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OURI COOPERATIVE HIGHWAY RESEARCH PROGRAM
REPORT 77-5

INVESTIGATION OF "D" CRACKING IN PCC PAVEMENTS

PHASE 3

Mar. 31, 1977

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Investigation of D-Cracking In Portland Cement Concrete Pavements

Phase 3 - Final Report
Study No. 68-3

Prepared By

Missouri State Highway Department

Division of Materials and Research

Research Section

January, 1977

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ABSTRACT

This report investigates the significance of specific design changes which were made in an attempt to eliminate or reduce the occurrence of D-cracking on Portland Cement Concrete Pavements.

This report covers Phase 3 or the field performance study of this investigation. The reduced maximum size coarse aggregate was shown to be a positive measure to reducing the rate of occurrence of D-cracking. A 4 mil polyethylene moisture barrier placed under the pavement did not show significant reduction in the occurrence or the rate of formation of D-cracking to warrant its continued useage. The use of a cement treated compacted granular base in an area of a possible high water table and slightly unstable fill resulted in accelerated occurrence and rate of D-cracking.

INTRODUCTION

Throughout many areas of the United States, a deterioration of portland cement concrete pavements, known as "D-Cracking" exists. Both laboratory and field analyses have been attempted to discover the cause, rate of progression, and a method of prevention of D-cracking. The coarse aggregate has generally been considered the major cause of D-cracking. In certain areas of the western part of the state, Bethany Falls limestone has been and is used extensively as a coarse aggregate in portland cement concrete pavements. These pavements have shown an increasing frequency of occurrence of D-cracking with serious deterioration in recent years.

The Phase 1 Report to this investigation, Investigation of "D" Cracking in PCC Pavements, records a significant relationship between concrete durability, as subjected to laboratory freeze and thaw, and the specific gravity properties of various samples of Bethany Falls limestone quarried within the State of Missouri.

The Phase 2 Report of this investigation records a significant relationship between concrete durability, as subjected to laboratory freeze and thaw, and the source of cement. The effect of air-entrainment was determined to be insignificant while high alkali content of the cement was shown to be more detrimental than low alkali.

These two laboratory phases of this investigation were designed to verify a decision which changed the mix designs for portland cement concrete used with coarse aggregates of known susceptibility to freeze and thaw.

Phase 3 of this Investigation, as reported herein, was designed to consider specific design changes and their significance on the occurrence of D-cracking. The major design changes being observed in this phase are the use of a 4 mil. polyethylene moisture barrier and the maximum size coarse aggregate. The method used in obtaining the data is shown in Appendix A to the report.

CONCLUSIONS

The variability in the age of the pavements considered in this study caused some problem in trying to analyze the relative rate and magnitude of deterioration. Trends and comparisons have been derived in this report which may be either strengthened or weakened as the projects continue to age.

Conclusions apparent at this time are:

1. The situation which now exists for these projects and the results collected to date, indicate that P.C.C.P. constructed with one inch maximum size Bethany Falls coarse aggregate and a 4 mil. polyethylene moisture barrier showed staining and D-cracking at an earlier age (approximately one year) than identical pavement without polyethylene. Thus, polyethylene did not eliminate nor did it reduce the occurrence of staining or D-cracking at the sawed joints.

2. Results indicate that for suspect D-cracking coarse aggregates other than Bethany Falls, which have shown poor service records and were also observed in this investigation, staining and D-cracking did show comparable deterioration relative to the polyethylene and non-polyethylene test sections as was observed for the Bethany Falls limestone. Again, the polyethylene did not eliminate nor did it reduce the occurrence of staining or D-cracking at the sawed joints.

3. Data obtained for the two inch maximum size Bethany Falls coarse aggregate projects could not be directly correlated with that obtained for the one inch maximum size results because of the lack of comparable age of pavement.

Indications were that staining occurred at approximately the same pavement age. D-cracking, however, was observed as occurring at a higher yearly rate of increase and by extrapolation was indicated as occurring at an earlier pavement age for the two inch maximum size coarse aggregate. Therefore, staining not being a problem in itself, reduction in the maximum size coarse aggregate did appear to be a practical move toward prolonging the service life of portland cement concrete pavements.

4. One project which was under contract utilizing a two inch maximum size Bethany Falls coarse aggregate, at the time the design changes were incorporated, was change ordered to place a polyethylene moisture barrier under part of the pavement. Comparison of the polyethylene and non-polyethylene sections of this project resulted in no significant reduction in the rate of staining or D-cracking being derived from the use of polyethylene.

5. On all projects investigated, with the polyethylene and no-polyethylene test sections, the first observation of D-cracking generally was noted when the pavement was 5½ to 6 years old, regardless of pavement design.

6. The rate of progression for staining and D-cracking of the portland cement concrete pavement was accelerated when the base was cement treated aggregate rather than a Type 3 (compacted granular) aggregate base, however, only one project was observed which was constructed with the cement treated aggregate base test section. The cement treated base was placed in an area of slightly unstable fill and a high free water table.

IMPLEMENTATION

1. Continue with reduction in maximum size coarse aggregate as now specified for projects constructed with the coarse aggregates showing susceptibility to freeze and thaw and consider testing for the affects of further reduction in maximum size coarse aggregate.
2. Discontinue use of a polyethylene moisture barrier on future construction projects.
3. All other concrete design changes as implemented in conjunction with the maximum size coarse aggregate be continued.
4. Conduct annual surveys of specific selected projects from within this study to establish the real significance of the trends indicated and definite terminal values for these projects.
5. To continue and complement the "Investigation of D-Cracking in Portland Cement Concrete Pavement", a new field study had been initiated. The new study entitled "Investigation of Roadway Design Variables to Reduce D-Cracking" will include the following variables: (1) aggregate size, (2) aggregate source, (3) four base types, and (4) moisture barrier between the base and portland cement concrete pavement.

DISCUSSION

SCOPE OF SURVEYS

Annual field surveys have been made on various portland concrete pavements in the geographical area where D-cracking has been observed to be the primary cause of pavement deterioration. The surveys have consisted of the observation of the relative amount of staining and D-cracking on the transverse structural cracks and sawed joints. Projects which were included in this survey were generally constructed after special provisions incorporating specific remedial design features were approved. These remedial design features were discussed in the introduction. Several projects were included in this study which were constructed without such remedial measures for the specific purpose of establishing significance of the measures which were taken. The projects included in this survey are shown in Table 1.

Twenty-eight of these projects had polyethylene sheeting placed under all or part of the pavement. The sample taken from each of these projects is shown as a function of the number of joints in the portland cement concrete pavement which was constructed with or without polyethylene sheeting. This report will terminate a maximum of six years of observations made on these projects.

Summaries of the 1976 survey data for these projects are shown in Table 2, Parts A and B. Part A shows the results of the survey for the transverse structural cracks and Part B shows

the results for the transverse sawed joints. The organization and explanation of the rating system used in these surveys is given in Appendix A. Therefore, the data in Table 2, shows the number of cracks or joints and the relative percentage of each being visually rated at each respective rating level for these test locations.

A condensed summary of the staining and D-cracking at the cracks and joints is shown in Table 3. This data, disregarding all variables, indicates that of 11,248 sawed joints observed, 7,878 or 70 percent show some amount of staining, 3,187 or 28 percent show some amount of D-cracking, and 3,343 or 30 percent show neither staining nor D-cracking. This data also indicates that of 10,689 transverse structural cracks observed, 10,063 or 94 percent show some amount of staining, 1,338 or 13 percent show some amount of D-cracking, and 646 or 6 percent show neither staining nor D-cracking. These values only reflect the gross and net totals of the structural cracks and sawed joints being observed in this survey regardless of any variables which will be further discussed in this report.

The purpose of these surveys was to provide yearly data of pavement conditions as related to specific design features as previously discussed for analysis. The remainder of this report will consider such analyses.

GENERAL

The change in the observed state of deterioration of concrete pavements from year to year as a result of these surveys is difficult to present. Two methods are used in this report, the graphical consideration and the analytical consideration, utilizing a Deterioration Function thus derived for this study.

Histograms are beneficial in showing visually a relative increase in deterioration with time. However, to use histograms or any other means of showing change with time, the basic number of items being observed must be constant. In the case of the structural cracks, the continual increasing number of cracks occurring from observation to observation, especially during the few years immediately after construction, influences the data to where the rate of failure from the previous year may be a negative value. Therefore, the histograms thus presented in this report, Figures B-1 through B-42 as contained in Appendix B, only show the results obtained for the sawed joints.

The method which is used to survey and record a pavement's present relative state of deterioration yields itself to some variation. The moisture condition in the concrete at the moment of observation and the general weather conditions preceeding the survey are very influential factors to the visual rating system. High moisture content in the surface layer of the concrete pavement will cause the cracks which are very hard to see in the dry condition to be easily seen. The wear of the concrete surface in the wheelpaths, especially of the driving lane of divided

roadways often obscures the deterioration to where visual observation is impossible. Other forms of deterioration may, in their early stages, show similar characteristics as the early stage of D-cracking. In such cases, the observation may be noted as D-cracking until sufficient time has passed to allow the full development of the failure. These variations may, over a period of time, cause slight adjustments in the data to be necessary.

The analyses which follow are based on general trends of the observed deterioration occurring within the projects surveyed. The data which were collected from each of these projects and previously shown in Table 2, has been further condensed to a single algebraic value which has been labeled "Deterioration Function" (λ). The deterioration function is a weighted parameter which has a value limit of zero, perfect clear pavement, to 100, completely deteriorated to a state of possibly needing repair or overlaying. This parameter accumulates the individual percentages representing each increment of area affected, as shown in Table 2, into one numerical number. However, the addition of these percentages are influenced by an ascending power series whereby, the sawed joints which have very little deterioration have less influence than those having more serious deterioration. This parameter allows for a pavement within a project which is very hard to summarize as being in a particular state of distress to be evaluated and compared with a project having a more uniform and more obvious state of distress. The parameter also allows for several crews to work simultaneously on the field surveys in order

to cover the projects in relatively similar environments respective to moisture and weather conditions.

The mathematics of the parameter are as follows:

$$_{y}\lambda_{x} = A + 0.8B + (0.8)^{2}C + (0.8)^{3}D + \ldots + (0.8)^{7}H$$

Where:

y = The calendar year the survey was made

x = The project identification code

A = Percentage of cracks or joints with 25 square feet or more affected area

B = Percentage of cracks or joints with 15 to 25 square feet or more affected area

C = Percentage of cracks or joints with 10 to 15 square feet of affected area

D = Percentage of cracks or joints with 5 to 10 square feet of affected area

E = Percentage of cracks or joints with 2 to 5 square feet of affected area

F = Percentage of cracks or joints with 1 to 2 square feet of affected area

G = Percentage of cracks or joints with 1/2 to 1 square foot of affected area

H = Percentage of cracks or joints with 0 to 1/2 square foot of affected area.

This equation effectively reduces the percentages of the individual rating values to one parameter which may then be used for direct comparisons of the associated variables.

The Deterioration Function for the projects included in this study for each year of observation and for each construction design are given in Table 4. The age of the pavement when the observations were made are shown in parenthesis immediately above the column of data for that particular project. The deterioration functions are also shown for the structural cracks in this table for information only.

POLYETHYLENE VS NO POLYETHYLENE MOISTURE BARRIER

Bethany Falls Limestone, One Inch Maximum Size, With Test Sections

The fourteen projects considered in this analysis were those which contain short test sections of portland cement concrete pavement which were constructed without the polyethylene moisture barrier. These test sections were constructed with the intention of providing a basis for direct comparison of the influence of the polyethylene moisture barrier. The data from these projects have been retabulated, as shown in Table 5, relative to the age of the pavement and particular item being observed. Part A is the results of the observed staining and Part B is the results of the observed D-cracking on the sawed joints.

Stain on the sawed joints has in all but a very few cases been noted on pavements prior to the observation of D-cracking, however, no particular indication has been derived from this association. Shown in Table 6, Part A, are the relative years at which each of the particular items were observed for the first time for each of these projects. Analyses two and three from Part B, Table 6, of the year at which stain was observed versus the year at which D-cracking was observed within each of the types of construction, yields non-significant results, because of the relative low coefficients of correlation and the high coefficients of variation. Thus, the predictability of D-cracking from the observed stain condition can not be done with any degree of reliable success. The span of time from the first indication of staining to the first indication of D-cracking may vary, according to these results, from zero to four years.

The association of the first observed occurrence of stain on the two types of construction (polyethylene or no polyethylene) are shown in analysis number one of Part B, Table 6. The correlation is significant, however, does carry a relatively high coefficient of variation. Regardless of the correlation level, the trend in the data shows without exception that stain did occur on the polyethylene construction in advance to or at the same time as that observed on the non-polyethylene construction.

The average deterioration functions relative to stain on the sawed joints and the age of the pavement with respect to the type of construction are shown graphically in Figure 1. This substantiates the earlier occurrence of stain on the polyethylene design than on the non-polyethylene design and also shows the occurrence to be advanced by approximately one year. Based on the average yearly rate of increase in the deterioration functions of 7.63 for the polyethylene design and 7.79 on the non-polyethylene designs, it is concluded that the annual rate of increase in stain is the same regardless of the construction design, even though they may be offset in occurrence by approximately one year. It must be noted in this text that the earliest that any observation was made on any project was at the age of two years, therefore, no zero point may be definitely shown for the polyethylene design data.

D-cracking has not been observed on several of these projects, however, there are six comparisons which are available for analysis. The results, as shown in analysis number four of Part B, Table 6, indicate that a correlation between type of construction does exist even though the average age at which D-cracking was noted on each type of construction are very close. Without exception,

D-cracking on the polyethylene construction was observed at the same time or one year prior to that observed on the associated non-polyethylene construction.

The yearly rate of increase in D-cracking from the first year in which D-cracking was observed to the last year that data was obtained was 3.01 for the polyethylene design and 2.37 for the non-polyethylene design. However, as shown in Figure 1, the rate of D-cracking takes a sharp change at six years of age and becomes 6.64 for the polyethylene design and 5.46 for the non-polyethylene design.

The results indicate that for the period of observation of these projects constructed with one inch Bethany Falls limestone with and without the polyethylene moisture barrier, the polyethylene did not eliminate nor did it reduce the occurrence of staining or D-cracking at the sawed joints.

Bethany Falls Limestone, One Inch Maximum Size, Without Test Sections

Several projects were observed which were constructed with or without polyethylene moisture barrier under all of the portland cement concrete pavement, with no design exceptions. These projects are shown in Table 7 with the calculated deterioration function for the observations on the sawed joints. These projects are similar in that all were constructed with Bethany Falls limestone with a one inch maximum size coarse aggregate gradation.

The results obtained from these projects may be compared with the previous discussion by regressing to Figure 1. The deterioration functions for the staining which has been observed is

generally higher, per relative years, on these projects than was observed as a median on the projects where test sections were located. Values for the deterioration function in the 40 range at the age of 4 years is almost double that shown for the polyethylene design in Figure 1. Likewise, the values for Project No. 28, the no-polyethylene design, indicated a considerably accelerated rate of failure as previously discussed. This data does indicate that the no-polyethylene design has greater amounts of staining than the polyethylene design. Observation of the D-cracking, however, indicates the reverse of this trend. From the three projects which show some D-cracking, the no-polyethylene design shows the least amount which, from their very low values, only represent a token amount of D-cracking occurring.

Therefore, the observations of these projects indicate similar trends to that previously stated for the projects having one inch Bethany Falls limestone.

Various Coarse Aggregates or Combinations of, With One Inch Maximum Size Design

Several projects have been included in this survey which were constructed with the same requirements of reduced aggregate size and, with one exception, the use of polyethylene moisture barrier. Two projects (Numbers 1 and 2) are constructed with Higginsville limestone, one (Number 4) with Raytown limestone, one (Number 8) with a mixture of Raytown and Bethany Falls limestones, one (Number 24) with a mixture of Amazonia and Bethany Falls limestones, and one (Number 38) with Oread limestone. These projects were included because from past service records, they too have shown

problems with D-cracking. The deterioration functions thus derived are shown in Table 8 for the staining and D-cracking on the sawed joints.

The results of this comparison may be reduced to the average deterioration function and presented as shown in Figure 2. These curves which represent staining and D-cracking for the sawed joints indicate that the rate of failure of these projects, for the period of observation, are very similar to that shown for the projects constructed with Bethany Falls limestone. The relationship between the polyethylene and no-polyethylene designs for both the staining and D-cracking observations is generally the same as previously stated for the Bethany Falls limestone. The polyethylene design indicates that the rate of staining and D-cracking will be similar to that for the no-polyethylene design, however, the magnitude of failure shows the occurrence to be advanced by approximately one year. The negative rate shown for the no-polyethylene projects for the period of 6 to 7 years of age is a result of one project dropping in magnitude of deterioration function and another being eliminated from observation because of a seal which was placed on the joints. Some effects such as weather and relative humidity may greatly affect the value of the staining which is observed. The dry weather which has been prevalent throughout this year may have caused these fluxuations.

The results indicate that for the period of observation of these projects constructed with one inch coarse aggregate of the Higginsville, Raytown, Amazonia and Oread limestones with or without the polyethylene moisture barrier, the polyethylene did not eliminate nor did it reduce the occurrence of staining or D-cracking at the sawed joints.

ONE INCH VS TWO INCH MAXIMUM SIZE COARSE AGGREGATE

Bethany Falls Limestone

Six projects were included in this study which were constructed under the standard pavement design with two inch maximum coarse aggregate with no-polyethylene moisture barrier. The results of the field surveys are shown in Table 9. These projects were included for the specific purpose of giving a comparitive analysis of the design changes which were made relative to the D-cracking problem.

The results of this analysis are best shown by reducing the data in Table 9 to the average deterioration function which is shown in Figure 3. The results which were discussed previously for the one inch maximum size coarse aggregate are also shown in this figure for comparison. The age differential is a result of the projects which were selected for observation had been in service for some time and that very little construction using Bethany Falls limestones had occurred for a span of approximately four years prior to the design change.

These curves which represent the staining and D-cracking on the one and two inch maximum designs indicate that the rate of failure compares very well for the staining. Extrapolation of the one inch Bethany Falls limestone curve would give values very near that shown for the two inch Bethany Falls limestone. Thus, the indication presented by this data is that the one inch coarse aggregate has not appreciably decreased the occurrence of staining on the sawed joints.

The occurrence of D-cracking, however, is not as clearly defined because of the minimal amount of data obtained for the one inch Bethany Falls projects. Comparison of the rate of failure, when computed over the later two years of observation for the one inch maximum size coarse aggregate, does show that the two inch maximum size coarse aggregate has a significantly higher rate of increase in D-cracking per year. This data is only good for the particular years of observation and only with continued observation of these projects will definite comparisons be possible.

