

Highway Materials Research Laboratory  
132 Graham Avenue, Lexington 29, Kentucky

August 2, 1951

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B. 2. 2.

TO: D. V. Terrell  
Director of Research

About two months ago Mr. Gray asked that we make a final inspection of the remaining test sections on the Versailles-Frankfort Road, U.S. 60, in order that some type of maintenance resurfacing could be set up to recondition this pavement. This inspection was made early in June, and with it the experiment was concluded after eight years of use.

The attached report prepared by W. B. Drake, Research Engineer, includes all the material we have accumulated with four inspections between 1946 and 1951. The report in itself is a summary, with data tabulated such that the results can be viewed from the standpoint of any bituminous material or aggregate gradation irrespective of the other materials in the project. These are supplemented by brief discussions of results pertaining to each material individually.

Obviously the results could not be specific, for the evaluations were limited to visual ratings and photographic records. Off hand, the photographs seem to be the more valuable of the two since they offer an opportunity for any reader to arrive at his own ratings independent of those given by the observers. Then too, through photographs conditions year by year can be compared. However, in most cases a single photograph represented only a small portion of any pavement test section, and the condition shown in the photograph was not necessarily representative of the entire section.

Visible surface conditions throughout a section could be averaged by observers walking on both sides of the pavement, particularly since they compared notes at the end of each section. Yet, it was difficult for an observer to maintain his rating standard for several hours and over a distance of five or six miles. It was even more difficult to carry it from one day to the next during an inspection for a given year. Finally, carrying a standard from year to year was impossible, particularly in view of the fact that the same individuals did not make all four of the separate inspections.

Despite these and other limitations, there was much valuable and reliable information gained through the work. The results leave no doubt of the superiority of asphalt cements over cut backs and tar in these

August 2, 1951

particular mixes; they leave no doubt of the exceptional quality of the mixes with gradings 2, 3, and 4 (having from 30 to 50 percent 11F limestone fines in the aggregate); and they indicate that the lighter asphalt cements (above 100 penetration) are preferable to the harder grades for these relatively thin and fine-graded surfaces even when traffic is heavy.

There were some other things of interest contained in the results. For example, the amount of material passing the No. 200 sieve ran as high as five percent in some of the mixes having limestone fines, yet the pavements showed no tendency toward slipperiness. These particular surfaces were the ones having the best performance records. Also, these were the sections having the neatest appearance at least from the time of the 1946 inspection to the present. Some of these are illustrated in the report by Fig. 11, Fig. 13, and that portion of Fig. 16 designated as Section 54.

One of the most impressive features of practically all the test sections was the elimination of a prominent center joint - a feature which is almost universally troublesome in present Class I and Class F surfaces. Of course, these experimental sections were more or less tailored by state forces when this pavement was placed in 1942 and 1943, but with the same equipment and similar personnel operating at present on the Jackson-Salyersville Road (experimental sandstone project) we are not being nearly as successful in obliterating the center joint. It appears that with mixes of the several types used on the Versailles-Frankfort Road it is inherently easy to join adjacent lanes satisfactorily.

As a final thing, the material designated as 11F for this project warrants a lot of attention. At the time this project was surfaced stone of this gradation was largely a waste product in this part of the state, and probably it still is so at some quarries. Locally, however, additional processing equipment has been installed to convert this to agriculture lime and to aggregate for concrete blocks. This increases the cost of the finer graded material 20 to 25 cents per ton over the No. 11.

Whether this additional cost enters or not, there should be a place for the 11F, or something closely resembling it, in our aggregate gradings and a place for its use in Class F surfaces or in something resembling sand-asphalt mixes used so successfully in many other states. For the Class F this could be accomplished by adding to our Specification 4.6.3 (1945 Standards page 228, and Amendment No. 16-R dated 3-22-50) a surface Type "C", in the same way that a third type of surface was added to the Class I specification by Amendment No. 25-R dated 7-31-51. For a mix resembling sand-asphalt, more study and thought should be given to it since stone sand as such is not produced at present, and we would want to avoid establishing something that would be difficult to control. At the moment we are gathering some information on applications of mixes of this sort elsewhere, and when all that is assembled it will be brought up for discussion.

Respectfully submitted,



L. E. Gregg  
Assistant Director of Research

Copies to: Research Committee

Final Report

on

EVALUATION OF PLANT MIX SURFACE TREATMENTS

by

ROAD TEST SECTIONS

(U.S. 60, Versailles-Frankfort Road)

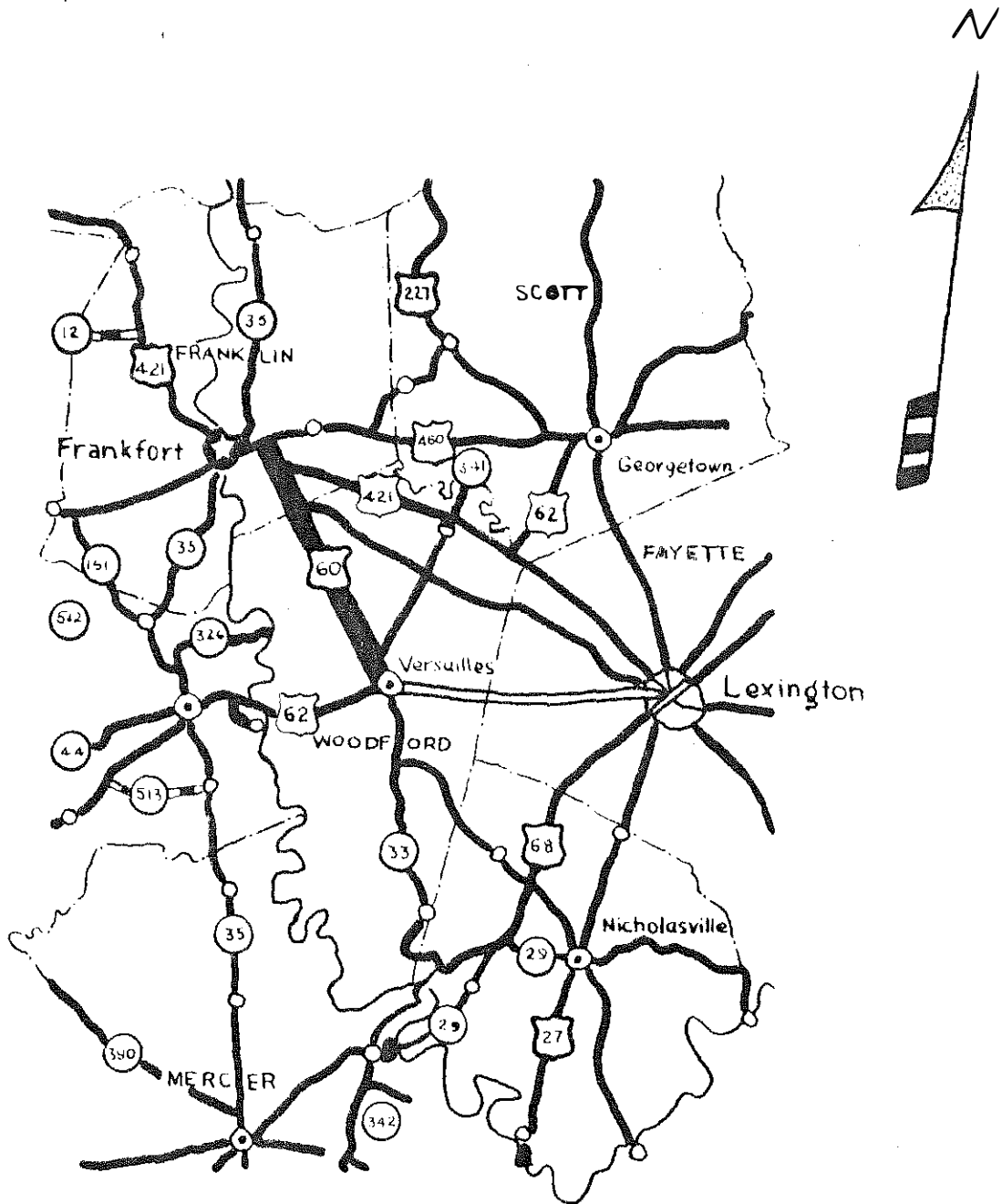
by

W. B. Drake  
Research Engineer

July, 1951

TABLE OF CONTENTS

	Page
I PROJECT STATEMENT . . . . .	1
II METHODS OF EVALUATION . . . . .	7
III RESULTS . . . . .	8
A. Bitumen . . . . .	8
1. RT-12 . . . . .	8
2. MG-5 . . . . .	10
3. RC-5 . . . . .	10
4. PAC-5 . . . . .	10
5. PAC-7 . . . . .	13
6. PAC-8 . . . . .	13
B. Gradation . . . . .	18
1. G-1 . . . . .	18
2. G-2 . . . . .	18
3. G-3 . . . . .	22
4. G-4 . . . . .	22
5. G-5 . . . . .	22
6. G-6 . . . . .	24
7. G-7 . . . . .	24
8. G-8 . . . . .	24
9. G-9 . . . . .	25
10. G-10 . . . . .	25
IV CONCLUSION . . . . .	25



PROJECT LOCATION  
FRANKFORT-VERSAILLES  
U. S. 60

## PROJECT STATEMENT

This project made use of six bituminous materials and ten aggregate gradations in plant mix paving operations. The test sections were installed by state forces in 1942 and 1943. The object was to determine which aggregate gradation with a specific bituminous material was best suited for an application of 75 pounds per square yard surface treatment.

The bituminous materials used were MC-5, RC-5, RT-12, PAC-5 (85 to 100 penetration), PAC-7 (120 to 150 penetration), and PAC-8 (150 to 200 penetration). Twenty sections of MC-5 and ten sections of RC-5 were laid in 1942; all the sections containing the other materials were placed in 1943. A lay-out of the project by sections is shown in Fig. 1.

There were three aggregates or aggregate combinations as follows: Limestone, Limestone and Concrete Sand, and Limestone and River Sand. The Limestone type consisted of four gradations made from mixing No. 9 and a fine stone designated as No. 11F. The Limestone and Concrete Sand type consisted of three gradations of No. 9 stone and the coarse sand. The Limestone and River Sand type consisted of three combinations of River Sand and No. 9 stone. These ten gradations are outlined in Table 1 and shown on the gradation chart in Fig. 2.

The gradation range for the 11F stone used in gradings G-1 to G-4 is in Table 1A. This was a much finer stone than the present No. 11 outlined in the same table. A plot of these gradation ranges along with one representing the Kentucky River Sand is presented in Fig. 3.

