



COMMONWEALTH OF KENTUCKY  
DEPARTMENT OF HIGHWAYS  
FRANKFORT

HENRY WARD  
COMMISSIONER OF HIGHWAYS

July 25, 1963

ADDRESS REPLY TO  
DEPARTMENT OF HIGHWAYS  
MATERIALS RESEARCH LABORATORY  
132 GRAHAM AVENUE  
LEXINGTON 29, KENTUCKY

B. 3.6  
D. 1.7

MEMO TO: W. B. Drake  
Assistant State Highway Engineer

SUBJECT: Interim Report on Rural Secondary, Base-  
Stabilization Projects; July, 1963.

Attached are copies of the Research Division's report on a series of experimental, base-stabilization projects which were sponsored by the Division of Rural Highways during the 1962 construction season. The Research Division was requested to observe these projects and to report their performance. More specifically, we were requested to evaluate the effectiveness of chloride salt treatments in stabilizing the traffic-bound bases. The report fulfills the nominal objectives of the assignment inasmuch as it records the history of the projects; however, the specific portion of the assignment became overshadowed by other factors in the projects; and it is the significance of these other factors with which the following discussion is largely concerned.

I think that it is appropriate to call attention to the fact that these few projects, as well as those in previous studies, demonstrate an overwhelming enticement or compulsion to surface or to protect a compacted aggregate base when it has been developed to an admirable stage. In further support of this contention, attention is invited to the several photographs showing the excellent appearance of the completed, rolled bases. The use of DGA and No. 610 stone in combination with agricultural limestone and, of course, the use of a roller on these projects greatly enhanced their appearance at this stage. Subsequent photographs show that they

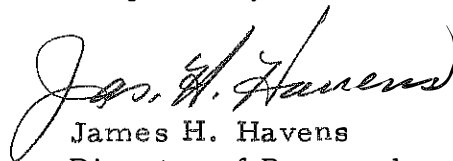
July 25, 1963

degraded somewhat in their appearance -- to which erosion, segregation, potholes, and subgrade failures are contributing factors.

Chloride salt treatments were beneficial, perhaps in maintaining some moisture in these bases and, thereby, in minimizing "dusting." The moisture, when appropriately maintained, serves as a binding influence and may have contributed some densification to the bases. However, these influences are active only when the prevailing weather is neither extremely dry nor extremely wet; but the effects of densification tend to persist somewhat into both extremes of weather -- that is, densification tends to shed rain water as well as to preserve moisture whereas continued soaking or a deluge of water may lead to complete loss of stability and to severe erosion of fines from the coarser material.

The concept of traffic-bound base (or surface) is predicated wholly upon the idea that it can be maintained or reworked with a patrol grader and that it can be built up to eventually provide a base for surfacing. Certain liabilities are associated with the traffic-bound base system; for instance, the cost of annual treatments with salt is about equal to the cost of adding a 1-inch thickness of graded aggregate each year. Thus, the cost of combined treatments in a "build-up" program may be double that of merely maintaining the status quo. In merely maintaining the status quo over a period of several years, much more aggregate is likely to have been used and lost than would have been needed to construct an adequate base (for surfacing) at the very outset. Admittedly, these points of view are somewhat argumentative or academic, but they offer a challenging incentive to provide some kind of a surface for these roads in conjunction with significant additions of base materials.

Respectfully submitted,



James H. Havens  
Director of Research

JHH:mkb

CC: T. R. Marcum  
A. O. Neiser  
R. O. Beauchamp  
T. J. Hopgood  
J. C. Moore  
R. L. Campbell  
D. V. Terrell

Commonwealth of Kentucky  
Department of Highways

INTERIM REPORT

on

RURAL SECONDARY, BASE  
STABILIZATION PROJECTS

by

R. C. Deen  
Assistant Director of Research

and

J. D. Shackelford  
Research Engineer Associate

Highway Materials Research Laboratory  
Lexington, Kentucky

July, 1963

## INTRODUCTION

Early in 1962, the Division of Rural Highways selected several base stabilization projects for construction during the 1962 season. These projects were to involve the addition of 1-1/2 to 3 inches of compacted granular base to existing, rural secondary, traffic-bound macadam roads. Since these roads were not intended to be surfaced, calcium chloride and sodium chloride were to be added to the additional granular base material in an attempt to retain or "hold" the aggregate on the road. This treatment was intended to improve the road and to build up the base over a period of a few years until the road could be surfaced.

The Division of Research was requested to observe the construction and performance of these projects and to evaluate the effectiveness of calcium or sodium chloride in this type of "stage" construction. Accordingly, eight projects totaling 40.111 miles were selected for observation. These projects included three (12.434 miles) in which calcium chloride was used, three (11.200 miles) in which sodium chloride was used, and two (16.477 miles) in which no additive was used. Two additional projects involving similar types of construction are also reported. The Garrard County project was completed

however, much of this base material is scattered or washed into the ditches or is pulverized and blown away. This results in an inadequate base when the wearing course is eventually constructed.

Traditionally, or at least for many years, the No. 610 grading of stone has been specified for traffic-bound base work. However, experience has shown that the gradation of stone, in addition to attrition and losses of stone from the roadway as described above, tends to segregate under the action of traffic, becomes rounded, and remains loose and unmanageable. In instances where this type of base has been found to be stable, the gradation has been found to be rather different from that of the stone originally placed on the road. This indicates that, perhaps by chance, traffic had degraded and sorted the original stone and produced a more favorable distribution of sizes. This latter grading compares more favorable with that of dense graded aggregate than with the original grading of the 610's. For this reason, and in an effort to simulate the stable grading, agricultural limestone was added to the 610 stone used on the Allen County project. On the other projects, DGA was used in lieu of the modified 610's.

It has been suggested by many engineers that the addition of controlled amounts of salt (calcium chloride or sodium chloride)

and water to a granular base material will minimize the loss of aggregate from the base by reducing attrition and dusting and thereby aid in stabilization of the base. It has been further suggested that the salt will aid in retaining the moisture during the consolidation process and thereby improve the quality of the base.

Calcium chloride has been used experimentally in Kentucky on other occasions as a means of maintaining traffic-bound roads (1). Calcium chloride was also used in granular base stabilization of some rural highways in 1956 (2), and it has been used rather extensively with graded aggregate to aid in controlling and maintaining the moisture content in base course construction for high-type pavements.

It was originally thought that these base stabilization projects constructed in 1962 and involving the use of calcium chloride or sodium chloride were not to receive any type of surfacing; however, for one reason or another, all except the Elliott County project were treated with an application of light oil

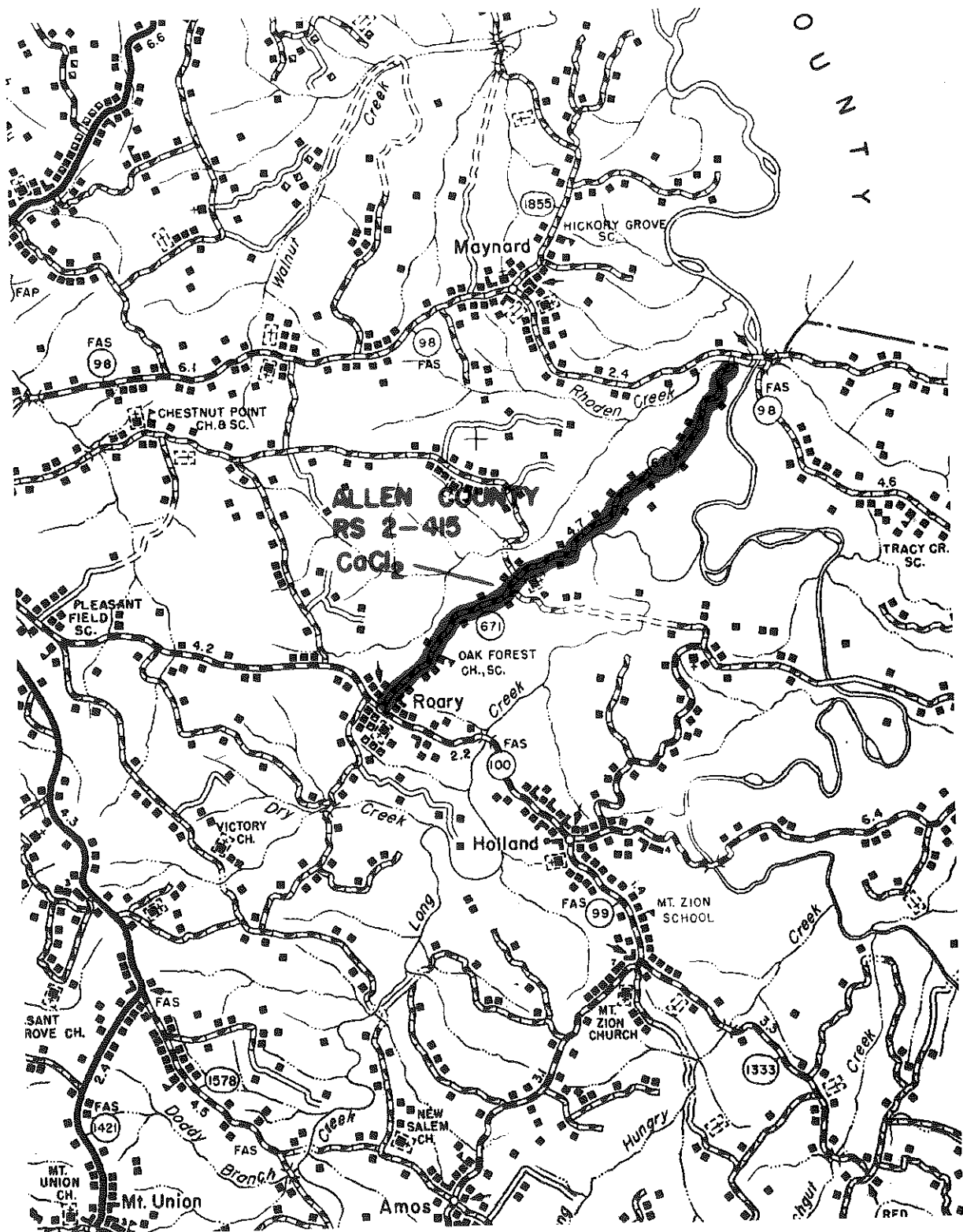
- 
- (1) Laughlin, G. R., "Progress Report on Calcium Chloride Maintained Traffic Bound Roads," Highway Research Laboratory, Kentucky Department of Highways, May, 1959.
  - (2) Havens, J. H. and Drake, W. B., "Ten Rural Highway Base Stabilization Projects," Highway Research Laboratory, Kentucky Department of Highways, August, 1957.

or a Double A-2 Seal within three months after completion of the base work. This, unfortunately, prevented the evaluation of the effectiveness of salt on the retention of aggregate and on the control of moisture over a long period of time. However, during the short interval of time between the completion of the base and the application of the surface treatment, the salt appeared to have some significant effect in maintaining the moisture content and thus in preventing dusting and raveling. On one project (Christian County, RS 24-655), a portion of the base was treated with 7 pounds of sodium chloride per ton of DGA while the remainder received about 3 pounds per ton. The section treated with 7 pounds per ton exhibited a decidedly better retention of aggregate.

The most significant factor influencing performance of these roads, regardless of the type of treatment, was drainage. Where the crown was poor or side ditches inadequate, performance of the road was unsatisfactory. This same conclusion was reached by Laughlin (3) from observations based on an earlier test series.

---

(3) Laughlin, G. R., Ibid.





## ALLEN COUNTY

Road: Ky. 671, Roary-Maynard Road, From Ky. 100 to Ky. 98.

Project: RS 2-415

Length: 4.734 miles designed. 4.495 miles constructed (northern 0.239 miles omitted because it fell within the limits of the Barren River Reservoir)

Width: 18 feet.

Initial Condition Survey: July 23, 1962: The traffic-bound macadam was approximately two inches thick. On the southern 2.3 miles of the project there were a few areas in which the metal was thin (1/2 inch) and the roadway soft. Some areas were noted to have water standing on the roadway and in ditches. There were two zones of rock outcropping through the base. Many deep potholes had developed on the tops of hills. The over-all condition of this portion of roadway was classified as fair to good. The northern portion of the project was in very good condition.

Treatment: 106 pounds per square yard of No. 610 crushed limestone. 52 pounds per square yard of agricultural limestone. Calcium chloride (77% anhydrous flake) -- 1.09 pounds per square yard. Additional compacted thickness approximately 1-1/2 inches.

Contractor: McClellan Stone Company

Construction Date: July 23 - July 30, 1962.

Construction Procedure:

1. Shaping existing roadway (Fig. 1).
2. Spreading of No. 610 crushed limestone with a Robinson Stone Spreader Box.
3. Spreading of agricultural limestone with a Robinson Stone Spreader Box. (Fig. 2)
4. Addition of water with a 5000-gallon sprinkler truck.
5. Application of calcium chloride with an Ezee-Flow Spreader (Fig. 3).
6. Mixing and spreading of granular base with patrol grader (Fig. 4).
7. Compaction of granular base with a 10-ton, 3-wheel roller and a 10-ton tandem roller (Fig. 5).

Performance Surveys: At end of construction: Fig. 6 shows the condition of the roadway after a brief rain shower that fell during construction.

August 8, 1962: The base appeared to be dense and holding in place very well. Figure 7 illustrates the generally excellent condition that was typical of the project on this date.

In Fig. 8 the difference in raveling that occurs between treated and untreated sections can be noted. It can be seen that there is very little loose material on the treated base in the background of the photograph while, in the foreground, loose untreated granular material covers the roadway.

December 18, 1962: The roadway was in very good condition at this time as shown in Fig. 9. The base, however, had been covered with a Double A-2 seal in the fall of the year by a crew of the Maintenance Division.

April 11, 1963: Loose stone was noted along the side of the roadway over the entire length. The seal was in very good condition (Fig. 10). There were several areas on the southern portion of the project showing evidence of weakness. These areas were usually observed where poor drainage was present (Fig. 11).



Fig. 1. RS 2-415. Existing Roadway Shaped and Prepared For Application of Stone.