These observations do indicate that the rate of D-cracking may generally be decelerated by reducing the maximum size coarse aggregate, however, the rate of staining does not appear to be affected. Staining is not a problem in itself, therefore, reduction in the coarse aggregate does seem to be a practical move toward prolonging the service life of portland cement concrete pavements.

Various Coarse Aggregates Other Than Bethany Falls With Two Inch Maximum Size Design

Four projects were included in this study which were constructed during the same time span as the one inch maximum size Bethany Falls projects which were previously discussed. Two of these projects were constructed with Burlington limestone, one with Kimmswick limestone, and one with Kereford limestone. The results of the surveys on these projects are shown in Table 10.

Staining on the two Burlington limestone projects indicate quite a large variation in age of occurrence. Fine aggregate is

the only material that was from the same source in these projects. The coarse aggregate, cement and thickness designs, were all variables as well as date of construction. Therefore, no reason can be evaluated from these observations.

Project No. 31, Kimmswick limestone, shows results which are comparable to that previously shown for the various coarse aggregates with one inch maximum size design.

Project No. 37, Kereford limestone, shows results which indicate that staining and D-cracking had occurred at a very young age. The magnitude of the deterioration functions would indicate that the two inch Kereford creates much the same rate and amount of deterioration as does the two inch Bethany Falls limestone. As a result of similar observations, the Kereford limestone was included in the job special provisions requiring the one inch maximum gradation with polyethylene moisture barrier.

The data thus obtained for the two inch maximum coarse aggregate projects cannot be definitely correlated with that shown for the one inch maximum coarse aggregate projects because of lack of comparable age of pavement. Indications are prevalent, however, that staining will continue to occur at approximately the same age and will continue at very similar rates per year thereafter. D-cracking of the one inch design appears to lag the two inch design in date of initial occurrence and rate of increase thereafter. Benefit of a direct comparison will only be possible after several more years of observations on these particular projects.

TWO INCH MAXIMUM SIZE BETHANY FALLS COARSE AGGREGATE WITH OTHER VARIABLES

Polyethylene Vs. No-Polyethylene

One project, which was under contract during the early stages of the change in concrete design and the requirement of polyethylene moisture barrier, was constructed with two inch maximum size Bethany Falls coarse aggregate under the standard specifications of that date, however, included test sections of P.C.C.P. with the polyethylene moisture barrier. The results of the surveys on this project, Project No. 3 or C058-36(9), are shown in Table 11, Part A.

The occurrence of staining and D-cracking on this project are greatly accelerated as shown in Figure 4, to those results which were discussed previously. The entry values at 4 years of age are relatively similar to those shown for the one inch maximum size design, however, the rate of increase per year thereafter is greatly accelerated. The rate per year of stain and D-cracking on the no-polyethylene sections were 16.57 and 14.88 respectively. This is slightly greater than twice that shown for the two inch Bethany Falls projects discussed in Figure 45. This increased rate may be attributed to any number of variables, but the most important fact is that the polyethylene afforded little or no protection to the concrete. The occurrence of stain and D-cracking on the polyethylene test sections superseded that shown for the no-polyethylene test sections by approximately one year. This follows the same pattern which was indicated for the one inch maximum design for the Bethany Falls limestone.

Based on this project, the use of a polyethylene moisture barrier with two inch maximum Bethany Falls coarse aggregate design has not shown a significant decrease in the rate of deterioration. Staining was observed to occur at a rate exceeding that shown for the one inch maximum size Bethany Falls coarse aggregate. D-cracking has excelled at a higher rate than has been shown for any of the other projects in this survey and at the age of eight years has a deterioration function which should cause concern.

Cement Treated Vs. Type 3, Compacted Granular, Base

One project which was constructed in conjunction with the Missouri Road Test, AASHTO Satellite Program, Sec. 31(1), was also included in this survey because of the change in base design. The base design for the 6 inch non-reinforced P.C.C.P. in this project was either 4 inches of Type 3 aggregate base or 4 inches of cement treated Type 3 aggregate base. A section of 8 inch non-reinforced P.C.C.P. was included in the summary of the non-treated base design. Combination of the 6 inch and 8 inch pavement thickness designs with the standard non-treated base did not change the ultimate conclusions significantly. Therefore, the combined results of the observations made on this project are shown in Table 11, Part B and in Figure 4.

Staining on the sawed joints with the untreated base is much less than that which was observed with the cement treated base or the other two inch Bethany Falls projects in this study. Staining on the sawed joints with the cement treated base is similar in

magnitude but slightly higher in rate of occurrence as was observed for the other two inch Bethany Falls projects constructed without polyethylene moisture barriers.

D-cracking on the sawed joints with the cement treated base has increased at a much higher rate than was previously shown for two inch Bethany Falls projects. The magnitude of deterioration of the D-cracking of the sawed joints on the cement treated base is considerably higher than is shown for the sawed joints with the untreated Type 3 aggregate base. D-cracking on the sawed joints with the untreated base are the lowest for all the Bethany Falls projects in this study which are 12 years of age or older.

This project was constructed in a geographical region having low rolling hills. The cement treated base test location was placed on a zero percent grade section, however, a channel change or a relatively larger water shed had to be relocated. The result was that the cement treated base test section is in an area of a slightly unstable fill and a relatively high free water table.

Therefore, based on one project only and the conditions mentioned above, the use of a cement treated base with a two inch maximum Bethany Falls coarse aggregate has not shown a significant decrease in the rate of deterioration.

TABLES

and

FIGURES

Table 1

List of Projects Surveyed

Proj. Ident.	Project Number	Route	County	Poly Used	Minimum % of Joints Sampled Poly	Minimum % of Joints Sampled No Poly	Coarse Aggr. Size
1	F-50-2(7)	50	Johnson	Yes	25.1	100	1"
2	F-50-2(11)	50	Johnson	Yes	23.8	100	1"
3	C058-36(9)	36	Linn	Yes	100	100	2"
4	**F-36-1(16)	36	DeKalb	Yes	22.8	100	1"
5	C083-9(2)UA	9	Platte	Yes	24.8	100	1"
6	**I-35-1(11)14	I-35	Clay	Yes	23.4	100	1"
7	I-IG-29-2(46)58	I-29	Andrew	Yes	100	100	1"
8	F-6-1(1)	6	Daviess	Yes	34.3	100	1"
9	C031-6(8)	6	Daviess	Yes	32.4	100	1"
10	U-45-1(3)	9	Platte	Yes	34.7	100	1"
11	#U-45-1(6)	9	Clay	Yes	Omitted		1"
12	###U-71-5(6)	291	Jackson	Yes	41.9	100	1"
13	C025-BB(1)	BB	Clinton	Yes	31.0	100	1"
14	F-71-4(9)	71	Cass	Yes	17.1	90.3	1"
15	*** ###I-435-1(61)16UA	I-435	Jackson	Yes	37.7	100	1"
16	###I-29-1(12)13C	I-29	Platte	Yes	15.2	68.9	1"
17	@I-29-1(12)13A&B	I-29	Platte	Yes	16.6	N/A	1"
18	I-35-2(27)105	I-35	Harrison	Yes	19.6	N/A	1"
19	C048-W(4)	W	Jackson	Yes	35.7	N/A	1"
20	***F-71-4(10)	71	Cass	Yes	26.1	100	1"
21	*** ###I-IG-435-1(59)	I-435	Jackson	Yes	23.5	100	1"
22	SU-SUG-647(7)	210	Clay-Jackson	Yes	21.2	N/A	1"
23	C024-210(1)U	210	Clay	Yes	27.2	100	1"
24	I-29-2(56)70	I-29	Holt	Yes	21.3	100	1"
25	I-29-2(45)70	I-29	Holt	Yes	100	N/A	1"
26	@I-29-2(18)53	I-29	Buchanan	No	N/A	23.8	2"
27	I-29-2(9)55	I-29	Andrew	No	N/A	100	2"
28	I-IG-35-2(18)61	I-35 & 69	Daviess	No	N/A	100	1"
29	##Sec. 31(1)	6	Daviess	No	N/A	17.2	2"
30	F-71-3(12)	71	Bates	No	N/A	25.5	2"
31	Sec. 61(2)	36	Macon	No	N/A	19.8	2"
32	C020-32(4)	32	Cedar	No	N/A	14.7	2"
33	Sec. 48(6)	50	Jackson	No	N/A	14.7	2"
34	F-50-1(2)	50	Jackson	No	N/A	22.8	2"
35	***C051-50(7)	50	Johnson	No	N/A	19.0	2"
36	Sec. 40(2)	6	Grundy	No	N/A	41.8	2"
37	I-29-2(49)	I-29	Andrew	No	N/A	100	2"
38	*I-29-2(59)111	I-29	Atchison	No	N/A	20.0	1"
39	*F-65-5(1)	65	Grundy	Yes	24.1	N/A	1"
40	*C024-71B(4)U	291	Clay-Jackson	Yes	18.2	N/A	1"
41	*###I-435-1(8)	I-435	Clay	Yes	33.4	N/A	1"
42	*###I-IG-435-1(9)	I-435	Jackson	Yes	42.1	N/A	1"

* These projects were not previously surveyed prior to 1976.

** Data obtained for these projects is reduced for 1976 because either the structural cracks or the joints or both had been freshly sealed with prime.

*** Data obtained for these projects is reduced for 1976 because the surface of the pavement around the structural cracks or sawed joints or both was covered by excessive mastic running out of the cracks and/or joints.

\# Short project, therefore, was omitted from test.

This project is not applicable to the Poly - No Poly test because it was constructed with cement treated and non-treated base, however, will be included as no poly in its entirety.

Data obtained for these projects is a combination of 12 and 24 foot wide test sections because the width of the pavement was 36 feet.

@ Data obtained for these projects is reduced for 1976 because of asphalt overlay at the beginning or end of these projects.

Table 2A

Summary of "D" Cracking Survey

CRACKS

Defective Area in Sq. Ft.	Project No. 1 F-50-2(7) Johnson Co. Route 50				Project No. 2 F-50-2(11) Johnson Co. Route 50				Project No. 3 C058-36(9) Linn Co. Route 36				Project No. 4 F-36-1(16)** DeKalb Co. Route 36				Project No. 5 C083-9(2)UA Platte Co. Route 9			
	No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---	1	3.4					---	---	---	---
½-1	---	---	---	---	---	---	---	---	6	4.0	5	17.3					---	---	---	---
1-2	3	2.4	2	2.1	1	1.6	1	0.5	7	4.6	---	---					1	1.8	4	8.2
2-5	3	2.4	4	4.3	1	1.6	9	4.6	5	3.3	3	10.4					2	3.7	6	12.2
5-10	9	7.1	8	8.6	9	14.9	26	13.1	5	3.3	1	3.4					18	33.3	2	4.1
10-15	17	13.5	22	23.7	21	34.4	63	31.8	25	16.6	8	27.6			Structural Cracks have been sealed.		12	22.2	11	22.4
15-25	88	69.8	32	34.4	29	47.5	96	48.5	24	15.9	8	27.6					2	3.7	19	38.8
25+	0	0.0	2	2.2	---	---	3	1.5	79	52.3	3	10.3					0		3	6.1
Clear	6	4.8	23	24.7	0	0.0	0	0.0	0	0.0	0	0.0					19	35.3	4	8.2
"D" Cracking 0-½	---	---	1	1.1	---	---	4	2.0	2	1.3	---	---					---	---	---	---
½-1	---	---	---	---	---	---	5	2.5	20	13.2	6	20.7					---	---	---	---
1-2	---	---	---	---	---	---	2	1.0	11	7.3	---	---					---	---	---	---
2-5	---	---	---	---	---	---	---	---	5	3.3	2	6.9					---	---	---	---
5-10	---	---	---	---	---	---	---	---	8	5.3	3	10.3					---	---	---	---
10-15	---	---	---	---	---	---	1	0.5	22	14.6	5	17.2					---	---	---	---
15-25	---	---	---	---	---	---	---	---	16	10.6	2	6.9					---	---	---	---
25+	---	---	---	---	---	---	---	---	59	39.1	3	10.3					---	---	---	---
Clear	126	100.0	92	98.9	61	100.0	186	94.0	8	5.3	8	27.7					54	100.0	49	100.0
Clear*	6	4.8	23	24.7	0	0.0	0	0.0	0	0.0	0	0.0					19	35.2	4	8.2
Total Cracks	126		93		61		198		151		29						54		49	
	1 inch Higginsville (1969)				1 inch Higginsville (1969)				2 inch Bethany Falls (1967)								1 inch Bethany Falls (1970)			

Defective Area in Sq. Ft.	Project No. 6 I-35-1(11)14*** Clay Co. Route I-35				Project No. 7 I-IG-29-2(46)58 Andrew Co. Route I-29				Project No. 8 F-6-1(1) Daviess Co. Route 6				Project No. 9 C031-6(8) Daviess Co. Route 6				Project No. 10 U-45-1(3) Platte Co. Route 9			
	No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1	1	1.0	2	1.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1-2	1	1.0	6	2.8	9	2.1	7	0.3	---	---	---	---	---	---	---	---	---	---	2	3.6
2-5	26	25.7	16	7.6	10	2.3	60	2.5	3	15.8	3	4.7	---	---	1	7.1	1	9.1	6	10.9
5-10	48	47.5	56	26.5	2	0.5	108	4.5	7	36.8	11	17.2	2	13.3	---	---	7	63.6	20	36.4
10-15	16	15.8	99	46.9	64	14.8	727	30.5	3	15.8	11	17.2	---	---	1	7.1	3	27.3	19	34.6
15-25	3	3.0	14	6.6	338	78.2	1237	51.8	6	31.6	30	46.9	---	---	6	42.9	---	---	8	14.5
25+	---	---	3	1.4	8	1.8	238	10.0	---	---	4	6.2	13	86.7	6	42.9	---	---	---	---
Clear	6	6.0	15	7.2	1	0.3	9	0.4	0	0.0	5	7.8	0	0.0	0	0.0	0	0.0	0	0.0
"D" Cracking 0-½	---	---	1	0.5	9	2.1	31	1.3	---	---	1	1.6	1	6.7	---	---	---	---	---	---
½-1	---	---	1	0.5	37	8.6	91	3.8	---	---	---	---	---	---	---	---	---	---	---	---
1-2	---	---	---	---	24	5.6	79	3.3	---	---	---	---	---	---	---	---	---	---	---	---
2-5	---	---	---	---	2	0.5	72	3.0	---	---	---	---	---	---	---	---	---	---	---	---
5-10	---	---	---	---	2	0.5	35	1.5	---	---	---	---	---	---	---	---	---	---	---	---
10-15	---	---	---	---	---	---	10	0.4	---	---	---	---	---	---	---	---	---	---	---	---
15-25	---	---	---	---	---	---	2	0.1	---	---	---	---	---	---	---	---	---	---	---	---
25+	---	---	---	---	---	---	1	0.0	---	---	---	---	---	---	---	---	---	---	---	---
Clear	101	100.0	209	99.0	358	82.7	2065	86.6	19	100.0	63	98.4	14	93.3	14	100.0	11	100.0	55	100.0
Clear*	6	5.9	15	7.1	1	0.2	9	0.4	0	0.0	5	7.8	0	0.0	0	0.0	0	0.0	0	0.0
Total Cracks	101		211		432		2386		19		64		15		14		11		55	
	1 inch Bethany Falls (1969)				1 inch Bethany Falls (1968)				1 inch Raytown & Bethany Falls (1969)				1 inch Bethany Falls (1970)				1 inch Bethany Falls (1971)			

Defective Area in Sq. Ft.	Project No. 11 U-45-1(6) Clay Co. Route 9				Project No. 12 U-71-5(6) Jackson Co. Route 291				Project No. 13 C025-BB(1) Clinton Co. Route BB				Project No. 14 F-71-4(9) Cass Co. Route 71				Project No. 15 I-435-1(61)16UA*** Jackson Co. Route I-435			
	No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1-2					---	---	---	---	---	---	---	---	---	---	2	0.4	---	---	3	14.3
2-5					---	---	---	---	---	---	---	---	17	4.9	22	3.9	3	23.0	2	9.5
5-10	Short Project Omitted				1	4.0	3	2.9	1	33.3	---	---	24	6.9	55	9.8	4	30.8	3	14.3
10-15					7	28.0	50	48.5	1	33.3	2	11.8	39	11.2	86	15.4	2	15.4	11	52.4
15-25					17	68.0	46	44.7	---	---	8	47.1	102	29.4	258	46.2	---	---	---	---
25+					---	---	4	3.9	---	---	1	5.9	---	---	19	3.4	---	---	---	---
Clear					---	---	---	---	1	33.4	6	35.2	165	47.6	117	20.9	4	30.8	2	9.5
"D" Cracking 0-½					---	---	1	1.0	---	---	---	---	3	0.9	4	0.7	---	---	---	---
½-1					---	---	---	---	---	---	---	---	---	---	6	1.1	---	---	---	---
1-2					---	---	---	---	---	---	---	---	---	---	18	3.2	---	---	---	---
2-5					---	---	---	---	---	---	---	---	---	---	8	1.4	---	---	---	---
5-10					---	---	---	---	---	---	---	---	---	---	5	0.9	---	---	---	---
10-15					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15-25					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25+					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clear					25	100.0	102	99.0	3	100.0	17	100.0	344	99.1	518	92.7	13	100.0	21	100.0
Clear*					0	0.0	0	0.0	1	33.3	6	35.3	165	47.6	117	20.9	4	30.8	2	9.5
Total Cracks					25		103		3		17		347		559		13		21	
	1 inch Bethany Falls (1971)				1 inch Bethany Falls (1970)				1 inch Bethany Falls (1968)				1 inch Bethany Falls (1970)				1 inch Bethany Falls (1970)			

* Total number of cracks or joints which have neither staining or "D" cracking.

** Data represents the joints and/or cracks which were observed. Sealing operations on this pavement prevented a complete survey from being made.

*** Data represents the joints and/or cracks which were surveyed. The surface of the pavement was covered with excess mastic running out out of the cracks and/or joints preventing a complete survey from being made.