TABLE 1  
TYPICAL GRADINGS OF AGGREGATES

NUMBER OF GRADING	GRADING No. 1	GRADING No. 2	GRADING No. 3	GRADING No. 4	GRADING No. 5	GRADING No. 6	GRADING No. 7	GRADING No. 8	GRADING No. 9	GRADING No. 10
AGGREGATES COMBINED	80%#9 20%#11F	70%#9 30%#11F	60%#9 40%#11F	50%#9 50%#11F	60%#9 40%C.S.	70%#9 50%C.S.	80%#9 20%C.S.	80%#9 20%R.S.	70%#9 30%R.S.	60%#9 40%R.S.
% PASSING 3/8"	96.5	97.5	98.0	98.5	100	100	100	100	100	100
% PASSING No. 4	40.0	48.0	56.0	66.0	51.2	43.4	35.6	36	44	52
% PASSING No. 8	17.0	22.0	27.0	32.0	34.6	26.7	18.8	22.4	32.1	41.8
% PASSING No. 16	8.0	12.0	17.0	20.0	27.6	21.2	14.8	19.6	28.4	37.2
% PASSING No. 50	3.0	4.0	6.0	7.0	3.8	3.1	2.4	4.4	6.1	7.8
% PASSING No. 100	2.0	3.0	5.0	6.0	0.7	0.7	0.6	0.6	0.6	0.6
% PASSING No. 200	1.0	1.5	2.5	4.0	0.3	0.3	0.3	0.2	0.2	0.2
% BITUMEN MIX DESIGNED FOR	4.9	5.1	5.2	5.4	5.3	5.2	5.0	5.3	5.5	5.7

Gradings based on combinations of average gradings of aggregates furnished the State in 1941.

U. S. Standard Sieve Sizes

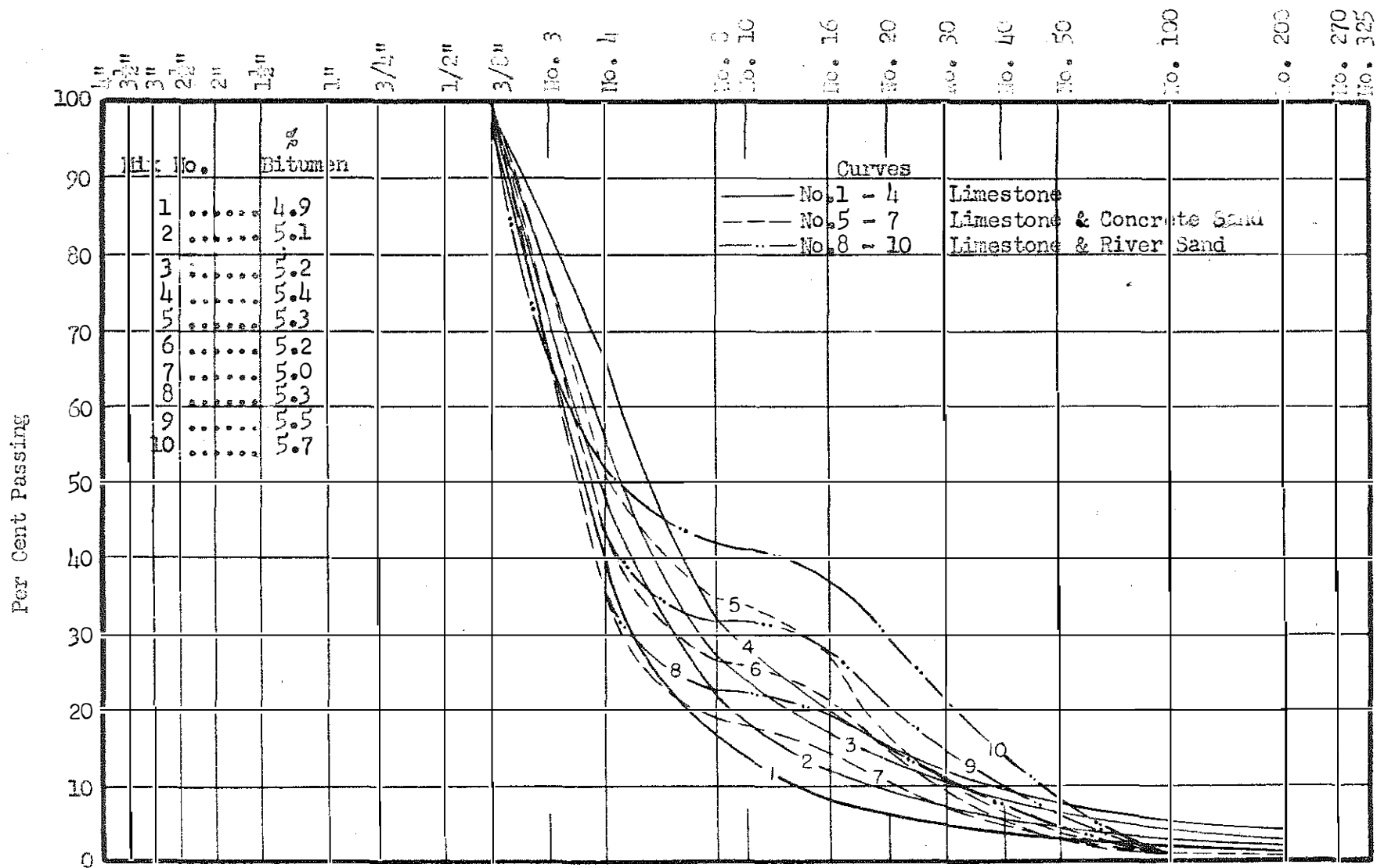


FIG. 2



TABLE 1-A  
GRADATION RANGES OF FINE AGGREGATES

<u>Sieve</u>	<u>No. 11F % Passing</u>	<u>No. 11 % Passing</u>
3/8"	100	100
No. 4	95-100	40-100
No. 8	50-70	0-40
No. 16	30-45	-
No. 50	10-25	-
No. 100	5-25	0-5
No. 200	5-15	-

<u>Sieve</u>	<u>Coarse or Concrete Sand From Ohio River (C.S.) % Passing</u>	<u>Fine or River Sand From Kentucky River (R.S.) % Passing</u>
3/8"	100	-
No. 4	85-100	-
No. 8	-	100
No. 16	40-80	75-100
No. 50	2-30	10-30
No. 100	0-5	-
No. 200	-	0-5

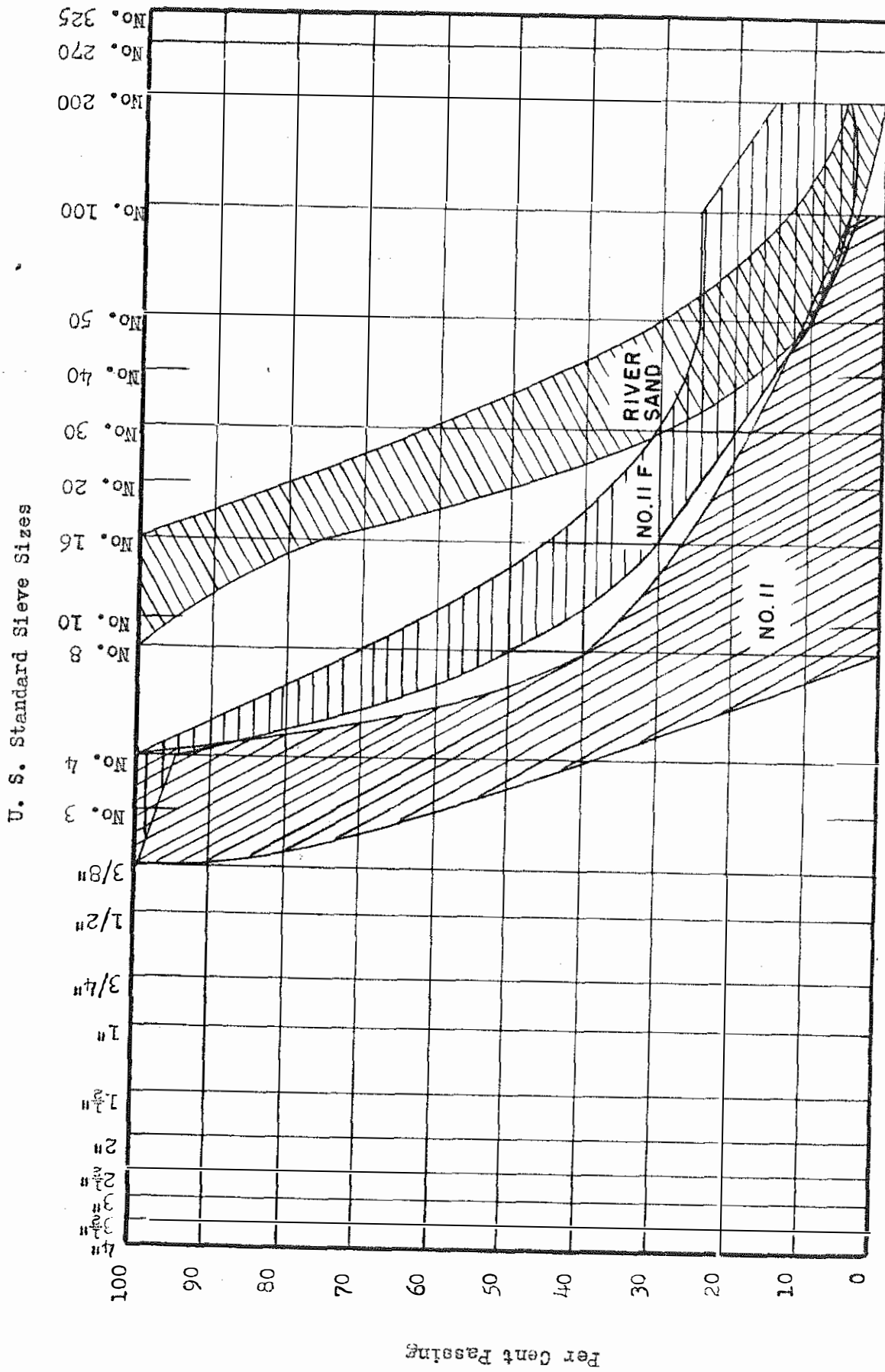


Fig. 3  
Gradation Range of Fine Aggregates

## METHOD OF EVALUATION

A visual condition inspection was made in 1946, 1947, 1948 and 1951. The condition ratings and comments for sections listed according to bituminous types are given in Tables 2 through 8; the ratings according to aggregate gradation are shown in Tables 9 through 18.

For many of the sections a photographic record was kept, beginning in 1947. An effort was made to photograph the same place within the section each succeeding year.