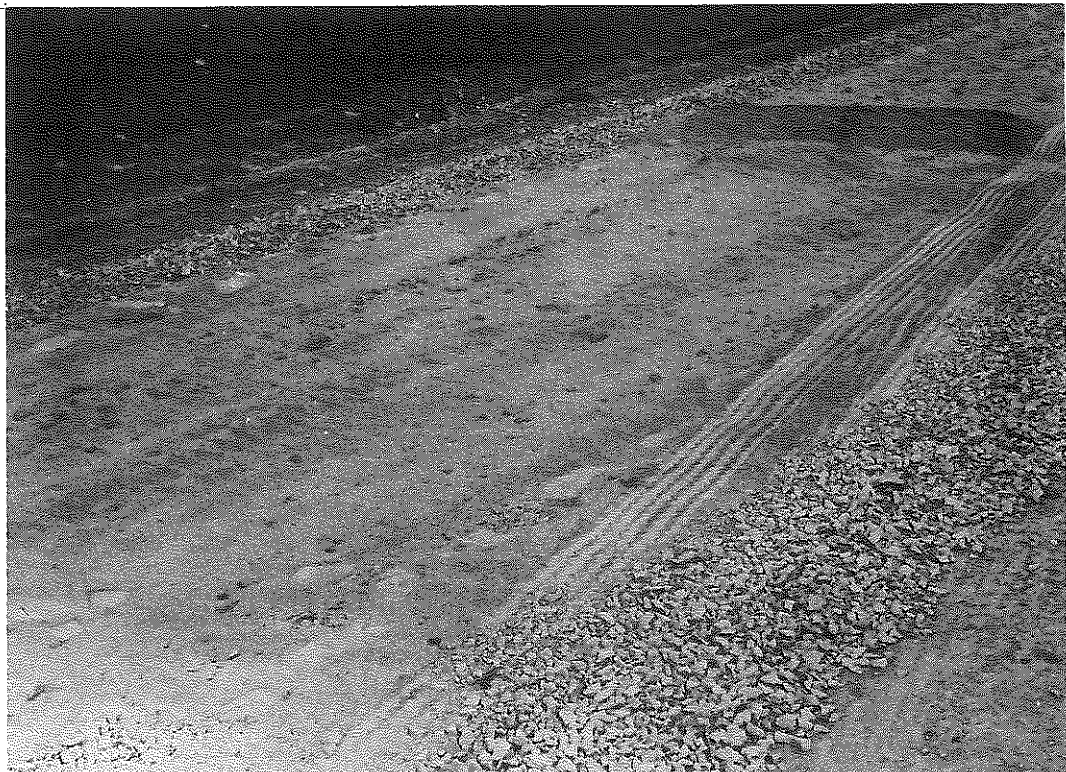


Fig. 2. RS 2-415. Application of No. 610 Limestone and Agricultural Limestone.



Fig. 3. RS 2-415. Application of Calcium Chloride.



Fig. 4. RS 2-415. Granular Base Mixed and Spread Ready for Compaction.



Fig. 5. RS 2-415. Compacted Granular Base, July, 1962.



Fig. 6. RS 2-415. Potholed Condition of Compacted Roadway after a Rain Shower, July, 1962.

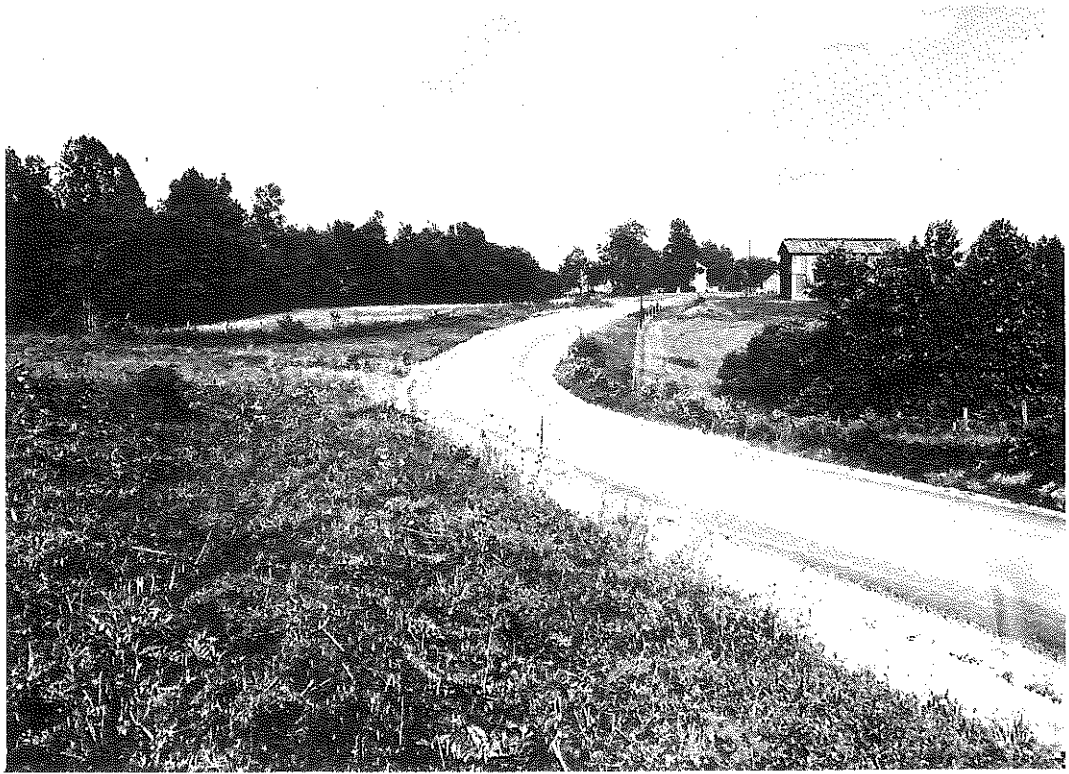


Fig. 7. RS 2-415. Condition of Roadway on August 8, 1962.



Fig. 8. RS 2-415. Photograph Showing Difference in Raveling in Treated and Untreated Base, August 8, 1962.

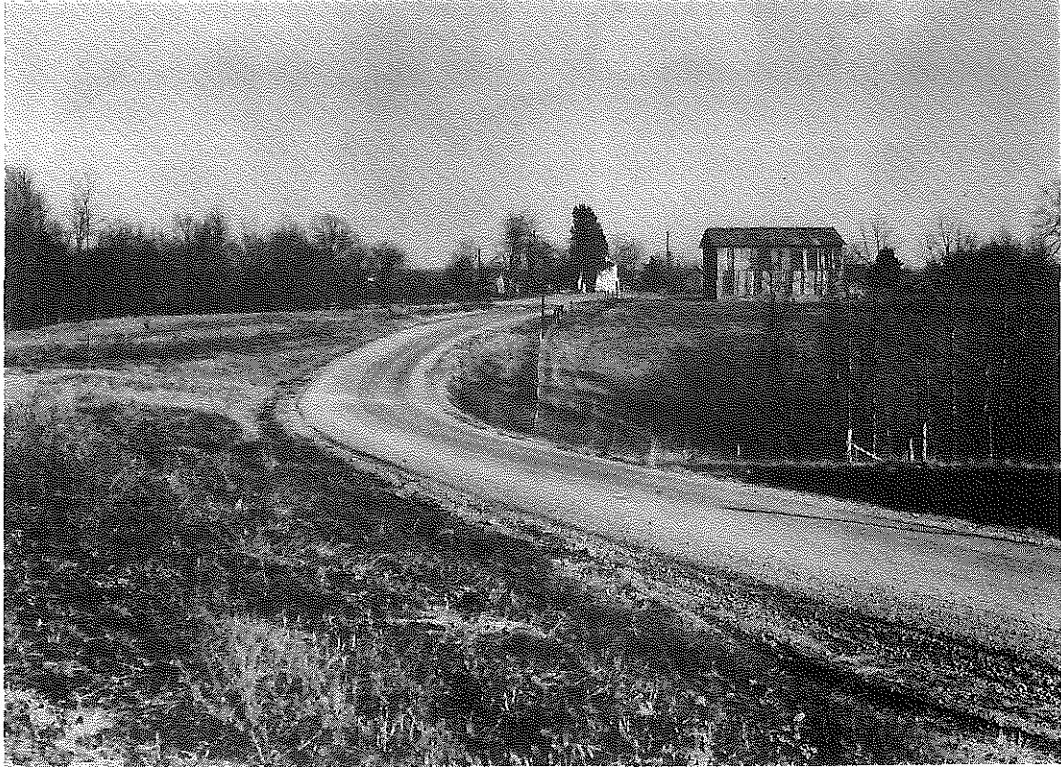


Fig. 9. RS 2-415. Condition of Roadway on December 18, 1962.

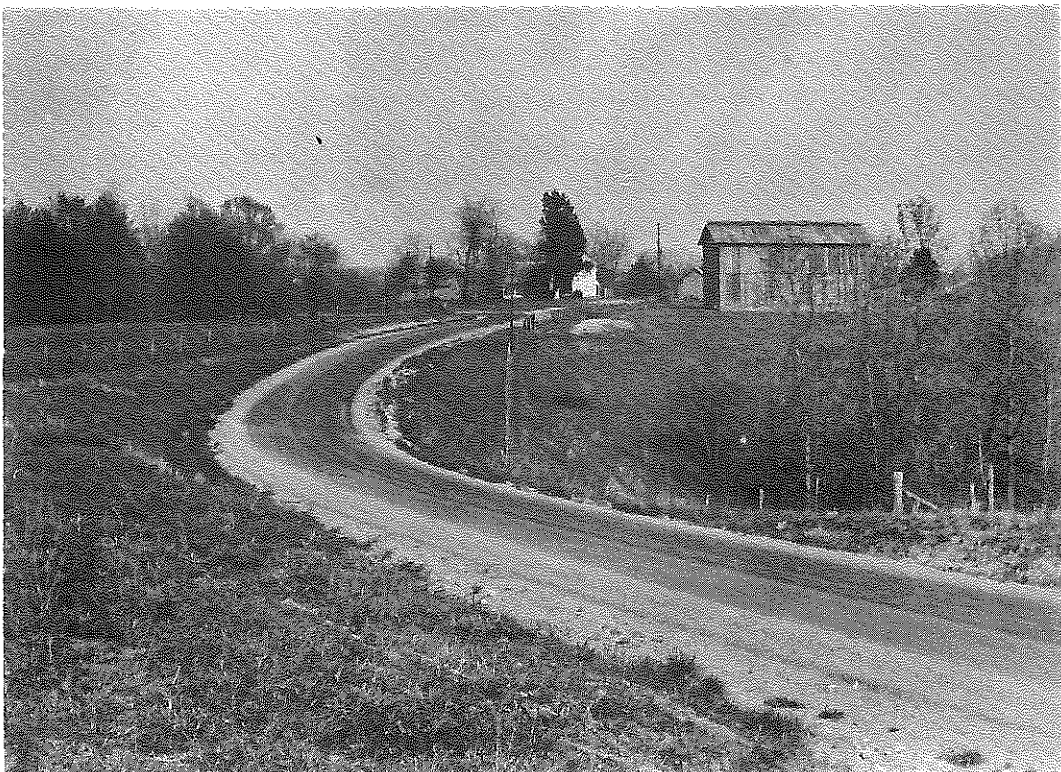
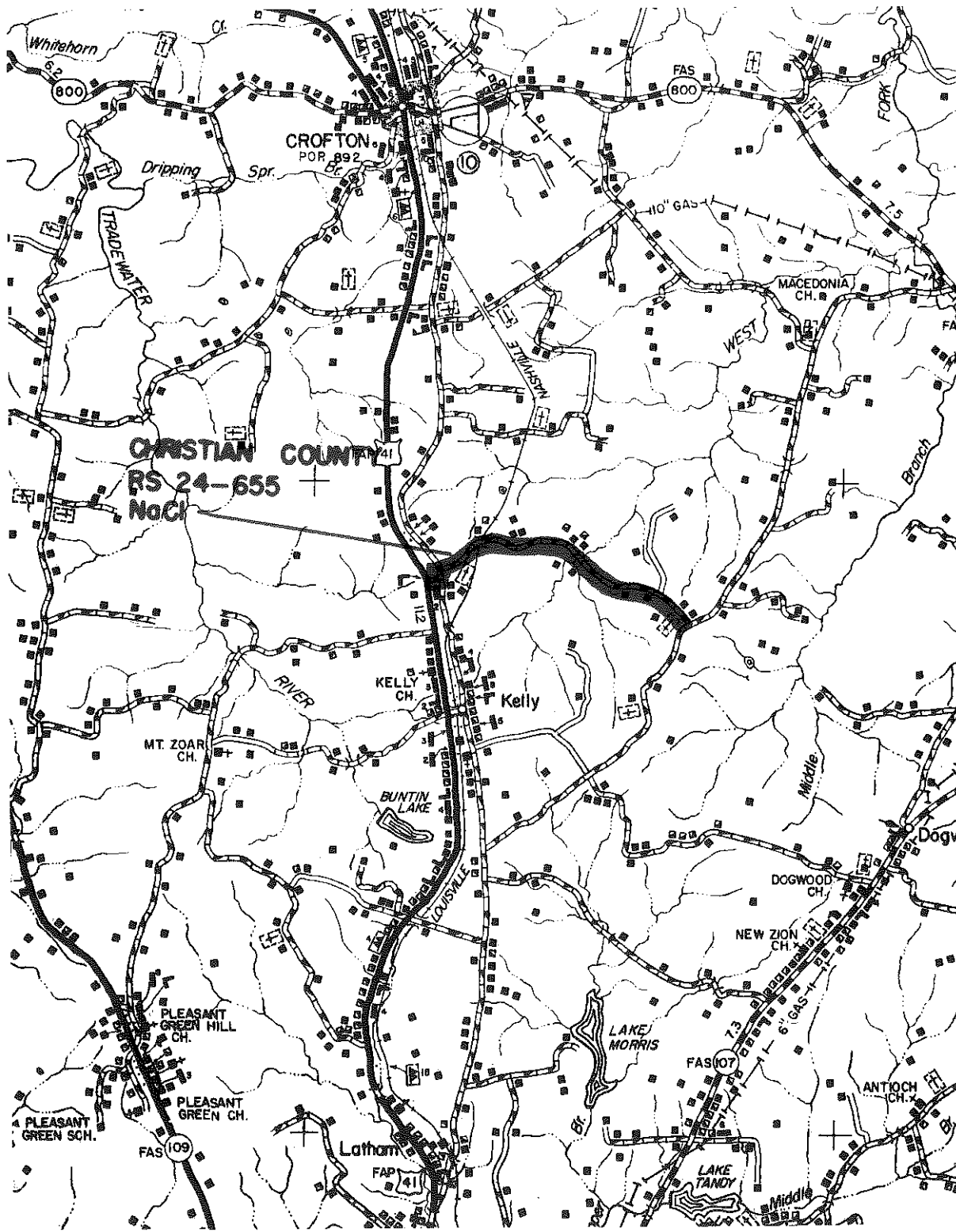


Fig. 10. RS 2-415. Condition of Roadway on April 11, 1963.



Fig. 11. RS 2-415. Condition of Roadway in Poor Drainage Area,  
April 11, 1963.





## CHRISTIAN COUNTY

Road: Cavanaugh Road from US 41 north of Kelly to RH 1143.

Project: RS 24-655.

Length: 3.000 miles.

Width: 16 feet.

Initial Condition Survey: May 9, 1962: Several areas were noted where the metal appeared to be thin and the roadway soft due to poor drainage conditions. A few areas of rock outcropping were also observed. The metal on the eastern most mile of the project was very thin with excessive amounts of clay inter-mixed, as shown in Fig. 1. The remainder of the project was in much better condition, as shown by Fig. 2.

