

**Evaluation
Of
Remote Truck Sampling Device
(Pavement Technology, Inc.)**



**Tennessee Department of Transportation
Division of Materials and Tests
Research and Product Evaluation Section**

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**Report on the Evaluation
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The Research and Product Evaluation Section, along with the Asphalt Mix Design Section of the Division of Materials and Tests, conducted tests to compare asphalt mix samples taken with the mechanical sampler to conventional sampling methods. All samples were taken from mixes produced at the Eubanks Asphalt Plant in Dickson, Tennessee.

Two different asphalt designs were used; a 411-D mix and a 307BM2 recycle mix. Samples were taken from three different trucks for each mix using the mechanical sampler, quarter point sampling, and random sampling. With the mechanical sampler two samples were taken from each truck and placed in a metal container, two samples were taken from this sample to determine asphalt content and gradation. A third sample was also taken from this sample by Eubanks to test in their lab. Initially the mechanical sampler was troublesome to keep clean. A PG 76-22 AC was used in both mixes and material was adhering to the sampling device. However, the Contractor applying a spray on "cooking oil" to the sampler prior to insertion into the mix overcame this problem. A shovel of mix taken from each quarter of the truck bed was placed in a metal container for the quarter point samples and two samples were taken from this sample to determine asphalt content and gradation. The random samples were obtained by filling two cardboard containers with mix from each truck bed at random locations. This made a total of 24 samples for testing.

The samples were then taken to the Asphalt Mix Design Section where the asphalt content and gradation of the samples were determined by vacuum extraction. All data from these samples are included in the tables at the end of this report.

Samples of the 411-D mix taken with the mechanical sampler more closely followed the gradation of the job mix formula than the other two sampling methods. Although the average gradations of each sampling method fell within the design range, the quarter point and random sample methods were not as consistent between the three truckloads as the mechanical sampler was. The average asphalt content of the samples taken with the mechanical sampler was higher and closer to the job mix formula than the other sampling methods. The average asphalt content of the quarter point method samples was out of the 0.35 percent tolerance and the average asphalt content of the random method samples was just barely in tolerance.

The average gradations of the 307BM2 mix also fell within the design range for each sampling method. Although the samples of the 307BM2 taken by the mechanical sampler were not as consistent between the three truckloads, when averaged together the gradations also more closely follow the job mix formula than the other two sampling methods. The average asphalt content followed the same pattern as the 411-D mix with the quarter point sample again out of the allowable tolerance of 0.35 percent.

The mechanical sampler consistently provided samples with finer gradations and higher AC contents than the 1/4 point and random sampling methods. The random sampling method provided more consistent results than the 1/4 point method on the 411-D mix but was less consistent on the 307BM2. Also, the random sampling method produced results closer to the Job Mix Formula than the 1/4 point method.



Typical of Mechanical Sampling



Typical of 1/4 Point and Random Sampling

**411-D Mix
Truck #1**

	JMF % Passing	Mechanical Sampler		Quarter Point State Lab	Random State Lab
		Eubanks Lab	State Lab		
%AC	5.90	6.03	5.98	5.18	5.53
3 / 4	100	100	100	100	100
1 / 2	97.6	96.8	96.0	95.0	97.2
3 / 8	87.6	87.7	86.2	82.6	85.0
#4	63.4	62.2	60.6	55.2	58.5
#8	47.5	45.1	44.0	39.3	42.0
#16	----	----	33.7	30.2	32.4
#30	26.3	26.5	26.2	23.6	25.2
#50	12.0	12.5	12.8	11.5	12.4
#100	6.80	5.9	6.06	5.38	5.92
#200	5.30	4.6	4.83	4.30	4.78

**411-D Mix
Truck #2**

	JMF % Passing	Mechanical Sampler		Quarter Point State Lab	Random State Lab
		Eubanks Lab	State Lab		
%AC	5.90	5.97	5.85	5.30	5.74
3 / 4	100	100	100	100	100
1 / 2	97.6	96.7	97.5	96.8	96.9
3 / 8	87.6	86.8	85.8	84.3	85.8
#4	63.4	62.3	60.4	58.3	60.0
#8	47.5	45.5	43.8	41.5	43.0
#16	----	----	33.7	32.0	33.2
#30	26.3	26.9	26.4	25.0	25.9
#50	12.0	12.7	13.1	12.2	12.4
#100	6.80	6.30	6.60	5.90	5.94
#200	5.30	5.00	5.33	4.61	4.75