For the performance of all sections to be comparable, only essential maintenance of an emergency nature was performed. Severe base failures had to be repaired along with some major widening and edge failures. Any maintenance performed was taken into account mainly with respect to the cause of the trouble. Failures caused by the inability of the lower layers to support the load, resulting in deformation of the base, were not charged against the surface.

Sections were studied by bituminous types and aggregate combinations and gradations. For each inspection, two men walked the entire length of the project and made visual observations of surface conditions. Each man evaluated one lane, and at the end of each section they compared notes and an overall performance rating of poor, fair, good or excellent was recorded.

The MC-5, RC-5, and RT-12 sections showed considerable failures as early as the 1946 inspection. The 1947 inspection of these sections resulted in a very poor rating for practically all of them. Because of this surface deterioration it was necessary in 1948 to resurface these three groups.

The 1948 resurfacing left only the three PAC groups open to inspection that year. Generally speaking the condition of all sections of PAC-5, 7 and 8 was excellent at that time. The only exceptions were PAC-5 gradation 8 (rated fair to good), PAC-5 gradation 9 (fair), and PAC-5 gradation 10 (fair to good). The three sections contained River Sand and No. 9 limestone.

The 1951 inspection was made three years, and one exceptionally severe winter (1950-51), later. Several base failures were noted and could be attributed primarily to frost action during the winter mentioned. At this time the condition of the road was such that some general conclusions could be drawn with respect to penetration grade of asphalt and aggregate type and gradation.

## RESULTS

Inasmuch as the cut-back and tars were resurfaced in 1948, the analysis of the surfaces pertain mostly to the asphalt cements. However, the tables in the back of this report carry the visual ratings of the surfaces that were inspected in 1946 and 1947.

### Bituminous Materials -

RT-12. The condition illustrated in Fig. 4 was representative of the tar (RT-12) sections in 1947. This particular location was in Section 27 which contained 50 percent No. 9 and 50 percent 11F. This aggregate combination was one of the best from the standpoint of performance throughout the project. The tar sections were subject to extreme pitting as early as 1946. There was much evidence of the tar being dry, brittle and dead

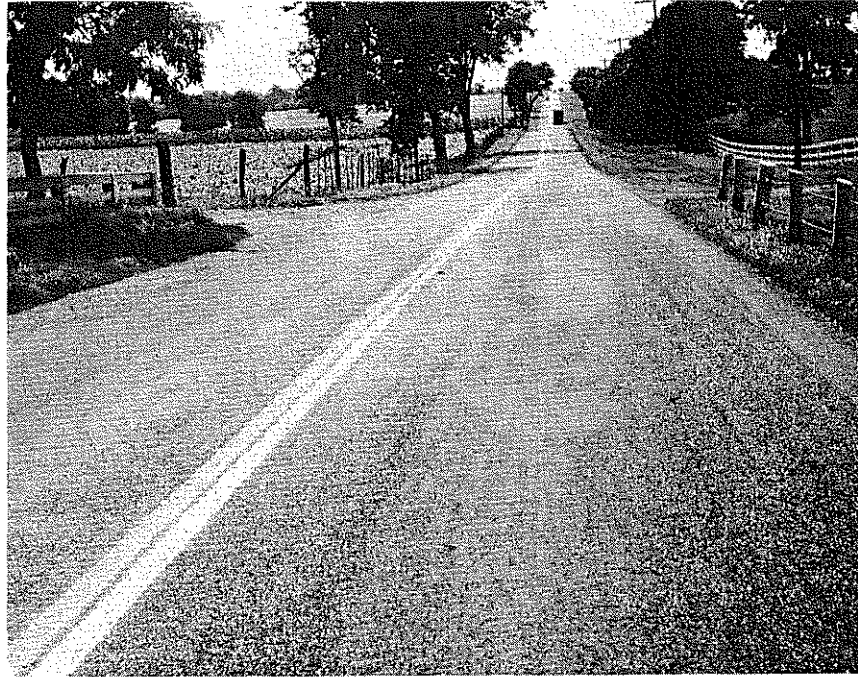


Fig. 4. Section 27, constructed in 1943, with RT-12. The aggregate for this section was 50% No. 9 and 50% 11F Limestone. This is Gradation No. 4 in Table 1 and Fig. 2. Rating in 1946 was Fair. Rating in 1947 was: Left Lane extremely poor, Right Lane poor. Note the extreme pitting of the surface. The tar had become very brittle resulting in loss of much of the aggregate. This is about an average condition for the RT-12 sections in 1947.

with consequent surface raveling and aggregate loss. This group of sections had been in service five years when they were resurfaced in 1948.

MC-5. The twenty MC-5 sections, all of which were laid in 1942, were almost six years old when covered in 1948. Fig. 5 is a photograph of the junction of four of these sections. The outstanding one of the four shown is 129 which contains 50 percent 11F. Another view of this section is Fig. 6, right lane. Many of the MC-5 sections were rated extremely poor in 1946.

RC-5. The RC-5 sections were generally fair in 1946, but in 1947 were poor. Fig. 7 is a representative photograph of two sections of RC-5 mix. Section 17 contained 50 percent 11F while Section 16 had 40 percent Concrete Sand. The pavement in Section 17 was a denser appearing mix than that in Section 16. Both sections had spotty performance. All the RC-5 sections were resurfaced in 1948 after six years of use.

PAC-5. In 1946, the PAC-5 mixes were not outstanding in performance although only one section with gradation 10 was rated as low as poor.

In 1947, there was very little change in performance. One entire section, and a lane from each of two other sections, were rated poor.

In 1948, the mixes with PAC-5 looked much better than in the two previous years. Eight of the eleven sections were judged excellent. Only the three mixes containing River Sand were not judged excellent, and these were rated fair to good.

Records from the 1951 inspection showed only sections with gradations 2, 3 and 4 as being excellent. These three mixes contained No. 11F. The coarse sand mixes were rated good with the River Sand being mostly poor.

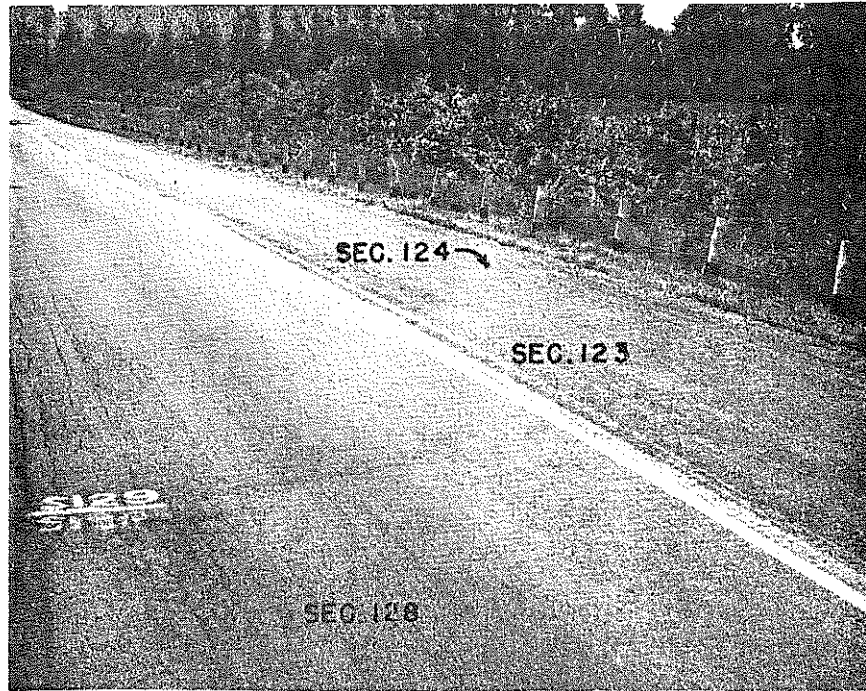


Fig. 5. Junction of four sections containing MC-5, as they appeared in July, 1947, or five years after paving.

Sec.	128	123	124	129
Agg.	20% C.S.	20% R.S.	20% 11F	50% 11F
Ratings				
1946	Fair	Fair	Good	Good
1947	Fair	Poor	Poor	Good

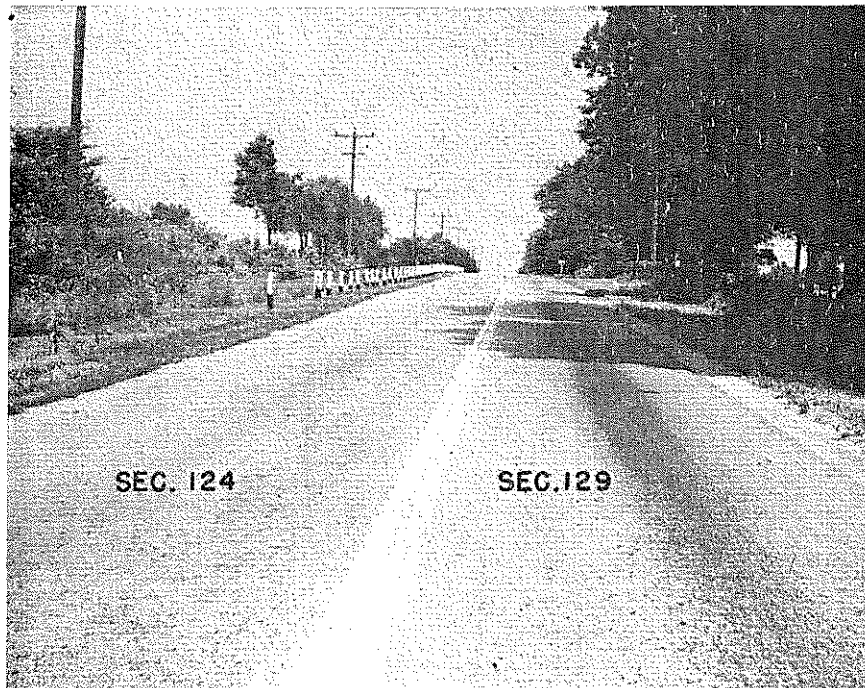


Fig. 6. View of another portion of Sections 124 and 129 referred to in Fig. 5. Section 124 is on the left and Section 129 on the right. These photographs show the difference in performance that can exist throughout the same sections in any one year and demonstrates the generalities inherent in any visual rating.

