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STATE OF CALIFORNIA
HIGHWAY TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

EXPERIMENTAL ASPHALT TEST SECTION

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State of California
Department of Public Works
Division of Highways
Materials and Research Department

August 17, 1966

Lab. Auth.
No. 643229

Mr. J. C. Womack
State Highway Engineer
Division of Highways
Sacramento, California

Dear Sir:

Submitted for your consideration is:

A

Progress Report

On

CONSTRUCTION OF AN EXPERIMENTAL

ASPHALT TEST SECTION ON HIGHWAY 21

BETWEEN BENICIA AND CORDELIA

TOGETHER WITH RELATED FIELD AND

LABORATORY STUDIES

Study made by.....Pavement Section
Under general direction of.....E. Zube
Work supervised by.....J. Skog & G. Kemp
Report written by.....J. Skog & G. Kemp

Very truly yours,

JOHN L. BEATON
Materials and Research Engineer

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SYNOPSIS

Approximately fifty tons of 1965 Tentative Specification paving asphalt was used in the paving mixture on Contract 65-10MAC049004, Road 10-Sol-21,680. This quantity permitted the paving of approximately 6200' of the surface course in the northbound travel lane between Stations 79+65 and 141+50. A control section involving the contract asphalt was used for comparison of rolling and "setting" properties.

Both asphalt test sections were laid by Standard Specification procedures, and no problems were encountered in mixing, paving or rolling. The "setting" quality of paving mixtures prepared from both asphalts was satisfactory.

Recovered asphalt tests and studies of cores removed shortly after construction indicate that both test sections are virtually identical. These sections should provide valuable future information on the weathering rates of the two asphalts since the durability test indicates wide differences for this property.

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INTRODUCTION

The purpose of this project was to incorporate approximately fifty tons of the new 1965 Tentative Specification paving asphalt into the paving mixture used on Contract 65-10MAC049004, Road 10-Sol-21,680. The Chevron Asphalt Co. produced the fifty tons of material. This quantity permitted the paving of approximately 6200' of the surface course in the northbound travel lane between Stations 79+65 and 141+50. A control section for future coring was established in the southbound travel lane between Stations 129+00 and 143+00. The control section contained the contract asphalt which was Standard Specification 85-100 grade produced by Douglas Oil Co.

The purpose of this report is to present observations and field test results during construction of the test sections together with laboratory studies on the original asphalts, field mix samples, and cores removed from the pavement shortly after construction.

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CONCLUSIONS

The 1965 Tentative Specification experimental asphalt provided a paving mixture on this project which rolled and "set" as well as the contract Standard Specification 85-100 grade asphalt. The control asphalt (Douglas) used on this contract has always provided very satisfactory "setting" mixtures during paving at high atmospheric temperatures. Therefore, it appears that asphalts of excellent durability (experimental material) may be manufactured with satisfactory "setting" properties.

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CONSTRUCTION OF TEST SECTIONS

Asphalt concrete paving on this project consisted of 0.06' open graded AC over 0.17' Type "A" AC over 0.33' Type "B" AC. The experimental asphalt was used in the 0.17' Type "A" AC surface course of the northbound travel lane between Stations 79+65 and 141+50. The asphalt content of the mix was 6.5%, the same as used for the contract.

In order to compare the rolling and "setting" properties of the experimental asphalt, a control section was established in the southbound travel lane between Stations 129+00 and 143+00. The control section contained the contract asphalt which was Standard Specification 85-100 grade produced by Douglas Oil Co.

Paving operations using the experimental and control asphalts were performed on August 7 and 8, 1965. Weather conditions were excellent with warm days and a slight breeze.

The paving mixture was produced in a Standard paving plant with a 6000# mixer. Arrangements were made at the plant to use the individual truckloads of the experimental asphalt as storage units. This arrangement prevented possible contamination and caused no delays in the contractor's paving operations.

The mixture was placed on the roadbed with bottom-dump trucks and spread with a Barber Greene paver. The rolling on the project was accomplished with a 12 ton steel wheel roller for breakdown, a pneumatic with tire pressure of 90 psi for intermediate rolling, and an 8 ton steel wheel roller for finish operations. All rolling was performed as required by the Standard Specifications. Average rolling temperatures were as follows:

	Breakdown	Pneumatic
Experimental Asphalt	236°F.	183°F.
Control 85-100 Grade Asphalt	243°F.	192°F.