**411-D Mix
Truck #3**

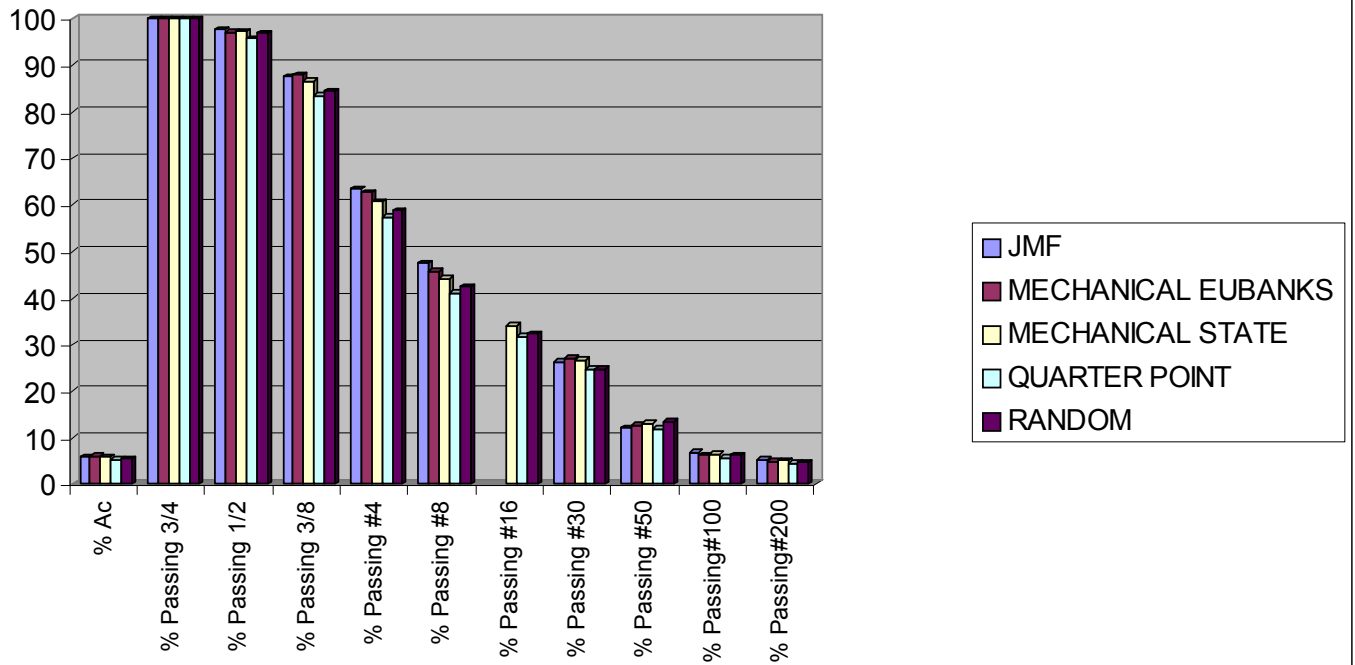
	JMF % Passing	Mechanical Sampler		Quarter Point State Lab	Random State Lab
		Eubanks Lab	State Lab		
%AC	5.90	6.05	5.96	5.51	5.45
3 / 4	100	100	100	100	100
1 / 2	97.6	97.4	98.2	95.3	96.4
3 / 8	87.6	89.1	87.4	83.2	82.3
#4	63.4	63.4	61.1	58.5	57.7
#8	47.5	46.5	44.9	42.7	42.1
#16	----	----	34.7	32.9	31.7
#30	26.3	27.8	27.2	25.7	23.1
#50	12.0	12.9	13.3	12.0	15.4
#100	6.80	6.50	6.68	5.88	7.01
#200	5.30	5.10	5.38	4.70	4.69

**411-D Mix
Consistency With-in Sampling Method
Using State Samples**

	Mechanical Sampler			Quarter Point			Random		
	High	Low	Diff.	High	Low	Diff.	High	Low	Diff.
%AC	5.98	5.85	0.13	5.51	5.18	0.33	5.74	5.45	0.19
3 / 4	100	100	0.00	100	100	0.00	100	100	0.00
1 / 2	98.2	96.0	2.2	96.8	95.0	1.8	97.2	96.4	0.8
3 / 8	87.4	85.8	1.6	84.3	82.6	1.7	85.8	82.3	3.5
#4	61.1	60.6	0.5	58.5	55.2	3.3	60.0	57.7	2.3
#8	44.9	43.8	1.1	42.7	39.3	3.4	43.0	42.0	1.0
#16	34.7	33.7	1.0	32.9	30.2	2.7	33.2	31.7	1.5
#30	27.2	26.2	1.0	25.7	23.6	2.1	25.9	23.1	2.8
#50	13.2	12.8	0.5	12.2	11.5	0.7	15.4	12.4	3.0
#100	6.68	6.06	0.62	5.90	5.38	0.52	7.01	5.92	1.09
#200	5.38	4.83	0.55	4.70	4.30	0.40	4.78	4.69	0.09

411-D Mix Avg. of All Samples

	Mechanical Sampler			Quarter Point State Lab	Random State Lab
	JMF % Passing	Eubanks Lab	State Lab		
%AC	5.90	6.02	5.93	5.33	5.57
3 / 4	100	100	100	100	100
1 / 2	97.6	97.0	97.2	95.7	96.8
3 / 8	87.6	87.9	86.5	83.4	84.4
#4	63.4	62.6	60.7	57.3	58.7
#8	47.5	45.7	44.2	41.1	42.4
#16	---	---	34.0	31.7	32.4
#30	26.3	27.1	26.6	24.7	24.7
#50	12.0	12.7	13.1	11.9	13.4
#100	6.80	6.20	6.45	5.72	6.29
#200	5.30	4.90	5.18	4.53	4.74