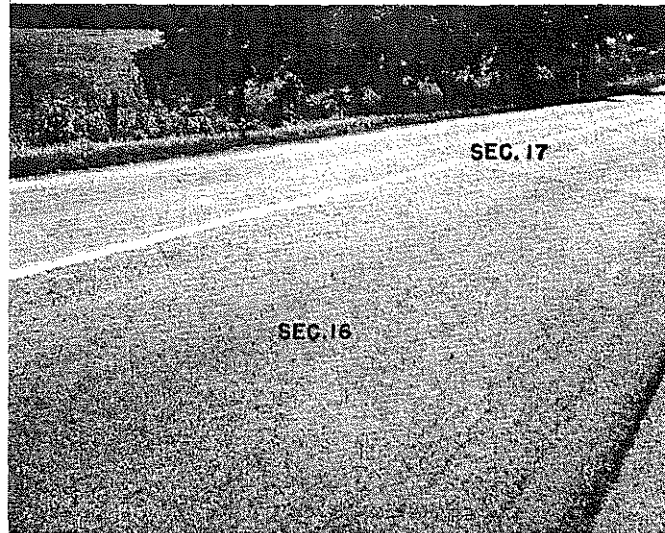


Fig. 7. Junction between Section 16 (gradation 5) and Section 17 (gradation 4), both containing RC-5. Section 16 had a pitted surface that was rougher in texture than Section 17. Gradation 4 had 4% passing the No. 200 sieve while Gradation 5 had only 0.3% of this size material.

Sec.	16	17
Agg.	40% C.S.	50% 11F
Ratings		
1946	Poor	L- Poor; R- Fair
1947	L-Poor; R- Extremely Poor	L- Poor; R- Fair

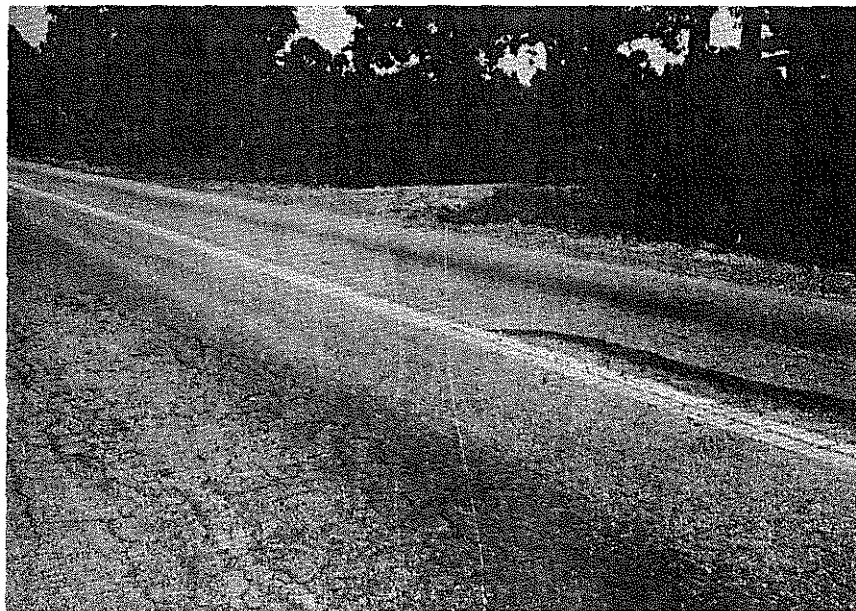
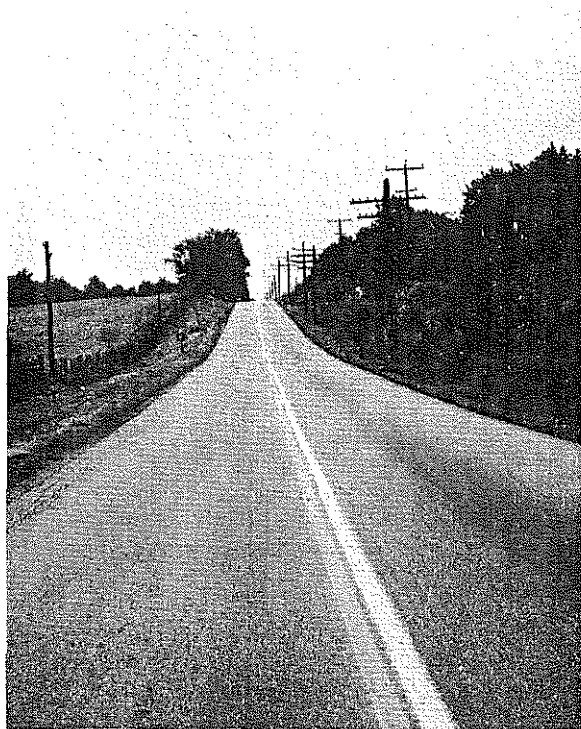


Fig. 8. Typical Base Failure. Portions of pavement that failed because of deformation of layers below the surface itself were recorded as base failures only. This photograph was taken in Section 3 containing MC-5 with gradation 3. The surface was rated poor in both 1946 and 1947, but not because of the base failures.





1947



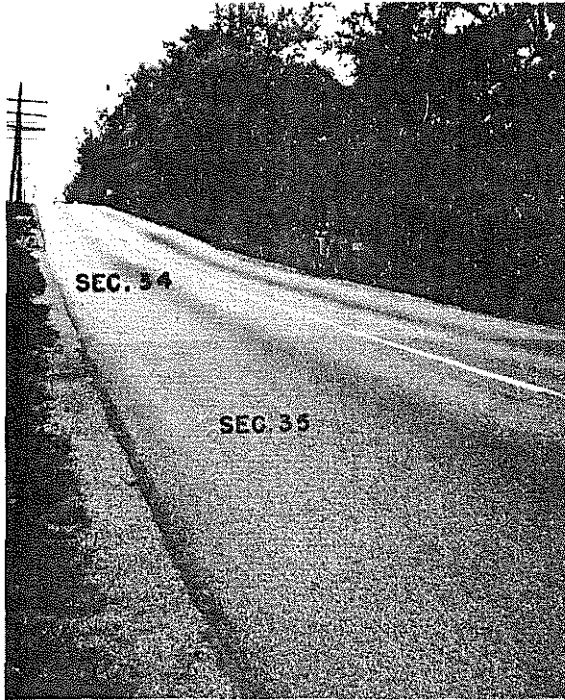
1948



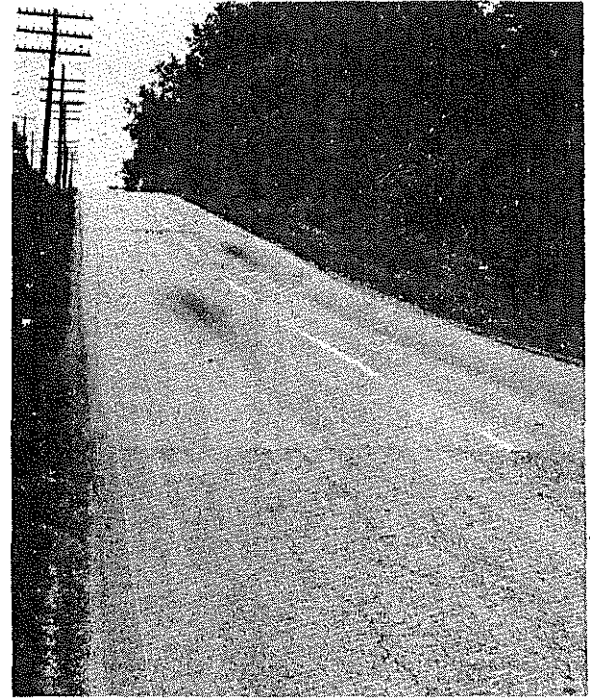
1951

Fig. 9. Section 141 in foreground and 41 in the distance. Both sections contain 60% No. 9 stone and 40% River Sand (gradation 10). The junction between the sections is shown in the upper right photograph. The Left Lane of Section 141 contains PAC-5, and the Right Lane PAC-7. Section 41 is all PAC-7.

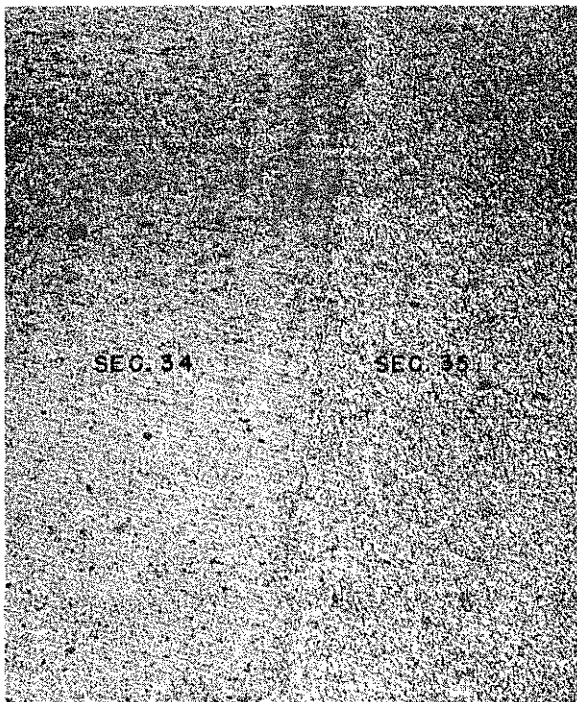
Sec.	41	141
Rating		
1946	L-Fair R-Good	L-Fair R-Fair to Poor
1947	L-Fair R-Good to Excellent	Fair
1948	Excellent	Excellent
1951	Fair	Poor



1948



1951



1947

Fig. 10. Contrast in texture between sections containing 50% 11F and 40% Concrete Sand. Section 35 has gradation 5 (40% C.S.) and Section 34 has gradation 4 (50% 11F). Both sections contain PAC-5 in the mix. The oil streaks or spots in Section 34 were caused by a dip in the grade and are not bleeding of the bitumen.

