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

FINAL REPORT ON INVESTIGATION OF SAMPLING PROCEDURE OF PAVING GRADE ASPHALTS

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MATERIALS & RESEARCH DEPARTMENT
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State of California
Department of Public Works
Division of Highways
Materials and Research Department

March 16, 1966

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

MR 231528
H.P.R. LCC 6F0781

Dear Sir:

Submitted for your consideration is:

FINAL REPORT

ON

INVESTIGATION OF SAMPLING

PROCEDURE OF PAVING

GRADE ASPHALTS

Study made by . . . . . .Pavement Section
Under General Direction of . . . . . .E. Zube
Supervised by . . . . . .J. Skog & G. Kemp
Work Done by . . . . . .Asphalt Group
Report by . . . . . .G. Kemp

Very truly yours,

JOHN L. BEATON
Materials and Research Engineer

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SYNOPSIS

This investigation was initiated to determine the reliability of our field sampling procedures of paving grade asphalts. It may be considered that this study was of the audit type inasmuch as the state plant inspector did not know when or how often the special laboratory sampler would appear.

Improper sampling by the State field representative was not the cause of failure of asphalt shipments to comply with penetration test requirements.

INTRODUCTION

Specification compliance is the goal of the producer and the requirement by the consumer. When a dispute occurs concerning a product that does not comply with the consumer's specification requirements, the producer will occasionally blame poor sampling procedures on the part of the consumer's personnel.

In the case of asphalt products the general cause of non-specification material, other than poor manufacturing, is contamination with other petroleum products. This contamination can occur at four locations which are listed as follows:

1. Manufacturers loading lines.
2. Hauling vehicles.
3. Contractors plant storage tanks.
4. Sampling.

As a large consumer agency we have many people involved in obtaining samples of asphalt products. One question that arises periodically is: Are our field personnel taking a truly representative asphalt sample of the manufacturer's product?

This report concerns an investigation to determine if a problem might exist in this sampling area. The investigation was confined to the steam refined paving grade asphalts because this product constitutes more than 80% of the total tonnage of all asphalt products used by the Division of Highways.

CONCLUSIONS

The data presented in this report indicates that sampling of paving grade asphalts is reliable. However, it is imperative that field personnel be well trained in proper sampling techniques as poor sampling procedures can result in misleading test results.

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SAMPLING

The sampling program was initiated in the fall of 1963 when some seventy (70) special asphalt samples were obtained from 29 separate contracts. All special samples during this fall sampling were obtained by one experienced sampler, from the headquarters laboratory, who followed a strict sampling procedure to avoid contamination and obtain a truly representative sample. No samples were obtained during the 1964 construction season.

In the summer and fall of 1965 fifty-one (51) additional special samples were obtained from 26 different contracts making a grand total of 121 special samples.

All special samples were obtained as described in the California Division of Highways Construction Manual. Samples were taken from a sampling valve which is located in the asphalt line leading from the asphalt tank to the mixer. Regular daily field samples were taken by each plant inspector at the same location as the special sample.

Parameters involved in not obtaining a truly representative sample from the sampling spigot may be listed as follows:

1. Unclean sample container.
2. Insufficient asphalt drained from sample line prior to taking sample.
3. Obtaining sample before asphalt has been well circulated.
4. Cleaning sample container with a solvent, etc. and thereby contaminating contents.
5. Improper sample identification.

During the sampling study it was also evident that more effort is needed along the line of safety regarding the sampling valves. Often, with only minor changes, a sampling valve could be made safer and more convenient. One fault that was occasionally encountered was a valve which did not have an elbow at the tip to deflect the asphalt in a downward direction, thereby endangering the sampler who possibly could be standing in front of the valve while sampling. Another fault was sample valve location. Just good common sense in valve location could correct most problems involving sampling ease and safety.

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TESTING

To eliminate as many variables as possible it was decided to test all field control and special samples in the same laboratory. Comparison of the two samples was made on the basis of the penetration test. This particular test was selected because of its simplicity and sensitiveness to any change in the material because of contamination.

Test results of this sampling program are shown in Tables A and B.

DISCUSSION OF TEST RESULTS

At first glance of the 1963 sampling results there appears to be definite evidence that improper sampling is a contributing factor to off grade paving asphalts. As is shown in Table A, the field samples had 14.4% off grade with only 5.7% off grade for the special samples. However, the great bulk of the off grade field samples are outside the specification limits by only a slight margin. By chance, involving test repeatability, the off grade percentage results could have been completely different because of these borderline results.

The 1965 sampling series gave 4.1% off grade for the field control samples and 5.9% for the special samples.

In comparing the two samplings, (field and special), on the basis of penetration averages, the results are very close. In the 1963 series, the field sample average penetration was 90.92 with 90.58 for the special sample. The 1965 series gave 87.12 for the field sample and 87.37 for the special sample.

It is quite evident the percentage of off grade penetrations could change quite drastically if the producers became lax and produced their products at or near the extreme limits of the specification.

For informational purposes, the percentage of off grade penetrations for all samples taken of material used by the California Division of Highways during this sampling period are as follows:

Year	% Off Grade Penetrations
1963	6.0
1965	6.1

Approximately 8,000 samples are represented for each year's sampling.

