Flexible Pavement Performance Studies in Arkansas

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This paper reports the test methods used and results obtained in evaluating the performance of 115 mi of flexible pavement. The pavement varies in age from three to eight years, from high-type asphaltic concrete in excellent condition to double surface treatments that have required extensive maintenance. All of the roads are on the same soil area and have similar climatic conditions. The deflections were measured by the Benkelman beam with Helmer recorder. Seven series of deflections were made over a period of two years at some 500 different stations. In-place densities and moisture contents were determined at about one-third of these stations. Also moisture-density samples of the subgrade were taken at the edge of the pavement at different seasons to study the variations of moisture and density with time. Physical properties of subgrade and base materials are also reported. Visual condition surveys were made at frequent intervals during the life of the project to detect changes in the pavement condition.

● THIS REPORT is part of a study of the performance of flexible pavement being conducted by the University of Arkansas in cooperation with the Arkansas Highway Department and the Department of Commerce, Bureau of Public Roads. The study was started in July 1958 on roads in the loess-terrace soil area located in eastern Arkansas. The purpose of the study is to evaluate 115 mi of pavement, relating performance with pavement deflection; physical properties of subgrade, base and pavement; engineering and agricultural soil classifications; maintenance required; and amount of traffic. The final goal is the development of a better method of design of flexible pavements. This paper reports the tests performed in evaluating pavement structure and the results of these tests. The information obtained on the asphalt pavement is reported in J. R. Bissett's paper, "Changes in Physical Properties of Asphalt Pavement with Time," HRB Proceedings, Vol. 41.

Physical properties of the pavement structure were determined by taking samples of the pavement, base, and subgrade at about every 3/4 mi along the study roads.

The pavement sample was secured from the centerline of the traffic lane. The base density was measured below this pavement sample and a sample of the subgrade was taken at this point and at the edge of the pavement. The subgrade samples were taken with a thin-wall sampling tube 3 in. in diameter by 10 in. long. The thickness of each layer encountered during sampling plus depths to subgrade samples were recorded.

The pavement deflections were measured with a Benkelman beam (Fig. 1); a Helmer recorder (Fig. 2) provided a graph of each deflection. In addition the maximum and final deflections were taken from the dial gage.

Deflections were obtained from seven series of tests along the study roads. There are about 500 locations where the tests were run, and both the inner and outer wheel deflections were measured each time, making a total of about 7,000 deflections which were used in preparing data for this paper.

ROADS UNDER STUDY

The roads under study range from high-type asphaltic concrete pavements in excellent

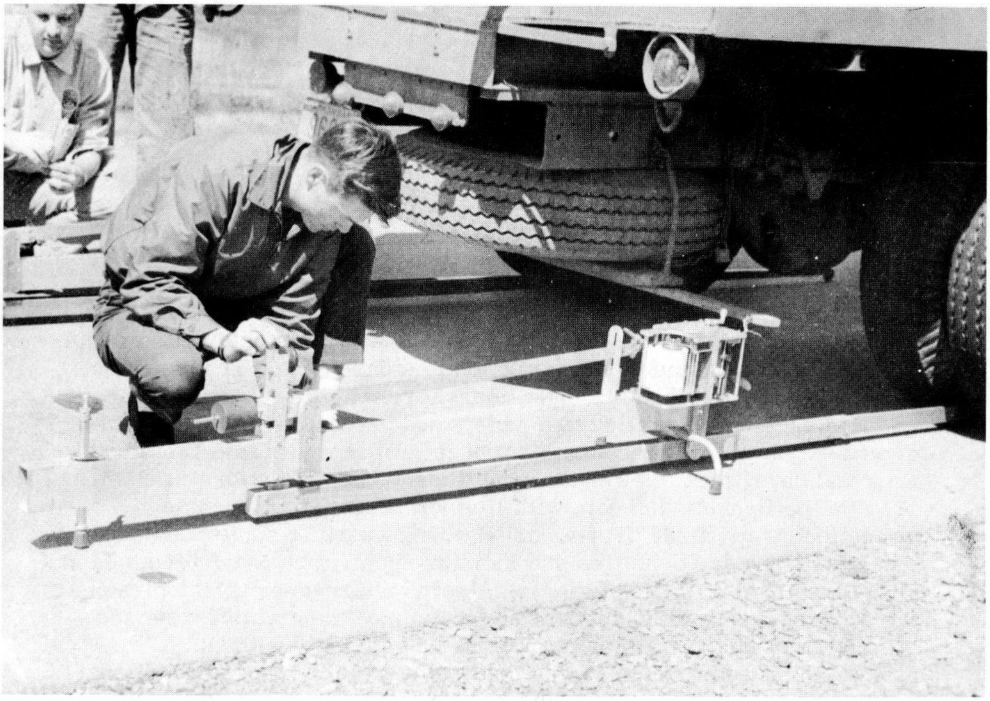

Figure 1.

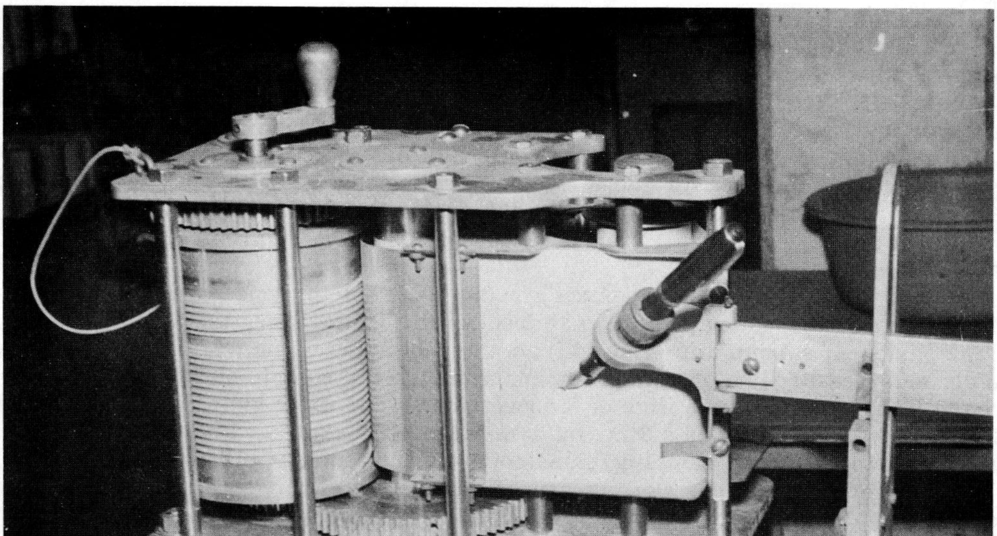

Figure 2.

condition to double surface treatments that have required almost complete rebuilding. Their age is from three to eight years, and they were built to Arkansas Highway Department specifications. They were chosen to represent the various types of pavement that have been constructed in Arkansas during the past few years. Each individual road will be referred to hereafter as a "job."

