institute (TTI) has, during the past four years, conducted considerable laboratory verification studies of the sand-asphalt-sulfur pavement concept developed in Canada. One of the prime objectives of this effort was to introduce to United States highway agencies the utilization of sulfur in asphalt concrete mixtures. The construction of this experimental test section represents the culmination of this effort.

A construction report describing details of the design and placement of the test section has been prepared. The report includes details of materials, mix designs, equipment, materials handling, quality control and evolved gas emissions analyses. Distribution will be on an "As Requested" basis (See Reference 1).

Upon completion of the S-A-S pavement placement, cores were obtained by District 21 personnel and a series of tests were run in accordance with the Test Matrix shown in Figure 1. The results of these tests, which were given the designation "Initial", are presented below. A schematic of the test sections as constructed is given in Figure 2. Location of the cores within the test sections was established by station numbers which are also provided in Figure 2.

Test Results

The results of the "Initial" testing phase are given in Table 1. Locations within the test section from which the cores were taken are designated by Station Numbers as indicated in Figure 2. Specific test methods employed include:

Density:	ASTM D-2041-71
Marshall Stability and Flow:	ASTM D-1559-73
Hveem Stability:	ASTM D-1560-65
Resilient Modulus, M_R	(As per Schmidt - Reference 2)
Indirect (Splitting) Tension:	ASTM C0496-71
Rice Specific Gravity:	ASTM D02041-71

The initial results indicate that the properties of the S-A-S materials were in accordance with those measured in the laboratory prior to going to the field. Some of the variability in stability and flow values at Station No. 1987 + 50 ft. could be attributed to differences in binder content. Although the mix design called for a binder content of

Test Description	Initial I	6 mo.	12 mo.	18 mo.	36 mo.
1. Traffic Analysis					
a. Average Daily Traffic Count	← continuous →				
b. Truck and Axle Weight Distribution	○				○
2. Visual Evaluation	△	△	△	△	△
3. Mays Meter (PSI)	△	△	△	△	△
4. Benkelman Beam Deflections	△	△	△	△	△
5. Dynaflect Deflections	△	△	△	△	△
6. Cored Samples				2 →	
a. Density (set of 3 cores (min) at each test section per sampling period (each lane))					
b. Stability, Marshall	△	△	△	△	△
c. Stability, Hveem					
d. Resilient Modulus	⊥				
e. Indirect Tension	⊥				
f. Rice Specific Gravity					
7. Interim Reports	△	△	△	△	△

○ Loadometer survey, 1-week duration

△ Evaluations on both sulfur-asphalt-sand mixes and asphalt binder pavement sections

⊥ Initial evaluation of paving materials

Notes: 1. Initial testing will be performed one week after pavement is open to traffic.
2. Continous at 6 month intervals.