Table 2A (Continued)

Summary of "D" Cracking Survey

CRACKS

Defective Area in Sq. Ft.	Project No. 16 I-29-1(12)13C Platte Co. Route I-29				Project No. 17 I-29-1(12)13A&B Platte Co. Route I-29		Project No. 18 I-35-2(27)105 Barrison Co. Route I-35		Project No. 19 C048-W(4) Jackson Co. Route W		Project No. 20 F-71-4(10)*** Cass Co. Route 71			
	No Poly		Poly		Poly		Poly		Poly		No Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1	---	---	2	0.8	---	---	---	---	---	---	---	---	---	---
1-2	1	1.7	24	8.2	---	---	3	1.5	17	13.3	---	---	1	0.3
2-5	6	10.5	72	24.7	1	1.4	17	8.1	25	19.7	1	0.7	17	5.2
5-10	27	47.4	118	40.6	7	10.0	77	37.4	9	7.1	2	1.3	51	15.6
10-15	20	35.1	65	22.3	27	38.6	79	38.4	3	2.4	20	13.1	81	24.8
15-25	3	5.3	10	3.4	33	47.1	28	13.6	---	---	31	20.4	173	52.9
25+	---	---	---	---	2	2.9	---	---	---	---	98	64.5	1	0.3
Clear	0	0.0	0	0.0	0	0.0	2	1.0	73	57.5	0		3	0.9
Cracking "D" 0-½	---	---	---	---	---	---	---	---	1	0.8	---	---	---	---
½-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1-2	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2-5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5-10	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10-15	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15-25	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25+	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clear	57	100.0	291	100.0	70	100.0	206	100.0	126	99.2	152	100.0	327	100.0
Clear*	0	0.0	0	0.0	0	0.0	2	1.0	73	57.5	0	0.0	3	0.9
Total Cracks	57		291		70		206		127		152		327	
	1 inch Bethany Falls (1970)				1 inch Bethany Falls (1970)		1 inch Bethany Falls (1972)		1 inch Bethany Falls (1970)		1 inch Bethany Falls (1971)			

Defective Area in Sq. Ft.	Project No. 21 I-IG-435-1(59)*** Jackson Co. Route I-435				Project No. 22 SU-SUG-647(7) Clay-Jackson Co. Route 210		Project No. 23 C024-210(1)U Clay Co. Route 210				Project No. 24 I-29-2(56)70 Holt Co. Route I-29				Project No. 25 I-29-2(45)70 Holt Co. Route I-29	
	No Poly		Poly		Poly		No Poly		Poly		No Poly		Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1	---	---	---	---	---	---	---	---	---	---	---	---	1	0.4	---	---
1-2	---	---	---	---	---	---	1	6.6	3	6.0	13	5.8	54	24.3	4	3.7
2-5	---	---	---	---	2	1.7	3	20.0	7	14.0	34	15.0	23	10.3	5	4.7
5-10	---	---	---	---	7	5.8	7	46.7	5	10.0	47	20.8	45	20.2	18	16.7
10-15	---	---	---	---	30	25.0	4	26.7	7	14.0	64	28.3	47	21.1	35	32.4
15-25	---	---	---	---	71	59.2	---	---	8	16.0	63	27.9	48	21.5	44	40.7
25+	---	---	---	---	10	8.3	---	---	1	2.0	2	0.9	1	0.4	2	1.8
Clear	---	---	16	100.0	0	0.0	0	0.0	19	38.0	3	1.3	4	1.8	0	0.0
Cracking "D" 0-½	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	1.8
½-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	2.8
1-2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5	4.6
2-5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5-10	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10-15	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15-25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25+	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clear	---	---	16	100.0	120	100.0	15	100.0	50	100.0	226	100.0	223	100.0	98	90.8
Clear*	---	---	16	100.0	0	0.0	0	0.0	19	38.0	3	1.3	4	1.8	0	0.0
Total Cracks	0		16		120		15		50		226		223		108	
	1 inch Bethany Falls (1970)				1 inch Bethany Falls (1972)		1 inch Bethany Falls (1972)				1 inch Bethany Falls & Amazonia (1971)				1 inch Bethany Falls (1968)	

Defective Area in Sq. Ft.	Project No. 26 I-29-2(18)53 Buchanan Co. Route I-29		Project No. 27 I-29-2(9)55 Andrew Co. Route I-29		Project No. 28 I-IG-35-2(18)61 Daviess Co. Route I-35 & 69		Project No. 29 Sec. 31(1) Daviess Co. Route 6				Project No. 30 F-71-3(12) Bates Co. Route 71	
	No Poly		No Poly		No Poly		Untreated Cement Base		Treated Cement Base		No Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---	---	---
½-1	---	---	---	---	---	---	---	---	---	---	---	---
1-2	7	3.2	9	1.4	31	2.2	---	---	---	---	---	---
2-5	27	11.9	72	10.1	213	14.8	9	25.8	1	1.5	---	---
5-10	23	10.2	105	14.8	219	15.3	6	17.1	6	8.8	4	15.4
10-15	50	22.1	236	33.2	464	32.3	---	---	20	29.4	7	26.9
15-25	100	44.2	210	29.6	451	31.4	---	---	21	30.9	13	50.0
25+	11	4.9	77	10.8	50	3.5	---	---	18	26.5	2	7.7
Clear	8	3.5	1	0.1	7	0.5	20	57.1	2	2.9	0	0.0
Cracking "D" 0-½	2	0.9	18	2.5	2	0.1	1	2.9	1	1.5	---	---
½-1	5	2.2	115	16.2	2	0.1	1	2.9	2	2.9	---	---
1-2	8	3.5	86	12.1	4	0.3	2	5.7	5	7.4	---	---
2-5	22	9.8	107	15.1	2	0.1	4	11.4	10	14.7	---	---
5-10	17	7.5	54	7.6	---	---	1	2.9	15	22.1	---	---
10-15	6	2.6	27	3.8	---	---	1	2.9	9	13.2	---	---
15-25	---	---	17	2.4	---	---	---	---	5	7.4	---	---
25+	---	---	7	1.0	---	---	---	---	13	19.1	---	---
Clear	166	73.5	279	39.3	1425	99.4	25	71.3	8	11.7	26	100.0
Clear*	8	3.5	1	0.1	7	0.5	20	57.1	2	2.9	0	0.0
Total Cracks	226		710		1435		35		68		26	
	2 inch Bethany Falls (1963)		2 inch Bethany Falls (1963)		1 inch Bethany Falls (1968)		2 inch Bethany Falls (1963)				2 inch Higginsville (1971)	

Table 2A (Continued)

Summary of "D" Cracking Survey

CRACKS

Defective Area in Sq. Ft.	Project No. 31 Sec. 61(2) Macon Co. Route 36 No Poly No.	%	Project No. 32 C020-32(4) Cedar Co. Route 32 No Poly No.	%	Project No. 33 Sec. 48(6) Jackson Co. Route 50 No Poly No.	%	Project No. 34 F-50-1(2) Jackson Co. Route 50 No Poly No.	%	Project No. 35 C051-50(7)*** Johnson Co. Route 50 No Poly No.	%
Staining 0-½	8	10.3	---	---	---	---	---	---	---	---
½-1	30	39.0	---	---	---	---	---	---	---	---
1-2	5	6.5	1	50.0	---	---	---	---	2	1.9
2-5	7	9.1	---	---	8	27.6	8	16.0	7	6.3
5-10	5	6.5	---	---	2	6.9	3	6.0	22	19.8
10-15	7	9.1	1	50.0	7	24.1	10	20.0	31	27.9
15-25	4	5.2	---	---	12	41.4	24	48.0	19	17.1
25+	4	5.2	---	---	---	---	1	2.0	18	16.2
Clear	7	9.1	0	0.0	0	0.0	4	8.0	12	10.8
"D" Cracking 0-½	1	1.3	---	---	---	---	---	---	6	5.4
½-1	---	---	---	---	1	3.4	---	---	4	3.6
1-2	---	---	---	---	---	---	1	2.0	13	11.7
2-5	---	---	---	---	---	---	---	---	17	15.3
5-10	---	---	---	---	---	---	---	---	6	5.4
10-15	---	---	---	---	---	---	---	---	2	1.8
15-25	---	---	---	---	---	---	---	---	4	3.6
25+	---	---	---	---	---	---	---	---	1	0.9
Clear	76	98.7	2	100.0	28	96.6	49	98.0	58	52.3
Clear*	7	9.1	0	0.0	0	0.0	4	8.0	12	10.8
Total Cracks	77		2		29		50		111	
	2 inch Kimmswick (1971)		2 inch Burlington (1967)		2 inch Bethany Falls (1965)		2 inch Bethany Falls (1965)		2 inch Bethany Falls (1966)	

Defective Area in Sq. Ft.	Project No. 36 Sec. 40(2) Grundy Co. Route 6 No Poly No.	%	Project No. 37 I-29-2(49) Andrew Co. Route I-29 No Poly No.	%	Project No. 38 I-29-2(59)111 Atchison Co. Route I-29 No Poly No.	%	Project No. 39 F-65-5(1) Grundy Co. Route 65 Poly No.	%	Project No. 40 C024-71B(4)U Clay Co. Route 291 Poly No.	%
Staining 0-½	---	---	---	---	1	0.3	---	---	---	---
½-1	---	---	---	---	10	2.9	---	---	---	---
1-2	7	14.6	---	---	102	29.6	8	21.6	---	---
2-5	21	43.8	5	9.8	159	46.0	8	21.6	7	6.4
5-10	9	18.8	7	13.7	41	11.9	2	5.4	22	20.2
10-15	4	8.3	10	19.6	1	0.3	---	---	42	38.5
15-25	3	6.2	28	54.9	---	---	---	---	35	32.1
25+	---	---	1	2.0	---	---	---	---	3	2.8
Clear	4	8.3	0	0.0	31	9.0	19	51.4	0	0.0
"D" Cracking 0-½	3	6.2	---	---	---	---	---	---	---	---
½-1	8	16.7	4	7.8	---	---	---	---	---	---
1-2	3	6.2	8	15.7	---	---	---	---	---	---
2-5	7	14.6	4	7.8	---	---	---	---	---	---
5-10	1	2.1	8	15.7	---	---	---	---	---	---
10-15	2	4.2	4	7.8	---	---	---	---	---	---
15-25	---	---	---	---	---	---	---	---	---	---
25+	---	---	---	---	---	---	---	---	---	---
Clear	24	50.0	23	45.2	345	100.0	37	100.0	109	100.0
Clear*	4	8.3	0	0.0	31	9.0	19	51.4	0	0.0
Total Cracks	48		51		345		37		109	
	2 inch Bethany Falls (1963)		2 inch Kereford (1967)		1 inch Oread (1972)		1 inch Bethany Falls (1972)		1 inch Bethany Falls (1973)	

Defective Area in Sq. Ft.	Project No. 41 I-435-1(8) Clay Co. Route I-435 Poly No.	%	Project No. 42 I-IG-435-1(9) Jackson Co. Route I-435 Poly No.	%
Staining 0-½	---	---	4	5.6
½-1	---	---	17	23.6
1-2	5	4.3	9	12.5
2-51	12	10.6	17	23.6
5-10	50	44.2	6	8.3
10-15	32	28.3	---	---
15-25	4	3.5	---	---
25+	1	0.9	---	---
Clear	9	8.0	19	26.4
"D" Cracking 0-½	---	---	---	---
½-1	---	---	---	---
1-2	---	---	---	---
2-5	---	---	---	---
5-10	---	---	---	---
10-15	---	---	---	---
15-25	---	---	---	---
25+	---	---	---	---
Clear	113	100.0	72	100.0
Clear*	9	8.0	19	26.4
Total Cracks	113		72	
	1 inch Bethany Falls (1972)		1 inch Bethany Falls (1971)	

Table 2B

Summary of "D" Cracking Survey

JOINTS

Defective Area in Sq. Ft.	Project No. 1 F-50-2(7) Johnson Co. Route 50				Project No. 2 F-50-2(11) Johnson Co. Route 50				Project No. 3 C058-36(9) Linn Co. Route 36				Project No. 4 F-36-1(16)** DeKalb Co. Route 36				Project No. 5 C083-9(2)UA Platte Co. Route 9			
	No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---	---	---					---	---	---	---
½-1	---	---	---	---	---	---	---	---	---	---	---	---					---	---	---	---
1-2	2	3.8	3	2.3	---	---	---	---	---	---	---	---					1	2.5	---	---
2-5	7	13.6	13	10.2	7	18.9	5	4.2	1	0.9	---	---					1	2.5	1	1.1
5-10	2	3.8	28	21.9	16	43.3	26	21.8	1	0.9	---	---					0	---	7	7.7
10-15	1	1.9	16	12.5	10	27.0	37	31.2	12	10.6	2	2.9	Sawed joints have				2	5.0	23	25.2
15-25	1	1.9	35	27.3	4	10.8	33	27.7	20	17.7	6	8.7	been sealed.				0	---	30	33.0
25+	0	---	1	0.8	---	---	10	8.4	79	69.9	61	88.4					0	---	6	6.6
Clear	39	75.0	32	25.0	0	0.0	8	6.7	0	0.0	0	0.0					36	90.0	24	26.4
"D" Cracking 0-½	2	3.8	9	7.0	6	16.2	14	11.8	---	---	---	---					1	2.5	10	11.0
½-1	2	3.8	12	9.4	11	29.7	11	9.2	1	0.9	---	---					---	---	12	13.2
1-2	---	---	6	4.7	6	16.2	4	3.4	0	---	---	---					---	---	4	4.4
2-5	---	---	9	7.0	---	---	2	1.7	3	2.6	---	---					---	---	---	---
5-10	---	---	7	5.5	---	---	6	5.0	1	0.9	1	1.4					---	---	1	1.1
10-15	---	---	4	3.1	---	---	5	4.2	23	20.3	2	2.9					---	---	---	---
15-25	---	---	1	0.8	---	---	5	4.2	16	14.2	5	7.3					---	---	---	---
25+	---	---	0	---	---	---	3	2.5	69	61.1	61	88.4					---	---	---	---
Clear	48	92.4	80	62.5	14	37.9	69	58.0	0	0.0	0	0.0					39	97.5	64	70.3
Clear*	39	75.0	32	25.0	0	0.0	0	0.0	0	0.0	0	0.0					36	90.0	24	26.4
Total Joints	52		128		37		119		113		69						40		91	
	1 inch Higginsville (1969)				1 inch Higginsville (1969)				2 inch Bethany Falls (1967)				1 inch Raytown (1969)				1 inch Bethany Falls (1970)			

Defective Area in Sq. Ft.	Project No. 6 I-35-1(11)14*** Clay Co. Route I-35				Project No. 7 I-IG-29-2(46)58 Andrew Co. Route I-29				Project No. 8 F-6-1(1) Daviess Co. Route 6				Project No. 9 C031-6(8) Daviess Co. Route 6				Project No. 10 U-45-1(3) Platte Co. Route 9			
	No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1	5	10.9	3	2.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1-2	17	36.9	8	6.8	16	7.4	34	1.8	---	---	2	1.6	---	---	---	---	---	---	1	1.9
2-5	5	10.9	21	17.8	36	16.7	99	5.4	3	10.0	5	4.0	---	---	1	0.9	1	7.7	---	---
5-10	---	---	17	14.4	13	6.0	67	3.6	4	13.3	34	27.0	---	---	1	0.9	6	46.1	5	9.7
10-15	---	---	4	3.4	16	7.4	172	9.4	3	10.0	25	19.8	---	---	---	---	1	7.7	2	3.8
15-25	---	---	---	---	49	22.7	922	50.3	2	6.7	16	12.7	3	11.1	3	2.6	---	---	---	---
25+	---	---	---	---	52	24.1	478	26.0	---	---	4	3.2	24	88.9	107	94.7	---	---	---	---
Clear	19	41.3	65	55.1	34	15.7	65	3.5	18	60.0	40	31.7	0	0.0	1	0.9	5	38.5	44	84.6
"D" Cracking 0-½	1	2.2	13	11.0	9	4.2	41	2.2	---	---	---	---	1	3.7	2	1.8	---	---	---	---
½-1	---	---	6	5.1	17	7.9	152	8.3	---	---	---	---	---	---	2	1.8	---	---	---	---
1-2	---	---	3	2.5	23	10.6	199	10.8	---	---	---	---	1	3.7	---	---	---	---	---	---
2-5	---	---	---	---	30	13.9	318	17.3	---	---	---	---	---	---	---	---	---	---	---	---
5-10	---	---	---	---	18	8.3	197	10.7	---	---	---	---	---	---	---	---	---	---	---	---
10-15	---	---	---	---	10	4.6	190	10.3	---	---	---	---	---	---	---	---	---	---	---	---
15-25	---	---	---	---	6	2.8	110	6.0	---	---	---	---	---	---	---	---	---	---	---	---
25+	---	---	---	---	1	0.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clear	45	97.8	96	81.4	102	47.2	630	34.4	30	100.0	126	100.0	25	92.6	109	96.4	13	100.0	52	100.0
Clear*	19	41.3	65	55.1	34	15.7	65	3.5	18	60.0	40	31.7	0	0.0	1	0.9	5	38.5	44	84.6
Total Joints	46		118		216		1837		30		126		27		113		13		52	
	1 inch Bethany Falls (1969)				1 inch Bethany Falls (1968)				1 inch Raytown (1969)				1 inch Bethany Falls (1970)				1 inch Bethany Falls (1971)			

Defective Area in Sq. Ft.	Project No. 11 U-45-1(6) Clay Co. Route 9				Project No. 12 U-71-5(6) Jackson Co. Route 291				Project No. 13 C025-BB(1) Clinton Co. Route BB				Project No. 14 F-71-4(9) Cass Co. Route 71				Project No. 15 I-435-1(61)16UA*** Jackson Co. Route I-435			
	No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly		No Poly		Poly	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Staining 0-½					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1-2					---	---	1	0.8	---	---	---	---	3	1.4	2	0.4	2	7.7	4	4.9
2-5					---	---	---	---	1	6.2	2	5.6	29	13.1	60	11.3	---	---	---	---
5-10	Short Project				4	13.8	26	20.8	3	18.8	4	11.1	68	30.6	69	13.0	---	---	---	---
10-15	Omitted				12	41.4	59	47.2	3	18.8	9	25.0	44	19.8	62	11.8	---	---	---	---
15-25					6	20.7	18	14.4	2	12.4	5	13.9	12	5.4	206	38.9	---	---	---	---
25+					---	---	---	---	---	---	---	---	---	---	13	2.5	---	---	---	---
Clear					7	24.1	21	16.8	7	43.8	16	44.4	66	29.7	117	22.1	24	92.3	78	95.1
"D" Cracking 0-½					1	3.4	---	---	---	---	---	---	1	0.4	8	1.5	---	---	---	---
½-1					---	---	---	---	1	6.2	---	---	1	0.4	25	4.7	---	---	---	---
1-2					---	---	---	---	---	---	---	---	3	1.4	18	3.4	---	---	---	---
2-5					---	---	---	---	---	---	---	---	5	2.3	15	2.8	---	---	---	---
5-10					---	---	---	---	---	---	---	---	1	0.4	10	1.9	---	---	---	---
10-15					---	---	---	---	---	---	---	---	---	---	1	0.2	---	---	---	---
15-25					---	---	---	---	---	---	---	---	---	---	1	0.2	---	---	---	---
25+					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clear					28	96.6	125	100.0	15	93.8	36	100.0	211	95.1	451	85.3	26	100.0	82	100.0
Clear*					7	24.1	21	16.8	7	43.8	16	44.4	66	29.7	117	22.1	24	92.3	78	95.1
Total Joints					29		125		16		36		222		529		26		82	
	1 inch Bethany Falls (1971)				1 inch Bethany Falls (1970)				1 inch Bethany Falls (1968)				1 inch Bethany Falls (1970)				1 inch Bethany Falls (1970			

* Total number of cracks or joints which have neither staining or "D" cracking.