Seven of the jobs are hot-mix asphaltic concrete pavement on gravel bases. Jobs I, J, and M are pavements made with crushed aggregate, and Jobs A, B, C, and F are pavements made with local gravel that was crushed to fit gradation requirements. The total length of these seven jobs is 60 mi. The hot-mix asphaltic concrete pavements are grouped as high-type pavements.

The remaining seven jobs totaling 55 mi in length will be grouped as low-type pavements in these discussions. Jobs D, G, H, K, L, and N are double surface treatments and all are laid on gravel bases except Job K which is laid on a crushed rock base. Job E is a road mix, laid on a gravel base.

No further mention will be made of Jobs C, D, and G for which data are not complete at this time.

SAMPLING

Station numbers were painted along each road at about every 0.2 mi to be used as reference points in carrying out the study. The pavement sample consisted of a 15- by 15-in. square cut from the centerline of the traffic lane, using an air hammer. The pavement was removed without disturbing the base. The density of base was measured with a balloon density apparatus. The base sample was placed in a syrup bucket and returned to the laboratory for drying and weighing. About 1/2 gal of the base material was secured for determination of the index properties. A thin-wall sampling tube was driven into the subgrade to obtain a sample. The ends of the tube were sealed with paraffin. The depths to the tube sample and thickness of subbase, base, and pavement were recorded at the time the sample was taken. A hole was dug at the edge of the pavement through the base and into the subgrade. A gallon bucket of this subgrade soil was taken for running the maximum density test. Finally a tube sample of the subgrade was taken at the edge of pavement for determination of in-place density and moisture.

PHYSICAL TESTS OF BASE AND SUBGRADE

The material removed from the holes in the base was placed in a 1-gal syrup bucket and transferred to the laboratory where the unit dry weight and moisture were determined. To avoid loss of moisture or parts of the sample, the weight of the bucket and material was obtained before the bucket was opened. The bucket was then opened and the material dried in an oven. A new type of ballon density apparatus having a vacuum-pressure pump with a pressure gage was used in determining the volume of the hole.

The volume of the soil in the thin-wall sampling tube was obtained by measuring the length of the sample before it was removed from the tube. The weight of the wet soil was determined, then the sample was removed from the tube and a representative sample taken to determine the moisture content. The unit dry weight was then determined.

The dry method of preparation of samples was used to prepare base and subgrade samples for testing.

The averages of the test results are given in Table 1 for both high- and low-type pavements. All the index properties of both the base and the subgrade were determined using the appropriate AASHO standard method. The maximum density and optimum moisture contents were determined by Method AASHO T 180-57 (Method A).

Present base and subgrade densities show considerable uniformity. There is no reason to believe that these densities were not higher at the time they were constructed. The only conclusion is that an increase in moisture of the subgrade has caused the densities to decrease. The majority of these jobs are on a flat plain where surface drainage is very poor; in fact in most cases, the roadside ditches are full of water throughout the year. Most of the loess-terrace soil area is underlain with a clay pan that is about 50 in. below the surface, and only Jobs A and F have good surface drainage.

The plasticity index of the high-type pavement subgrade varies from 5 to 8 except

TABLE 1

AVERAGE PHYSICAL PROPERTIES

Pavement	Thickness (in.)		Density				Moisture (%)		Liquid Limit, Subgrade	Plasticity Index, Subgrade	Silt Size, Subgrade (%)	Clay Size, Subgrade (%)
	Pave-ment	Base	Base		Subgrade		Subgrade	Subgrade Opt.				
			Max. (pcf)	In-Place (%)	Max. (pcf)	In-Place (%)						
High-type												
A	2.2	6.5	131	96	120	88	17	14	29	8	68	23
B	1.9	7.4	130	94	119	84	20	14	37	15	44	39
F	1.8	6.9	133	93	120	88	15	15	30	8	61	28
I	2.0	7.0	138	89	117	87	17	13	32	7	67	26
J	1.9	9.5	132	92	120	83	16	13	28	6	56	22
M	2.2	9.9	138	91	126	81	17	11	30	5	56	20
Low-type												
E	2.2	5.2	136	93	118	86	18	14	26	3	64	25
H	-	3.8	137	89	110	87	21	13	32	12	66	26
K	0.7	8.5	137	91	121	84	17	13	31	6	62	27
L	0.9	6.0	133	94	120	85	17	11	33	12	62	29
N	0.6	6.1	136	93	120	87	20	14	34	12	62	27

for Job B which has a plasticity index of 15. The subgrade plasticity index for the low-type pavements vary from 3 to 12, with Jobs H, L, and N having a plasticity index of 12.

The base index properties are not tabulated because they were very nearly the same for all jobs. This material is a clay gravel, well graded, having a plasticity index from 0 to 3. This material can be compacted into a rather dense material as indicated from the maximum base densities given in Table 1.

The base thickness (Table 1) was taken from the measurement made at the center of the traffic lane. The average for high-type pavements was 7.9 in., with Job M being thickest with 9.9 in. The base under the low-type pavement averaged 5.9 in., with Job K being thickest with 8.5 in. and Job H being thinnest with 3.8 in. However, Job H had a sandy subbase material that varied in thickness from 3 to 7 in.

DEFLECTION TESTS

Two Benkelman beams were used simultaneously for making the pavement deflection tests. These two beams were equipped with the Helmer recorder, so that curves of the deflections as well as the gage readings were determined at point of maximum deflection. In all cases, the loading truck wheel was 4 ft to the rear of the probe point at the beginning of the test. The truck was then moved forward at the slowest possible rate until the wheel of the truck was at least 6 ft beyond the probe.

The loading truck was equipped with two water tanks so constructed that the water could be shifted from one tank to the other by means of a pump. The actual wheel loads were maintained at 9,000 lbs each and the tire pressure was maintained at 90 psi. Loadometers were used to determine the weight of the truck wheels.

Figure 3 shows curves typical of the average and maximum deflection obtained on Job I. In these curves, the Helmer graph shows a horizontal line for some distance before the deflection started. This is in agreement with field tests in which the truck was placed some 30 or 40 ft forward of the beam probes and then backed to the probes. In all cases the dial gages on the beams did not indicate any deflection until the wheel was within from 2 to 3 ft of the probe.