FIGURE 1. Testing Matrix

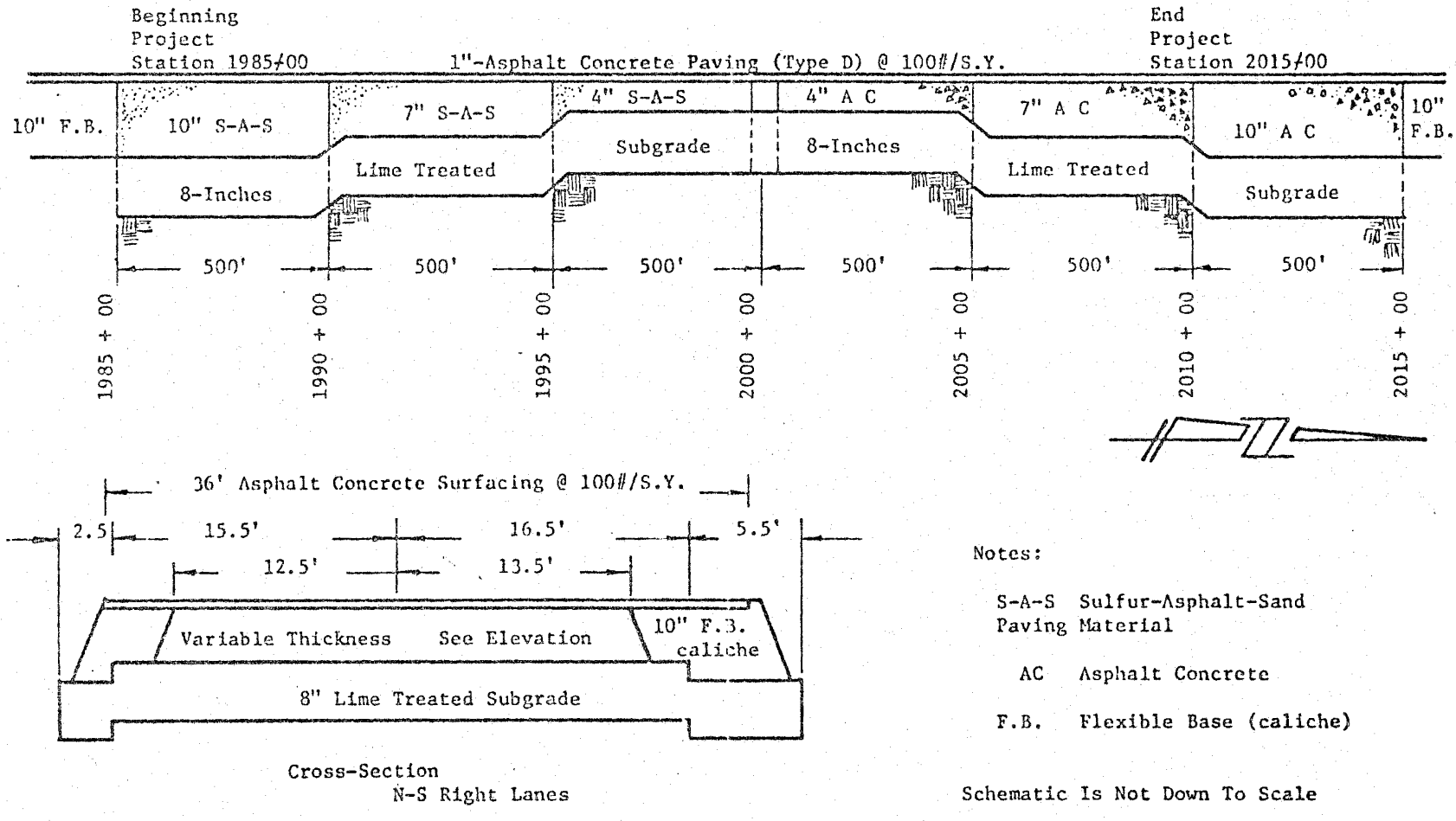

FIGURE 2. Schematic Showing Arrangement of Subsections and Construction of Mineral Aggregate-Asphalt-sulfur Experimental Project

TABLE 1. Test Results of Initial Core Sampling From Kenedy County SAS Test Sections

Type	Sample Binder Content (%)	Location Benchmark (ft)	Specific Gravity	Test Marshall Stability (lb)	Marshall Flow (1/100 in)	Hveem Stability (%)	Resilient Modulus (68°F) (psi) x 10^6	Splitting Tensile Strength (psi)	Rice Specific Gravity
SAS	6.2	1987 + 50	2.017	1350	16.9	24.8	.459	156	2.285
SAS	6.2	1992 + 50	2.012	1866	14.9	33.5	.444	143	2.283
SAS	6.2	1997 + 50	2.011	1889	14.3	32.0	.446	154	2.276
AC	6.2	2007 + 50	2.258	676	17.5	No Test	.813	242	2.374
AC	6.2	2002 + 50	2.133	340	10.8	35.8	.732	216	2.381

*The mix design established for these systems was 6.2 weight percent asphalt and 13 weight percent sulfur. However asphalt contents in the field ranged from 5.8 to 6.9 weight percent. (See Construction Report - April, 1977) (See Reference 1).

6.2 weight percent field measurements indicate asphalt content in the mixes ranged from 5.8 to 6.9 weight percent.

The results of the traffic analysis, visual evaluation, Mays Meter, Benkleman Beam and Dynaflect tests being conducted by District 21 were not available at this writing but will be given in the next interim report.

Conclusions to Date

Nothing in the data generated from the initial samplings indicate any anomalies or adverse trends in either the conventional or sulfur-asphalt-sand system. The next series of cores are scheduled to be obtained during November 1977.

References

1. Gallaway, B.M., Saylak, D., Izatt, John O., "Sand-Asphalt-Sulfur Experimental Project - Highway U.S. 77, Kenedy County, Texas", Texas Transportation Institute, Texas A&M University, April, 1977.

2. Schmidt, R. J., "A Practical Method for Determining the Resilient Modulus of Asphalt Treated Mixes", Highway Research Record 404, Highway Research Board, National Academy of Sciences, Washington, D.C., 1972.