Treatment: 345 pounds per square yard of dense-graded aggregate base (limestone). Sodium Chloride: Eastern half of project - 1.2 pounds per square yard (7 pounds per ton of DGA). Western half of project - 3.1 pounds per square yard (18 pounds per ton of DGA). Additional compacted thickness approximately three inches.

Contractor: E. P. Moynahan

Construction Date: June, 1962

Construction Procedure:

1. Shaping existing roadway with patrol grader (Fig. 3).
2. Spreading of aggregate with a Barber-Greene paver (Fig. 4). Sodium chloride, water and aggregate mixed at a pugmill and transported to project.
3. Compaction of base course with a 10-ton, 3-wheel roller (Fig. 5).
4. Shaping surface of DGA with a patrol grader.
5. Compaction with a pneumatic roller (Fig. 6).

Performance Surveys: July 30, 1962: Much and wide-spread raveling was observed on the eastern portion of the project (low sodium chloride content)(Fig. 7). The western portion was retaining the aggregate significantly better, but some minor raveling had developed (Fig. 8).

September 25, 1962: On the eastern section of the project raveling had continued and numerous potholes had developed. Much material had been carried off by erosion (Figs. 9 and 10). Scattered potholes were present in the western portion.

December 19, 1962: A Double A-2 seal had been placed by a maintenance crew since the last inspection. The seal was in good condition (Fig. 11) and there were only a very few potholes on the entire project; however, some wet areas were noted (Fig. 12). The road has not been accepted for state maintenance because of substandard widths.

April 11, 1963: Loose stone was present on both sides of the roadway over most of the distance. Mild rutting was noted in areas on the western part of the project. Potholes were noted in only one low area on the eastern part (Fig. 13), although some were starting to form in other areas. The roadway was generally in good condition with the western portion slightly better. Figure 14 shows the bridge which is the dividing point between the eastern and western sections.



Fig. 1. RS 24-655-1. Condition of Roadway on Eastern-Most Mile of Project on May 9, 1962.



Fig. 2. RS 24-655-1. Condition of Western Portion of Project on May 9, 1962.



Fig. 3. RS 24-655-1. Shaped Roadway Prepared for Application of Stone. Note Drains.

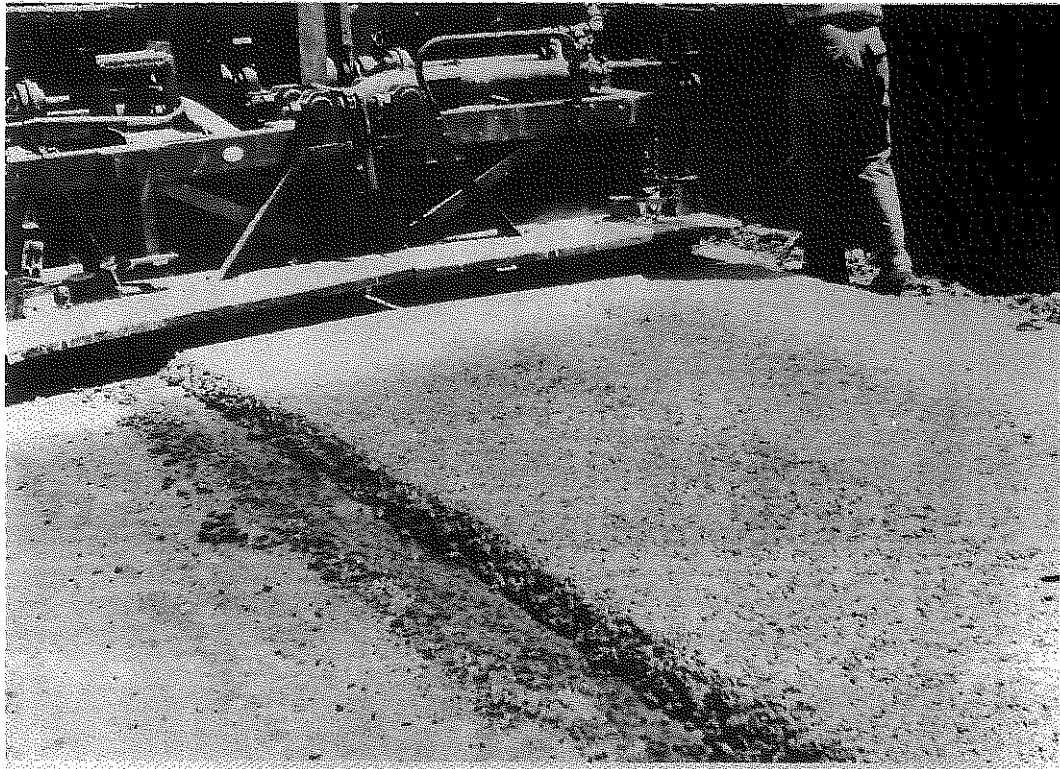


Fig. 4. RS 24-655-1. Application of Dense Graded Aggregate Base with Intermixed Sodium Chloride.

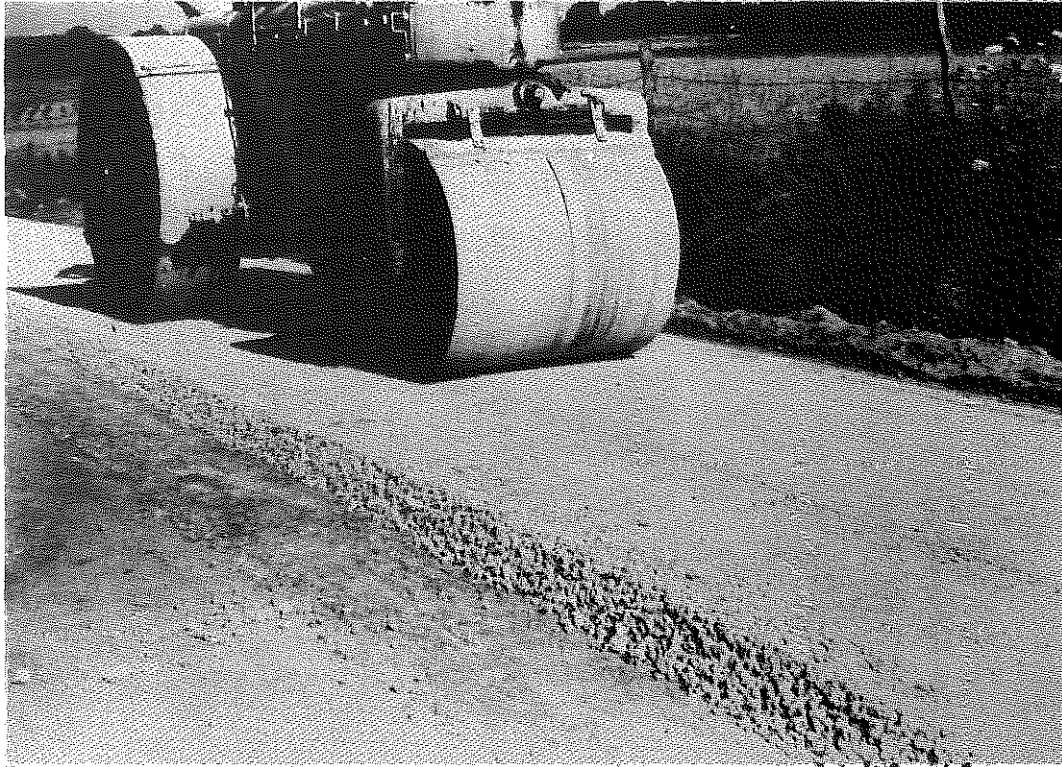


Fig. 5. RS 24-655-1. Compaction of Base Course.

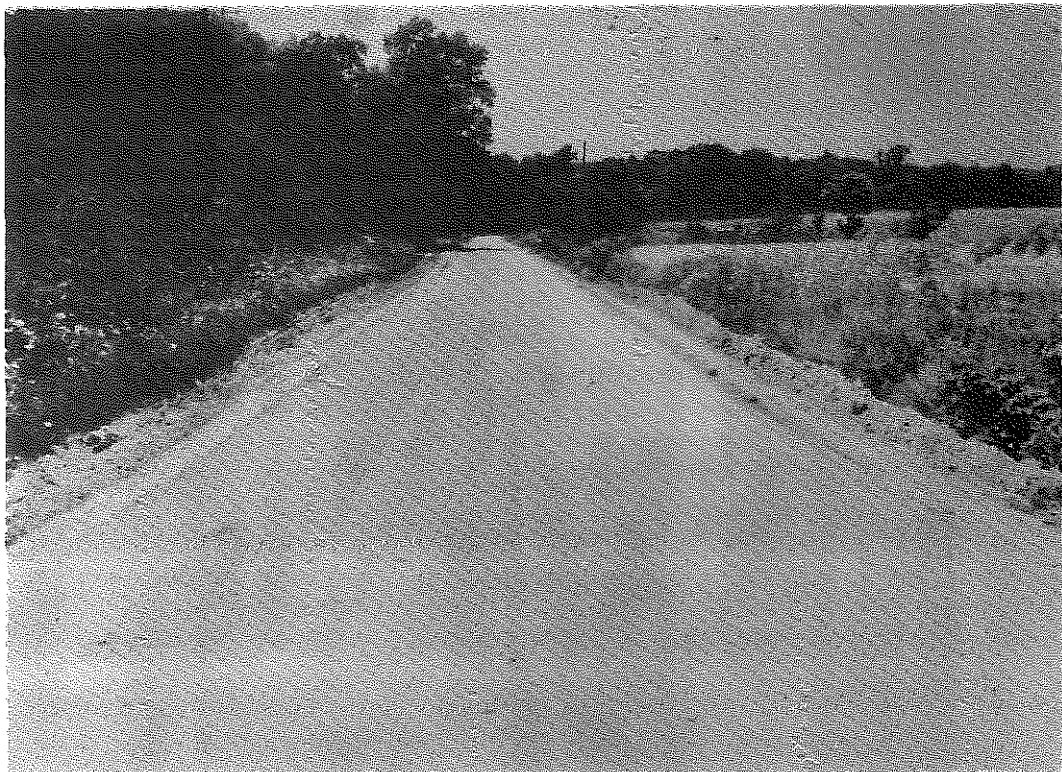


Fig. 6. RS 24-655-1. Completed Roadway, June, 1962.



Fig. 7.

RS 24-655-1. Raveling of Aggregate on Eastern Portion (Low Sodium Chloride Content) of Project, July 30, 1962.



Fig. 8. RS 24-655-1. Condition of Western Part of Project, July 30, 1962.



Fig. 9. RS 24-655-1. Condition of Eastern Portion of Project, September 25, 1962.



Fig. 10. RS 24-655-1. Condition of Eastern Portion of Project, September 25, 1962.



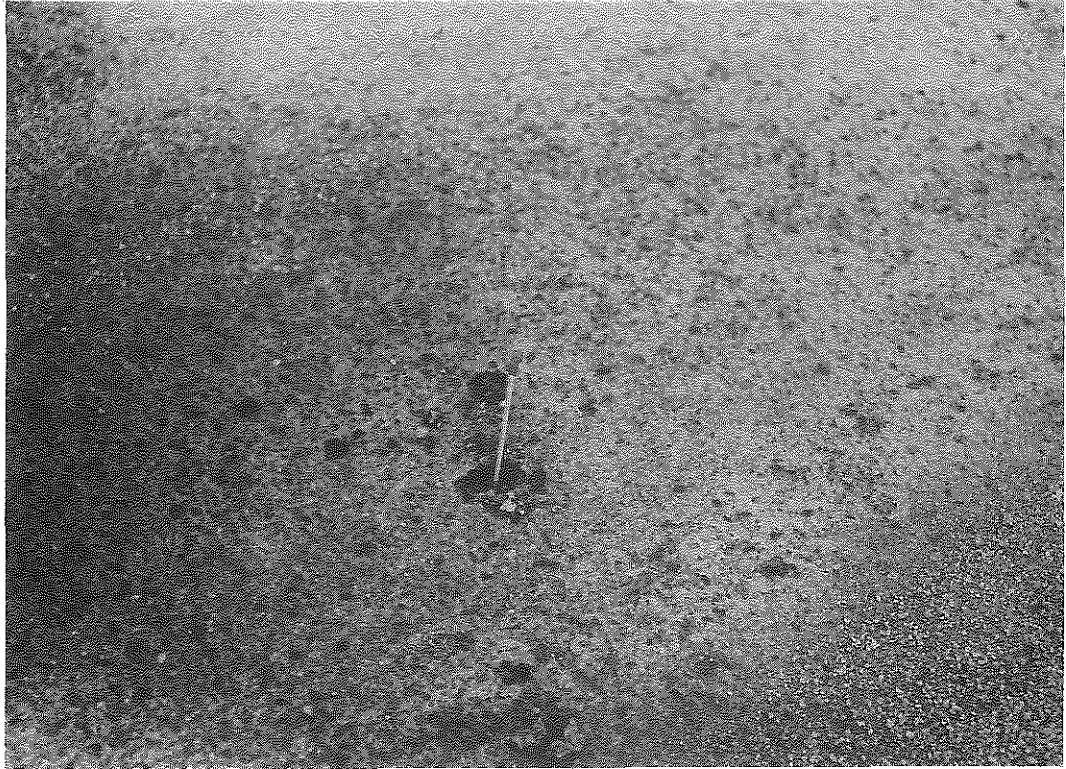


Fig. 11. RS 24-655-1. Seal Coat, December 19, 1962.



Fig. 12. RS 24-655-1. Photograph Showing Wet Area, December 19, 1962.



Fig. 13. RS 24-655-1. Potholes Formed in a Low, Wet Area,  
April 11, 1963.



Fig. 14. RS 24-655-1. Condition of Roadway on April 11, 1963.  
The eastern portion of the project is in the background.



## ELLIOTT COUNTY

Road: Ky. 504, Green-Gimlet-Ault Road, 0.7 miles east of Ky. 1620 to Ky. 649.

Project: RS 32-189

Length: 4.900 miles

Width: Proposal called for 14 feet, but the base was constructed 14 to 20 feet wide, averaging approximately 16 feet.

Initial Condition Survey: July 10, 1962: The metal on the entire road was moderately thick (Fig. 1). Most curves had thin metal on the inside edge and an accumulation of sandy material. Two areas of extremely thin base near the middle of the project were noted.

Treatment: 345 pounds per square yard of dense-graded aggregate base (limestone). Calcium chloride (94% anhydrous) - 1.24 pounds per square yard (7.2 pounds per ton). Additional compacted thickness approximately 3 inches.

Contractor: Eastern Kentucky Paving Corporation.

Construction Date: September 17 - October 11, 1962

Construction Procedure:

1. Shaping existing roadway with patrol grader.
2. Spreading of aggregate with 10-foot wide spreader box.
3. Compaction of base course with a 10-ton tandem roller.
4. Shaping surface of DGA with a patrol grader.
5. Compaction of base using a 3-wheel roller with vibratory compactor attachment (Figs. 2 & 3).
6. Rerolling one day later to tie down loose metal.