There is some question whether the recovery part of the Benkelman beam curve shown by the Helmer recorder is accurate because of frictional resistance between the recording pen and the paper. There is also some flexibility in the recording beam. The recording beam was constructed so that the pressure of the pen on the paper was adjustable. This pressure was reduced to the minimum that would mark the paper, yet in test it was found that the gage on the beam did not return to zero after the truck had been moved beyond the zone of influence. When the recording pen was removed from the device and the recording beam permitted to swing freely, the dial gage

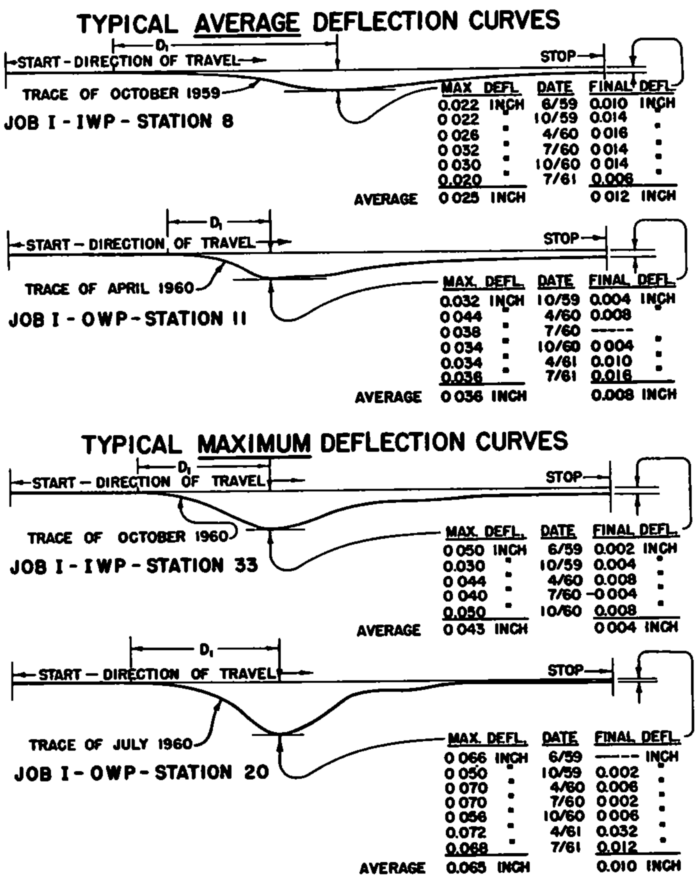

Figure 3. Typical deflection curves, Benkelman beam with Helmer recorder, 9,000-lb wheel load. Scale: Horiz. 1 in. = 1 ft - vert. 1 in. = 0.10 in.

invariably returned to zero or within 0.001 of the initial starting place.

Table 2 gives average deflections for all of the jobs and for the seven series of deflections. In most cases the deflection of the high-type pavement was low and rarely did the average of the deflection of the inner wheel exceed 0.03 in. or the outer wheel exceed 0.04 in. in every series of deflection tests. There were a few erratics due to pavement conditions where the test was made. The deflection was always made at the same location at each station by using a line painted on the pavement and the truck wheel was stopped on this line for the beginning of the deflection measurement. The lateral location of the truck wheel did not vary more than about 6 in. for any station, and ranged from 18 to 24 in. from the edge of the pavement.

A wide variation in the deflection at the same station was noted at different times. Figure 3 shows these variations. For example, for Job I on the outer wheelpath at station 20, the average of the maximum deflections is 0.065 in., but the range is from 0.050 to 0.072 in. No reason has been discovered for these erratics. Usually the deflections followed a fairly uniform pattern.

In most cases there was a residual deflection as explained previously. To illustrate, on Job I, for the outer wheelpath, at station 20 the average of the residual deflection was 0.010 in., the minimum residual was 0.002 in. and maximum residual 0.032 in. Checks and investigations have convinced that most of this residual deflection is due to the friction of the pen on the paper and, possibly, some to the flexibility of the recording arm of the beam. Frequently the truck was moved some distance beyond the end of the probe at the end of the test and allowed to stand for several minutes. The dial gage on the beam did not indicate any change in the deflection, even after several minutes. It is felt that if residual deflection existed in the pavement under each truck load, a severe rutting would be evident but this is not the case.

HIGH-TYPE PAVEMENT DEFLECTION

The average deflection obtained for each job from the seven series of tests is shown in Figure 4. The jobs are placed left to right in order of their pavement age. Computed to July 1960 (Table 3). Other data given in Table 3 are daily traffic, equivalent wheel loads per day, total equivalent wheel loads, average condition surveys, selected deflection data, radius of influence, and ratio of radius of influence to deflection.

The outer wheel deflection on the average exceeded the inner wheel deflection by about 40 percent. This differential deflection is believed to be caused primarily by the lack of confining support from the shoulder. Job M has the widest shoulders and has a differential deflection of only 0. 004 in., and Job B has the narrowest shoulders and has a differential deflection of 0. 015 in.

Figure 4 indicates that the youngest job (Job M) had the lowest deflection, the middle-aged pavements had a higher deflection (Jobs F, J, and I) and then the oldest pavements (Jobs A and B) decreased in deflection below that of the middle pavements and were slightly higher than the younger pavement.

TABLE 2

AVERAGE DEFLECTIONS

Date	Deflection (10^{-3} in.)													
	Job A		Job B		Job F		Job I		Job J		Job M		Average	
	IWP	OWP	IWP	OWP	IWP	OWP	IWP	OWP	IWP	OWP	IWP	OWP	IWP	OWP
(a) High-Type Pavement														
June '59	11	21	17	33	17	23	28	44	24	35	21	28	20	31
Oct. '59	19	31	26	37	24	30	30	42	23	29	19	25	23	33
April '60	13	33	18	46	18	35	34	48	24	34	22	28	21	37
July '60	19	32	20	36	18	23	30	43	18	28	18	21	20	30
Nov. '60	18	18	26	27	27	23	32	34	26	21	18	17	24	23
April '61	15	30	20	41	19	36	29	37	19	24	14	21	19	31
July '61	15	24	22	34	17	20	33	40	28	27	17	15	22	27
Average	16	27	21	36	20	27	31	41	23	28	18	22	21	30