**307BM2 Mix
Truck #1
Two Samples Combined Before Testing**

	JMF % Passing	Mechanical Sampler		Quarter Point State Lab	Random State Lab
		Eubanks Lab	State Lab		
%AC	5.00	4.89	5.21	4.42	4.77
1 ½	100	100	100	100	100
3 / 4	91.6	90.7	94.0	87.8	84.6
1 / 2	----	----	87.3	78.1	77.1
3 / 8	71.9	70.9	77.1	67.3	65.9
#4	46.2	45.6	50.8	42.5	43.2
#8	34.0	33.8	37.0	31.1	31.4
#16	----	----	28.6	24.4	24.4
#30	19.7	19.9	22.6	19.5	19.3
#50	9.8	9.6	12.1	10.5	10.2
#100	6.0	5.8	7.04	6.13	5.90
#200	4.7	4.4	5.59	5.42	4.78

**307BM2 Mix
Truck #2
Two Samples Combined Before Testing**

	JMF % Passing	Mechanical Sampler		Quarter Point State Lab	Random State Lab
		Eubanks Lab	State Lab		
%AC	5.00	4.65	5.41	4.61	4.72
1 ½	100	100	100	100	100
3 / 4	91.6	85.3	88.6	84.9	85.6
1 / 2	----	----	80.9	77.1	80.6
3 / 8	71.9	69.4	70.4	68.2	70.2
#4	46.2	44.9	48.2	44.5	46.2
#8	34.0	33.4	34.9	32.6	34.1
#16	----	----	26.6	25.2	26.3
#30	19.7	20.4	21.0	20.1	21.0
#50	9.8	10.5	11.6	11.2	11.8
#100	6.0	6.1	6.49	6.42	6.79
#200	4.7	4.8	5.12	5.04	4.98

**307BM2 Mix
Truck #3
Two Samples Combined Before Testing**

	JMF % Passing	Mechanical Sampler		Quarter Point	Random
		Eubanks Lab	State Lab	State Lab	State Lab
%AC	5.00	5.10	4.79	4.55	4.80
1 ½	100	100	100	100	100
3 / 4	91.6	90.0	81.4	89.8	90.2
1 / 2	----	----	71.7	79.7	82.7
3 / 8	71.9	74.0	62.2	68.0	70.9
#4	46.2	49.3	41.5	41.2	46.8
#8	34.0	36.1	29.8	30.3	34.2
#16	----	----	23.1	23.9	26.5
#30	19.7	21.9	18.3	19.1	21.0
#50	9.8	11.7	10.1	10.6	11.5
#100	6.0	6.6	5.63	5.91	6.47
#200	4.7	5.1	4.60	4.79	5.02

**Consistency With-in Sampling Method
Using State Samples**

	Mechanical Sampler			Quarter Point			Random		
	High	Low	Diff.	High	Low	Diff.	High	Low	Diff.
%AC	5.41	4.79	0.62	4.61	4.42	0.19	4.80	4.72	0.08
1 ½	100	100	0.00	100	100	0.00	100	100	0.00
3 / 4	94.0	81.4	12.6	89.8	84.9	4.9	90.2	84.6	5.6
1 / 2	87.3	71.7	15.6	79.7	77.1	2.6	82.7	77.1	5.6
3 / 8	77.1	62.2	14.9	68.2	67.3	0.9	70.9	65.9	5.0
#4	50.8	41.5	9.3	44.5	41.2	3.3	46.8	43.2	3.6
#8	37.0	29.8	7.2	32.6	30.3	2.3	34.2	31.4	2.8
#16	28.6	23.1	5.5	25.2	23.9	1.3	26.5	24.4	2.1
#30	22.6	18.3	4.3	20.1	19.1	1.0	21.0	19.3	1.7
#50	12.1	10.1	2.0	11.2	10.5	0.7	11.8	10.2	1.6
#100	7.04	5.63	1.14	6.42	5.91	0.51	6.79	5.90	0.89
#200	5.59	4.60	0.99	5.42	4.79	0.63	5.02	4.79	0.24

307BM2 Mix Avg. of All Samples

	JMF	Mechanical Sampler		Quarter Point	Random
	% Passing	Eubanks Lab	State Lab	State Lab	State Lab
%AC	5.0	4.88	5.14	4.53	4.76
1 1/2	100	100	100	100	100
3 / 4	91.6	88.7	88.0	87.5	86.8
1 / 2	---	---	80.0	78.3	80.1
3 / 8	71.9	71.4	69.9	67.8	69.0
#4	46.2	46.6	46.8	42.7	45.4
#8	34.0	34.4	33.9	31.3	33.2
#16	---	---	26.1	24.5	25.7
#30	19.7	20.7	20.6	19.6	20.4
#50	9.8	10.6	11.3	10.8	11.2
#100	6.0	6.17	6.39	6.15	6.39
#200	4.7	4.77	5.10	5.08	4.93