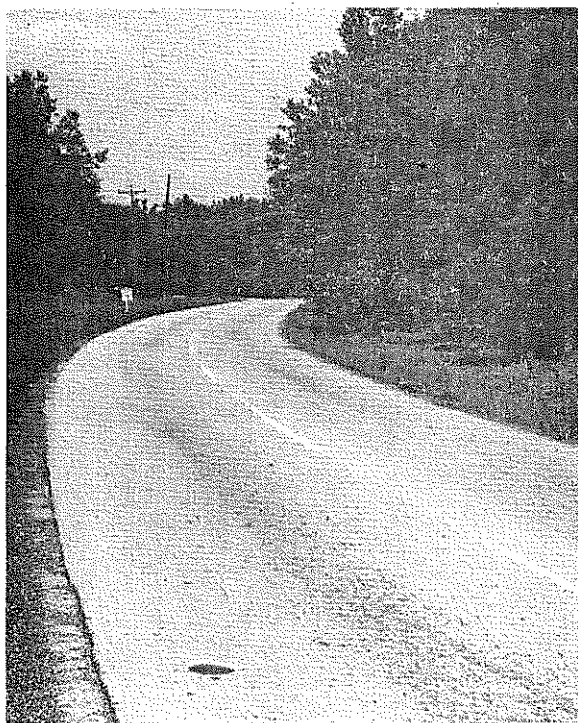
Sec.	34	35
Ratings		
1946	Fair	Good
1947	Good	Fair to Good
1948	Excellent	Excellent
1951	Excellent	Good



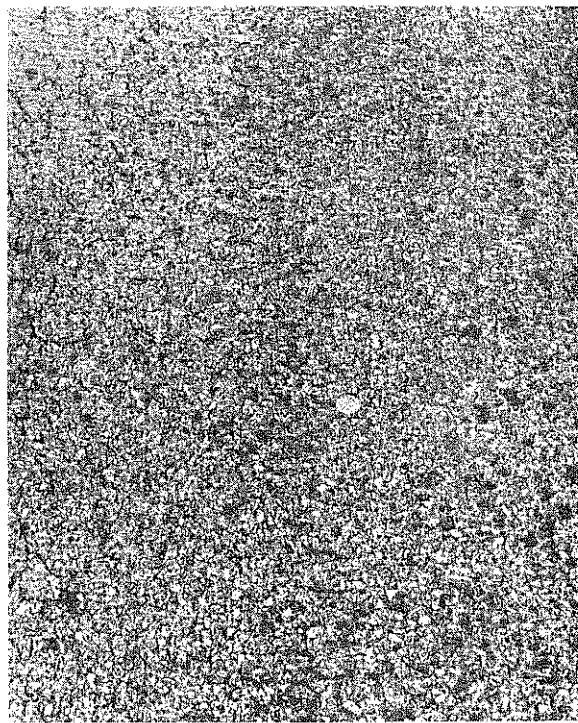
1947



1948



1951



1951

Fig. 11. Section No. 49 containing PAC-7 and aggregate gradation 2 (30% 11F). This was rated excellent in all inspections from 1946 to 1951. The lower right is a near view of this pavement.

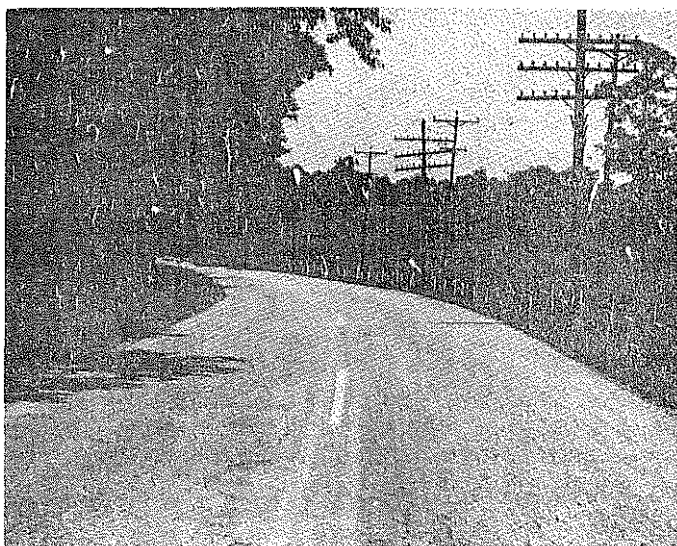




1947



1948



1951

Fig. 12. Section 43 consisting of PAC-7 with 20% River Sand. Performance was rated as excellent despite the general coarseness of surface texture.

Sec. 43

Bit. PAC-7

Agg. 80% No. 9 and 20% R.S.

Rating

1946 Excellent

1947 Excellent

1948 Excellent

1951 Fair

Fig. 13 shows two sections of pavement with PAC-8 and 40 percent and 50 percent 11F. These pavements are very dense and the performance has been good to excellent. In Fig. 14 two sections with the same gradation of aggregate are shown. Section 50 contains PAC-7 and Section 51 contains PAC-8, both with aggregate gradation 2 having 30 percent 11F. These photographs indicate that the PAC-8 had more tendency to bleed than did the PAC-7. This bleeding was not excessive and did not produce a slick surface at this location.

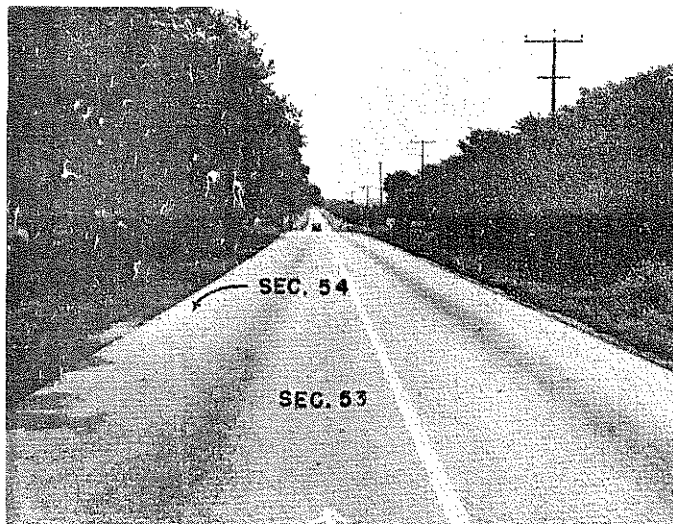
#### Aggregate Gradation -

Gradation 1 (80% No. 9 and 20% 11F Ls.). The PAC-5, 7, and 8 mixes with this gradation did not have a section that was rated poor in any of the four inspections. The PAC-5 was classed as fair in 1947 and 1951. For the last inspection (1951) the rating for the other two sections were: PAC-7 excellent and PAC-8 good.

One of the photographs in Fig. 15 shows adjacent sections containing gradation No. 1. This was a fairly coarse mix with a resultant rough textured surface. The performance of mixes with this aggregate grading was not outstanding with any of the bituminous materials throughout the project, as evidenced by Table 9.

Gradation 2 (70% No. 9 and 30% 11F Ls.). The ratings of the PAC mixes G-2 were predominately excellent for all four inspections; the performance of mixes with the same grading and other bituminous materials was generally poor.

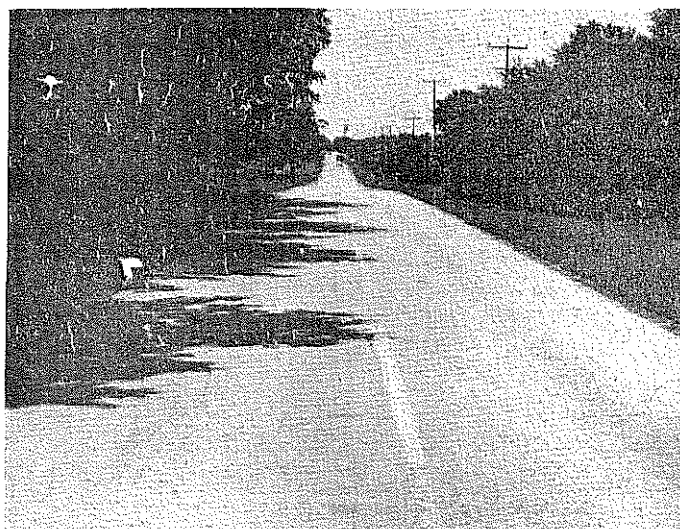
In the 1951 inspection the PAC-5 and PAC-7 sections were given an excellent rating with the PAC-8 good. This gradation was an outstanding



1947



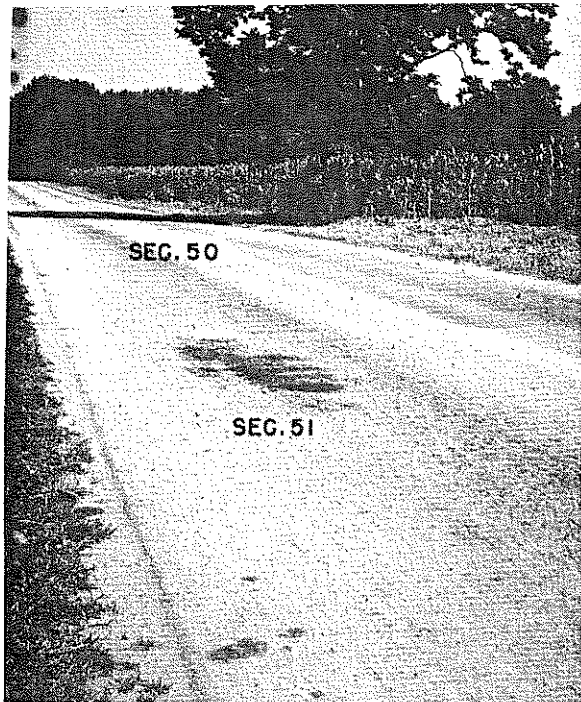
1948



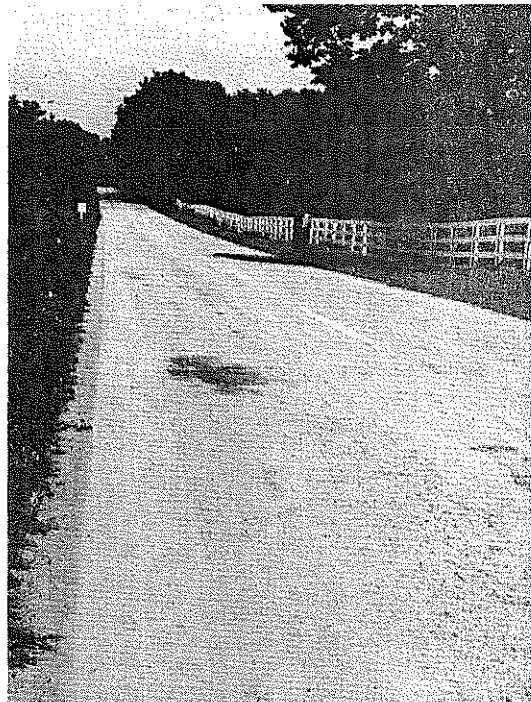
1951

Fig. 13. Two sections of PAC-8 are shown in these photographs; Section 53 and Section 54. The junction is located on the 1947 photograph.