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TABLE A

1963 SAMPLING

CONTRACT	ASPHALT GRADE	DATE SAMPLED	PENETRATION FIELD SAMPLE	PENETRATION SPECIAL SAMPLE
62-1T13C6	85-100	8-20-63	86, 94	98
		8-21-63	91	92
		8-22-63	96	96
		8-23-63	96	92
631T13C4	85-100	10-31-63	85	87
		11-1-63	85	96
61-1T13C27	85-100	8-21-63	-	91
		8-22-63	89	95
62-2T13C8	85-100	8-21-63	90, 92	91
		8-22-63	87, 89	92
		9-5-63	98	91
		9-6-63	86	86
61-3T13C37	85-100	8-7-63	101*, 92	97
		8-8-63	95, 96	100
61-3T13C38	85-100	8-7-63	109*	94
		8-8-63	91	92
62-3T13C26	60-70	8-29-63	69	66
		8-30-63	66	68
		9-6-63	87*	62
		9-9-63	61	66
63-3T13C4	85-100	9-5-63	91	88
		9-6-63	93	98
63-3T13C5	85-100	8-8-63	92	91
		8-9-63	94	92
64-3T13C8	120-150	8-7-63	130	131
		8-8-63	134	132
63-4T13C27	85-100	8-1-63	91	93
		8-1-63	95	98
63-4T13C7	85-100	8-1-63	92	89
		8-2-63	91	92
		10-30-63	86	93
		10-31-63	90	92
		11-1-63	93	93
64-4T13C6	85-100	8-2-63	94	88
63-4T13C41	85-100	8-14-63	85	84*
		8-14-63	94	92
63-4T13C9	85-100	8-14-63	97, 98	92
		8-15-63	93, 92	91
62-4T13C31	85-100	8-14-63	91	86
64-4T15C2	120-150	8-20-63	141	143
		8-23-63	138	143
	85-100	9-18-63	87	91
		9-18-63	87	92
63-4T13C26	85-100	9-13-63	103*	98
		9-17-63	83*	85
		9-18-63	103*	98

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TABLE A continued

CONTRACT	ASPHALT GRADE	DATE SAMPLED	PENETRATION FIELD SAMPLE	PENETRATION SPECIAL SAMPLE
61-4T13C30	85-100	9-17-63	84*	86
63-4T13C13	85-100	9-17-63	83*	88
		9-18-63	83*	80*
62-4T13C64	120-150	9-24-63	131	123
64-4T13C3	85-100	10-30-63	94	93
		11-1-63	95	96
63-4T13C14	85-100	11-1-63	91	92
63-6T13C7	60-70	9-20-63	66	67
63-10T13C9	60-70	7-30-63	63	64
		8-29-63	83*	82*
		8-29-63	68	61
		9-26-63	60	64
		9-26-63	61	63
		9-26-63	62	60
62-10T13C14	85-100	9-24-63	94	88
		9-26-63	91	88
		9-26-63	91	93
63-10T13C20	85-100	10-28-63	89	89
62-10T13C11	85-100	10-28-63	88	90
		10-30-63	90	87
63-10T13C1	85-100	10-28-63	83*	92
		11-1-63	89	88
61-14T13C14	85-100	9-13-63	93	102*
		9-24-63	89	88
Total Samples			76	70
*Total Off-Grade Penetrations			11	4
% of Off-Grade Penetrations			14.4	5.7
Average Penetration			90.92	90.58

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TABLE B

1965 SAMPLING

CONTRACT	ASPHALT GRADE	DATE SAMPLED	PENETRATION FIELD SAMPLE	PENETRATION SPECIAL SAMPLE
02-030134	85-100	6-3-65	90	98
		6-4-65	93	99
02-030224	85-100	6-3-65	87	97
		6-4-65	85	90
		8-26-65	93	90
		8-27-65	100	90
		9-2-65	93	93
02-030234	85-100	9-1-65	88	87
		9-2-65	86	85
		8-27-65	89	85
02-043504	120-150	8-26-65	130	129
03-038504	85-100	6-2-65	88	91
03-047744	85-100	6-3-65	100	85
		6-4-65	89	95
03-074024	85-100	6-2-65	88	90
		6-3-65	89	94
		8-16-65	91	92
		8-17-65	88	92
		8-26-65	-	91
		8-27-65	-	88
		10-5-65	88	86
		10-5-65	86	89
06-0450024	60-70	8-19-65	67	65
06-032384	60-70	8-20-65	61	62
06-057804	60-70	8-16-65	68	70
06-058004	60-70	8-30-65	61	63
	60-70	9-3-65	72*	72*
07-003924	85-100	9-8-65	86	86
07-033114	85-100	9-2-65	92	85
07-031724	85-100	9-3-65	91	90
08-039614	85-100	7-22-65	84*	85
		9-22-65	89	85
08-093504	85-100	9-3-65	90	90
08-018204	85-100	9-3-65	85	86
10-049004	85-100	10-14-65	88	86
		10-7-65	87	86
11-039314	60-70	7-7-65	65	59*
11-094814	40-50	7-13-65	45	46
	85-100	7-13-65	85	88
02-030124	85-100	12-8-65	93	91
		12-9-65	90	92
		12-9-65	95	95
03-039904	85-100	12-6-65	93	97
		12-8-65	98	101*
		12-9-65	96	93

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TABLE B Continued

CONTRACT	ASPHALT GRADE	DATE SAMPLED	PENETRATION FIELD SAMPLE	PENETRATION SPECIAL SAMPLE
03-055414	85-100	12-8-65	92	91
		12-9-65	94	91
10-090604	85-100	11-5-65	86	86
		12-6-65	89	94
		12-8-65	94	90
		12-8-65	92	95
Total Samples			49	51
*Total Off-Grade Penetrations			2	3
% of Off-Grade Penetrations			4.1	5.9
	Average Penetration		87.12	87.37

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