** Data represents the joints and/or cracks which were observed. Sealing operations on this pavement prevented a complete survey from being made.

*** Data represents the joints and/or cracks which were surveyed. The surface of the pavement was covered with excess mastic running out of the cracks and/or joints preventing a complete survey from being made.

Table 2B (Continued)

Summary of "D" Cracking Survey

JOINTS

Defective Area in Sq. Ft.	Project No. 16 I-29-1(12)13C*** Platte Co. Route I-29 No Poly No.	%	Poly No.	%	Project No. 17 I-29-1(12)13A&B Platte Co. Route I-29 Poly No.	%	Project No. 18 I-35-2(27)105 Harrison Co. Route I-35 Poly No.	%	Project No. 19 C048-W(4) Jackson Co. Route W Poly No.	%	Project No. 20 F-71-4(10)*** Cass Co. Route 71 No Poly No.	%	Poly No.	%
Staining														
0-½	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1	1	3.4	4	2.1	1	1.5	---	---	---	---	---	---	---	---
1-2	2	6.9	24	12.6	1	1.5	---	---	6	5.4	11	6.9	36	8.3
2-5	1	3.4	49	25.9	8	11.8	27	11.0	7	6.2	15	9.4	65	15.0
5-10	3	10.4	36	18.9	11	16.2	99	40.3	4	3.6	19	11.9	64	14.8
10-15	---	---	4	2.1	23	33.7	43	17.6	0		28	17.4	47	10.7
15-25	---	---	---	---	4	5.9	8	3.3	0		19	11.9	71	16.4
25+	---	---	---	---	---	---	---	---	0		---	---	---	---
Clear	22	75.9	73	38.4	20	29.4	68	27.8	95	84.8	68	42.5	151	34.8
"D" Cracking														
0-½	---	---	---	---	---	---	---	---	5	4.5	---	---	---	---
½-1	1	3.4	5	2.6	---	---	---	---	1	0.9	---	---	---	---
1-2	---	---	1	0.5	---	---	---	---	---	---	---	---	---	---
2-5	---	---	2	1.0	---	---	---	---	---	---	---	---	---	---
5-10	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10-15	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15-25	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25+	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clear	28	96.6	182	95.9	68	100.0	245	100.0	106	94.6	160	100.0	434	100.0
Clear*	21	72.4	73	38.4	20	29.4	68	27.8	95	84.8	68	42.5	151	34.8
Total Joints	29		190		68		245		112		160		434	
	1 inch Bethany Falls (1970)				1 inch Bethany Falls (1970)		1 inch Bethany Falls (1972)		1 inch Bethany Falls (1970)		1 inch Bethany Falls (1971)			

Defective Area in Sq. Ft.	Project No. 21 I-IG-435-1(59)*** Jackson Co. Route I-435 No Poly No.	%	Poly No.	%	Project No. 22 SU-SUG-647(7) Clay-Jackson Co. Route 210 Poly No.	%	Project No. 23 C024-210(1)U Clay Co. Route 210 No Poly No.	%	Poly No.	%	Project No. 24 I-29-2(56)70 Holt Co. Route I-29 No Poly No.	%	Poly No.	%	Project No. 25 I-29-2(45)70 Holt Co. Route I-29 Poly No.	%
Staining																
0-½	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
½-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	2.4
1-2	---	---	---	---	---	---	---	---	2	2.1	3	2.0	9	2.9	1	2.4
2-5	---	---	---	---	5	4.6	---	---	1	1.0	12	8.0	49	15.9	3	7.3
5-10	---	---	---	---	4	3.7	---	---	---	---	10	6.6	67	21.8	4	9.8
10-15	---	---	---	---	21	19.5	1	4.2	---	---	4	2.6	57	18.5	10	24.4
15-25	---	---	---	---	29	26.9	---	---	---	---	2	1.3	52	16.9	18	43.9
25+	---	---	---	---	2	1.8	---	---	---	---	---	---	---	---	2	4.9
Clear	144	100.0	291	100.0	47	43.5	23	95.8	92	96.9	120	79.5	74	24.0	2	4.9
"D" Cracking																
0-½	---	---	1	0.3	---	---	---	---	---	---	1	0.7	---	---	---	---
½-1	---	---	1	0.3	---	---	---	---	---	---	---	---	1	0.3	1	2.4
1-2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6	14.6
2-5	---	---	1	0.3	---	---	---	---	---	---	---	---	---	---	8	19.5
5-10	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5	12.2
10-15	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	4.9
15-25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	4.9
25+	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clear	144	100.0	288	99.1	108	100.0	24	100.0	95	100.0	150	99.3	307	99.7	17	41.5
Clear*	144	100.0	288	99.1	47	43.5	23	95.8	92	96.9	120	79.5	74	24.0	2	4.9
Total Joints	144		291		108		24		95		151		308		41	
	1 inch Bethany Falls (1970)				1 inch Bethany Falls (1972)		1 inch Bathany Falls (1972)				1 inch Bethany Falls & Amazonia (1971)				2 inch Bethany Falls (1968)	

Defective Area in Sq. Ft.	Project No. 26 I-29-2(18)53 Buchanan Co. Route I-29 No Poly No.	%	Project No. 27 I-29-2(9)55 Andrew Co. Route I-29 No Poly No.	%	Project No. 28 I-IG-35-2(18)61 Daviess Co. Route I-35 & 69 No Poly No.	%	Project No. 29 Sec. 31(1) Daviess Co. Route 6 Untreated Cement Base No.	%	Treated Cement Base No.	%	Project No. 30 F-71-3(12) Bates Co. Route 71 No Poly No.	%
Staining												
0-½	---	---	---	---	---	---	---	---	---	---	---	---
½-1	---	---	---	---	---	---	---	---	---	---	---	---
1-2	---	---	---	---	2	0.2	6	10.6	---	---	3	1.8
2-5	1	0.8	1	0.2	20	1.5	13	22.8	---	---	7	4.1
5-10	---	---	2	0.5	49	3.7	2	3.5	---	---	11	6.5
10-15	7	5.3	3	0.7	94	7.2	4	7.0	4	6.1	3	1.8
15-25	47	35.3	31	7.3	579	44.3	13	22.8	18	27.3	57	33.5
25+	77	57.8	390	91.3	546	41.7	7	12.3	44	66.6	80	47.0
Clear	1	0.8	---	---	19	1.4	12	21.0	---	---	9	5.3
"D" Cracking												
0-½	2	1.5	3	0.7	13	1.0	3	5.3	---	---	---	---
½-1	7	5.3	14	3.3	12	0.9	8	14.0	---	---	---	---
1-2	6	4.5	10	2.3	6	0.5	4	7.0	1	1.5	---	---
2-5	11	8.3	29	6.8	3	0.2	7	12.3	1	1.5	---	---
5-10	21	15.8	30	7.0	---	---	3	5.3	10	15.2	---	---
10-15	21	15.8	36	8.4	---	---	3	5.3	9	13.6	---	---
15-25	33	24.8	73	17.1	---	---	5	8.8	12	18.2	---	---
25+	24	18.0	225	52.7	---	---	---	---	30	45.4	---	---
Clear	8	6.0	7	1.7	1275	97.4	24	42.0	3	4.6	170	100.0
Clear*	1	0.8	0	0.0	19	1.4	12	21.0	0	0.0	9	5.3
Total Joints	133		427		1309		57		66		170	
	2 inch Bethany Falls (1963)		2 inch Bethany Falls (1963)		1 inch Bethany Falls (1968)		2 inch Bethany Falls (1963)				2 inch Higginsville (1971)	

Table 2B (Continued)

Summary of "D" Cracking Survey

JOINTS

Defective Area in Sq. Ft.	Project No. 31 Sec. 61(2) Macon Co. Route 36 No Poly No.	%	Project No. 32 C020-32(4) Cedar Co. Route 32 No Poly No.	%	Project No. 33 Sec. 48(6) Jackson Co. Route 50 No Poly No.	%	Project No. 34 F-50-1(2) Jackson Co. Route 50 No Poly No.	%	Project No. 35 C051-50(7)*** Johnson Co. Route 50 No Poly No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---
½-1	19	14.2	---	---	1	0.7	---	---	---	---
1-2	4	3.0	2	3.6	2	1.5	---	---	1	0.6
2-5	4	3.0	7	12.7	1	0.7	---	---	---	---
5-10	15	11.2	11	20.0	9	6.6	---	---	---	---
10-15	29	21.6	8	14.6	8	5.8	---	---	2	1.2
15-25	16	11.9	7	12.7	13	9.5	42	28.6	4	2.4
25+	23	17.2	---	---	95	69.3	105	71.4	161	95.2
Clear	24	17.9	20	36.4	8	5.9	0	0.0	1	0.6
"D" Cracking 0-½	---	---	---	---	2	1.5	---	---	---	---
½-1	---	---	---	---	6	4.4	2	1.4	---	---
1-2	---	---	---	---	11	8.0	7	4.8	---	---
2-5	---	---	---	---	11	8.0	28	19.0	3	1.8
5-10	---	---	---	---	22	16.1	20	13.6	4	2.4
10-15	---	---	---	---	16	11.7	22	15.0	---	---
15-25	---	---	---	---	36	26.3	26	17.7	13	7.7
25+	---	---	---	---	23	16.8	42	28.5	148	87.5
Clear	134	100.0	55	100.0	10	7.2	0.0	0.0	1	0.6
Clear*	24	17.9	20	36.4	6	4.4	0.0	0.0	1	0.6
Total Joints	134		55		137		147		169	
	2 inch Kimmswick (1970)		2 inch Burlington (1967)		2 inch Bethany Falls (1965)		2 inch Bethany Falls (1965)		2 inch Bethany Falls (1966)	

Defective Area in Sq. Ft.	Project No. 36 Sec. 40(2) Grundy Co. Route 6 No Poly No.	%	Project No. 37 I-29-2(49) Andrew Co. Route I-29 No Poly No.	%	Project No. 38 I-29-2(59)111 Atchison Co. Route I-29 No Poly No.	%	Project No. 39 F-65-5(1) Grundy Co. Route 65 Poly No.	%	Project No. 40 C024-71B(4)U Clay Co. Route 291 Poly No.	%
Staining 0-½	---	---	---	---	---	---	---	---	---	---
½-1	---	---	---	---	5	1.1	---	---	---	---
1-2	34	5.7	---	---	64	13.8	19	10.9	---	---
2-5	47	8.0	1	3.2	4	0.9	31	17.8	---	---
5-10	49	8.3	6	19.4	---	---	35	20.1	---	---
10-15	62	10.5	5	16.1	---	---	8	4.6	---	---
15-25	110	18.6	12	38.7	---	---	---	---	---	---
25+	38	6.4	7	22.6	---	---	---	---	---	---
Clear	251	42.5	---	---	388	84.2	81	46.6	---	---
"D" Cracking 0-½	37	6.3	---	---	---	---	---	---	---	---
½-1	34	5.8	---	---	---	---	---	---	---	---
1-2	37	6.3	---	---	---	---	---	---	---	---
2-5	44	7.3	2	6.5	---	---	---	---	---	---
5-10	27	4.6	6	19.4	---	---	---	---	---	---
10-15	8	1.4	4	12.9	---	---	---	---	---	---
15-25	14	2.4	4	12.9	---	---	---	---	---	---
25+	13	2.2	5	16.1	---	---	---	---	---	---
Clear	377	63.7	10	32.2	461	100.0	174	100.0	137	100.0
Clear*	251	42.5	0	0.0	388	84.2	81	46.6	137	100.0
Total Joints	591		31		461		174		137	
	2 inch Bethany Falls (1963)		2 inch Hereford (1967)		1 inch Oread (1972)		1 inch Bethany Falls (1972)		1 inch Bethany Falls (1973)	

Defective Area in Sq. Ft.	Project No. 41 I-435-1(8) Clay Co. Route I-435 Poly No.	%	Project No. 42 I-IG-435-1(9) Jackson Co. Route I-435 Poly No.	%
Staining 0-½	---	---	---	---
½-1	---	---	---	---
1-2	1	0.7	---	---
2-5	1	0.7	---	---
5-10	---	---	1	0.5
10-15	---	---	1	0.5
15-25	---	---	---	---
25+	---	---	---	---
Clear	138	98.6	216	99.0
"D" Cracking 0-½	---	---	---	---
½-1	---	---	---	---
1-2	---	---	---	---
2-5	---	---	---	---
5-10	---	---	---	---
10-15	---	---	---	---
15-25	---	---	---	---
25+	---	---	---	---
Clear	140	100.0	218	100.0
Clear*	138	98.6	216	99.0
Total Joints	140		218	
	1 inch Bethany Falls (1972)		1 inch Bethany Falls (1971)	

Table 3

A Condensed Summary of Staining and "D" Cracking at Joints and Cracks for 1976

Project Ident.	Project Number	Joints Total	Joints Staining	Joints "D" Crack	Joints Clear	Cracks Total	Cracks Staining	Cracks "D" Crack	Cracks Clear
1	F-50-2(7)#	180	109	65	67	219	190	1	29
	Percent		60.6	36.I	37.2		86.8	0.5	13.2
	(1969)								
2	F-50-2(11)**#	156	148	73	0	259	259	12	0
	Percent		94.9	46.8			100.0	4.6	
	(1969)								
3	C058-36(9)	182	182	182	0	180	180	164	0
	Percent		100.0	100.0			100.0	91.1	
	(1967)								
4	F-36-1(16)*		Entire Project Sealed						
	Percent								
	(1969)								
5	C083-9(2)UA	131	71	28	60	103	80	0	23
	Percent		54.2	21.4	45.8		77.7		22.3
	(1970)								
6	I-35-1(11)14**	164	80	23	84	312	291	2	21
	Percent		48.8	14.0	51.2		93.3	0.6	6.7
	(1969)								
7	I-IG-29-2(46)##	2,053	1,954	1,321	99	2,818	2,808	395	10
	Percent		95.2	64.3	4.8		99.6	14.0	0.4
	(1969)								
8	F-6-1(1)	156	98	0	58	83	78	1	5
	Percent		62.8		37.2		94.0	1.2	6.0
	(1969)								
9	C031-6(8)	140	139	6	1	29	29	28	0
	Percent		99.3	4.3	0.7		100.0	96.6	
	(1970)								
10	U-45-1(3)	65	17	0	49	66	66	0	0
	Percent		26.2		75.4		100.0		
	(1971)								
11	U-45-1(6)		Short Project Omitted						
	Percent								
	(1971)								
12	U-71-5(6)	154	126	1	28	128	128	1	0
	Percent		81.8	0.6	18.2		100.0	0.8	
	(1970)								
13	C025-BB(1)	52	29	1	23	20	13	0	7
	Percent		55.8	1.9	44.2		65.0		35.0
	(1968)								

* Indicates that the project summary will not compare with previous surveys because some test sections were omitted for 1976 because of sealing operations on the cracks and/or joints.

** Indicates that the project summary will not compare with previous surveys because some cracks and/or joints were omitted because the surface of the pavement was covered by excessive mastic running out of the cracks and/or joints.

\# Indicates that the project summary will not compare with previous surveys because some test sections which were excluded in previous surveys were included in this survey.

Indicates that the project summary will not compare with previous surveys because cracks and/or joints which were sealed in previous surveys were not sealed at the time of this survey and were included.

@ Indicates that the project summary will not compare with previous surveys because of asphalt overlay at the beginning or end of the project.

Table 3 (Continued)

Project Ident.	Project Number	Joints Total	Joints Staining	Joints "D" Crack	Joints Clear	Cracks Total	Cracks Staining	Cracks "D" Crack	Cracks Clear
14	F-71-4(9)#	751	568	89	183	906	624	44	282
	Percent		75.6	11.8	24.4		68.9	4.9	31.1
	(1970)								
15	I-435-1(61)UA**	108	6	0	102	34	28	0	6
	Percent		5.6		94.4		82.4		17.6
	(1970)								
16	I-29-1(12)13C	219	124	9	94	348	348	0	0
	Percent		56.6	4.1	42.9		100.0		
	(1970)								
17	I-29-1(12)13A&B@	68	48	0	20	70	70	0	0
	Percent		70.6		29.4		100.0		
	(1970)								
18	I-35 2(27)105	245	177	0	68	206	204	0	2
	Percent		72.2		27.8		99.0		1.0
	(1972)								
19	C048-W(4)	112	17	6	95	127	54	1	73
	Percent		15.2	5.4	84.8		42.5	0.8	57.5
	(1970)								
20	F-71-4(10)**	594	375	0	219	479	476	0	3
	Percent		63.1		36.9		99.4		0.6
	(1971)								
21	I-IG-435-1(59)**	435	0	3	432	16	0	0	16
	Percent			0.7	99.3				100.0
	(1970)								
22	SU-SUG-647(7)	108	61	0	47	120	120	0	0
	Percent		56.5		43.5		100.0		
	(1972)								
23	C024-210(1)U	119	4	0	115	65	46	0	19
	Percent		3.4		96.6		70.8		29.2
	(1972)								
24	I-29-2(56)70	459	265	2	194	449	442	0	7
	Percent		57.7	0.4	42.3		98.4		1.6
	(1971)								
25	I-29-2(45)70	41	39	24	2	108	108	10	0
	Percent		95.1	58.5	4.9		100.0	9.2	
	(1968)								
26	I-29-2(18)53@	133	132	125	1	226	218	60	8
	Percent		99.2	94.0	0.8		96.5	26.5	3.5
	(1963)								
27	I-29-2(9)55	427	427	420	0	710	709	431	1
	Percent		100.0	98.4			99.9	60.7	0.1
	(1963)								
28	I-IG-35-2(18)61	1,309	1,290	34	19	1,435	1,428	10	7
	Percent		98.6	2.6	1.4		99.5	0.7	0.5
	(1968)								
29	Sec. 31(1)	123	111	98	12	103	81	70	22
	Percent		90.2	79.7	9.8		78.6	68.0	21.4
	(1963)								
30	F-71-3(12)	170	161	0	9	26	26	0	0
	Percent		94.7		5.3		100.0		
	(1971)								

Table 3 (Continued)