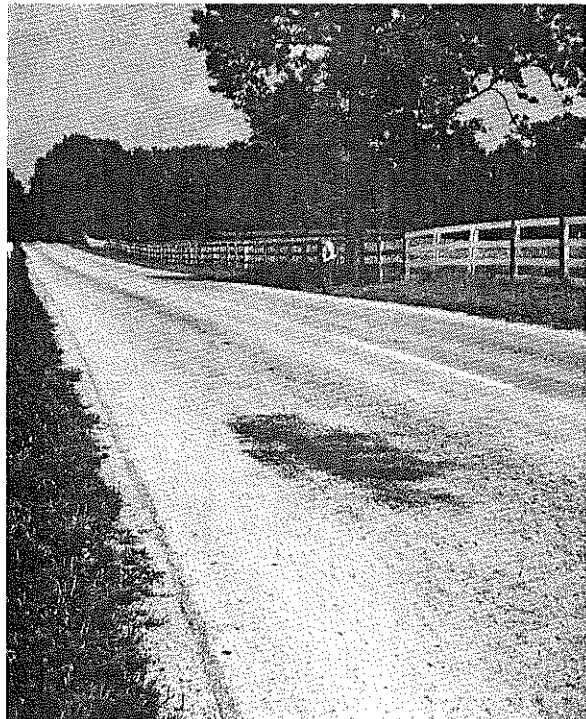
Sec.	53	54
Bit.	PAC-8	PAC-8
Agg.	60% No. 9 40% 11F	50% No. 9 50% 11F
Rating		
1946	L-Excellent R-Fair	Good
1947	L-Excellent R-Good	Excellent
1948	Excellent	Excellent
1951	Good	Excellent



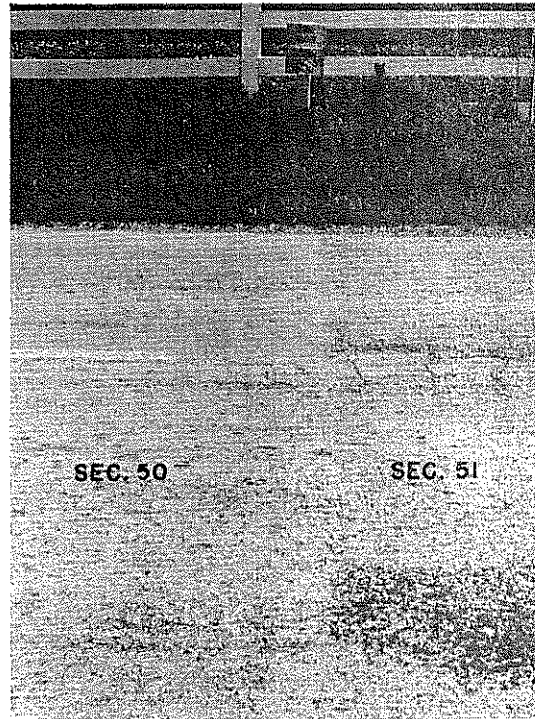
1947



1948



1951



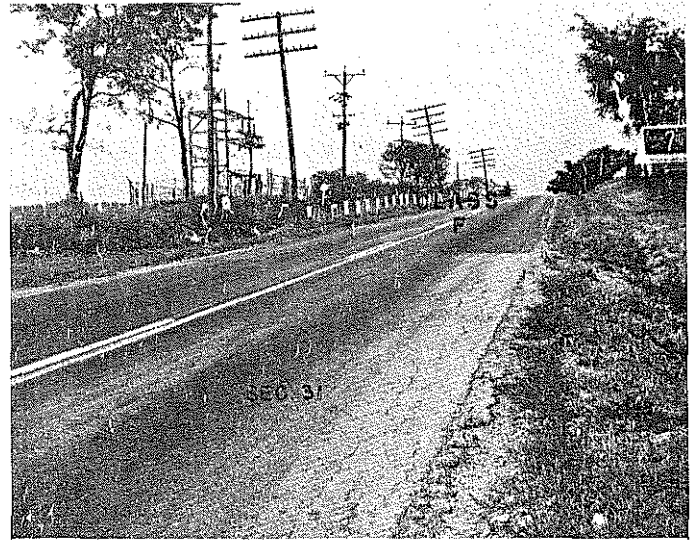
1951

Fig. 14. Junction between Section 50(PAC-7, G-2) and Section 51(PAC-8, G-2), viewed from a distance and close up. The fat spot is just inside the PAC-8 section. Performance ratings are given in Table 9.

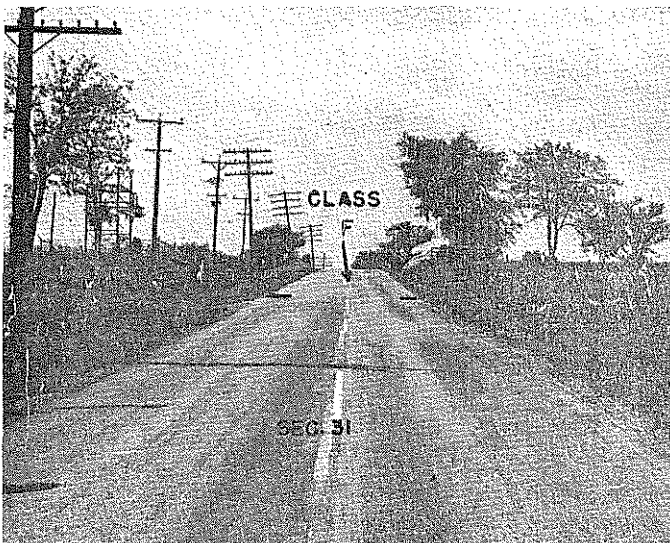




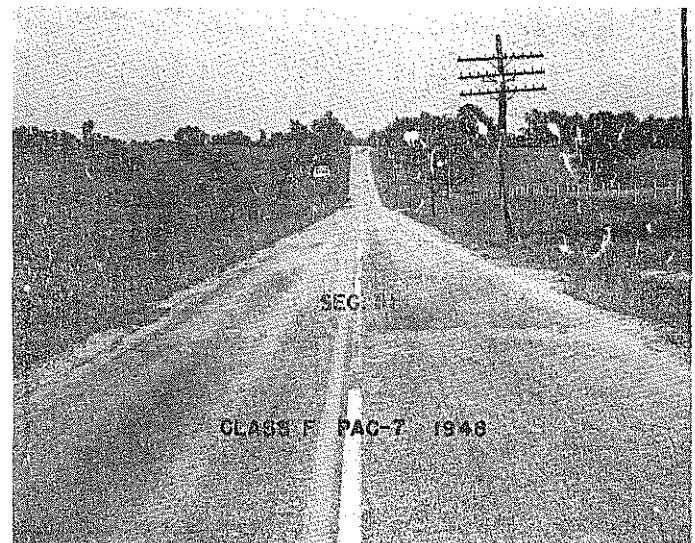
1947



1948



1951



1951

Fig. 15. Junction between Section 31 (in the foreground) containing PAC-5 and Section 131 containing RT-12, in the distance on the photograph taken in 1947. Both mixes contained gradation 1 (80% No. 9 and 20% 11F Limestone). In 1948 prior to the inspection and the taking of photographs that year, the tar was covered with a Class F mix containing PAC-7. This mix is shown in the distance of the corresponding 1948 and 1951 views, and in the foreground of the additional view taken in 1951 looking the opposite direction (lower right). Note the rough texture of the Class F. Ratings of the two sections are given in Table 9.



performer. Figs. 11 and 14 were taken of sections made up with this aggregate gradation. See Table 10.

Gradation 3 (60% No. 9 and 40% 11F Ls.). This gradation with all three grades of PAC was mostly excellent. The 1951 ratings were PAC-5 and PAC-7 excellent, and PAC-8 good.

Section 53, illustrated in Fig. 13, contained 40 percent 11F. The performance of this section was obviously outstanding. Data in Table 11 confirm the fact that this grading also had a fairly good record with cut-backs and the tar.

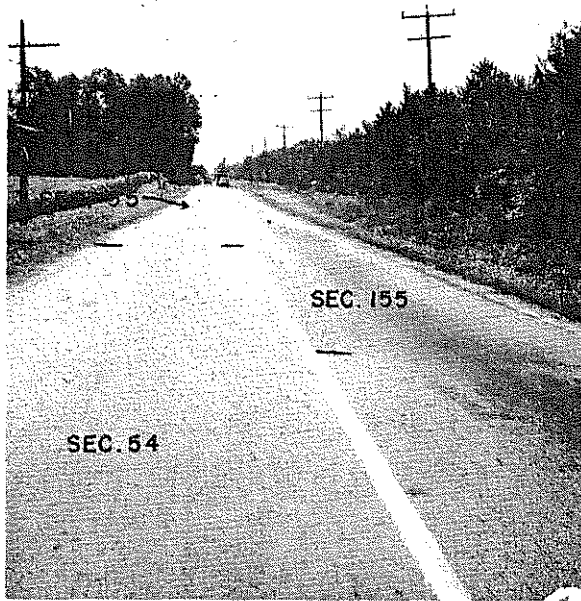
Gradation 4 (50% No. 9 and 50% 11F Ls.). This grading was a component of the outstanding group of sections. The mixes with PAC-5, 7 and 8 were all rated excellent in 1951. Section 47 with PAC-7 was carried as excellent through the four inspections. Performance records are listed in Table 12. It is interesting to note in Table 1 that this mix contained 4.0 percent passing the No. 200 sieve.

Section 54, represented by Fig. 13 and Fig. 16, was an excellent section of this gradation in combination with PAC-8. Section 34, (Fig. 10) with PAC-5 was another outstanding section of pavement with this aggregate grading. Both of these sections were exceptionally dense but not slick.

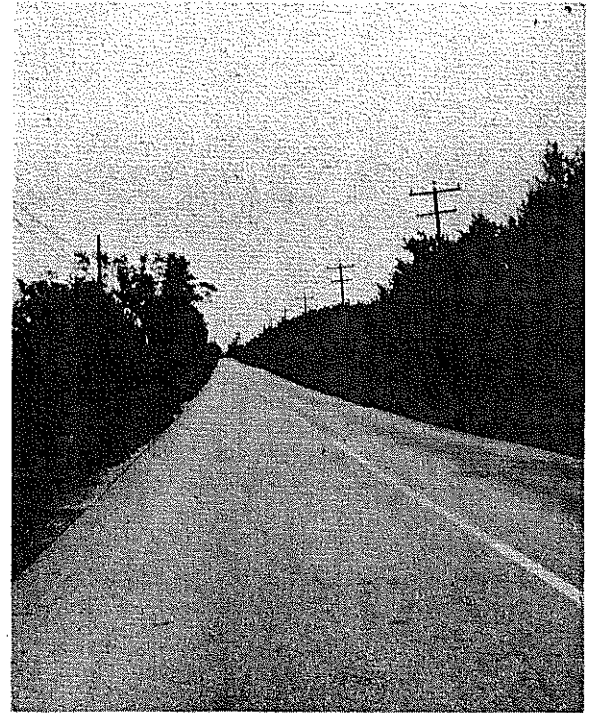
Gradation 5 (60% No. 9 and 40% C.S.). Sections with grading 5 were mostly good to excellent. The final inspection rated the PAC-5 good, PAC-7 excellent, and the two sections of PAC-8 good.