Performance Surveys: February 5, 1963: Some sections were still in good condition showing very little raveling (Fig. 4). Other areas showed many potholes, wet and soft places. Subgrade had pumped through the dense-graded aggregate and the aggregate was thin in areas.

April 23, 1963: Lack of crown had permitted water to flow down the roadway causing erosion. Water collecting on the roadway in the low areas has resulted in many large potholes (Fig. 5). Numerous potholes are also present on the crests of rises and hills (Fig. 6). Several soft areas were noted and in some of the soft areas clay was intermixed with the granular material (Fig. 7). The DGA was generally tight with some raveling on the curves (Fig. 8). A patrol grader was in the process of blading the roadway (Fig. 9).



Fig. 1. RS 32-189. Condition of Roadway on July 10, 1962.

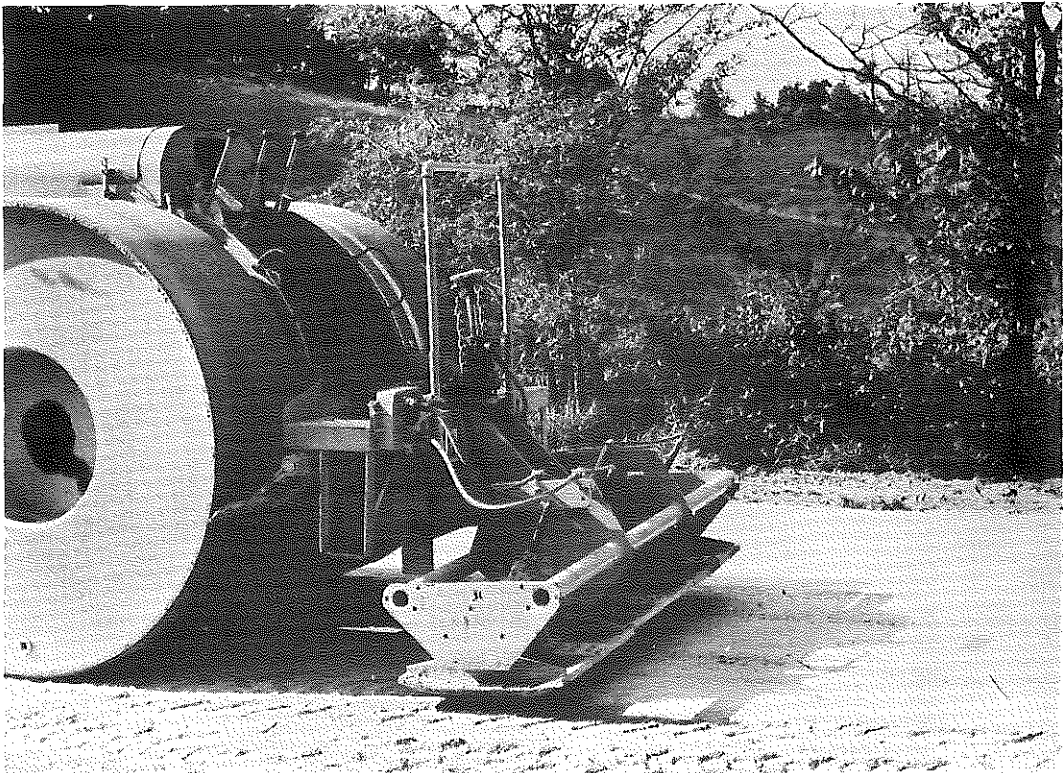


Fig. 2. RS 32-189. Three-Wheel Roller with Vibratory Attachment used for Compaction.



Fig. 3. RS 32-189. Compacted Granular Base,  
September, 1962.



Fig. 4. RS 32-189. Condition of Roadway on  
February 5, 1963.



Fig. 5. RS 32-189. Condition of a Low Area of Roadway,  
April 23, 1963.



Fig. 6. RS 32-189. Condition of Roadway at the Crest of a Rise,  
April 23, 1963.



Fig. 7. RS 32-189. Soft Area in Roadway, April 23, 1963.

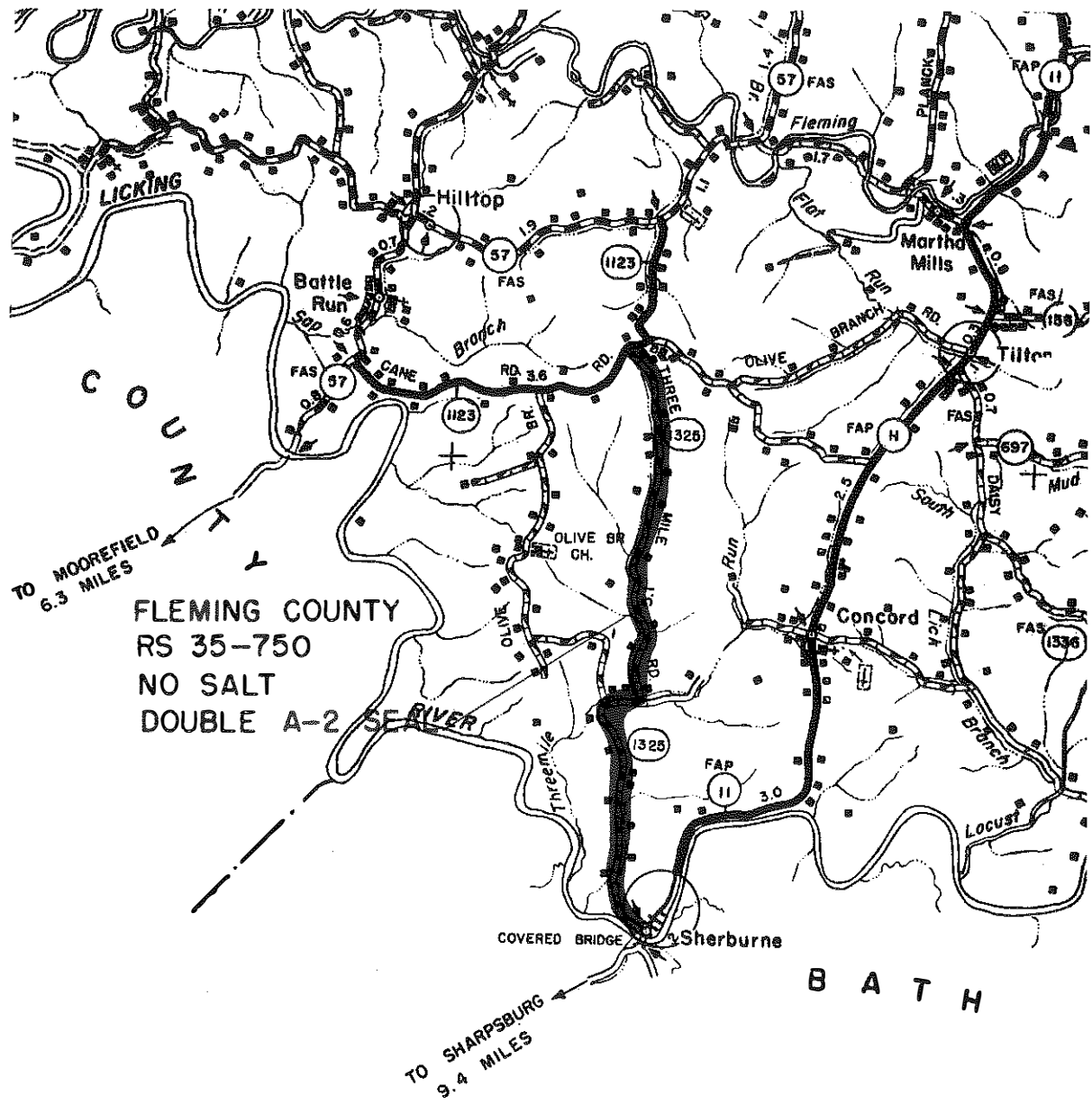


Fig. 8. RS 32-189. Condition of Roadway on April 23, 1963.

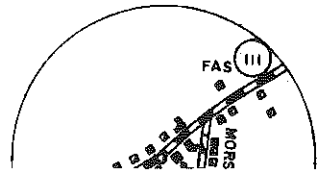
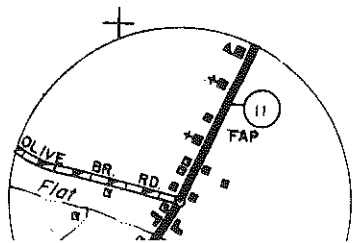
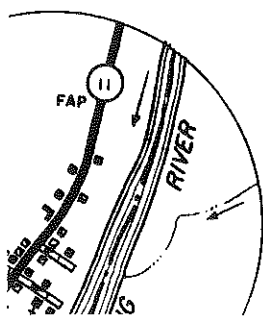




Fig. 9. RS 32-189. Condition of Roadway After Blading,  
April 23, 1963.



FLEMING COUNTY  
 RS 35-750  
 NO SALT  
 DOUBLE A-2



## FLEMING COUNTY

Road: The Three Mile Road from Ky. 11 to Sherburne, extending northerly to Ky. 1123.

Project: RS 35-750

Length: 5.076 miles

Width: 16 feet

Initial Condition Survey: July 10, 1962: The roadway was narrow throughout the entire length. Numerous rock outcrops and potholes were noted. Metal appeared to be thick, uniform and in good condition over entire length (Fig. 1).

Treatment: 345 pounds per square yard of dense-graded aggregate base (limestone). Additional compacted base thickness approximately 3 inches. Double A-2 seal.

Contractor: Carey and Adams

Construction Date: August 2 - October 22, 1962.

Construction Procedure: 

1. Shaping existing roadway with patrol grader (Fig. 2).
2. Spreading of aggregate with 10-foot wide spreader box (Fig. 3).
3. Compaction of base course with a pneumatic-tired roller (Fig. 4).
4. Shaping surface of DGA with grader (Note in Fig. 5 the segregation resulting from too much blading).
5. Compaction using vibratory compactor towed by tractor (Fig. 6).

Performance Surveys: February 5, 1963: The road was in good condition. No severe failures were observed although mild rutting had begun. Several wet places were also noted.

April 23, 1963: Loose metal was noted over the entire length of the project. Rutting was occurring in several areas, mostly in the outside wheel track of the southbound lane. Map cracks were observed over the length of the roadway. In some areas this cracking was quite severe (Fig. 7). Scattered potholes were present and several large chip seal patches had been made. Figure 8 shows the general condition of the roadway.



Fig. 1. RS 35-750. Condition of Roadway on July 10, 1962.

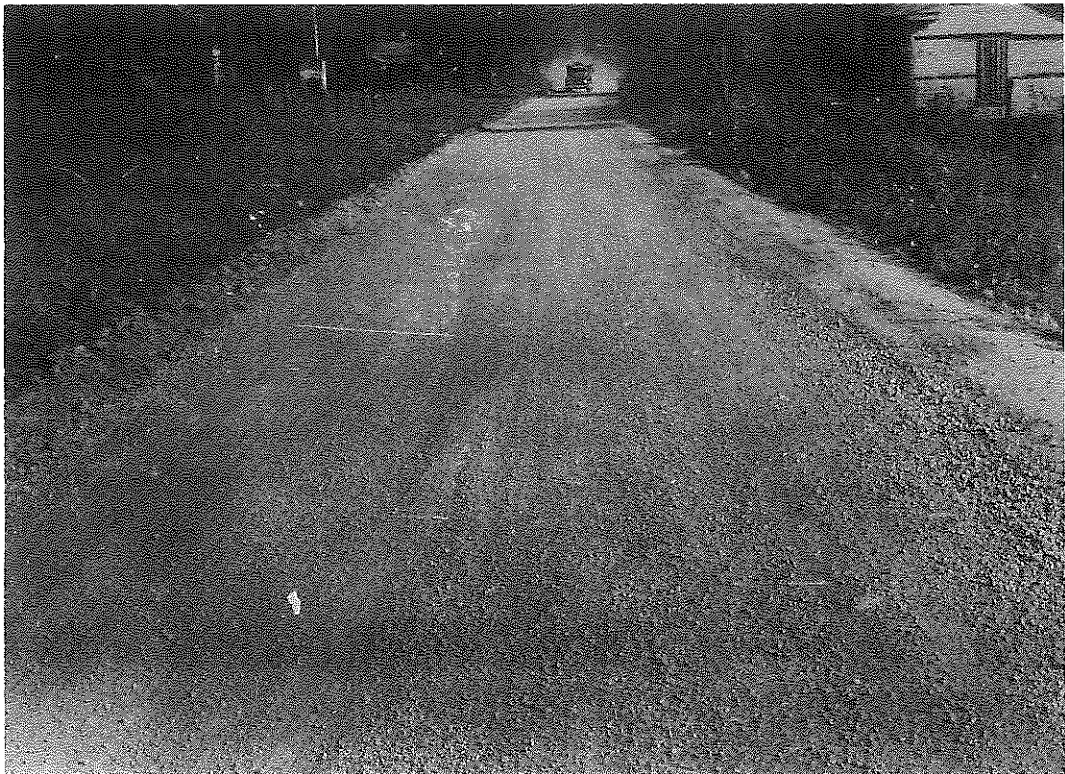


Fig. 2. RS 35-750. Shaped Roadway Prepared for Application of Aggregate.

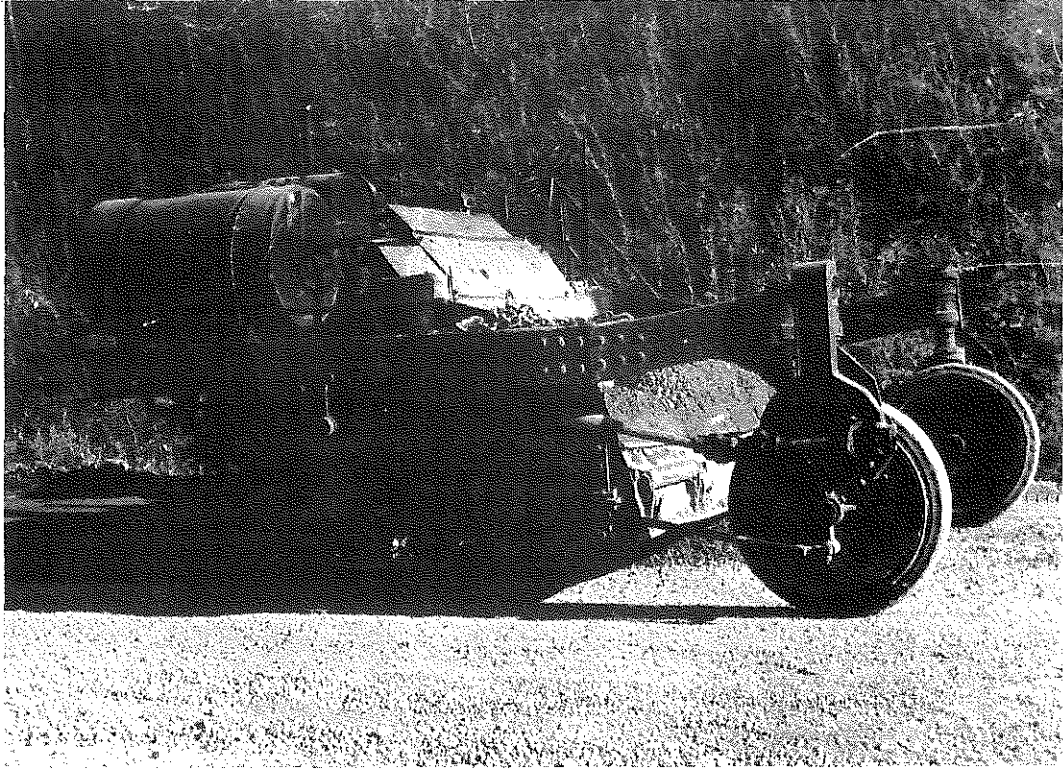


Fig. 3. RS 35-750. Self-Propelled Spreader Box used for Spreading the Base Material.