(b) Low-Type Pavement

	Job E		Job H		Job K		Job L		Job N		Average	
	IWP	OWP	IWP	OWP	IWP	OWP	IWP	OWP	IWP	OWP	IWP	OWP
June '59	36	27	31	41	20	38	17	28	20	32	25	33
Oct. '59	43	43	38	45	20	32	26	36	29	40	31	39
April '60	49	41	33	37	19	34	19	42	25	49	29	41
July '60	39	32	29	40	18	23	18	23	11	26	23	29
Nov. '60	41	33	32	35	21	19	23	24	24	26	28	27
April '61	44	39	37	47	21	28	16	30	18	41	27	37
July '61	35	23	37	42	21	20	17	27	21	27	26	28
Average	41	34	34	41	20	28	19	30	21	34	27	33

Figure 5 shows the variation of deflection of both inner and outer wheel for each series of test run on Job A. Comparison with Figure 6 plotted for Job I shows quite a large difference between these two jobs in over-all deflection, but attention is called to the uniform deflection of the inner wheel with season, while the outer wheel fluctuates seasonally. It has been observed that the highest deflections occur during the spring tests for the outer wheel and during the fall tests for the inner wheel. However, there is not a great amount of difference in the average deflections; with the inner wheel ranging from 0. 019 to 0. 024 in. and the outer wheel ranging from 0. 027 to 0. 037 in.

Figures 7 and 8 show the variation of deflections within a single job for the outer wheel. Figure 7 is for Job I, the maximum deflection occurs at station 27, where the pavement has a large longitudinal crack, and the deflection is 0. 094 in. The second highest deflection occurs at station 36 and amounts to 0. 084 in. There is no apparent reason for such a high deflection at this location. The minimum deflection for this job occurs both at station 14 and 45 in the amount of 0. 015 in. Deflections along Job A are shown on Figure 8. The range in deflection is less than for Job I; the maximum

TABLE 3

MISCELLANEOUS DATA

Pavement	ADT 1960 (VPD)	No of Equiv Wheel Loads[1]		Condition Survey (%)			Pavement Age July 1960 (yr)	Average Deflection (in.)		Avg Radius of Influence (ft)		Radius/ Deflection (in /in)	
		Per Day	Total (thousands)	Average	Highest	Lowest		IWP	OWP	IWP	OWP	IWP	OWP
A	1, 000	401	650	88	95	86	8 1	0 017	0 025	2 3	2 4	1, 623	1, 152
B	1, 700	796	1, 743	66	70	62	8. 1	0 020	0 039	2 4	2 5	1, 440	769
F	1, 300	401	694	70	81	60	5 7	0 020	0. 030	1 9	1 9	1, 140	633
I	2, 100	1, 531	3, 129	88	95	81	6 7	0 031	0. 043	2 5	2 5	968	465
J	2, 150	1, 856	3, 048	97	98	95	5. 2	0 027	0. 032	2 6	2 4	1, 156	900
M	2, 100	1, 856	1, 328	98	98	97	2 1	0 021	0 025	2 4	2 2	1, 371	1, 056
E	900	209	459	69	83	60	7 0	-	-	-	-	-	-
H	450	126	103	80	89	66	2 9	-	-	-	-	-	-
K	575	195	289	77	80	75	4 9	-	-	-	-	-	-
L	550	126	188	82	95	68	5. 6	-	-	-	-	-	-
N	325	126	106	82	85	68	2 7	-	-	-	-	-	-

[1]5, 000 lb.

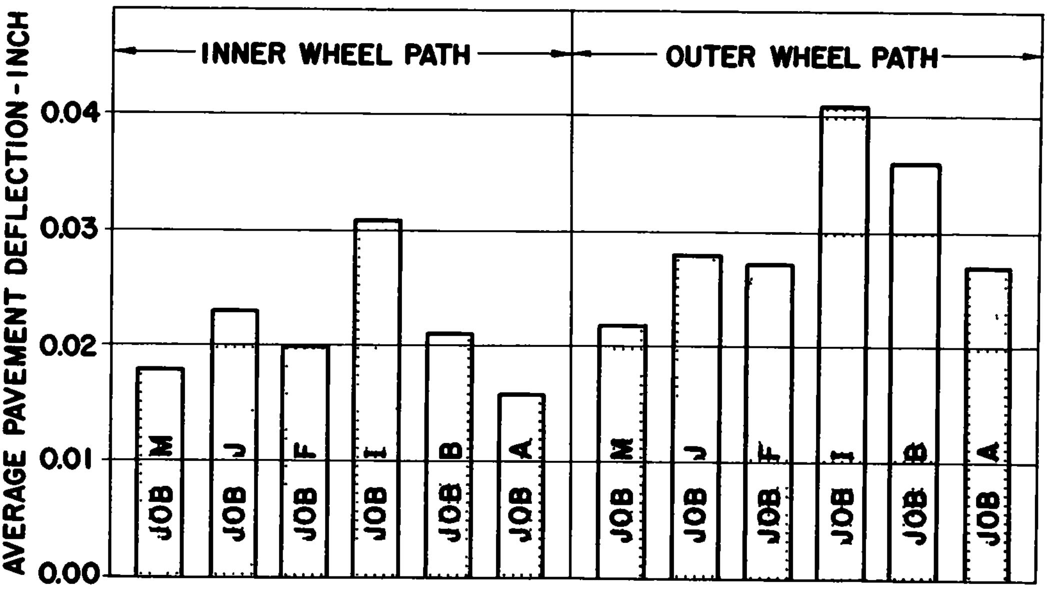

Figure 4. Average pavement deflection vs job, Benkelman beam, 9,000-lb wheel load, high-type pavement.

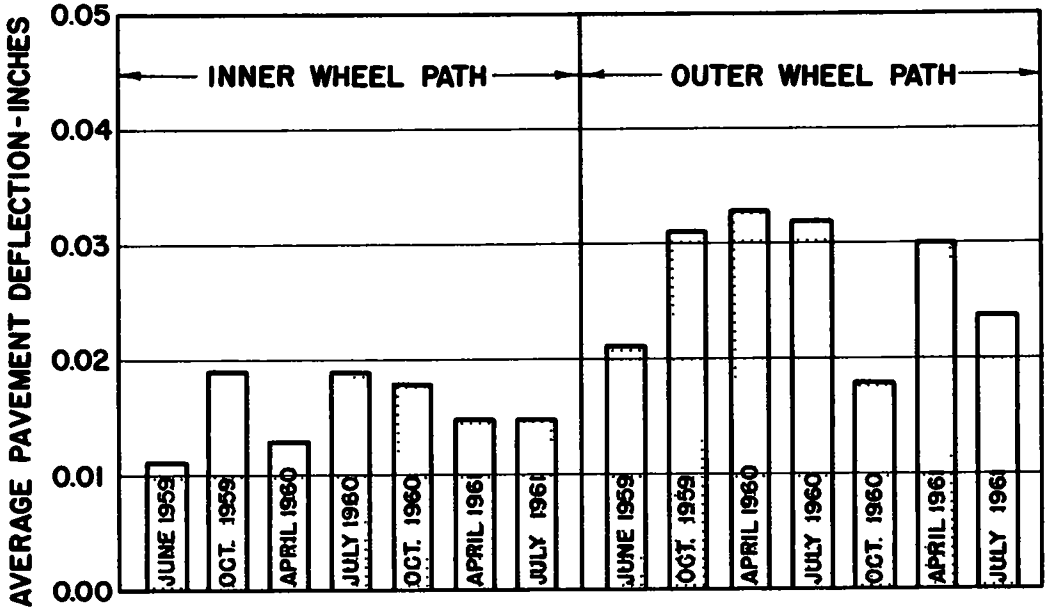

Figure 5. Average deflection vs test date, Job A, Benkelman beam, 9,000-lb wheel load.