Project Ident.	Project Number	Joints Total	Joints Staining	Joints "D" Crack	Joints Clear	Cracks Total	Cracks Staining	Cracks "D" Crack	Cracks Clear
31	Sec. 61(2)	134	110	0	24	77	70	1	7
	Percent		82.1		17.9		91.0	1.3	9.0
	(1970)								
32	C020-32(4)	55	35	0	20	2	2	0	0
	Percent		63.6		36.4		100.0		
	(1967)								
33	Sec. 48(6)	137	129	127	6	29	29	1	0
	Percent		94.2	92.7	4.4		100.0	3.4	
	(1965)								
34	F-50-1(2)##	147	147	147	0	50	46	1	4
	Percent		100.0	100.0			92.0	2.0	8.0
	(1965)								
35	C051-50(7)**	169	168	168	1	111	99	53	12
	Percent		99.4	99.4	0.6		89.2	47.7	10.8
	(1966)								
36	Sec. 40(2)	591	340	214	251	48	44	24	4
	Percent		57.5	36.2	42.5		91.7	50.0	8.3
	(1964)								
37	I-29-2(49)	31	31	21	0	51	51	28	0
	Percent		100.0	67.7			100.0	54.9	
	(1967)								
38	I-29-2(59)111	461	63	0	388	345	334	0	31
	Percent		14.0		86.0		91.0		9.0
	(1972)								
39	F-65-5(1)	174	93	0	81	37	18	0	19
	Percent		53.4		46.6		48.6		51.4
	(1972)								
40	C024-71B(4)U	137	0	0	137	109	109	0	0
	Percent				100.0		100.0		
	(1973)								
41	I-435-1(8)**	140	2	0	138	113	104	0	9
	Percent		1.4		98.6		92.0		8.0
	(1972)								
42	I-IG-435-1(9)**	218	2	0	216	72	53	0	19
	Percent		0.9		99.1		73.6		26.4
	(1971)								

Table 4

Deterioration Functions for Projects Being Surveyed in the Area Where D-Cracking is a Major Problem

(*Number above each column is age of the pavement in years)

Proj. Ident.	Project No.	Crack/ Joint	Defect	Poly or No Poly	Deterioration Function 71λx	72λx	73λx	74λx	75λx	76λx
					(2)*	(3)*	(4)*	(5)*	(6)*	(7)*
1	F-50-2(7)	Cracks	Stain	NP	36.73	54.15	32.28	68.91	69.78	69.88
			Stain	P	35.14	49.73	27.90	59.39	59.41	51.73
			D Cr.	NP	0	0.17	0	0	0	0
			D Cr.	P	0	0	0	0	1.72	0.23
		Joints	Stain	NP	1.68	0	0	8.06	9.45	11.50
			Stain	P	0.37	9.98	2.11	20.76	14.36	46.75
			D Cr.	NP	1.01	0.78	0.99	0	0.88	1.79
			D Cr.	P	0	0.17	0	0	0	13.76
					(2)	(3)	(4)	(5)	(6)	(7)
2	F-50-2(11)	Cracks	Stain	NP	32.38	35.63	62.78	71.39	72.94	68.80
			Stain	P	42.63	48.58	62.28	69.63	70.15	69.38
			D Cr.	NP	0	0	0.57	0	0	0
			D Cr.	P	0	0	0.24	0.18	0.48	1.72
		Joints	Stain	NP	0	0.41	11.02	23.24	48.39	55.75
			Stain	P	1.12	1.75	23.02	31.95	51.28	63.37
			D Cr.	NP	0	0	0	0	2.40	16.47
			D Cr.	P	0.10	0	0	0	2.45	17.79
					(4)	(5)	(6)	(7)	(8)	(9)
3	C058-36 (9)	Cracks	Stain	NP	47.32	51.90	64.43	81.45	92.26	81.24
			Stain	P	48.25	47.11	46.82	78.60	81.71	61.25
			D Cr.	NP	4.66	9.64	34.01	59.69	75.62	67.09
			D Cr.	P	6.50	10.74	35.49	47.20	57.55	40.29
		Joints	Stain	NP	8.71	18.54	37.76	75.78	93.45	91.67
			Stain	P	28.45	32.41	64.52	94.05	97.80	97.22
			D Cr.	NP	12.80	27.54	51.83	75.94	88.36	87.21
			D Cr.	P	22.31	38.62	71.67	89.07	97.42	96.81
						(3)	(4)	(5)	(6)	
4	F-36-1(16)	Cracks	Stain	NP	---	21.74	41.06	45.43	55.60	---
			Stain	P	---	53.35	55.17	57.16	61.10	---
			D Cr.	NP	---	0	0	0	0	---
			D Cr.	P	---	0	0	0	0	---
		Joints	Stain	NP	---	0	8.82	24.46	40.14	---
			Stain	P	---	0.25	10.39	31.83	59.85	---
			D Cr.	NP	---	0	0	0	0	---
			D Cr.	P	---	0	0	0	0.25	---
						(2)	(3)	(4)	(5)	(6)
5	C083-9(2) UA	Cracks	Stain	NP	---	2.53	0	42.86	41.04	36.26
			Stain	P	---	25.87	24.14	51.76	49.78	61.28
			D Cr.	NP	---	0	0	0	0	0
			D Cr.	P	---	0	0	0	0	0
		Joints	Stain	NP	---	0	0	14.18	14.18	5.05
			Stain	P	---	20.89	8.64	28.61	29.04	53.51
			D Cr.	NP	---	0	0	0	0	0.53
			D Cr.	P	---	0	0	0	0.29	7.76
						(3)	(4)	(5)	(6)	(7)
6	I-35-1(11) 14	Cracks	Stain	NP	---	26.79	40.64	39.79	44.44	47.86
			Stain	P	---	34.98	35.11	35.63	53.03	54.51
			D Cr.	NP	---	0	0	0	0	0
			D Cr.	P	---	0	0	0	0	0.24
		Joints	Stain	NP	---	0	12.01	13.60	7.51	19.48
			Stain	P	---	0.70	10.42	14.84	14.16	19.71
			D Cr.	NP	---	0	0	0	0	0.46
			D Cr.	P	---	0	0	0	0	4.46
						(4)	(5)	(6)	(7)	(8)
7	I-IG-29-2 (46)58	Cracks	Stain	NP	---	44.34	64.98	74.09	75.45	75.72
			Stain	P	---	54.99	66.21	70.02	72.22	74.38
			D Cr.	NP	---	0.04	0	0.04	3.96	4.99
			D Cr.	P	---	1.50	1.35	0.29	3.94	4.68
		Joints	Stain	NP	---	1.12	4.96	21.24	51.98	59.35
			Stain	P	---	5.76	21.20	45.84	69.77	76.90
			D Cr.	NP	---	1.69	2.54	3.26	14.79	22.05
			D Cr.	P	---	1.47	1.21	2.61	22.19	30.13

Table 4 (Continued)

Proj. Ident.	Project No.	Crack/ Joint	Defect	Poly or No Poly	Deterioration Function 71 λx	72 λx	73 λx	74 λx	75 λx	76 λx
						(3)	(4)	(5)	(6)	(7)
8	F-6-1(1)	Cracks	Stain	NP	---	0	40.90	15.71	48.23	60.64
			Stain	P	---	0.62	27.43	28.01	61.93	65.43
			D Cr.	NP	---	0	0	0	1.01	0
			D Cr.	P	---	0	0	0	0.86	0.34
		Joints	Stain	NP	---	0	5.10	15.30	30.53	22.64
			Stain	P	---	0	11.46	37.22	47.70	41.97
			D Cr.	NP	---	0	0	0	1.78	0
			D Cr.	P	---	0	0	0	0	0
						(2)	(3)	(4)	(5)	(6)
9	C031-6(8)	Cracks	Stain	NP	---	0	64.43	72.90	85.53	93.48
			Stain	P	---	5.43	52.19	63.94	87.14	84.68
			D Cr.	NP	---	0	0	0	0	1.41
			D Cr.	P	---	0	0	0	0	0
		Joints	Stain	NP	---	0	59.22	62.66	98.27	97.78
			Stain	P	---	9.59	52.99	74.02	99.32	97.61
			D Cr.	NP	---	0	0	0	2.59	2.00
			D Cr.	P	---	0	0	0	2.36	0.85
							(2)	(3)	(4)	(5)
10	U-45-1(3)	Cracks	Stain	NP	---	---	0	54.72	55.20	53.64
			Stain	P	---	---	18.43	67.33	58.99	57.97
			D Cr.	NP	---	---	0	0	0	0
			D Cr.	P	---	---	0	0	0	0
		Joints	Stain	NP	---	---	0	0	0	31.60
			Stain	P	---	---	0	0	0	7.87
			D Cr.	NP	---	---	0	0	0	0
			D Cr.	P	---	---	0	0	0	0
							(2)			
11	U-45-1(6)	Cracks	Stain	NP	---	---	34.00	---	---	---
			Stain	P	---	---	37.65	---	---	---
			D Cr.	NP	---	---	0	---	---	---
			D Cr.	P	---	---	0	---	---	---
		Joints	Stain	NP	---	---	0	---	---	---
			Stain	P	---	---	0	---	---	---
			D Cr.	NP	---	---	0	---	---	---
			D Cr.	P	---	---	0	---	---	---
							(3)	(4)	(5)	(6)
12	U-71-5(6)	Cracks	Stain	NP	---	---	33.18	73.05	0	74.36
			Stain	P	---	---	57.64	64.41	0	72.18
			D Cr.	NP	---	---	0	0	0	0
			D Cr.	P	---	---	0	0	0	0.21
		Joints	Stain	NP	---	---	0	43.71	43.72	50.09
			Stain	P	---	---	1.23	27.92	27.51	52.60
			D Cr.	NP	---	---	0	0	0	0.71
			D Cr.	P	---	---	0	0	0	0
							(5)	(6)	(7)	(8)
13	C025-BB(1)	Cracks	Stain	NP	---	---	53.68	55.33	38.30	38.30
			Stain	P	---	---	54.23	48.22	51.04	51.13
			D Cr.	NP	---	---	0	0	0	0
			D Cr.	P	---	---	0	0	2.58	0
		Joints	Stain	NP	---	---	0	40.58	37.13	34.08
			Stain	P	---	---	0	35.84	39.51	35.08
			D Cr.	NP	---	---	0	0	1.64	1.61
			D Cr.	P	---	---	0	0	0	0
							(3)	(4)	(5)	(6)
14	F-71-4(9)	Cracks	Stain	NP	---	---	43.45	66.00	66.15	36.22
			Stain	P	---	---	68.50	68.85	66.26	56.95
			D Cr.	NP	---	---	0	0	0	0.19
			D Cr.	P	---	---	0	0	0.07	2.52
		Joints	Stain	NP	---	---	0.90	16.94	26.08	38.43
			Stain	P	---	---	11.68	35.68	50.04	52.57
			D Cr.	NP	---	---	0	0	0	1.80
			D Cr.	P	---	---	0	0	1.75	5.06

Table 4 (Continued)

Proj. Ident.	Project No.	Crack/ Joint	Defect	Poly or No Poly	Deterioration Function 71λx	72λx	73λx	74λx	75λx	76λx
								(4)	(5)	(6)
15	I-435-1	Cracks	Stain	NP	---	---	---	63.23	60.52	34.99
	(61)16		Stain	P	---	---	---	61.74	49.56	49.44
			D Cr.	NP	---	---	---	0	0	0
			D Cr.	P	---	---	---	0	0	0
		Joints	Stain	NP	---	---	---	0	0	2.54
			Stain	P	---	---	---	0	0.17	1.62
			D Cr.	NP	---	---	---	0	0	0
			D Cr.	P	---	---	---	0	0	0
								(4)	(5)	(6)
16	I-29-1	Cracks	Stain	NP	---	---	---	39.96	43.90	55.74
	(12)13		Stain	P	---	---	---	45.65	52.99	50.74
	Sec. C		D Cr.	NP	---	---	---	0	0	0
			D Cr.	P	---	---	---	0	0	0
		Joints	Stain	NP	---	---	---	0	5.38	9.86
			Stain	P	---	---	---	17.96	23.00	26.31
			D Cr.	NP	---	---	---	0	0	0.88
			D Cr.	P	---	---	---	0	0	1.25
								(4)	(5)	(6)
17	I-29-1	Cracks	Stain	P	---	---	---	49.44	56.02	70.96
	(12)13		D Cr.	P	---	---	---	0	0	0
	Sec.A&B	Joints	Stain	P	---	---	---	15.53	17.34	40.27
			D Cr.	P	---	---	---	0	0	0
									(4)	(5)
18	I-35-2	Cracks	Stain	P	---	---	---	---	57.42	58.35
	(27)105		D Cr.	P	---	---	---	---	0	0
		Joints	Stain	P	---	---	---	---	44.41	38.97
			D Cr.	P	---	---	---	---	0	0
									(4)	(5)
19	C048-W(4)	Cracks	Stain	P	---	---	---	---	0	17.62
			D Cr.	P	---	---	---	---	0	0.17
		Joints	Stain	P	---	---	---	---	0	6.16
			D Cr.	P	---	---	---	---	0	1.18
									(4)	(5)
20	F-71-4	Cracks	Stain	NP	---	---	---	---	62.63	90.15
	(10)		Stain	P	---	---	---	---	58.30	68.68
			D Cr.	NP	---	---	---	---	0	0
			D Cr.	P	---	---	---	---	0	0
		Joints	Stain	NP	---	---	---	---	5.68	32.86
			Stain	P	---	---	---	---	3.23	36.41
			D Cr.	NP	---	---	---	---	0	0
			D Cr.	P	---	---	---	---	0	0
									(5)	(6)
21	I-IG-435-	Cracks	Stain	NP	---	---	---	---	0	0
	1(59)		Stain	P	---	---	---	---	0	0
			D Cr.	NP	---	---	---	---	0	0
			D Cr.	P	---	---	---	---	0	0
		Joints	Stain	NP	---	---	---	---	1.93	0
			Stain	P	---	---	---	---	3.16	0
			D Cr.	NP	---	---	---	---	0	0
			D Cr.	P	---	---	---	---	0	0.26
									(3)	(4)
22	SU-SUG-	Cracks	Stain	P	---	---	---	---	74.53	75.32
	647(7)		D Cr.	P	---	---	---	---	0	0
		Joints	Stain	P	---	---	---	---	41.88	39.57
			D Cr.	P	---	---	---	---	0	0
									(4)	(5)
23	C024-210	Cracks	Stain	NP	---	---	---	---	50.53	51.28
	(1)U		Stain	P	---	---	---	---	45.40	36.58
			D Cr.	NP	---	---	---	---	0	0
			D Cr.	P	---	---	---	---	0	0
		Joints	Stain	NP	---	---	---	---	0	2.69
			Stain	P	---	---	---	---	0.92	1.10
			D Cr.	NP	---	---	---	---	0	0
			D Cr.	P	---	---	---	---	0	0

Table 4 (Continued)

Proj. Ident.	Project No.	Crack/ Joint	Defect	Poly or No Poly	Deterioration Function 71 λx	72 λx	73 λx	74 λx	75 λx	76 λx
									(4)	(5)
24	I-29-2	Cracks	Stain	NP	---	---	---	---	60.44	60.00
	(56)70		Stain	P	---	---	---	---	60.80	53.75
			D Cr.	NP	---	---	---	---	0.13	0
			D Cr.	P	---	---	---	---	0	0
		Joints	Stain	NP	---	---	---	---	3.09	10.01
			Stain	P	---	---	---	---	30.88	43.95
			D Cr.	NP	---	---	---	---	0	0.15
			D Cr.	P	---	---	---	---	0.16	0.08
									(7)	(8)
25	I-29-2(45)	Cracks	Stain	P	---	---	---	---	62.35	66.76
	70		D Cr.	P	---	---	---	---	2.79	2.62
		Joints	Stain	P	---	---	---	---	42.39	65.04
			D Cr.	P	---	---	---	---	26.88	26.72
						(9)	(10)	(11)	(12)	(13)
26	I-29-2	Cracks	Stain	NP	---	12.14	29.30	40.90	48.54	65.54
	(18)53		D Cr.	NP	---	0.16	5.57	5.29	11.28	11.42
		Joints	Stain	NP	---	39.94	47.36	59.92	72.55	89.76
			D Cr.	NP	---	18.51	34.27	32.56	51.86	62.59
						(9)	(10)	(11)	(12)	(13)
27	I-29-2(9)	Cracks	Stain	NP	---	43.50	42.88	52.18	62.81	67.88
	55		D Cr.	NP	---	3.58	10.49	8.43	22.49	24.15
		Joints	Stain	NP	---	57.51	65.14	76.92	95.36	97.93
			D Cr.	NP	---	29.74	48.56	58.89	77.98	79.88
					(4)	(5)	(6)	(7)	(8)	(9)
28	I-IG-35-2	Cracks	Stain	NP	47.67	56.06	65.82	63.34	68.02	63.89
	(18)61		D Cr.	NP	0	0	0.90	0.40	0.44	0.19
		Joints	Stain	NP	39.99	35.68	52.61	64.38	85.18	84.32
			D Cr.	NP	0	0	0.03	0	0.92	0.69
						(9)	(10)	(11)	(12)	(13)
29	Sec. 31(1)	Cracks	Stain	NP/UNT	---	12.43	6.38	7.60	0	19.30
			Stain	NP/T	---	7.83	29.66	27.61	0	75.14
			D Cr.	NP/UNT	---	5.21	0	3.39	0	11.25
			D Cr.	NP/T	---	3.81	16.17	9.92	0	54.28
		Joints	Stain	NP/UNT	---	20.96	25.65	27.03	50.01	49.65
			Stain	NP/T	---	35.64	64.99	66.48	92.23	92.34
			D Cr.	NP/UNT	---	12.27	13.86	20.44	31.32	25.24
			D Cr.	NP/T	---	21.32	10.34	34.05	77.46	77.53
							(2)	(3)	(4)	(5)
30	P-71-3(12)	Cracks	Stain	NP	---	---	66.35	69.26	70.51	72.77
			D Cr.	NP	---	---	0	0	0	0
		Joints	Stain	NP	---	---	11.32	40.36	55.04	80.54
			D Cr.	NP	---	---	0	0	0	0
								(4)	(5)	(6)
31	Sec. 61(2)	Cracks	Stain	NP	---	---	---	63.32	53.02	36.68
			D Cr.	NP	---	---	---	0	0	0.27
		Joints	Stain	NP	---	---	---	30.93	43.58	52.17
			D Cr.	NP	---	---	---	0	0	0
								(7)	(8)	(9)
32	C020-32	Cracks	Stain	NP	---	---	---	0	33.00	48.50
	(4)		D Cr.	NP	---	---	---	0	0	0
		Joints	Stain	NP	---	---	---	8.70	13.78	36.10
			D Cr.	NP	---	---	---	0	0	0
									(10)	(11)
33	Sec. 48(6)	Cracks	Stain	NP	---	---	---	---	35.79	63.38
			D Cr.	NP	---	---	---	---	1.09	0.88
		Joints	Stain	NP	---	---	---	---	70.03	84.94
			D Cr.	NP	---	---	---	---	51.70	60.92