Fig. 4. RS 35-750. Compaction with the Pneumatic Tired Roller.

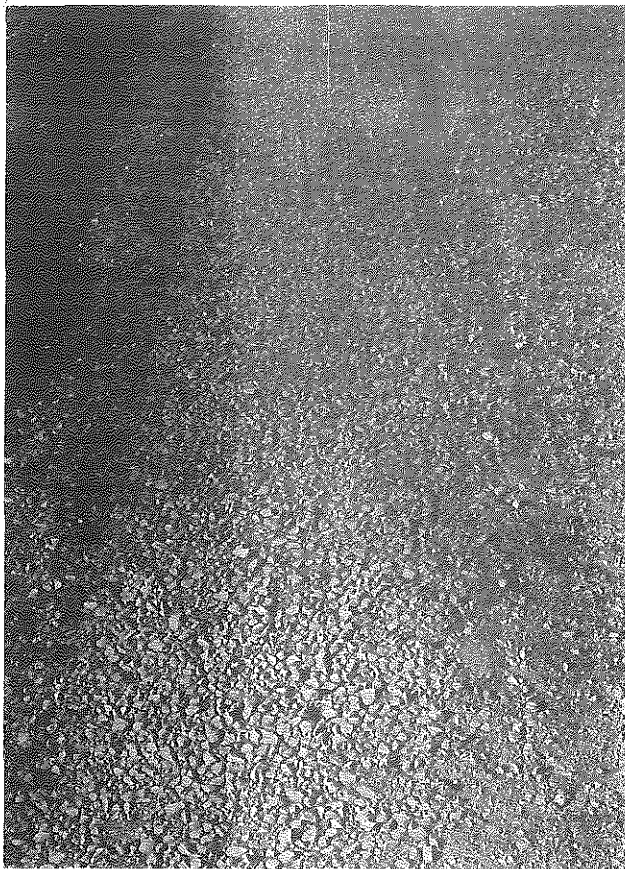


Fig. 5.

RS 35-750. Segregation Resulting from Overblading the Aggregate.

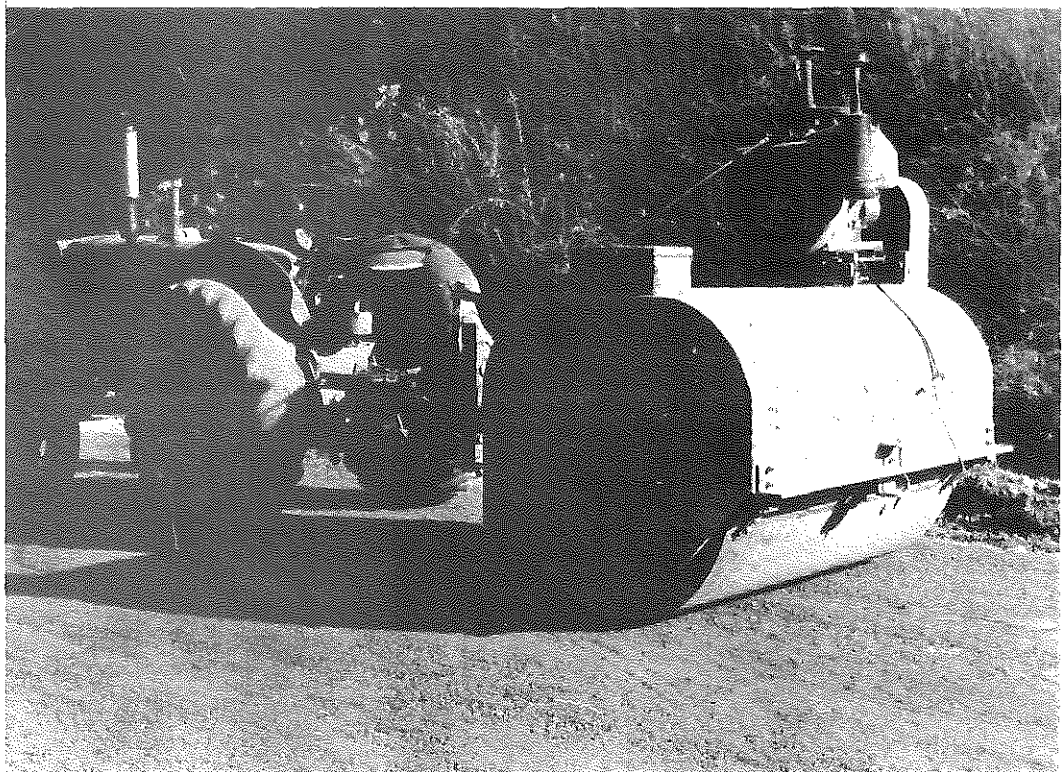


Fig. 6. RS 35-750. Vibratory Compactor used to Compact the Stone.



Fig. 7.

RS 35-750. Distressed Area of Roadway, April 23, 1963.



Fig. 8. RS 35-750. Condition of Roadway on April 23, 1963.





GARRARD COUNTY

Road: The Bryantsville-Buena Vista Road (Ky. 753) from US 27 at Bryantsville to Ky. 152 at Buena Vista.

Project: RS 40-326

Length: 2.819 miles

Width: 18 feet

Initial Survey Condition: March 22, 1961: Scattered potholes were noted over the length of the project. Two areas in the northbound lane were rutted. The macadam on the southern 1.8 miles was 2-1/2 to 3 inches thick and on the northern portion approximately 1-1/2 inches\*.

Treatment: Base - The southern 1.8 miles - 122 pounds per square yard of No. 610 crushed limestone, 53 pounds per square yard of No. 10 crushed limestone. The northern portion - 92 pounds per square yard of No. 610 crushed limestone, 186 pounds per square yard of No. 10 crushed limestone. Calcium chloride for entire project - 1 pound per square yard to be intermixed, 1/2 pound per square yard for top dressing. Total compacted base thickness approximately 4-1/4 inches.

Surface - Class C-1 roadmix - 165 pounds per square yard of limestone aggregate (50% No. 6 stone and 50% No. 9 stone) and liquid asphalt MC-4 at the rate of 1.30 gallon per square yard.

Seal - A-2 seal - 22 pounds per square yard of No. 9 limestone and 0.3 gallon per square yard of RS-2 emulsified asphalt.

Contractor: Base Course and Seal - Kentucky Department of Highways, Maintenance.  
Surface - Walden and Grubbs.

Construction Dates: Base Course - April 19-April 28, 1961.  
Surface Course - September 23-September 30, 1961  
Seal - September 27, 1962

---

\* Deen, Robert C., "Base Stabilization, Bryantsville-Buena Vista Road, Garrard County, RS 40-326," Highway Research Laboratory, Kentucky Department of Highways, February, 1962.

- Construction Procedure:
1. Spreading the No. 610 stone.
  2. Spreading the No. 10 stone.
  3. Scarifying the material to a depth of 6 inches (including the spread stone).
  4. Mixing the material with a pulvimixer.
  5. Adding the calcium chloride and mixing.
  6. Compaction with a pneumatic-tired roller.
  7. Application of top dressing of calcium chloride
  8. Laying the surface course 5 months later.
  9. Sealing the road one year after surfacing.

Performance Surveys: August 29, 1961: This survey was before surfacing. The general condition of the base appeared to be rather good. Scattered potholes were noted. Rapid runoff of water in some areas had eroded some fines from the surface. The average thickness of the base was approximately 3-3/4 inches with sufficient loose stone along the side of the road to account for another 1/2 inch of thickness.

February 13, 1962: The general condition of the project was excellent (Fig. 1). Some areas of rutting and base failures were noted in the outside wheel track of the southbound lane for a distance of approximately 0.3 mile near Buena Vista (Fig. 2). These areas coincide with weak places noted in earlier surveys. This weak condition could also be due to placing a wider pavement than originally existed. There appeared to be some water trapped in the pavement system between the surface and base.

December 27, 1962: The sealed surface appeared to be tight and impervious to water (Figs. 3 and 4). Rutting in the outside wheel track of the southbound lane near Buena Vista was still present. Two areas of surface cracking were noted - one 0.3 mile south of Buena Vista in the center of the pavement (Fig. 5) and one 0.7 mile south of Buena Vista in the outside wheel track of the southbound lane (Fig. 6). Subgrade was starting to extrude through the surface at these locations.

April 19, 1963: Figure 7 shows the general condition of the roadway. Most of the failures noted were in the outside wheel track of the southbound lane. Some areas of settlement and cracking were observed over the length of the project (Fig. 8). Several patches had been placed, one over the center of the road failure observed in the previous survey. Settlement was again occurring in the patch.



Fig. 1. RS 40-326. Condition of Roadway on February 13, 1962.



Fig. 2. RS 40-326. Area of Distress in Outside Wheel Track of Roadway, February 13, 1962.



Fig. 3. RS 40-326. Condition of Roadway on December 27, 1962.



Fig. 4. RS 40-326. Condition of Roadway on December 27, 1962.



Fig. 5. RS 40-326. Distressed Area in Center of the Roadway,  
December 27, 1962.



Fig. 6. RS 40-326. Distressed Area in Outside Wheel Track of  
Roadway, December 27, 1962.

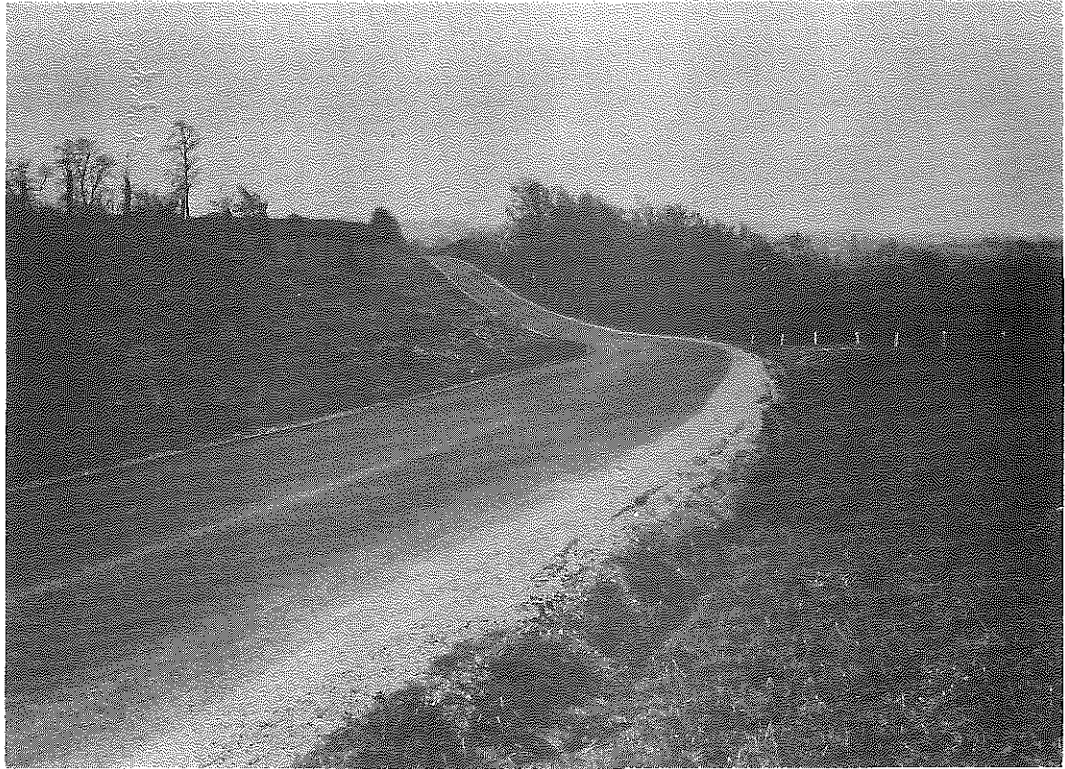


Fig. 7. RS 40-326. Condition of Roadway on April 19, 1963.