Section 35, shown in Fig. 10, contains PAC-5 with 40 percent coarse sand. The rough texture in this section is accentuated by the dense appearing surface of Section 34. Section 35 was rated good in 1951.

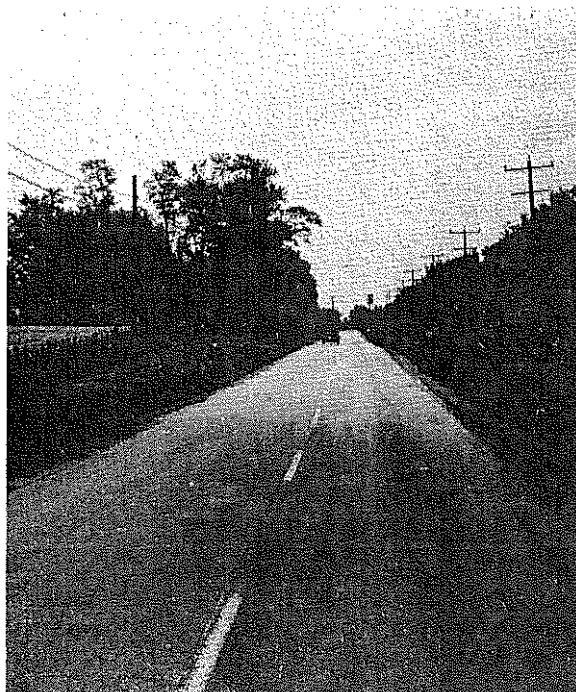
Ratings for all the sections having this gradation are given in



1947



1948



1951

Fig. 16. Three sections with PAC-8 and contrasting aggregate gradations. Section locations are noted on the 1947 photograph.

Sec.	54	55	155
Agg.	50% 11F	40% C.S.	20% R.S.
Rating			
1946	Good	Good	Fair
1947	Excellent	Excellent	Good
1948	Excellent	Excellent	Excel.
1951	Excellent	Good	Good

Table 13. Other illustrations of pavement with this aggregate grading and different bituminous materials are Fig. 16 (PAC-8) and Fig. 7 (RC-5).

Gradation 6 (70% No. 9 and 30% C.S.). All sections with asphalt cement and grading 6 were rated good to excellent throughout the four inspections. At the time of the 1951 inspection Section 56 with PAC-8 was in excellent condition. One lane of the PAC-7 (Section 45) was excellent, the other being good. See Table 14.

Gradation 7 (80% No. 9 and 20% C.S.). Ratings of sections with gradation 7 and the asphalt cements were mostly fair to good, with the 1951 inspection showing PAC-5 fair to good, and PAC-7 and PAC-8 good.

The only photographic illustration of a mix with this grading is Fig. 5, which shows Section 128 (20 percent C.S. with MC-5). The performance rating was fair for both the 1946 and the 1947 inspections. All the records pertaining to this grading are in Table 15.

Gradation 8 (80% No. 9 and 20% R.S.). Mixes with gradation 8 were mediocre even with the asphalt cements, and with the other bituminous materials they were almost invariably poor by the end of four to five years of service.

Final overall rating for this grading in combination with PAC-5 was fair, and with PAC-7 it was excellent up to 1951, where it ended fair. With PAC-8 these mixes improved with age, going from fair in 1946 to good in 1947, and excellent in 1948 and 1951.

Section 123, one of the four illustrated in Fig. 5, had gradation 8 with MC-5. Performance was fair to poor.

Section 155, shown in Fig. 16, contains PAC-8 in combination with this aggregate grading. The performance was still good in 1951 after 8 years of service.

Section 43 (Fig. 12) contained grading 8 with PAC-7, and it was rated excellent in 1946, 1947, and 1948. The rating for 1951 was fair. See Table 16.

Gradation 9 (70% No. 9 and 30% R.S.). The performance of sections with this grading was similar to that of grading 8. With PAC-5 it went from good to poor; and with PAC-7 it was fair on the average. In combination with PAC-8 it definitely improved with age. There it ran from good to excellent. See Table 17.

Gradation 10 (60% No. 9 and 40% R.S.). Except where it was combined with PAC-8, gradation 10 had a relatively poor performance record. With PAC-8 it looked excellent in 1946 and 1948, but it was rated fair to poor in 1947 and fair in 1951.

Sections 41 and 141, shown in Fig. 9, contain gradation 10 with PAC-5 and PAC-7. Table 18 contains the records for this gradation.

#### CONCLUSIONS

On the basis of results from these tests; the following conditions hold with respect to performance of the bituminous-aggregate combinations:

1. PAC-7 is the best all-around performing bituminous material ~~and~~ and it can be used to an advantage with all the aggregates except grading 10.
2. PAC-8 is a close second in versatility with the aggregate gradings, and particularly good with River Sand where the other bituminous materials were not.
3. PAC-5 was not satisfactory with any of the River Sand mixes nor with mixes containing 20 percent of either 11F or Concrete Sand fines. It is particularly suited to use with 11F fines varying from 30 to 50 percent of the total aggregate.

4. For this type of construction, RT-12, MC-5 and RC-5 are not satisfactory.
5. Aggregate grading 10 (40% River Sand) is unsatisfactory probably because of the limited gradation range of the sand and the fact that voids in the No. 9 stone are overfilled when the fine sand fraction is as great as 40 percent. Even with smaller percentage of this fine material the mix has little to offer unless the amount is kept to 20 percent or lower.
6. The relatively long gradation of the concrete sand offers greater possibility for a dense and durable mix with No. 9 stone, particularly where the amount of sand is in the vicinity of 30 to 40 percent.
7. No. 11F fines in amounts greater than 20 percent of the total aggregate can provide excellent pavements with satisfactory surface textures and lasting qualities. When the 11F is 30 to 50 percent of the total aggregate, excellent surfaces with any of the asphalt cements are possible.

TABLE 2

## COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING RC 5

Sec. No.	Grada-tion	Comments	Visual Rating of Conditions	
			1946	1947
11	10	Pronounced crack at center of lane	Good	Good
12	9	Pavement cracked badly throughout	Fair to Poor	Fair to Good
13	8	Cracked, pitted and pulled	L - Fair R - Poor	Poor
14	7	Much pitting and surface pulled away; little cracking	L - Fair R - Good	Poor
15	6	Badly cracked	L - Good R - Fair	L - Poor R - Fair to Good
16	5	Cracked throughout entire section	Poor	L - Poor R - Extremely Poor
17	4	Many edge cracks	L - Poor R - Fair	L - Poor R - Fair
18	3	Occasional tendencies toward rutting	L - Good R - Fair	Poor
19	2	Occasional breaks at center line	Good	L - Good R - Fair
20	1	Pavement broken; progressive failures	Poor	Extremely Poor

TABLE 3

## COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING MC 5(1)

Sec. No.	Grada- tion	Comments	Visual Rating of Conditions	
			1946	1947
1	1	Extremely poor in 1946	Extremely Poor	Poor
2	2	Pavement broken badly	Extremely Poor	Extremely Poor
3	3	Base and pavement failures throughout	Extremely Poor	Good to Extremely Poor
4	4	Portions of pavement good	Extremely Poor	Fair to Extremely Poor
5	5	Broken pulled, pitted and failed	Extremely Poor	Extremely Poor
6	6	Failed throughout	Extremely Poor	Extremely Poor
7	7	Broken on center line and near edges	Fair	L - Extremely Poor R - Poor
8	8	Fat spots and pavement broken	L - Fair R - Fair	Poor
9	9	Entire surface in distress	Good (Applies to surface condition not dependent upon subgrade)	L - Fair R - Fair to Good
10	10	Numerous cracks and failures	L - Poor R - Fair	L - Poor R - Fair

TABLE 4

## COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING MC 5(2)

Sec. No.	Grada- tion	Comments	Visual Rating of Conditions	
			1946	1947
121	10	Diagonal cracks	Fair	Fair to Poor
122	9	Section pitted throughout	Fair	Fair to Poor
123	8	Pitted throughout and cracked in places	Fair	Poor
124	1	Pronounced cracks longitudinally	Good	Poor
125	2	Slight amount of pitting	Good	Good
126	5	Number of base and edge failures	Fair	Fair
127	6	Cracks and pitting	Fair	Fair
128	7	Pitted throughout	Fair	Fair
129	4	Slight edge cracking	Good	Good
130	3	No defects	Excellent	Excellent



TABLE 5

## COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING RT 12

Sec. No.	Grada-tion	Comments	Visual Rating of Conditions	
			1946	1947
21	10	All surface removed in many spots	Extremely Poor	Poor
22	9	Pitted, cracked and peeled	Extremely Poor	Extremely Poor
23	8	Stripping and pitting throughout entire section	Poor	Extremely Poor
24	7	Surface practically removed	Extremely Poor	Extremely Poor
25	6	Much pitting with very coarse surface	Poor	Poor
26	5	Surface texture very open; extensive pitting	Poor	Extremely Poor
27	4	Section cracked throughout	Fair	L - Extremely Poor R - Poor
28	3	Pavement firm but pitted	Very Poor	Very Poor
29	2	Cracked throughout	Extremely Poor	Extremely Poor
30	1	Pavement broken throughout	Extremely Poor	Extremely Poor
131	1	Performance intermittent throughout	Poor	L - Poor R - Fair

TABLE 6

## COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING PAC 5 (85-100 Pen.)

Sec. No.	Grada- tion	Comments	Visual Rating of Condition			
			1946	1947	1948	1951
31	1	Checking at center line, dry appearing	L - Good R - Excel.	Fair	Excellent	Fair
32	2	Some minor base failure	Excellent	L - Good R - Excel.	Excellent	Excellent
33	3	Major base failures - dense surface	L - Excel. R - Good	Good	Excellent	Excellent
34	4	Surface appears very dense, several base failures	Fair	Good	Excellent	Excellent
35	5	Rough texture surface	Good	L - Good E - Fair to Good	Excellent	Good
36	6	Rough texture surface	L - Good R - Excel.	Good	Excellent	Good
37	7	Rough texture and dry appearing	L - Fair R - Excel	L - Fair R - Good	Excellent to Good	Fair to Good
38	8	Cracking and dry	L - Fair R - Good	L - Poor R - Fair	Fair to Good	Fair
39	9	Considerable cracking	L - Good R - Fair to Good	L - Poor R - Fair	Fair	Poor
40	10	Surface scaling	Poor	Poor	Good to Fair	Poor
141	10	Many cracks	L - Fair	Fair	Excellent	Poor