Table 4 (Continued)

Proj. Ident.	Project No.	Crack/ Joint	Defect	Poly or No Poly	Deterioration Function 71λx	72λx	73λx	74λx	75λx	76λx
									(10)	(11)
34	F-50-1(2)	Cracks	Stain	NP	---	---	---	---	49.33	62.82
			D Cr.	NP	---	---	---	---	0	0.66
		Joints	Stain	NP	---	---	---	---	89.19	94.28
			D Cr.	NP	---	---	---	---	56.95	68.93
									(9)	(10)
35	C051-50 (7)	Cracks	Stain	NP	---	---	---	---	39.97	61.04
			D Cr.	NP	---	---	---	---	1.73	19.89
		Joints	Stain	NP	---	---	---	---	91.73	98.09
			D Cr.	NP	---	---	---	---	84.68	95.62
									(12)	(13)
36	Sec. 40(2)	Cracks	Stain	NP	---	---	---	---	0	42.64
			D Cr.	NP	---	---	---	---	0	17.44
		Joints	Stain	NP	---	---	---	---	29.66	37.39
			D Cr.	NP	---	---	---	---	10.43	15.27
									(8)	(9)
37	I-29-2(49)	Cracks	Stain	NP	---	---	---	---	62.87	69.47
			D Cr.	NP	---	---	---	---	24.73	23.41
		Joints	Stain	NP	---	---	---	---	62.30	75.07
			D Cr.	NP	---	---	---	---	54.30	47.24
										(4)
38	I-29-2 (59)111	Cracks	Stain	NP	---	---	---	---	---	35.71
			D Cr.	NP	---	---	---	---	---	0
		Joints	Stain	NP	---	---	---	---	---	5.21
			D Cr.	NP	---	---	---	---	---	0
										(4)
39	F-65-5(1)	Cracks	Stain	P	---	---	---	---	---	18.74
			D Cr.	P	---	---	---	---	---	0
		Joints	Stain	P	---	---	---	---	---	24.09
			D Cr.	P	---	---	---	---	---	0
										(3)
40	C024-71B (4)U	Cracks	Stain	P	---	---	---	---	---	66.05
			D Cr.	P	---	---	---	---	---	0
		Joints	Stain	P	---	---	---	---	---	0
			D Cr.	P	---	---	---	---	---	0
										(4)
41	I-435-1(8)	Cracks	Stain	P	---	---	---	---	---	50.19
			D Cr.	P	---	---	---	---	---	0
		Joints	Stain	P	---	---	---	---	---	0.52
			D Cr.	P	---	---	---	---	---	0
										(5)
42	I-IG-435 -1(9)	Cracks	Stain	P	---	---	---	---	---	25.35
			D Cr.	P	---	---	---	---	---	0
		Joints	Stain	P	---	---	---	---	---	0.58
			D Cr.	P	---	---	---	---	---	0

Table 5

Survey Results From P.C.C.P. Constructed With Bethany Falls Coarse Aggregates With a Maximum of One Inch Size Design, With and Without Polyethylene

Proj. Ident.	Project No.	Poly or No Poly	Deterioration Function by Age of Pavement (λ) (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			A. Staining on Sawed Joints											
5	C083-9(2)UA	NP		0	0	14.18	14.18	5.05						
		P		20.89	8.64	28.61	29.04	53.51						
6	I-35-1(11)14	NP			0	12.01	13.60	7.51	19.48					
		P			0.70	10.42	14.84	14.16	19.71					
7	I-IG-29-2(46)58	NP				1.12	4.96	21.24	51.98	59.35				
		P				5.76	21.20	45.84	69.77	76.90				
9	C031-6(8)	NP		0	59.22	62.66	98.27	97.78						
		P		9.59	52.99	74.02	99.32	97.61						
10	U-45-1(3)	NP		0	0	0	31.60							
		P		0	0	0	7.87							
11	U-45-1(6)	NP		0										
		P		0	(Short project omitted from observations)									
12	U-71-5(6)	NP			0	43.71	43.72	50.09						
		P			1.23	27.92	27.51	52.60						
13	C025-BB(1)	NP					0	40.58	37.13	34.08				
		P					0	35.84	39.51	35.08				
14	F-71-4(9)	NP			0.90	16.94	26.08	38.43						
		P			11.68	35.68	50.04	52.57						
15	I-435-1(61)16UA	NP				0	0	2.54						
		P				0	0.17	1.62						
16	I-29-1(12)13 Sec. C	NP				0	5.38	9.86						
		P				17.96	23.00	26.31						
20	F-71-4(10)	NP				5.68	32.86							
		P				3.23	36.41							
21	I-IG-435-1(59)	NP					1.93	0						
		P					3.16	0						
23	C024-210	NP				0	2.69							
		P				0.92	1.10							
			B. D-Cracking on Sawed Joints											
5	C083-9(2)UA	NP		0	0	0	0	0.53						
		P		0	0	0	0.29	7.76						
6	I-35-1(11)14	NP			0	0	0	0	0.46					
		P			0	0	0	0	4.46					
7	I-IG-29-2(46)58	NP				1.69	2.54	3.26	14.79	22.05				
		P				1.47	1.21	2.61	22.19	30.13				
9	C031-6(8)	NP		0	0	0	2.59	2.00						
		P		0	0	0	2.36	0.85						
10	U-45-1(3)	NP		0	0	0	0							
		P		0	0	0	0							
11	U-45-1(6)	NP		0										
		P		0	(Short project omitted from observations)									
12	U-71-5(6)	NP			0	0	0	0.71						
		P			0	0	0	0						
13	C025-BB(1)	NP					0	0	1.64	1.61				
		P					0	0	0	0				
14	F-71-4(9)	NP			0	0	0	1.80						
		P			0	0	1.75	5.06						
15	I-435-1(61)16UA	NP				0	0	0						
		P				0	0	0						
16	I-29-1(12)13 Sec. C	NP				0	0	0.88						
		P				0	0	1.25						
20	F-71-4(10)	NP				0	0							
		P				0	0							
21	I-IG-435-1(59)	NP					0	0						
		P					0	0.26						
23	C024-210	NP				0	0							
		P				0	0							

Table 6

Analysis of Pavement Age When Stain and D-Cracking Are First Observed

Part A - Summary of Pavement Age to Obtain Evidence of Staining or D-Cracking

Project	No Polyethylene: Age Stain Observed (Years)	No Polyethylene: Age D-Cracking Observed (Years)	Polyethylene: Age Stain Observed (Years)	Polyethylene: Age D-Cracking Observed (Years)
5	4	6	2	5
6	4	7	3	7
7	4	4	4	4
9	3	5	2	5
10	5	-	5	-
11	-	-	-	-
12	4	6	3	-
13	6	7	6	-
14	3	6	3	5
15	6	-	5	-
16	5	6	4	6
20	4	-	4	-
21	5	-	5	6
23	5	-	4	-
$\bar{x}$	4.462	5.875	3.846	5.428

Part B - Analyses of Data in Part A

Analysis

(1) Age Stain Observed, No Polyethylene Vs. Polyethylene
(2) Age Stain Observed, No Polyethylene Vs. Age D-Cracking Observed, No Polyethylene
(3) Age Stain Observed, Polyethylene Vs. Age D-Cracking Observed, Polyethylene
(4) Age D-Cracking Observed, No Polyethylene Vs. Polyethylene

(f)	Analysis (1)	(2)	(3)	(4)
N	13	8	7	6
$\bar{x}$	4.46	4.12	3.28	5.67
$\bar{y}$	3.85	5.88	5.43	5.33
b	1.06	0.45	0.15	0.88
a	-0.89	4.00	4.92	0.38
r^2	0.72	0.21	0.03	0.76
r	0.84	0.45	0.18	0.88
MS	0.46	0.91	1.11	0.31
$S_{y.x}$	0.68	0.95	1.05	0.56
CV%	17.59	16.23	19.39	10.48

Table 7

Survey Results from P.C.C.P. Constructed With Bethany Falls Coarse Aggregate
With a Maximum of One Inch Size Design, With Entire Project Being Either Polyethylene or No Polyethylene

Ident.	Project No.	Poly or No Poly	Deterioration Function by Age of Pavement (λ) (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						A. Staining on Sawed Joints								
28	I-IG-35-2(18)61	NP				39.99	35.68	52.61	64.38	85.18	84.32			
17	I-29-1(12)13,Sec.A&B	P				15.53	17.34	40.27						
18	I-35-2(27)105	P				44.41	38.97							
19	C048-W(4)	P				0	6.16							
22	SU-SUG-647(7)	P			41.88	39.57								
25	I-29-2(45)70	P							42.39	65.04				
39	F-65-5(1)	P				24.09								
40	C024-71B(4)U	P			0									
41	I-435-1(8)	P				0.52								
42	I-IG-435-1(9)	P					0.58							
						B. D-Cracking on Sawed Joints								
28	I-IG-35-2(18)61	NP				0	0	0.03	0	0.92	0.69			
17	I-29-1(12)13,Sec.A&B	P				0	0	0						
18	I-35-2(27)105	P				0	0							
19	C048-W(4)	P				0	1.18							
22	SU-SUG-647(7)	P			0	0								
25	I-29-2(45)70	P							26.88	26.72				
39	F-65-5(1)	P				0								
40	C024-71B(4)U	P			0									
41	I-435-1(8)	P				0								
42	I-IG-435-1(9)	P					0							

Table 8

Survey Results from P.C.C.P. Constructed With Various Coarse Aggregates
With a Maximum of One Inch Size Design

Proj. Ident.	Project No.	Poly or No Poly	Deterioration Function by Age of Pavement (λ) (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						A. Staining on Sawed Joints								
1	F-50-2(7)	NP		1.68	0	0	8.06	9.45	11.50					
		P		0.37	9.98	2.11	20.76	14.36	46.75					
2	F-50-2(11)	NP		0	0.41	11.02	23.24	48.39	55.75					
		P		1.12	1.75	23.02	31.95	51.28	63.37					
4	F-36-1(16)	NP			0	8.82	24.46	40.14	**					
		P			0.25	10.39	31.83	59.85	**					
8	F-6-1(1)	NP			0	5.10	15.30	30.53	22.64					
		P			0	11.46	37.22	47.70	41.97					
24	I-29-2(56)70	NP				3.09	10.01							
		P				30.88	43.95							
38	I-29-2(59)111	NP				5.21								
						B. D-Cracking on Sawed Joints								
1	F-50-2(7)	NP		1.01	0.78	0.99	0	0.88	1.79					
		P		0	0.17	0	0	0	13.76					
2	F-50-2(11)	NP		0	0	0	0	2.40	16.47					
		P		0.10	0	0	0	2.45	17.79					
4	F-36-1(16)	NP			0	0	0	0	**					
		P			0	0	0	0.25	**					
8	F-6-1(1)	NP			0	0	0	1.78	0					
		P			0	0	0	0	0					
24	I-29-2(56)70	NP				0	0.15							
		P				0.16	0.08							
38	I-29-2(59)111	NP				0								

*Structural cracks sealed
**Sawed joints sealed

Table 9

Survey Results From P.C.C.P. Constructed With Bethany Falls Coarse Aggregate
With a Maximum of Two Inch Size Design, With Entire Project Having No Polyethylene Moisture Barrier

Proj. Ident.	Project No.	Poly or No Poly	Deterioration Function by Age of Pavement (λ) (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
						A. Staining on Sawed Joints									
26	I-29-2(18)53	NP									39.94	47.36	59.92	72.53	89.76
27	I-29-2(9)55	NP									57.51	65.14	76.92	95.36	97.93
33	Sec. 48(6)	NP										70.03	84.94		
34	F-50-1(2)	NP										89.19	94.28		
35	C051-50(7)	NP									91.73	98.09			
36	Sec. 40(2)	NP												29.86	37.39
						B. D-Cracking on Sawed Joints									
26	I-29-2(18)53	NP									18.51	34.27	32.56	51.86	62.59
27	I-29-2(9)55	NP									29.74	48.56	58.89	77.98	79.88
33	Sec. 48(6)	NP										51.70	60.92		
34	F-50-1(2)	NP										56.95	68.93		
35	C051-50(7)	NP									84.68	94.62			
36	Sec. 40(2)	NP												10.43	15.27

*Structural Cracks Sealed.

Table 10

Survey Results from P.C.C.P. Constructed With Various Coarse Aggregates With a Maximum of Two Inch Size Design

Proj. Ident.	Project No.	Poly or No Poly	Deterioration Function by Age of Pavement (λ) (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			A. Staining on Sawed Joints											
30	F-71-3(12)	NP		11.32	40.36	55.04	80.54							
31	Sec. 61(2)	NP				30.93	43.58	52.17						
32	C020-32(4)	NP							8.70	13.78	36.10			
37	I-29-2(49)	NP								62.30	75.07			
			B. D-Cracking on Sawed Joints											
30	F-71-3(12)	NP		0	0	0	0							
31	Sec. 61(2)	NP				0	0	0						
32	C020-32(4)	NP							0	0	0			
37	I-29-2(49)	NP								54.30	47.24			

Table 11

Survey Results on Sawed Joints from P.C.C.P. Constructed With Two Inch Maximum Bethany Falls Limestone and Other Variables of Interest

Proj. Ident.	Proj. No.	Observation	Poly or No Poly	Deterioration Function by Age of Pavement (λ) (4)	(5)	(6)	(7)	(8)	(9)
		A. Two Inch Bethany Falls with Polyethylene Test Sections							
3	C058-36(8)	Stain	NP	8.71	18.54	37.76	75.78	93.45	91.67
		Stain	P	26.45	32.41	64.52	94.05	97.80	97.22
		D Cr.	NP	12.80	27.54	51.83	75.94	88.36	87.21
		D Cr.	P	22.31	38.62	71.67	89.07	97.42	96.81
		B. Two Inch Bethany Falls With Cement Treated Base Test Sections							
					(9)	(10)	(11)	(12)	(13)
28	Sec. 11(1)	Stain	NP/UNT		20.96	25.65	27.03	50.01	49.65
		Stain	NP/T		35.64	64.99	66.48	92.23	92.34
		D Cr.	NP/UNT		12.27	13.86	20.44	31.32	25.24
		D Cr.	NP/T		21.32	10.34	34.05	77.46	77.53

Figure 1

Average Yearly Deterioration Function of Staining and D-cracking Observed on Projects Constructed With and Without Polyethylene With One Inch Maximum Size Bethany Falls Limestone Coarse Aggregate.

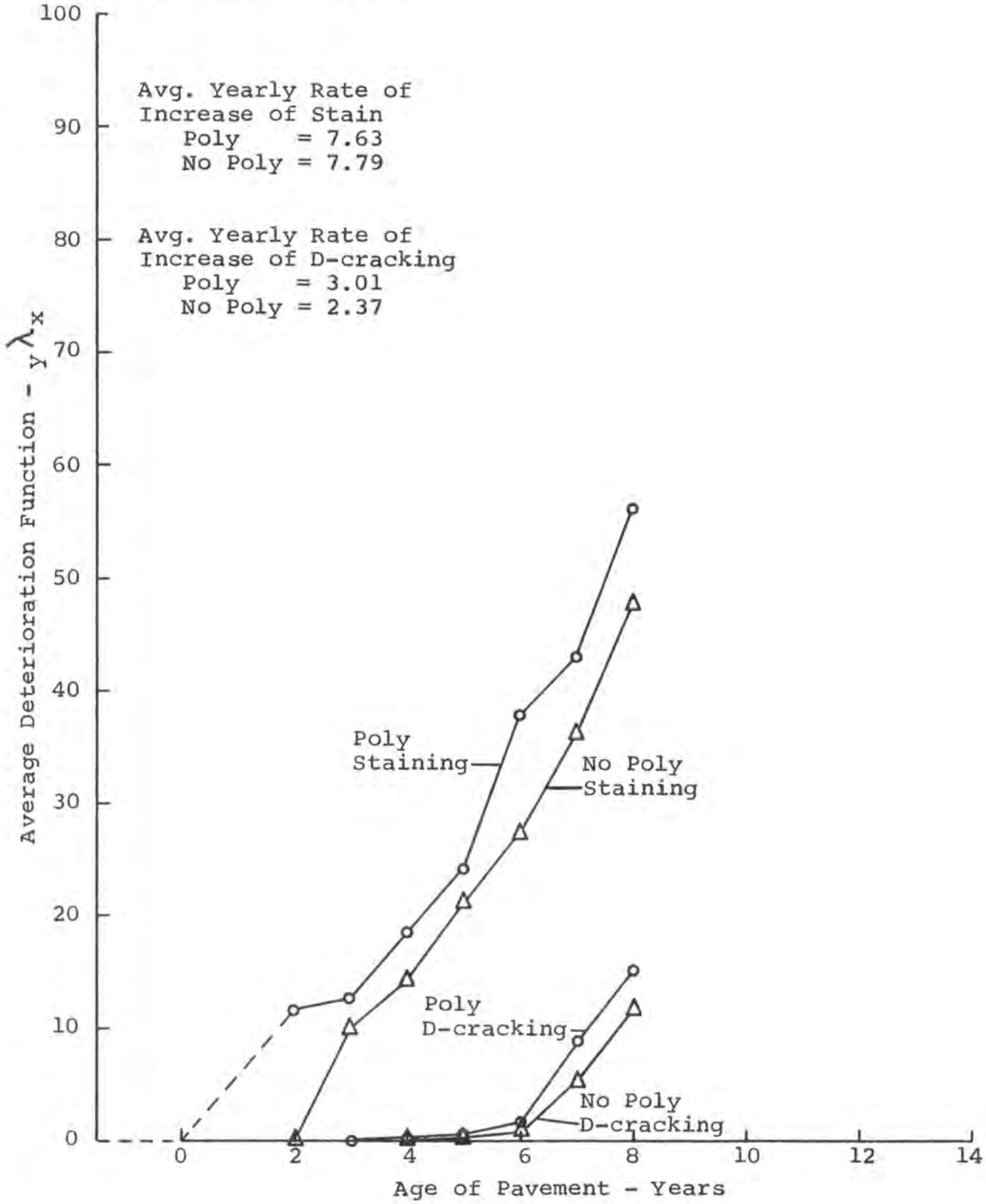


Figure 2

Average Yearly Deterioration Function of Staining and D-cracking Observed on Projects Constructed With and Without Polyethylene With One Inch Maximum Size Coarse Aggregates From Formations Other Than Bethany Falls Limestone.