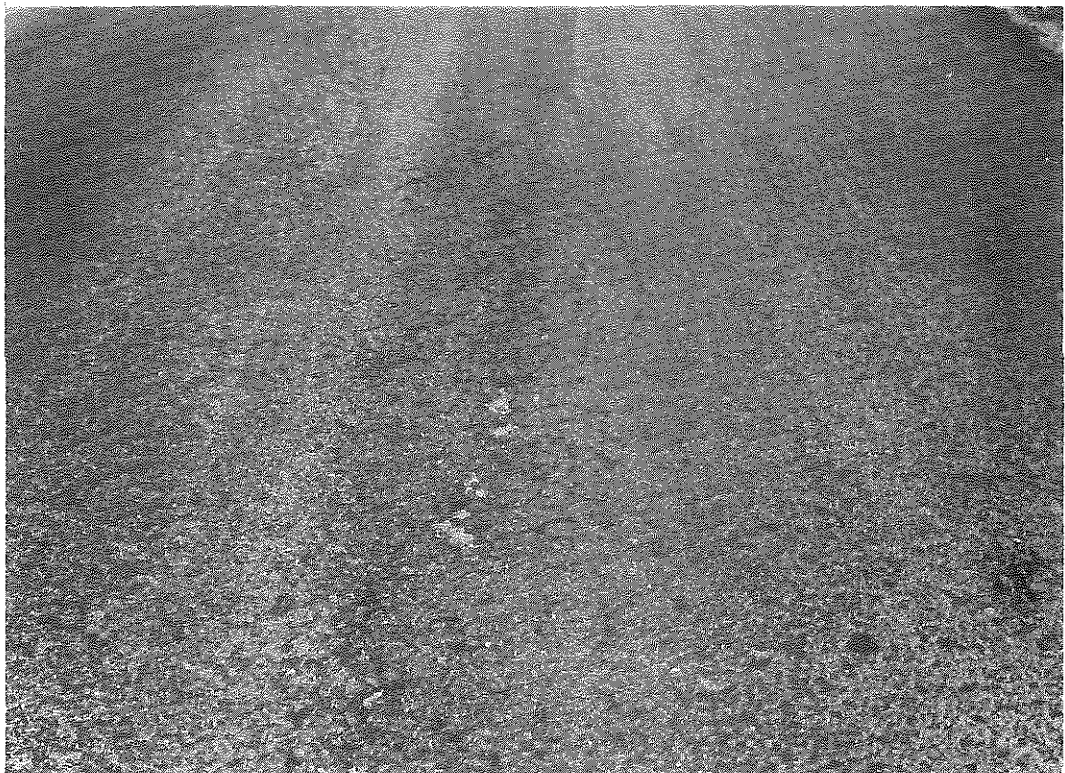
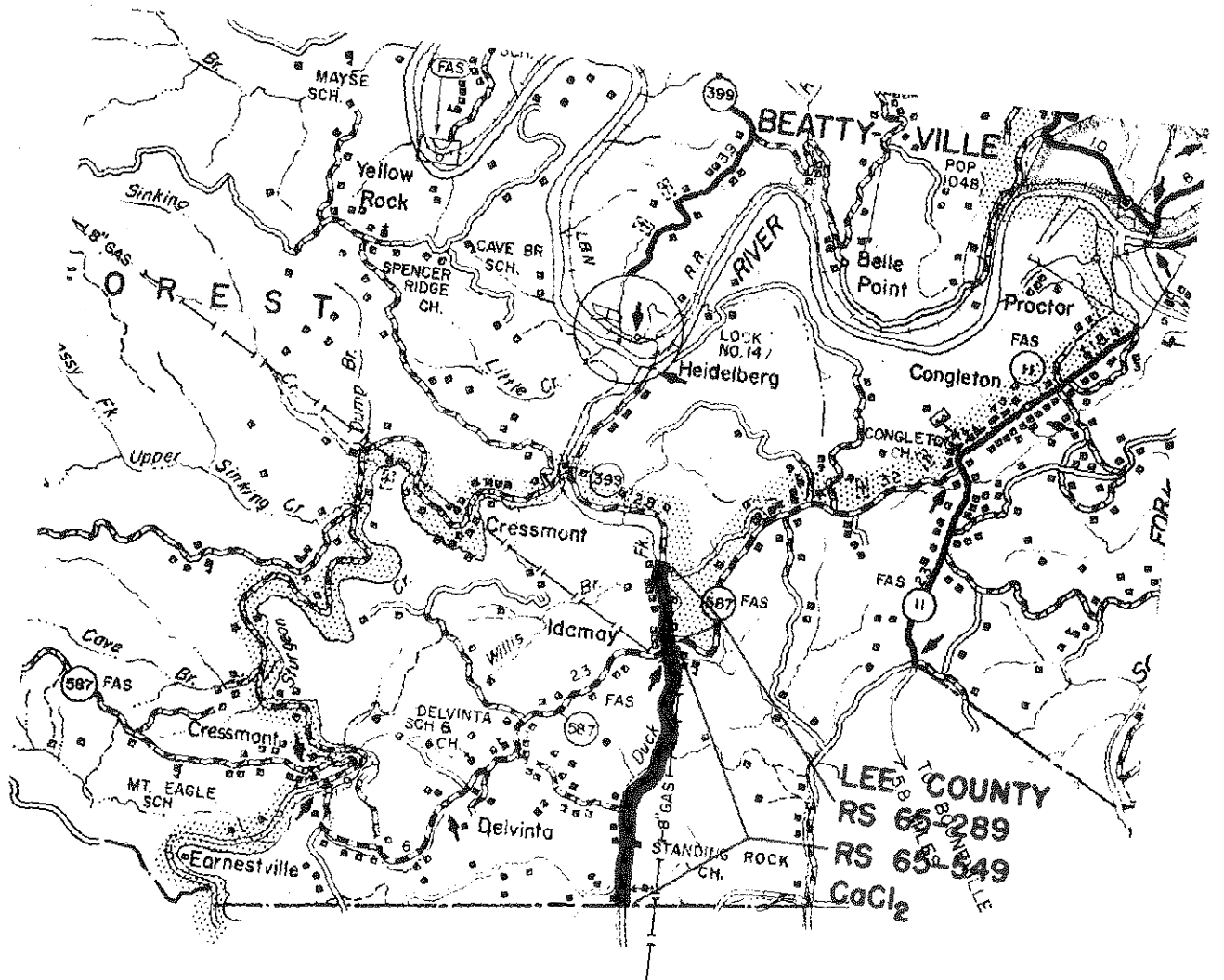
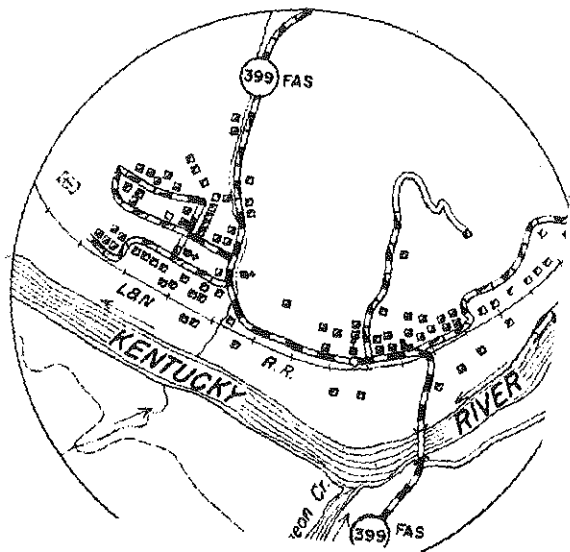


Fig. 8. RS 40-326. Distressed Area of Roadway, April 19, 1963.  
Note subgrade starting to extrude through the surface.



OWSLEY



LEE COUNTY

Road: The Heidelberg-Ida May-Duck Fork Road from northwest of Ida May to the Owsley County Line.

Projects: RS 65-289 and RS 65-549

Length: 2.800 miles (0.800 miles on RS 65-249)

Width: 16 feet.

Initial Condition Survey: May 23, 1962: Thin metal and clay intermixed with metal were noted on RS 65-289. The macadam was generally in good condition on both projects (Figs. 1 and 2).

Treatment: 345 pounds per square yard of dense-graded aggregate base (limestone). Calcium Chloride - 1.6 pounds per square yard (8.8 pounds per ton of DGA). Additional compacted thickness approximately three inches.

Contractor: Cardinal Construction Company.

Construction Date: September 15 - October 16, 1962.

Construction Procedure: 1. Re-shaping existing roadway with a patrol grader.  
2. Spreading aggregate with a Robinson spreader.  
3. Shaping DGA with a grader.  
4. Compaction with a pneumatic-tired roller.  
5. Final compaction with a 10-ton, steel wheel roller.

Performance Surveys: February 6, 1963: Both projects had received an application of light road oil over most of the length since the time of construction. Numerous patched and open potholes (Figs. 3 and 4) were observed. Map cracking had also developed. Drains had been installed in an attempt to alleviate wet conditions existing. Drainage ditches were not functioning to carry off free water. Very little loose metal was noted.

April 15, 1963: Considerable raveling and loss of fines was occurring on RS 65-549 (Fig. 5), the light oil application not being too effective. Only a small number of open potholes were observed on this project. On project RS 65-289 numerous potholes were noted but raveling was not as severe (Fig. 6). It appeared that an application of some type of asphalt surface treatment had been placed on this project.





Fig. 1. RS 65-289. Condition of Roadway on May 23, 1962.

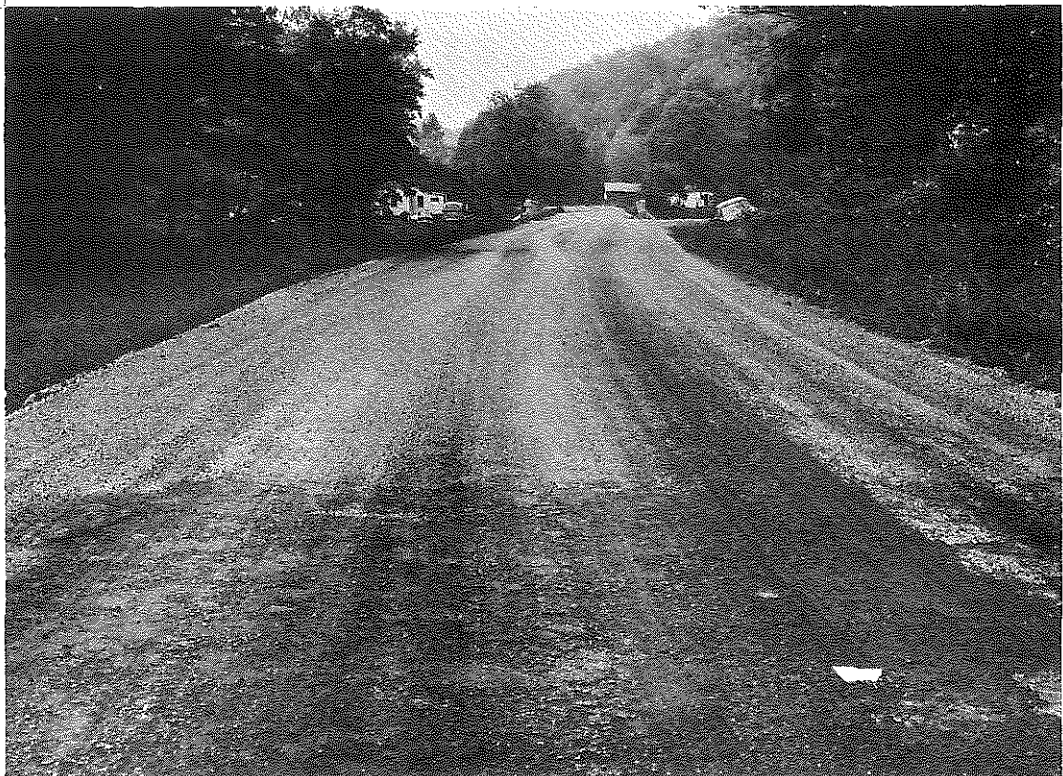


Fig. 2. RS 65-549. Condition of Roadway on May 23, 1962.



Fig. 3. RS 65-289. Condition of Roadway on February 6, 1963.



Fig. 4. RS 65-549. Condition of Roadway on February 6, 1963.



Fig. 5. RS 65-549. Condition of Roadway on April 15, 1963.

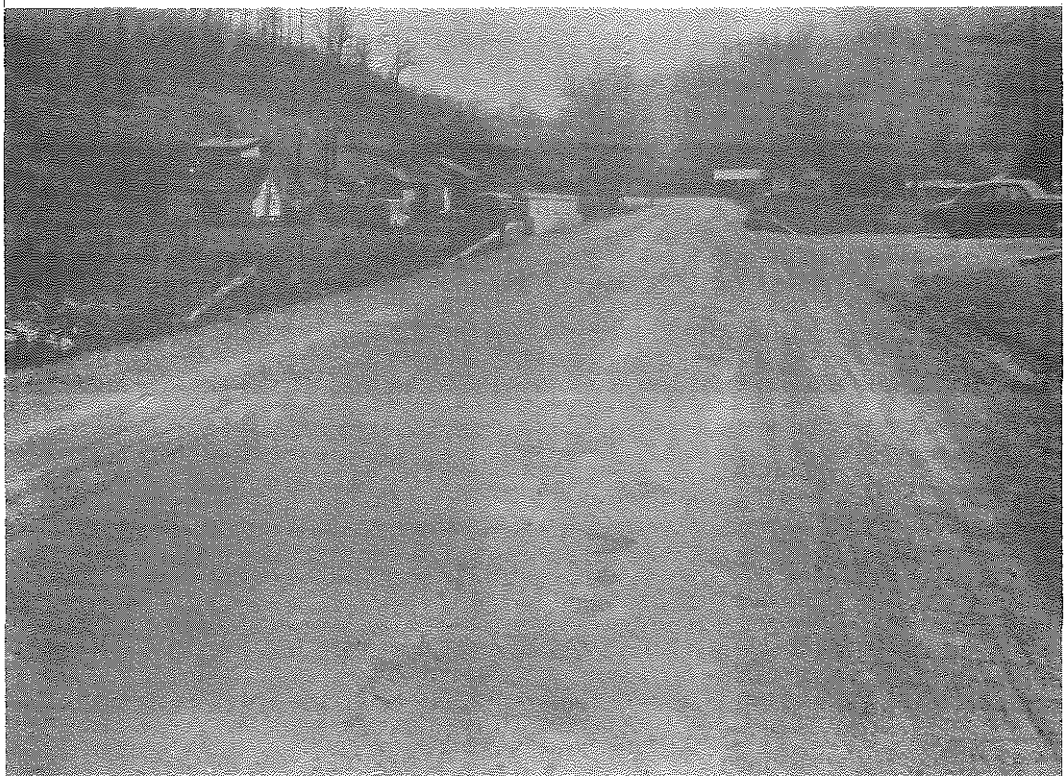
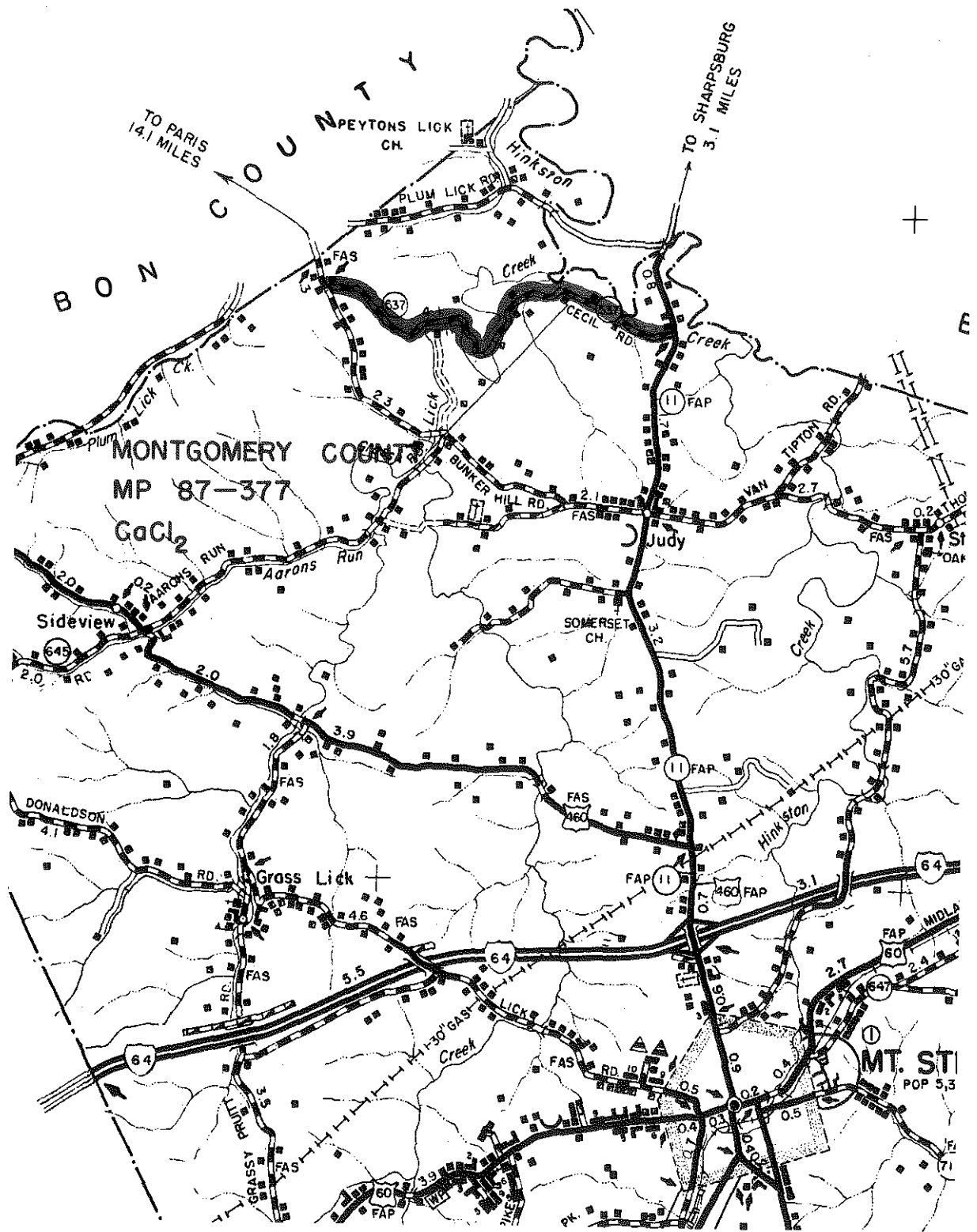


Fig. 6. RS 65-289. Condition of Roadway on April 15, 1963.