TABLE 7

## COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING PAC 7 (120-150 Pen.)

Sec. No.	Grada- tion	Comments	Visual Rating of Condition			
			1946	1947	1948	1951
41	10	Extensive lateral cracking	L - Fair R - Good	L - Fair R - Good to Excel.	Excellent	Fair
42	9	Surfacing checking	L - Poor R - Good	Fair	L - Excel. R - Good	Fair
43	8	Dry and rough	Excellent	Excellent	Excellent	Fair
44	7	Edge failures and cracking	L - Excel. R - Good	Fair	Good to Excellent	Good
45	6	Several base failures, surface has rough appearance	L - Excel. R - Good	L - Excel. R - Good	Excellent	L - Excel. R - Good
46	5	Dense appearing surface	L - Good R - Excel.	Excellent	Excellent	Excellent
47	4	Very tough and dense surface	L - Excel. R - Excel.	Excellent	Excellent	Excellent
48	3	Very fine surface	L - Excel. R - Good to Excel.	Excellent	Excellent	Excellent
49	2	Only a few edge failures noted	Excellent	Excellent	Excellent	Excellent
50	1	Practically no bleeding through the bitumen	L - Good R - Excel.	Good	Excellent	Excellent
141	10	Abundance of base failures and surface poor	R - Fair to Poor	Fair	Excellent	Poor

TABLE 8

## COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING PAC 8 (15.0-200 Pen.)

Sec. No.	Grada- tion	Comments	Visual Rating of Condition			
			1946	1947	1948	1951
51	1	Some bleeding through of asphalt	Good	Good	Excellent	Good
52	2	Fat spots	L - Good (aside from cracks) R - Fair	Good	Excellent	Good
53	3	Right lane contains more fat spots than left	L - Excel. R - Fair	L - Excel. R - Good	Excellent	Good
54	4	Some base failures but surface excellent	Good	Excellent	Excellent	Excellent
55	5	Some surface cracking near center line	Good	Excellent	Excellent	Good
56	6	Few base failures	Good	Excellent	Excellent	Excellent
57	7	Many base and edge failures	Good	Fair to poor	Excellent	Good
58	5	Rather fat and slick appearing	Good	Good	Excellent	Good
155	8	Some bleeding	Fair	Good	Excellent	Excellent
156	9	One small base failure noted	Good	Fair to Excellent	Excellent	Excellent
157	10	Numerous cracks and surface failures	Excellent	Fair to poor	Excellent	Fair

TABLE 9

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 1 (80% No. 9 and 20% 11 F Limestone)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
1	MC 5	Extremely poor in 1946	Extremely poor	Poor		
20	RC 5	Pavement broken; progressive failures	Poor	Extremely poor		
30	RT 12	Pavement broken throughout	Extremely poor	Extremely poor		
31	PAC 5 (85-100)	Checking at center line, dry appearing	L - Good R - Excellent	Fair	Excellent	Fair
50	PAC 7 (120-150)	Practically no bleeding through of bitumen	L - Good R - Excellent	Good	Excellent	Excellent
51	PAC 8 (150-200)	Some bleeding through of asphalt	Good	Good	Excellent	Good
124	MC 5	Pronounced cracks longitudinally	Good	Poor		
131	RT 12	Performance intermittent throughout	Poor	L - Poor R - Fair		

TABLE 10

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 2 (70% No. 9 and 30% 11 F Limestone)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
2	MC 5	Pavement broken badly	Extremely poor	Extremely poor		
19	RC 5	Occasional breaks at center line	Good	L - Good R - Fair		
29	RT 12	Cracked throughout	Extremely poor	Extremely poor		
32	PAC 5 (85-100)	Some minor base failure	Excellent	L - Good R - Excellent	Excellent	Excellent
49	PAC 7 (120-150)	Only a few edge failures noted	Excellent	Excellent	Excellent	Excellent
52	PAC 8 (150-200)	Fat spots	L - Good (aside from cracks) R - Fair	Good	Excellent	Good
125	MC 5	Slight amount of pitting	Good	Good		

TABLE 11

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 3 (60% No. 9 and 40% 11 F Limestone)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
3	MC 5	Base and pavement failures throughout	Extremely poor	Good to extremely poor		
18	RC 5	Occasional tendencies toward rutting	L - Good R - Fair	Poor		
28	RT 12	Pavement firm but pitted	Very poor	Very poor		
33	PAC 5 (85-100)	Major base failures - dense surface	L - Excellent R - Good	Good	Excellent	Excellent
48	PAC 7 (120-150)	Very fine surface	L - Excellent R - Good to Excellent	Excellent	Excellent	Excellent
53	PAC 8 (150-200)	Right lane contains more fat spots than left	L - Excellent R - Fair	L - Excellent R - Good	Excellent	Good
130	MC 5	No defects	Excellent	Excellent		

TABLE 12

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 4 (50% No. 9 and 50% 11 F Limestone)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
4	MC 5	Portions of pavement good	Extremely poor	Fair to extremely poor		
17	RC 5	Many edge cracks	L - Poor R - Fair	L - Poor R - Fair		
27	RT 12	Section cracked throughout	Fair	L - Extremely poor R - Poor		
34	PAC 5 (85-100)	Surface appears very dense, several base failures	Fair	Good	Excellent	Excellent
47	PAC 7 (120-150)	Very tough and dense surface	L - Excellent R - Excellent	Excellent	Excellent	Excellent
54	PAC 8 (150-200)	Some base failures but surface excellent	Good	Excellent	Excellent	Excellent
129	MC 5	Slight edge cracking	Good	Good		



TABLE 13

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 5 (60% No. 9 Ls. and 40% Coarse Sand)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
5	MC 5	Broken pulled, pitted and failed	Extremely poor	Extremely poor		
16	RC 5	Cracked throughout entire section	Poor	L - Poor R - Extremely Poor		
26	RT 12	Surface texture very open; extensive pitting	Poor	Extremely poor		
35	PAC 5 (85-100)	Rough texture surface	Good	L - Good R - Fair to good	Excellent	Good
46	PAC 7 (120-150)	Dense appearing surface	L - Good R - Excellent	Excellent	Excellent	Excellent
55	PAC 8 (150-200)	Some surface cracking near center line	Good	Excellent	Excellent	Good
58	PAC 8 (150-200)	Rather fat and slick appearing	Good	Good	Excellent	Good
126	MC 5	Number of base and edge failures	Fair	Fair		

TABLE 14

TS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 6 (70% No. 9 Ls. and 30% Coarse Sand)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
6	MC 5	Failed throughout	Extremely poor	Extremely poor		
15	RC 5	Badly cracked	L - Good R - Fair	L - Poor R - Fair to poor		
25	RT 12	Much pitting with very coarse surface	Poor	Poor		
36	PAC 5 (85-100)	Rough texture surface	L - Good R - Excellent	Good	Excellent	Good
45	PAC 7 (120-150)	Several base failures, surface has rough appearance	L - Excellent R - Good	L - Excellent R - Good	Excellent	
56	PAC 8 (150-200)	Few base failures	Good	Excellent		
127	MC 5	Cracks and pitting	Fair	Fair		

TABLE 15

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 7 (80% No. 9 Ls. and 20% Coarse Sand)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
7	MC 5	Broken on center line and near edges	Fair	L - Extremely poor R - Poor		
14	RC 5	Much pitting and surface pulled away; little cracking	L - Fair R - Good	Poor		
24	RT 12	Surface practically removed	Extremely poor	Extremely poor		
37	PAC 5 (85-100)	Rough texture and dry appearing	L - Fair R - Excellent	L - Fair R - Good	Excellent to good	Fair to good
44	PAC 7 (120-150)	Edge failures and cracking	L - Excellent R - Good	Fair	Good to Excellent	Good
57	PAC 8	Many base and edge failures	Good	Fair to poor	Excellent	Good
128	MC 5	Pitted throughout	Fair	Fair		

TABLE 16

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 8 (80% No. 9 Ls. and 20% River Sand)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
8	MC 5	Fat spots and pavement broken	L - Fair R - Fair	Poor		
13	RC 5	Cracked, pitted and pulled	L - Fair R - Poor	Poor		
23	RT 12	Stripping and pitting throughout entire section	Poor	Extremely poor		
38	PAC 5 (85-100)	Cracking and drying	L - Fair R - Good	L - Poor R - Fair	Fair to good	Fair
43	PAC 7 (120-150)	Dry and rough	Excellent	Excellent	Excellent	Fair
123	MC 5	Pitted throughout and cracked in places	Fair	Poor		
155	PAC 8 (150-200)	Some bleeding	Fair	Good	Excellent	Excellent

TABLE 17

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 9 (70% No. 9 Ls. and 30% River Sand)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
9	MC 5	Entire surface in distress	Good	L - Fair R - Fair to good		
12	RC 5	Pavement cracked badly throughout	Fair to poor	Fair to good		
22	RT 12	Pitted, cracked and peeled	Extremely poor	Extremely poor		
39	PAC 5 (85-100)	Considerable cracking	L - Good R - Fair to good	L - Poor R - Fair	Fair	Poor
42	PAC 7 (120-150)	Surface checking	L - Poor R - Good	Fair	Excellent to good	Fair
122	MC 5	Section pitted throughout	Fair	Fair to poor		
156	PAC 8 (150-200)	One small base failure noted	Good	Fair to excellent	Excellent	Excellent

TABLE 18

COMMENTS AND VISUAL RATINGS OF SECTIONS CONTAINING GRADATION NO. 10 (60% No. 9 Is. and 40% River Sand)

Sec. No.	Bitumen	Comments	Visual Rating of Conditions			
			1946	1947	1948	1951
10	MC 5	Numerous cracks and failures	L - Poor R - Fair	L - Poor R - Fair		
121	MC 5	Diagonal cracks	Fair	Fair to poor		
11	RC 5	Pronounced crack at center lane	Good	Good		
21	RT 12	All surface removed in many spots	Extremely poor	Poor		
40	PAC 5 (85-100)	Surface scalling	Poor	Poor	Fair to good	Poor
41	PAC 7 (120-150)	Extensive lateral cracking	L - Fair R - Good	L - Fair R - Good to Excellent	Excellent	Fair
141	L - PAC 5 (85-100)	Many cracks	Fair	Fair	Excellent	Poor
141	R - PAC 7 (120-150)	Abundance of base failures and surface poor	Fair to poor	Fair	Excellent	Poor
157	PAC 8 (150-200)	Numerous cracks and surface failures	Excellent	Fair to poor	Excellent	Fair