The breakdown roller followed directly behind the paver. The pneumatic followed as fast as it could without picking up the mix on the tires. The final roller made two or three passes directly behind the pneumatic. There were no "setting" problems with either asphalt and rolling was accomplished in an efficient manner. Both test sections

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showed no signs of slow "setting" twenty-four hours after laying. Our previous studies indicate that Douglas asphalt has excellent "setting" properties. The observations on this project indicate that asphalts produced to meet the "setting" requirements of the 1965 Tentative Specifications should be satisfactory since the experimental material was rolled in the same manner as the control and no problems were encountered.

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FIELD AND LABORATORY TEST RESULTS

Water permeability tests were performed on both test sections twenty-four hours and one week after completion of paving. The average results are shown below:

Asphalt	Permeability Results	
	24 Hours After Paving Ml./Min.	1 Week After Paving Ml./Min.
Experimental	143	44
Douglas 85-100 Control	84	61

The permeability results for both test sections are below the 150 ml./min. tentative requirement for measurements after 24 hours. The drop in permeability after one week is best explained by cold flow of the asphalt since no traffic was permitted on the pavement.

Asphalt concrete mix samples were obtained at the plant and the normal routine tests performed. Abson Recoveries were also performed and various tests on the asphalt were made. The average results are shown in the Tables below:

Average Paving Mixture Test Results

Asphalt	Stab.	Cohesion	Asphalt Content	Grading					
				3/4"	3/8"	#4	#8	#30	#200
Experimental	40	286	5.5	96	58	42	31	14	5
Douglas Control	43	381	5.5	97	57	43	32	14	5

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Average Recovered Asphalt Properties

Asphalt	Mix. Temp. Plant	Pen. 77°F.	S.P. °F.	Duct. 77°F. 5cm/min.	Viscosity 140°F. Poises	Viscosity 275°F. Centistokes
Experimental	299	50	127	100+	5005	541
Douglas Control	283	53	128	100+	5911	679

The average recovered asphalt properties indicate that both asphalts should have good "setting" properties and this was confirmed during paving operations.

Four inch diameter cores were removed from each test section shortly after construction and prior to any traffic. The average laboratory test results on these cores are shown below:

Asphalt	Air Permeability Mls/Min.	Percentage of Air Voids: Complete Core	Percentage of Air Voids: Type A 3/4" Max Surface	Percentage of Air Voids: Type B 3/4" Max Level	Percentage of Air Voids: Type B 3/4" Max Base
Experimental	81	7.8	8.2	7.3	8.0
Douglas Control	37	7.9	8.3	7.0	7.9

There is very little difference in the percentage of air voids in either section and both asphalts should be exposed to the same conditions during future service life. Actually the experimental asphalt was only used in the surface course and in this case there is no difference in pavement properties between the test sections. All of the field and laboratory tests indicate that the pavement in the two test sections is virtually identical. This should permit an excellent evaluation of future weathering of the two asphalts.

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The test properties of the experimental and control asphalts are compared with the 1965 Tentative Specifications below. The Douglas 85-100 grade control asphalt was manufactured to comply with the 1964 Standard Specifications.

Test	Specification Requirements	Experimental Asphalt	Douglas Control Asphalt
Flash Point, P.M.C.T. °F. Min.	475	470	440
Penetration of Original Sample at 77°F.	—	76	87
Stain Number of Original Sample. Max. After 120 Hrs.- 140°F.-50#/sq.in.	10	4	6
Rolling Thin Film Test 325°F. 75 Min.			
Viscosity, Residue			
140°F., Poises	4000-6000	5035	7005
275°F., Centistokes	425-800	521	705
Duct.,Residue,77°F., Min.	75	100+	100+
Durability Test			
Viscosity of Residue After Durability Test, Megapoises at 77°F.			
Shear Rate 0.05 Sec^{-1} Max.	25	16	91
Shear Rate 0.001 Sec^{-1} Max.	60	31	342
Micro Ductility of Residue 1/2 cm./min. Minimum, mm	10	10	2
Solubility, CCl_4, Orig. Sample % Min.	99	100	100

The experimental asphalt was slightly low on the flash test, but complied with all other requirements. As previously mentioned, both test sections have virtually the same properties immediately after construction, and the differences in the durability test results of the two asphalts should provide a very valuable future test of the correctness of the new requirements.

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