## MONTGOMERY COUNTY

Road: Ky. 537, Cecil Road, from Ky. 11 north of Judy to near the Nicholas County Line.

Project: MP 87-377

Length: 3.916 miles

Width: 14 feet.

Initial Condition Survey: March 21, 1963: The drainage of the roadway was very poor (Figs. 1 and 2). In some areas the ditches are filled and water has been flowing across the road. The outer foot or two on each side of the metal was extremely soft and unstable (Fig. 3). North of Grassy Lick Creek are many areas where the road is unstable over the entire width. The average thickness of the existing metal was two inches north of the creek and three and one-half inches south of the creek. Figure 4 is a general view of one of the better sections of the project.

Treatment: Proposed - 135 pounds per square yard of No. 610 crushed limestone. 65 pounds per square yard of agricultural limestone. Calcium chloride - 1.5 pounds per square yard (15 pounds per ton) at time of construction with 0.5 pounds per square yard surface dressing to follow. Additional compacted thickness approximately two inches.

Contractor: Kentucky Department of Highways, Maintenance,

Construction Date: 1963 construction season.

Construction Procedure: Proposed:

1. Prepare and shape existing roadway.
2. Spread No. 610 crushed limestone.
3. Spread agricultural limestone.
4. Add water to obtain a moisture content of approximately 4.5 to 5.0%.
5. Spread the calcium chloride.
6. Mix with a patrol grader.
7. Spread and shape the base material.
8. Compact base material.



Fig. 1. MP 87-377. Poor Drainage Area on Southern Portion of Roadway, April 10, 1963.



Fig. 2. MP 87-377. Poor Drainage Condition on Northern Portion of Roadway, April 10, 1963.

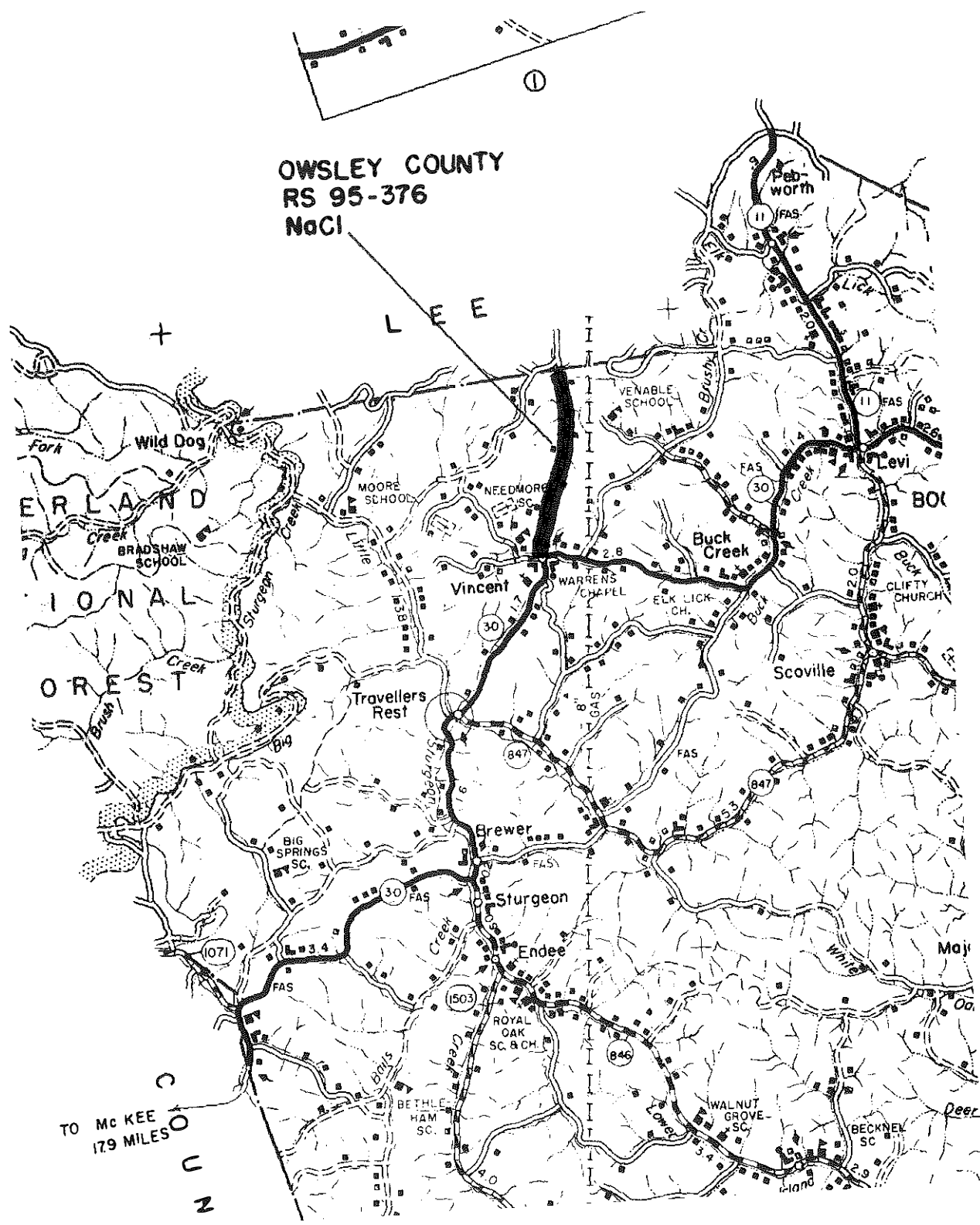


Fig. 3. MP 87-377. Northern Portion of Roadway on April 10, 1963. Note soft area on the right of the road.



Fig. 4. MP 87-377. Condition of Southern Portion of Roadway on April 10, 1963.

**OWSLEY COUNTY  
RS 95-376  
No. 1**





## OWSLEY COUNTY

Road: The Vincent-Ida May Road from Ky. 30 at Vincent to the Lee County Line.

Project: RS 95-376.

Length: 1,900 miles.

Width: 16 feet.

Initial Condition Survey: May 23, 1962: Very little loose metal was noted. The 2-inch traffic-bound road was in good condition (Fig. 1).

Treatment: 345 pounds per square yard of dense-graded aggregate base (limestone). Sodium Chloride - 2.0 pounds per square yard (17 pounds per ton of DGA). Additional compacted thickness approximately three inches.

Contractor: Cardinal Construction Company

### Construction

Date: September 14 - September 21, 1962.

### Construction

Procedure:

1. Re-shaping existing roadway with patrol grader (Fig. 2).
2. Spreading of aggregate with a Robinson spreader.
3. Shaping surface of DGA with a grader.
4. Compaction with a pneumatic-tired roller (Fig. 3).
5. Final compaction with a 10-ton steel wheel roller (Fig. 3).

### Performance

Survey: At end of construction: Figures 4 to 7 show completed sections at the time of construction and shortly after. Note longitudinal cracking due to side slip and failure occurring on the right in Fig. 5. Also potholes formed (Fig. 6) two days after rain.

February 6, 1963: A light road oil had been applied to the road since the completion of construction. Map cracking and soft places were observed (Fig. 8). Numerous patches (Fig. 9) and many potholes were also noted.

April 15, 1963: Many potholes, both patched and open, were present over the entire project (Fig. 10). Figure 11 shows the amount of raveling occurring over the project. Several soft areas were noted. In the foreground of Fig. 12 is the best section of the roadway.



Fig. 1. RS 95-376. Condition of Roadway on May 23, 1962.



Fig. 2. RS 95-376. Existing Roadway Prepared for Application of Stone, September, 1962.

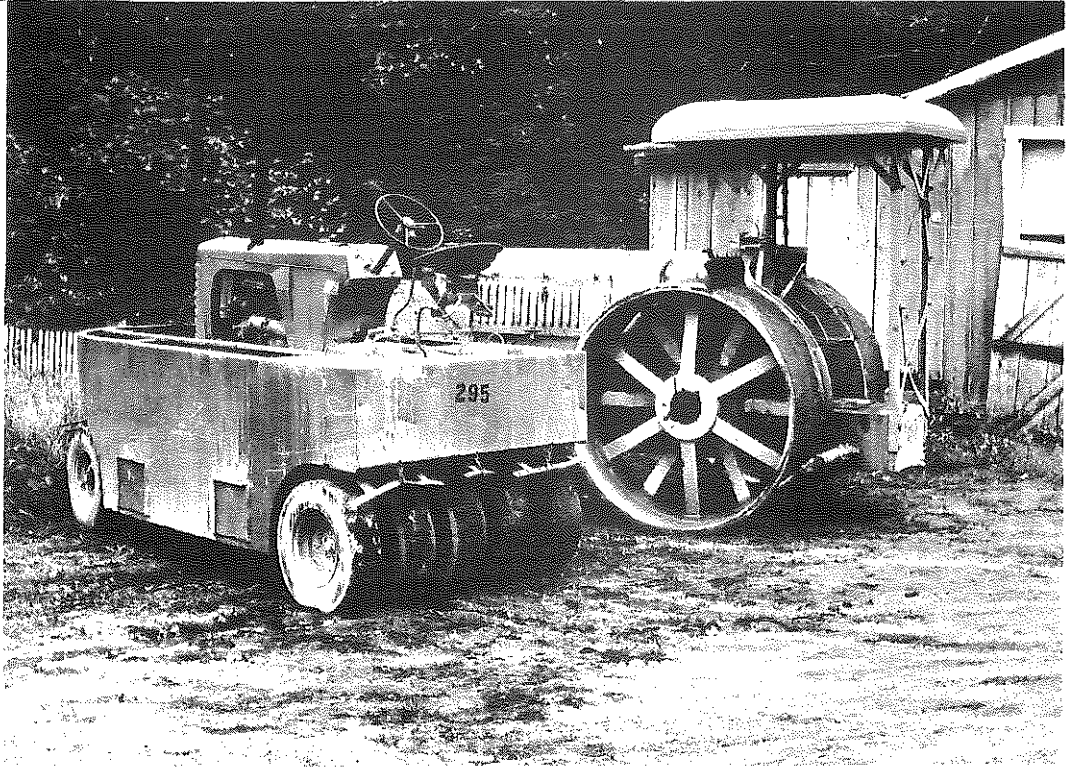


Fig. 3. RS 95-376. Compaction Equipment used on Project.



Fig. 4. RS 95-376. Compacted Granular Base, September, 1962.



Fig. 5.

RS 95-376. Road Condition Shortly After Construction, September, 1962.

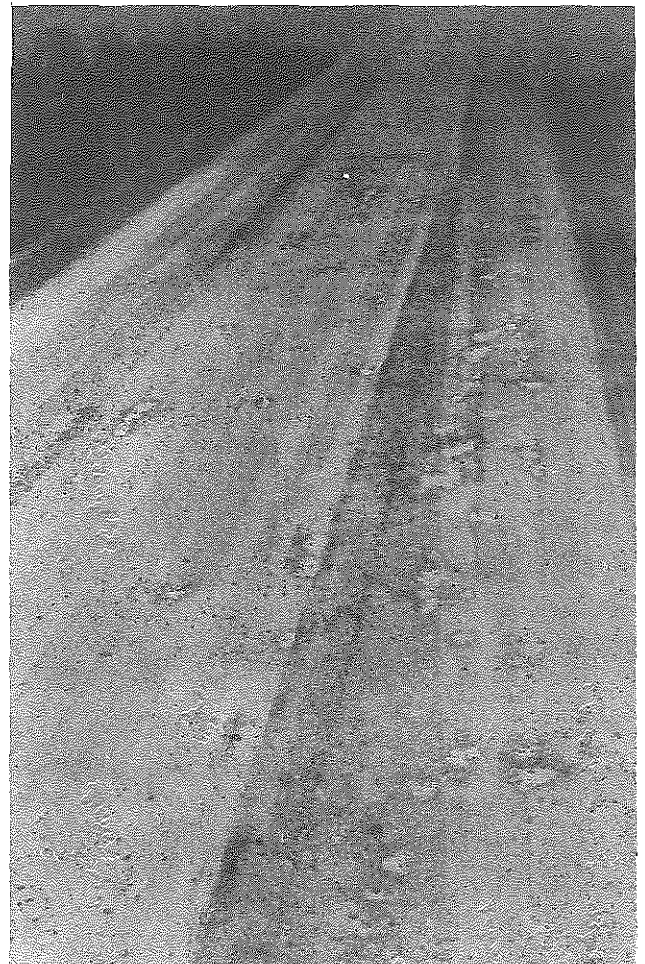


Fig. 6.

RS 95-376. Completed Roadway Two Days After a Rain Shower, September, 1962.



Fig. 7. RS 95-376. South End of Completed Project, September, 1962.



Fig. 8. RS 95-376. Roadway Condition at South End of Project on February 6, 1963.



Fig. 9. RS 95-376. Condition of Roadway on February 6, 1963.