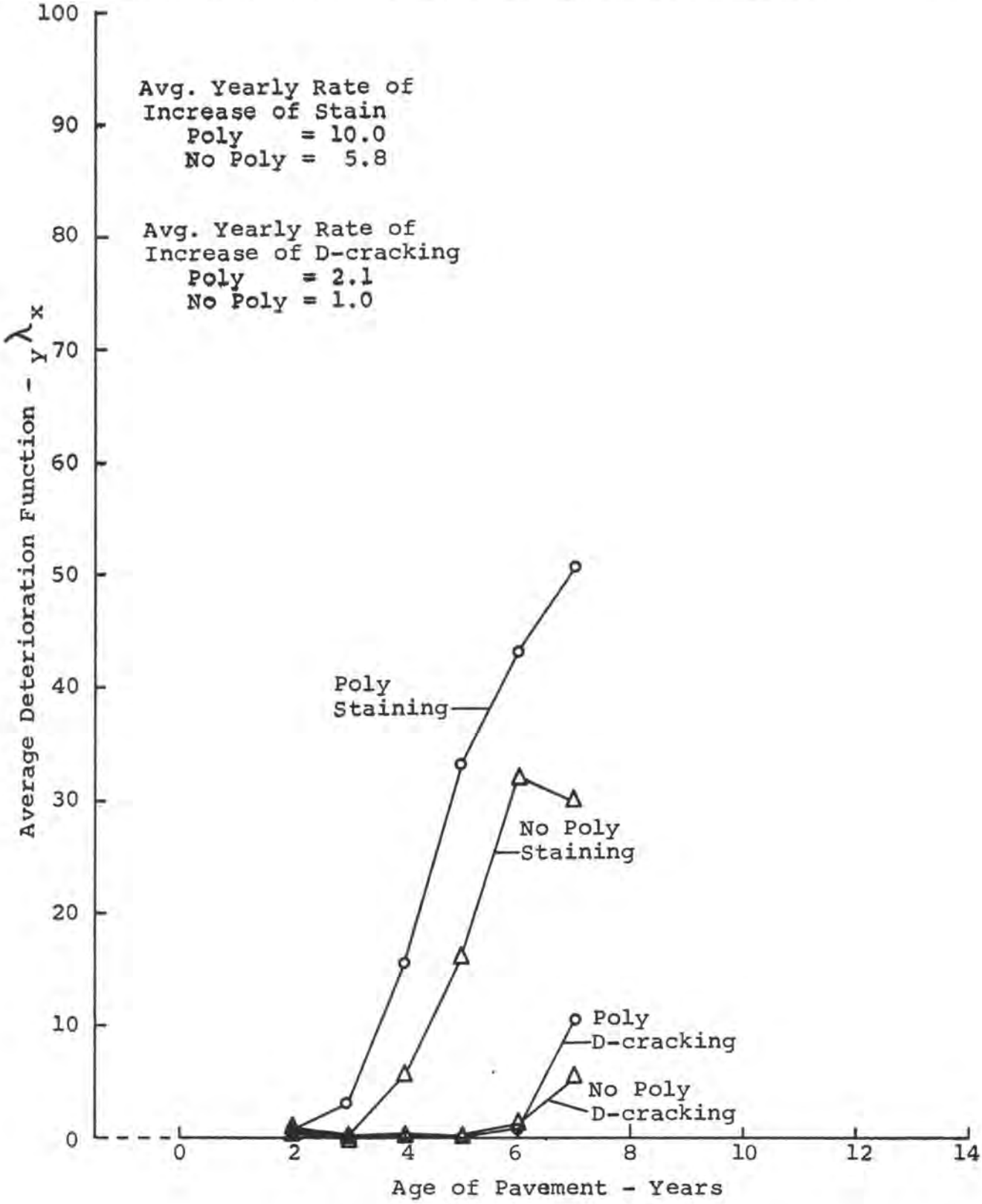


Figure 3

Average Yearly Deterioration Function of Staining and D-cracking Observed on Projects Constructed With and Without Polyethylene With Two Inch Maximum Size Bethany Falls Limestone Coarse Aggregate.

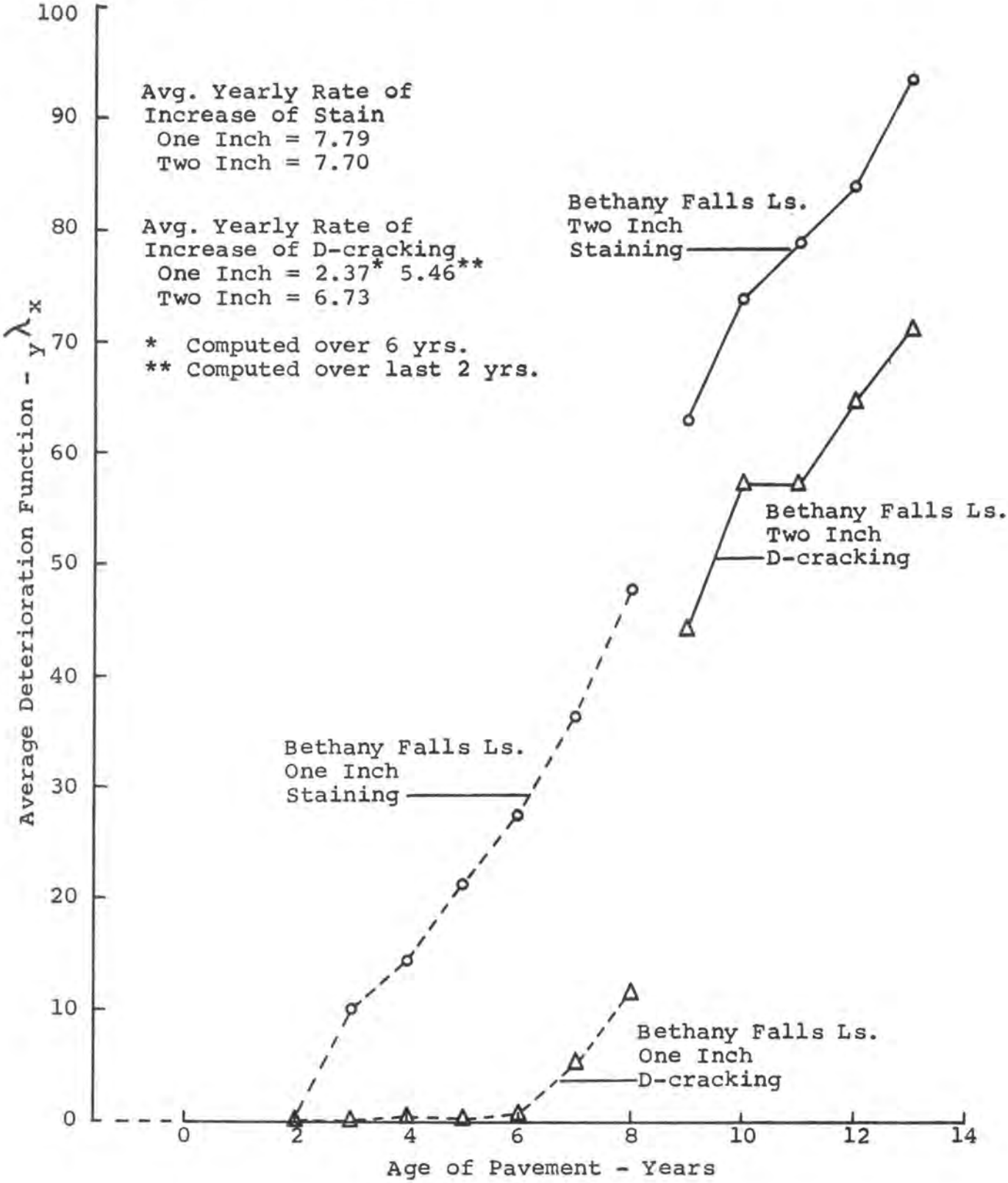
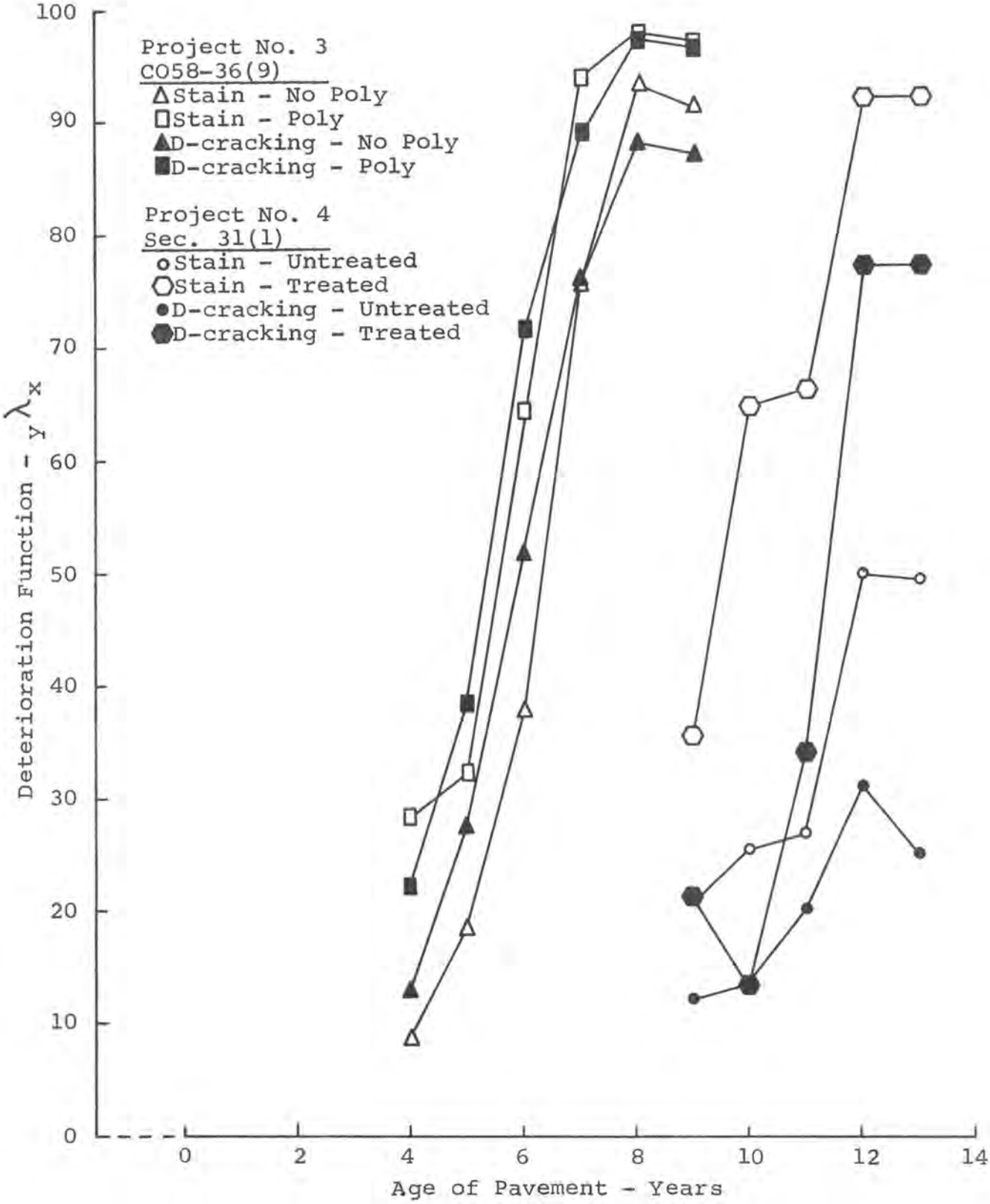


Figure 4

Yearly Deterioration Function of Staining and D-cracking Observed on Projects Constructed With Two Inch Bethany Falls Limestone and With Either Polyethylene Moisture Barrier or Cement Treated Base Test Sections.



APPENDIX A

SPECIFICATIONS FOR D-CRACKING SURVEYS

SPECIFICATIONS FOR D-CRACKING SURVEYS

The description and specifics mentioned herein are for a detailed survey requiring the observer to exercise the best possible degree of accuracy under the conditions given as he can. This survey is a visual examination of the surface of PCC pavement that is suspected of having deterioration due to freeze and thaw at the joints and structural cracks. This survey requires the observer to maintain a record of his observations on strip maps which will be updated each subsequent observation. The data thus obtained will be applied to statistical methods for interpretation and possible relevent correlations determined.

In order for the data to be significant, the best possible care must be taken to estimate the stage of deterioration that really exists within the pavement. The guidelines which are set forth are to give consistence between the various locations and projects which will be included in these surveys. The methods and descriptions may not be completely agreeable to all, however, shall be strictly adhered to in all cases. Where situations arise that are not covered by these guidelines, complete details of the condition should be recorded and the observers opinion indicated. This will greatly reduce the uncertain situations that arise when tabulations are being made in the office. Any assumptions which are made should be recorded and any statement which the observer thinks needs to be made to clarify the assumption should also be noted.

Test Section Definition and Location:

The first form which shall be partially completed as the survey team begins work and completed as the test section is complete is Figure A-1. This form, Field Test Section Record Summary, will be the fore page to each group of test sections of PCC pavement which is surveyed. The test sections surveyed under similar conditions will be so indicated by listing on the left side of that section of the form so applying. A test section will be defined as that section of pavement consisting of two driving lanes in width, that is surveyed as one continuous section. If multiple lanes occur, increase the strip map to indicate such and survey full width. The section length will be constant at 0.2 mile which shall be equivalent to 1000 feet or ten (10) stations. If construction features such as bridges, bridge approaches, cross roads, etc. happen to occur within a 1000 foot section exclusion of that portion shall be done with a comparable increment of length to replace this exclusion added at the end of the test section. If the construction feature is over 300 feet in length, the test section shall be located forward (with the direction of the survey) of the feature so as to have a continuous test section.

The test sections shall be located at the first 0.2 per mile of project length. The first test section shall be located beginning with the end station of the project or with the first station within the project which has not been resurfaced if such is the case. If short asphalt overlays occur within a project, their length shall be counted in determining the location of the test sections, with consideration for beginning at the first non-resurfaced station number as above.

When nearing the end of a project, if the remaining mileage is less than 0.5 mile, do not survey any portion of that remaining. However, if the remainder is greater than 0.5 mile, survey a full 0.2 mile test section.

The Field Test Section Record Summary sheets (Figure A-1) shall be stapled to the strip maps for the particular project it represents. The test section results shall be filed together by project.

Strip Maps:

The purpose of obtaining the information on the projects which show deterioration or a definite indication of possible deterioration occurring in the future, is to determine the point in time which the pavement begins to show possible deterioration or becomes so deteriorated as to require an asphaltic concrete overlay to maintain a safe travelable roadway surface. The observations made each year effectively establish a rate of deterioration for each of the particular projects and the specific materials and design constants for that project. It is very important that as detailed and accurate a record as possible of the area and severity of the deterioration at each joint and crack within the test section be made each year.

The strip maps to be used will be similar to that shown in Figure A-2. This form will allow for the test sections of 1000 feet, with any possible exclusions, to be recorded on one sheet. An office copy will be maintained each year that a survey is made with that year being represented by a color code or by xeroxing a copy and dating it by year for reference. All subsequent years would be filed with the original by project.

The original information which is desired on the strip maps is shown in Figure A-3. This information will serve to establish the location of the test section with regard to station numbers, cross roads, bridges, etc., or the natural topography of the locations. This information will be compiled and the original survey sheets prepared prior to the first survey if possible so no observed variations in the project will influence a judgment as to location.

Figures A-3a through A-3d represent what may be a typical test section and the observed rate of deterioration and the appearance of the relative set of strip maps which may be created with each successive observation. The particular spot where deterioration is occurring is marked on these strip maps and with time will show the relative increase in the affected areas. The values either numerical for D-cracking or alphabetical for Stain which are shown adjacent to each structural crack and joint indicate the estimated area which each is observed to cover. The representative values for each increasing increment of area involved is:

Area (Sq. Ft.)	Stain	D-Cracking
0 - ½	A	1
½ - 1	B	2
1 - 2	C	3
2 - 5	D	4
5 - 10	E	5
10 - 15	F	6
15 - 25	G	7
+25	H	8

Therefore, the increase in area involved gives relative measure of the rate of deterioration occurring in the PCC pavement being observed.

This precisely is the reason for taking care to evaluate and to record the observations in as accurate and consistent a manner as possible. This data will be evaluated by statistical methods which means these guidelines shall be followed as close as possible. Any deviations should be noted..

If it is possible to survey these test sections after an overlay has been placed, then Figures A-4 through A-4b may be examples of what may happen. This information will also be very useful in recording the benefit of pre-maintenance or pre-construction procedures that may be done on such PCC pavements.

Special Items to Consider:

Several items which may have to be considered in the location or evaluation of these test sections are: Interchanges, ramps, variable widths, paved shoulders, map cracking, spalling, faulting, reflection cracking or dowels, etc. As these items are observed, specific notes to that effect shall be made on the strip map.

When rating the deterioration due to D-cracking, the resulting deterioration due to the other items mentioned above should be disregarded. Special notes shall be kept on these other items but not counted in the summary statistics relating to D-cracking.

Specific Examples of Deterioration:

The photographs in Figure A-5 are typical of the stain and D-cracking which is being rated in these surveys.

Figure A-1

Field Test Section Record Summary

County _____

Route _____

Project _____

Lane . . . . NB EB SB WB

Begin odometer _____ End odometer _____

Begin Station _____ End Station _____

Survey Party . . . . . Surveyor _____

Recorder _____

Driver _____

Form of Survey . . . . . A. Spot check from car

B. Joint by Joint from car

C. Walking

Direction surveyed . . . . . N E S W

Approximate time of day 9 11 2 4

Weather condition . . . . . Clear - Cloudy - Partly Cloudy

Other _____

Pavement Condition . . . . . Normal Other _____

Approximate slab length . . . . R. N.R.