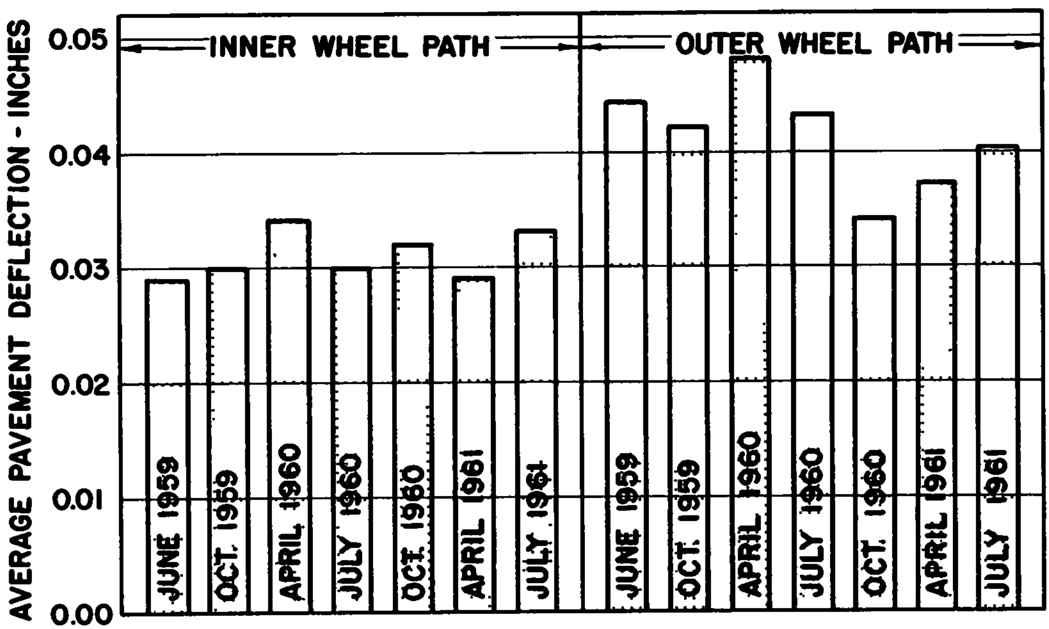

Figure 6. Average deflection vs test date, Job I, Benkelman beam, 9,000-lb wheel load.

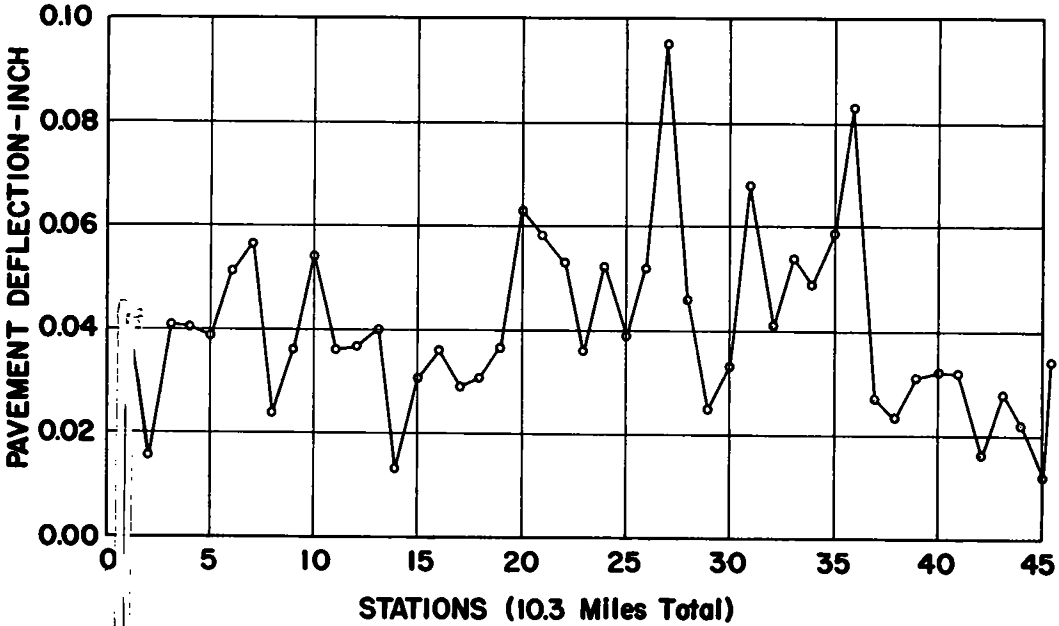

Figure 7. Average deflection vs location, Job I, Benkelman beam, outer wheelpath.