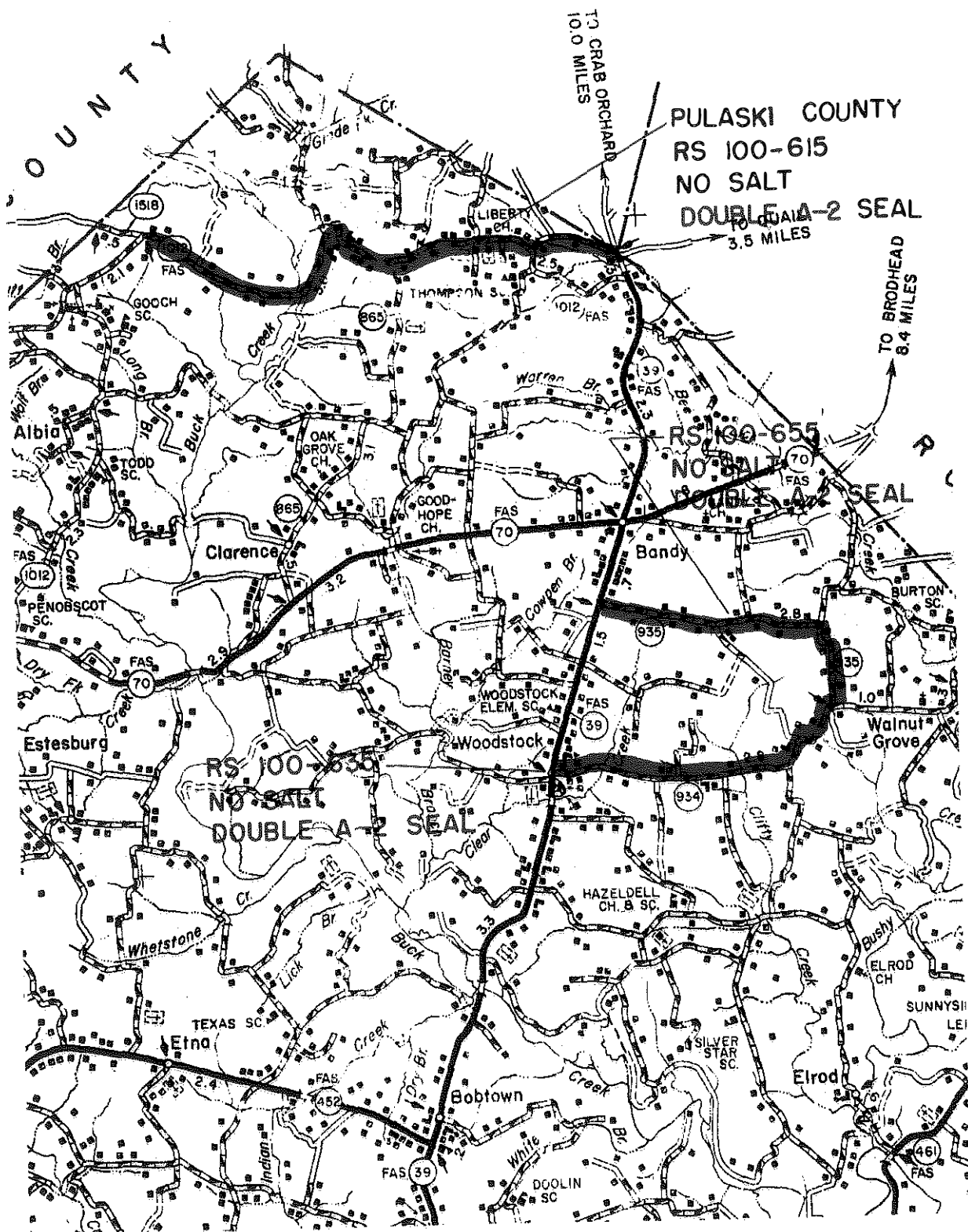
Fig. 10. RS 95-376. Potholes and Map Cracks on Roadway, April 15, 1963.



Fig. 11. RS 95-376. Condition of Roadway on April 15, 1963.



Fig. 12. RS 95-376. Photograph Showing Best Section on April 15, 1963.





PULASKI COUNTY

Roads: The Liberty-Penobscott Road (KY. 1012) from Ky. 39 near the Rockcastle County Line, extending westerly.

The Woodstock-Clifty Creek-Rockcastle County Line Road (Ky. 934) from Ky. 39 at Woodstock to Ky. 935.

The Bush Creek Road (Ky. 935) from Ky. 39 approximately 0.79 mile south of Bandy to the Woodstock-Clifty Creek - Rockcastle County Line road.

Projects: RS 100-615 (Ky. 1012);  
RS 100-635 (Ky. 934);  
RS 100-655 (Ky. 935).

Length: 11.401 miles total; 5.700 miles - RS 100-615; 2.856 miles - RS 100-635, 2.845 miles - RS 100-655.

Width: 18 feet.

Initial Condition Survey: August 16, 1962: RS 100-615; A rock outcrop was noted on the east end of the project. Thin metal on the edges of the roadway was observed. The road was in a generally good condition.

RS 100-635 & RS 100-655: There were scattered areas of potholes over both projects. Thin areas with soil showing were noted. The roadways were generally in good condition (Fig. 1 ).

Treatment: 345 pounds per square yard of dense-graded aggregate base (limestone). Double A-2 seal - 35 pounds per square yard of No. 8 limestone, 20 pounds per square yard No. 9 limestone; emulsified asphalt RS-2. Additional compacted base thickness approximately three inches.

Contractor: Kelly Contracting Company

Construction Date: July 31 - November 8, 1962

Construction Procedure: 1. Shaping existing roadway with patrol grader (Fig. 2).  
2. Watering and rolling re-shaped roadway with a 10-ton, 3-wheel roller.  
3. Spreading of dense-graded aggregate base with two spreaders.  
4. Compaction of base with a 10-ton, 3-wheel roller.  
5. Shaping surface of DGA with a patrol grader.  
6. Compaction with a vibratory compactor attached to a 3-wheel roller (Figs. 3 and 4).  
7. Re-rolling one day later to tie down loose material.

Performance  
Surveys:

January 22, 1963: The seal did not bond to the base in some areas (Fig. 5), however, it was generally in very good condition (Fig. 6). Figure 7 shows a low wet area on RS 100-635 where the only failure on these projects has occurred to date. Several wet areas were noted on project RS 100-615 (Fig. 8).

April 12, 1963: Many patched potholes were present on all three projects, except for the eastern part of project RS 100-655 (Fig. 9). Several large areas had required additional chip seal (Fig. 10). These patched areas were also accompanied by longitudinal and/or map cracks (Fig. 11). Figures 12, 13 and 14 show general views of these projects.



Fig. 1. RS 100-635. Condition of Roadway on August 16, 1962.



Fig. 2. RS 100-615. Shaped Roadway Prepared for Application of Aggregate, August, 1962.

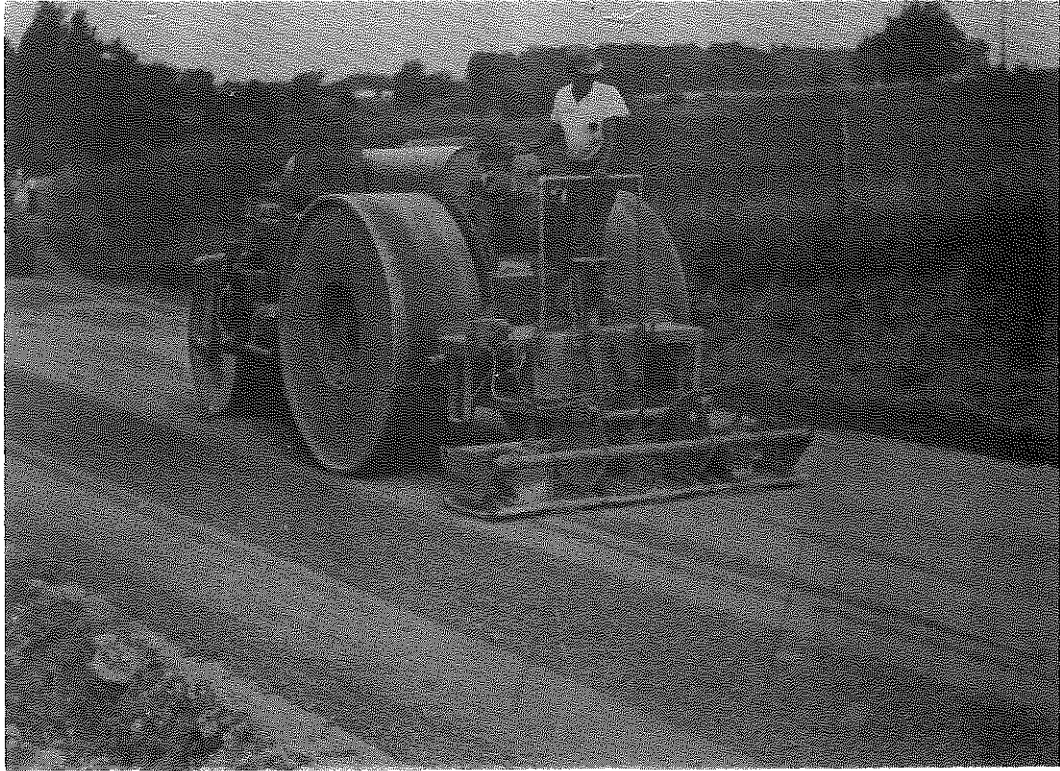


Fig. 3. RS 100-615. Compaction with a Vibratory Compactor, August, 1962.

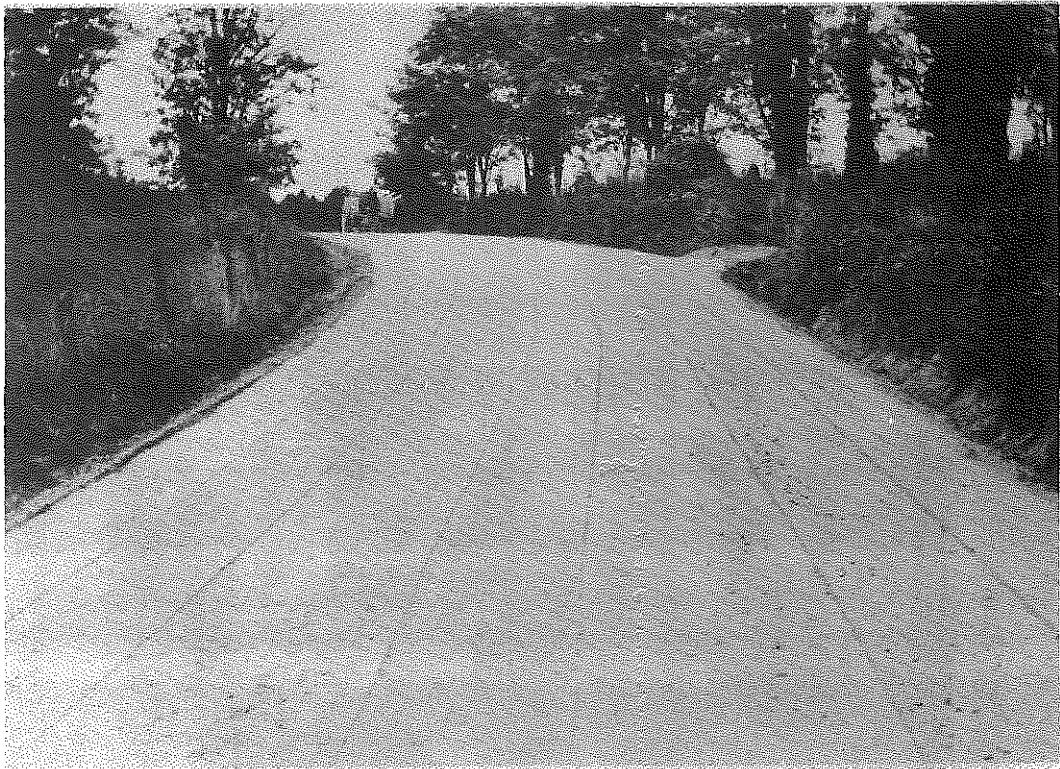


Fig. 4. RS 100-615. Compacted Granular Base, August, 1962.

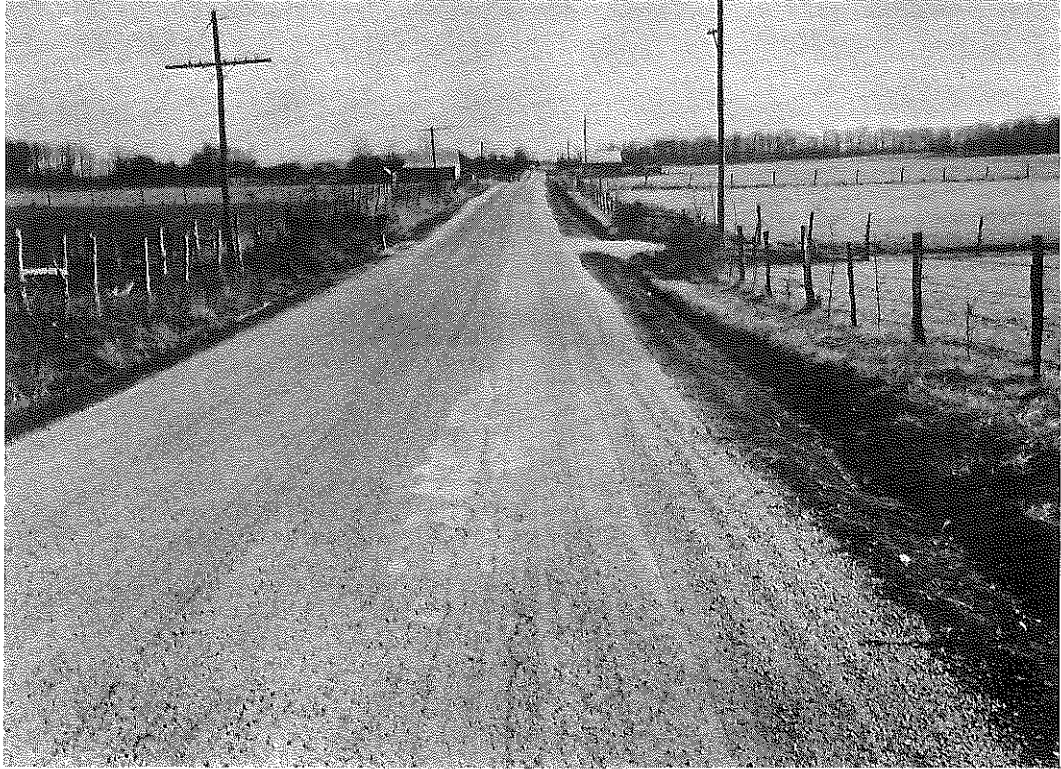


Fig. 5. RS 100-655. Area Showing Poor Bond of Double A-2 Seal to Base Course, January 22, 1963.



Fig. 6. RS 100-615. Condition of Roadway on January 22, 1963.



Fig. 7. RS 100-635. Condition of Roadway in a Low Area,  
January 22, 1963.



Fig. 8. RS 100-615. General View of a Wet Area, January 22, 1963.