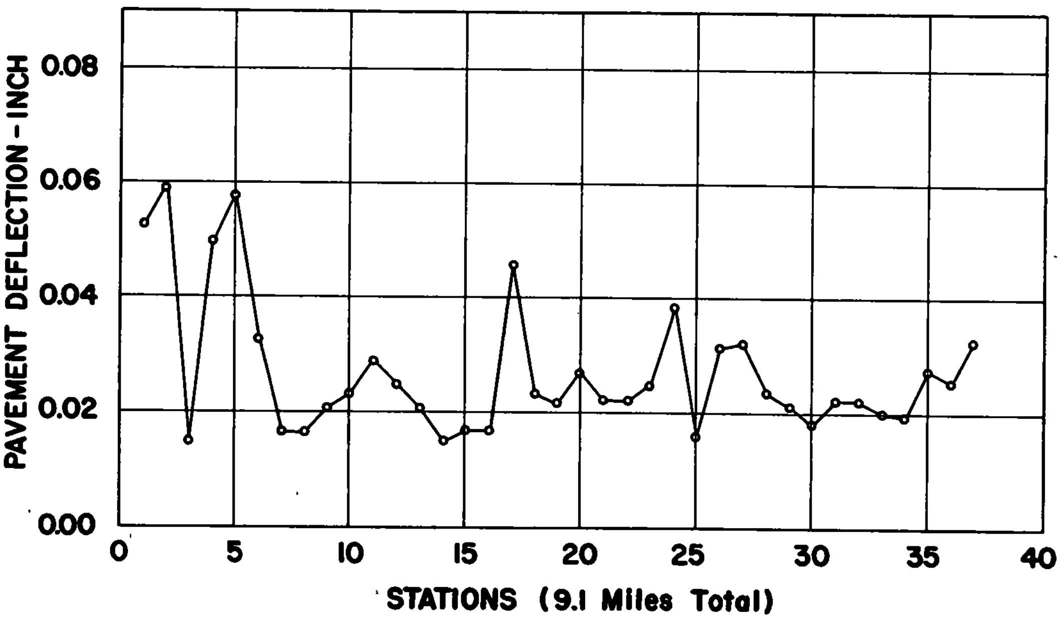

Figure 8. Average deflection vs location, Job A, Benkelman beam, outer wheelpath.

deflection occurs at station 2 and totals 0.059 in., with the minimum deflection occurring at station 3 in the amount of 0.015 in.

Figure 9 shows the pavement deflections plotted against the total thickness of pavement and base for both the inner and outer wheels of Job M. There is a definite decrease in pavement deflection with thickness of structure for most jobs. This trend is not very well indicated where the average deflections were comparatively low, however. For Job M the inner wheel has the more positive trend, indicating a deflection of 0.045 in. with a structure thickness of 8 in., varying to a deflection of 0.008 in. with a structure thickness of 16 in.

Results of the analysis of the deflection curves obtained from the Helmer recorder are shown in Table 3. The radius of influence of the wheel is assumed to be from the point of maximum deflection back to where the curve becomes tangent to the horizontal. This radius of influence as defined is shown as d_1 in Figure 3. Measurement of this radius of influence shown on the graph given by the Helmer recorder has been completed on selected stations of the high-type pavement only. The radius of influence varies from 1.9 ft on Job F to 2.6 ft on Job J. It is noted that the deflections given in Table 3 are average deflections for selected stations and are not to be confused with the average deflections given in Table 2.

The ratio of radius of influence to pavement deflection is calculated in units of inches of radius of deflection to inches of pavement deflection (in./in.). The average of both inner and outer wheel ratios range from 1,387 on Job A to 716 on Job I. It is noted that the higher the ratio of influence to deflection for a single job was the larger the zone of influence indicated or the smaller the deflection occured. It is felt that the ratio for outer wheelpath is more indicative of the pavement structure condition, and with a ratio less than 800 the pavement is in poor condition.

Again grouping the pavements into three groups based on their age and averaging their outer wheel ratio of influence to deflection gives an interesting comparison. The youngest Job M's ratio is 1,152, the middle-aged pavements Jobs F, I, and J's ratio is 666, and the older pavement for Job B's ratio is 960.

Table 4 gives the criteria followed in evaluating the condition of the pavement. The average condition shown is a percent based on a new pavement having 100 percent

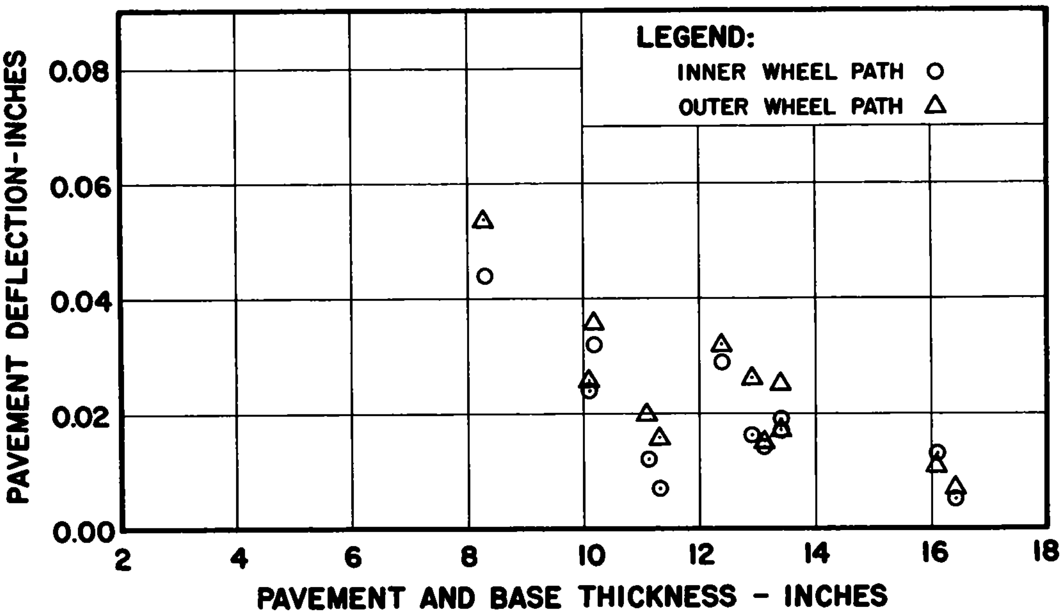

Figure 9. Deflection vs pavement structure, Job M.

TABLE 4

CRITERIA FOR CONDITION SURVEYS

EXCELLENT	95-100	
		No defects apparent
		Good riding surface
GOOD	90-95	
		Few small isolated cracks
		Slight surface roughness
		No patching required
FAIR	80-90	
		Some isolated cracks
		Slight surface irregularities
		Some raveling at edge of pavement
AVERAGE	70-80	
		Slight rutting
		Small areas showing map cracking
		Small raveled areas
		Minor base failures
		Surface roughness evident
POOR	55-70	
		Distorted surface
		Base failures extend entire width of lane
		Considerable surface cracking
		Rutting
FAILURE	below 55	
		Extensive patching
		Surface distortion
		Extensive base failures

condition. Seven condition surveys have been completed. Each segment of road between stations is evaluated from visual observations and the average per job determined. The maximum, average, and minimum percent condition surveys are given in Table 3.

The percent condition varied from survey to survey, with the maintenance work performed increasing the pavement rating. The lowest condition rating may be the best comparison between jobs in over-all performance. The lowest ratings vary from 60 percent on Job F to 97 percent on Job M.

The traffic data given in Table 3 was prepared by the planning and research staff of the Arkansas Highway Department. All wheel loads are converted into equivalent 5, 000- lb wheel loads. No definite relationship has been established between loading and percent condition or pavement deflection. The average daily traffic varies from 1, 000 to 2, 100 vehicles per day.

LOW-TYPE PAVEMENT DEFLECTION

The bar graph in Figure 10 compares the inner and outer wheel deflections obtained.

Only Job E showed a higher deflection in the inner wheel path than in the outer wheel path. This particular job is in very bad condition. No explanation has been found for this unusual behavior. In fact most of this job has required resurfacing or rebuilding during the period of these tests. Table 2 gives the total number of equivalent 5, 000- lb loads for this job as 459, 000, considerably more than for any other low-type pavement. The average deflections on this pavement were one of the two highest studied.

Job H also shows very high deflections. This job has failed almost completely and been rebuilt. The thickness of the base varied widely from station to station. However, there was about 5 in. of sandy subbase under the base material.

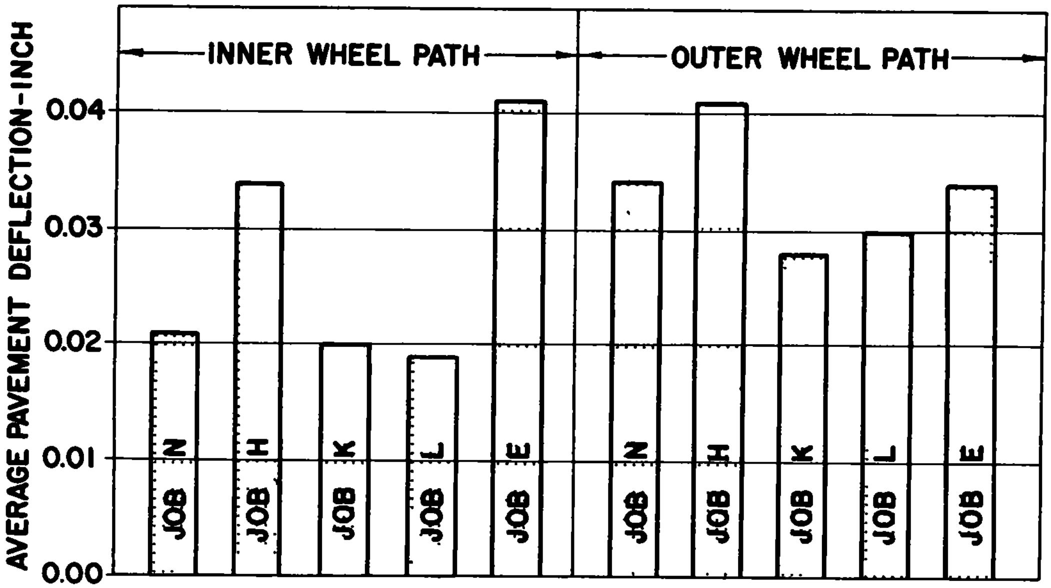

Figure 10. Average pavement deflection vs job, Benkelman beam, 9,000-lb wheel load, low-type pavement.

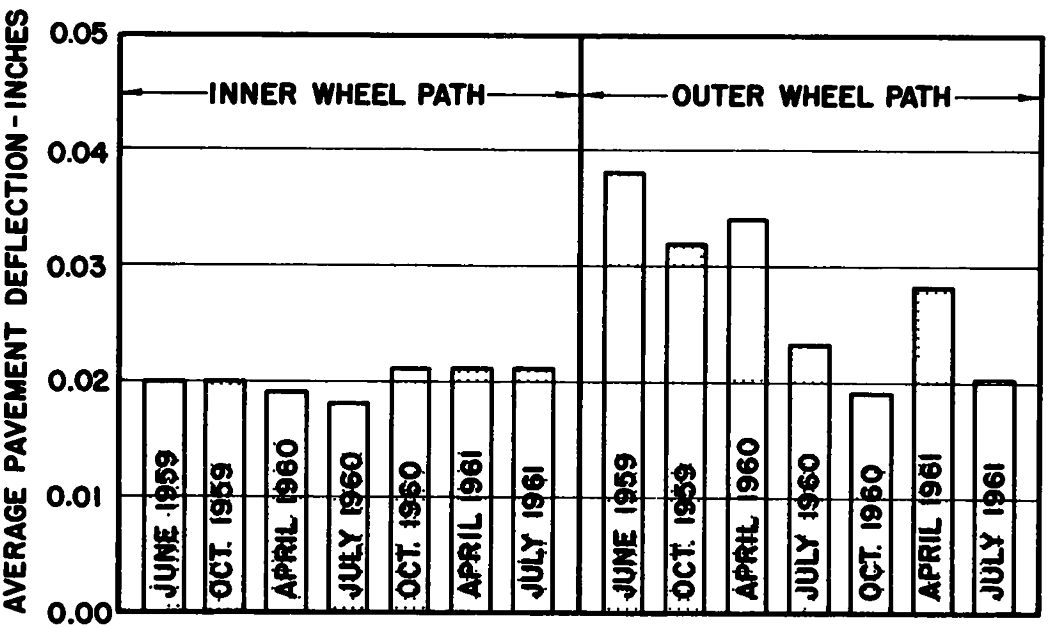

Figure 11. Average deflection vs test date, Job K, Benkelman beam, 9,000-lb wheel load.

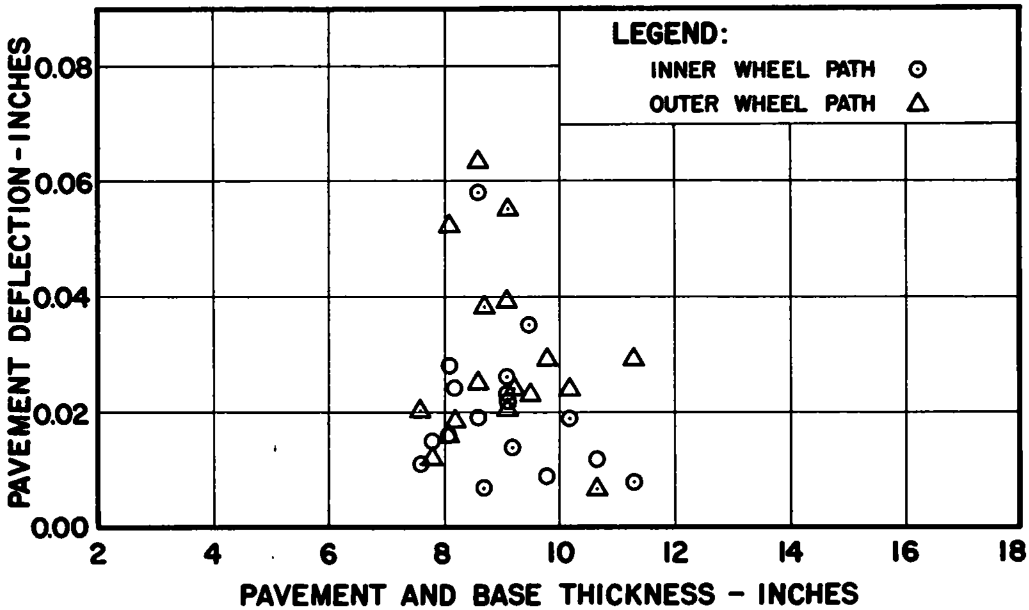

Figure 12. Deflection vs pavement structure, Job K.

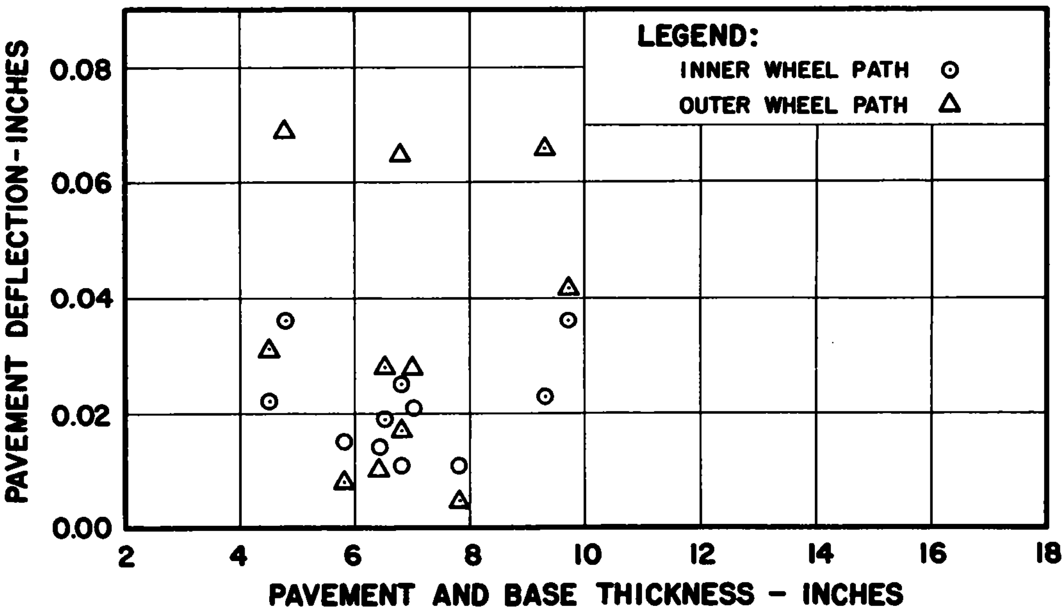

Figure 13. Deflection vs pavement structure, Job L.

Job K is a double surface treatment with moisture conditions very similar to the other jobs. The base material on Job K is of a better quality and is about 2 in. thicker. This project is in excellent condition and has required very little maintenance. The average deflections for the project are below the over-all average of the high-type pavements. Figure 11 shows that there is little variation in the deflection under the inside wheel from season to season.

Figures 12 and 13 show the variation of deflection with pavement structure. Job K (Fig. 12) is an example of an excellent double surface treatment in good condition. There is not enough variation in structure thickness to establish trends for this job. Job L (Fig. 13) is typical of the double surface treatment roads and the road mix Job E, also, in that the plotted points vary as if placed from a shot gun. No trend can be established. This job has narrow shoulders and is beginning to require extensive maintenance, especially in the outer wheelpath.

Job E is as an example of a road in very poor condition. The deflections listed are those occuring when a pavement requires extensive maintenance and could be considered a total failure.

Determination of the radius of influence shown by the graph from the Helmer recorder is not complete.

Condition survey data are shown in Table 4. The minimum condition ranges from 60 percent on Job E to 75 percent on Job K.

The poor condition of Job E is reflected in the condition survey. Job K is the surface treatment constructed on crushed rock base. The pavement does not show any signs of distress. The observations of this job indicate that a double surface treatment can show higher deflections than a high-type pavement and still be in good condition.

DEFLECTION RELATED TO PAVEMENT THICKNESS

A plot of pavement deflection along Job I for the outer wheel is shown in Figure 9. The average deflection from station 0 to station 36 is 0.044 in., and the average pavement thickness here is 1.8 in. The average deflection from station 37 to station 46 is 0.026 in. and the pavement thickness is 3.1 in. The average deflection decreased by 0.018 in., or about 41 percent, where the pavement thickness increased. Data for the inner wheel are deflection averaged 0.031 in. from station 0 to station 36, and 0.026 in. from station 37 to station 46. The average deflection decreased 0.05 in. or 16 percent with the increased pavement thickness. This decrease in deflection for both wheels is credited primarily to a double layer of hot-mix asphaltic concrete pavement encountered from station 37 to station 46.

SUMMARY

The pavement deflection in the inner wheelpath is more uniform than in the outer wheelpath and changes only slightly with the season.

The deflection in the outer wheelpath is normally greater than the inner wheelpath, averaging about 40 percent larger on the high-type pavements and about 45 percent larger on the low-type pavements.

On high-type pavements there is a definite trend that deflection is proportional to thickness of pavement structure.

CONCLUSION

The zone of influence for a wheel loan can be measured using a Benkelman beam with Helmer recorder. This is true only so long as this zone of influence does not reach the beam supports. The graph drawn by the Helmer recorder shows where the zone of influence reaches from the point of maximum deflection. When the initial deflection extends beyond the beam support, this condition is immediately shown by the trace of the deflected point deviating from a horizontal line.

The deflection of pavement alone is not sufficient information to indicate pavement performance. For example, Job F has an average deflection of 0.024 in. and is rated 70 percent condition, Job M has an average deflection of 0.020 in. and rates 98 percent condition, and Job I has an average deflection of 0.036 in. and rates 88 percent condition. Job M is the best pavement and has the lowest deflection, and Job I is a good pavement but has a higher deflection than Job F, which is a poor pavement.

The ratio of radius of influence to deflection can be used as a criteria for over-all pavement performance. For the high-type pavements studied a ratio radius to deflection for the outer wheel of 800 appears to divide the good from the poor pavements. Of the pavements reported, only Job I does not follow these criteria. The average ratio of Job I is 465, considerably lower than that indicating a good pavement; however, this pavement is classed as a good pavement with an average condition rating of 88 percent. Only future observations of this particular job will tell what the low ratio of radius to deflection actually means.