Percent surveyed . . . . . Poly _____ No Poly _____

Tie Points:

Project _____ Test Section _____ Date_____

Figure A-2

Survey Form

Project I-IG-36(72)140 (PCCP) Test Section 2 Date 8/16/70

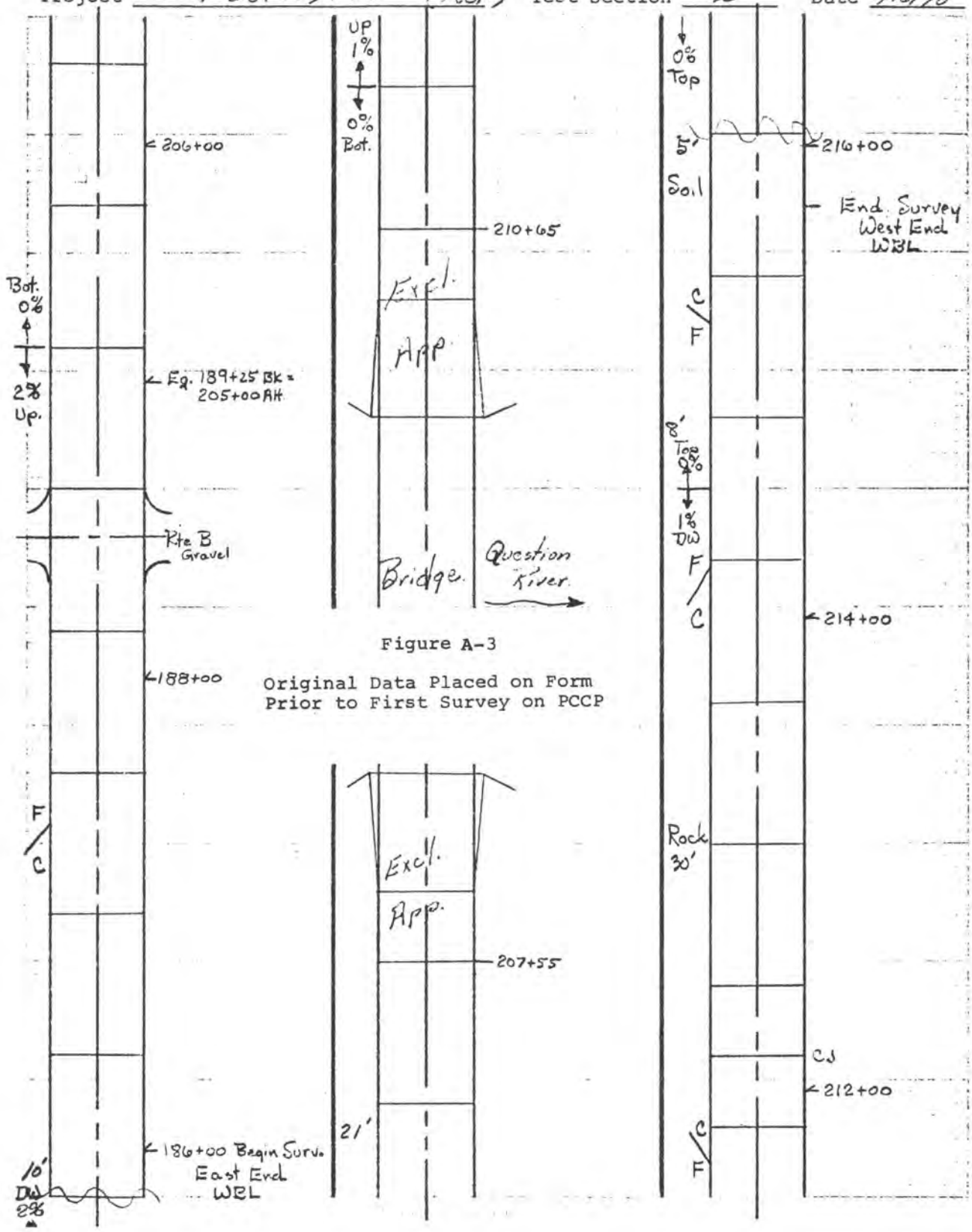


Figure A-3

Original Data Placed on Form
Prior to First Survey on PCCP

Project I-IG-36(72)140 (PCCP) Test Section 2 Date 8/16/78

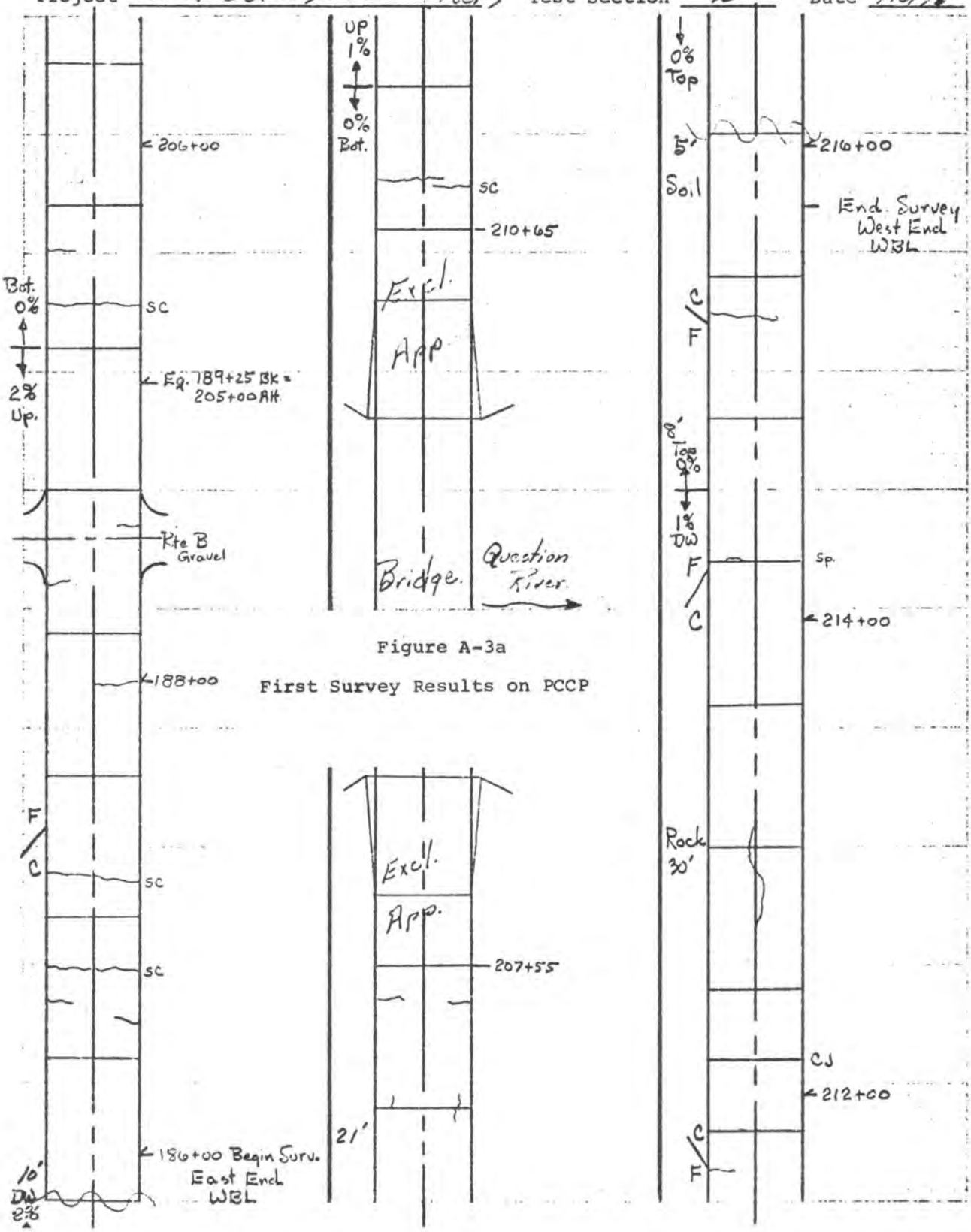


Figure A-3a

First Survey Results on PCCP

Project I-IG-36(72)140 (PCCP) Test Section 2 Date 8/16/72

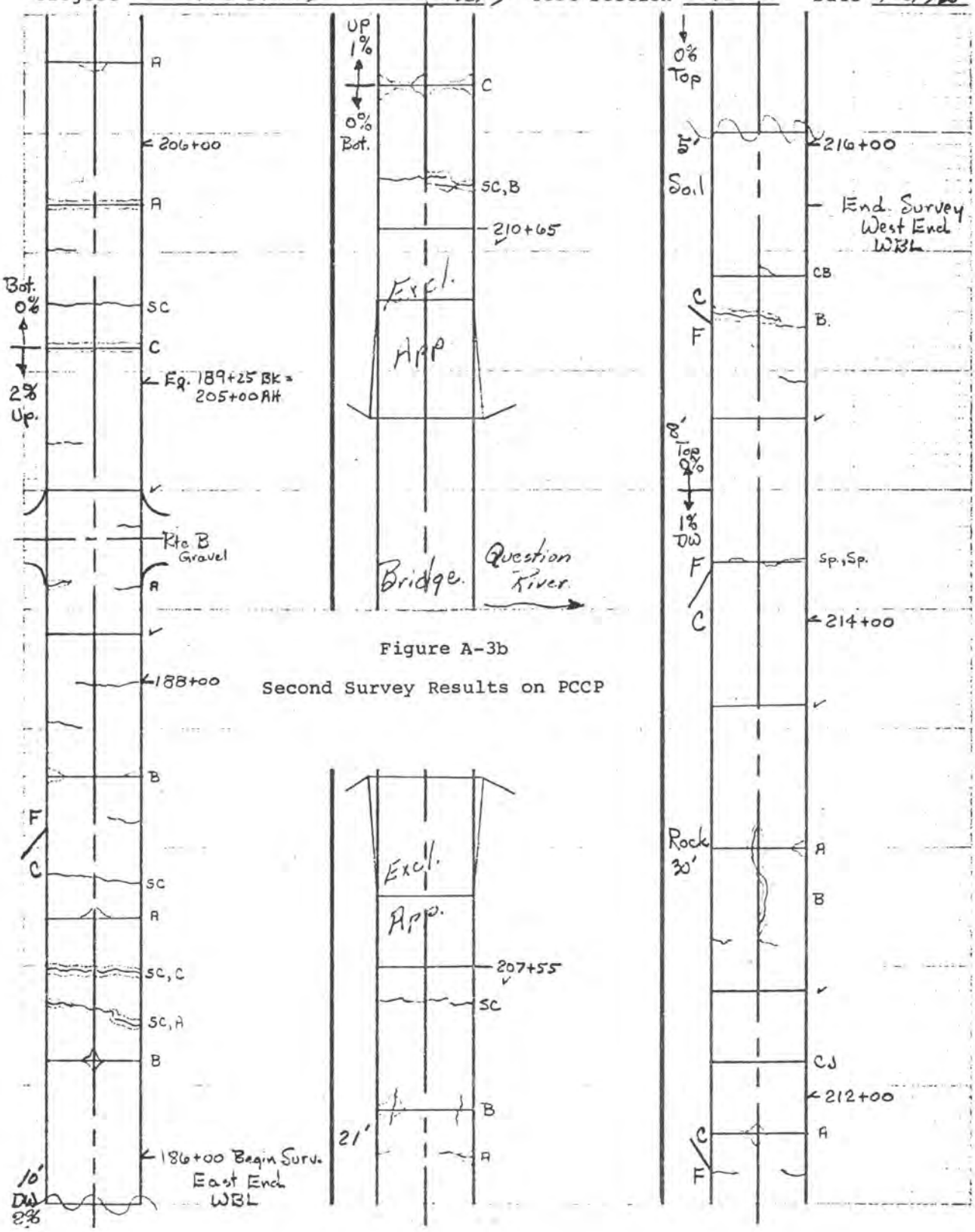


Figure A-3b

Second Survey Results on PCCP

Project I-IG-36(72)140 (PCCP) Test Section 2 Date 8/16/78

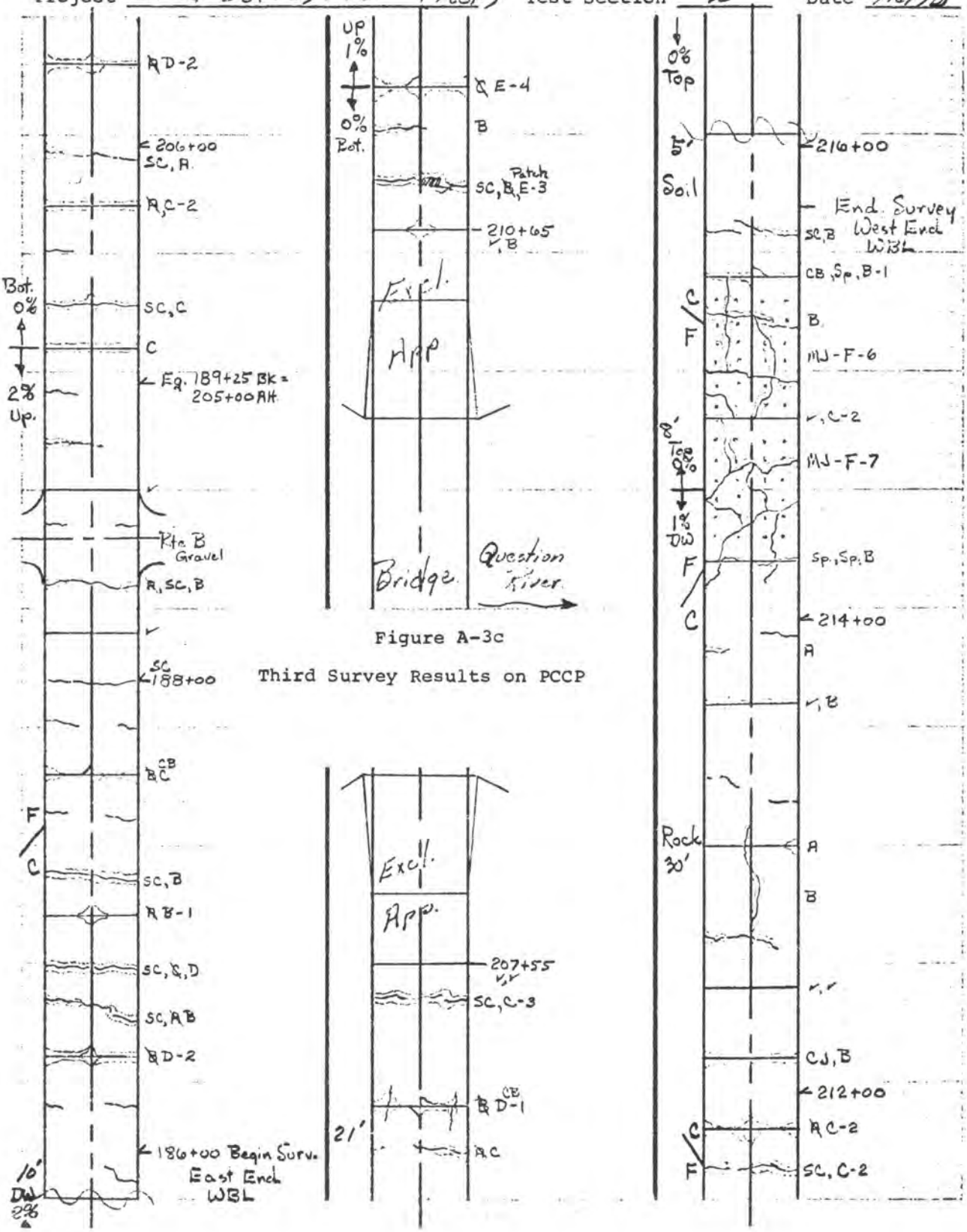


Figure A-3c

Third Survey Results on PCCP

Project I-IG-36(72)140 (PCCP) Test Section 2 Date 8/16/74

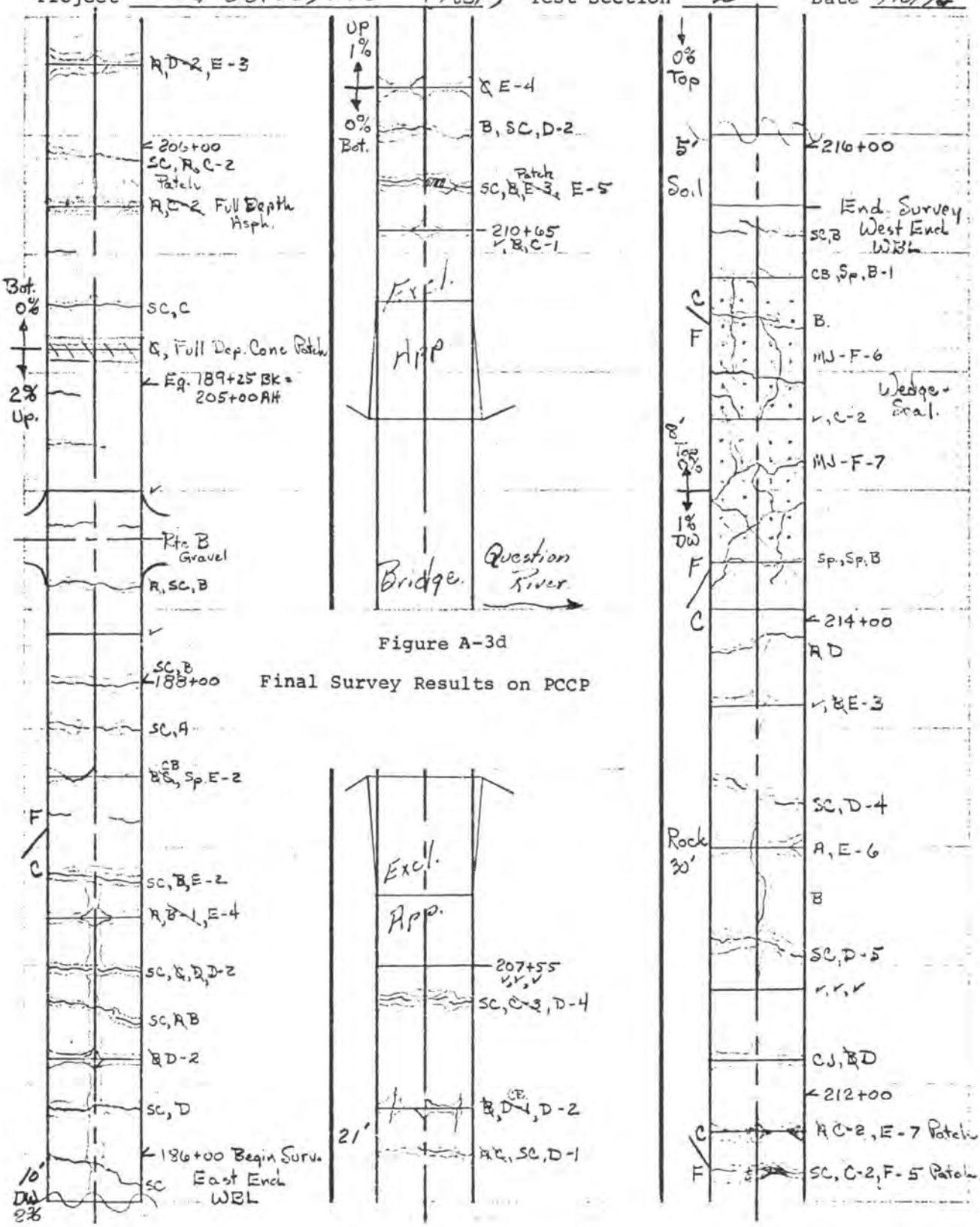


Figure A-3d

Final Survey Results on PCCP

Project C083-56(3) [illegible] Test Section 2 Date 2/3/75

(Asph.) (PCCP)

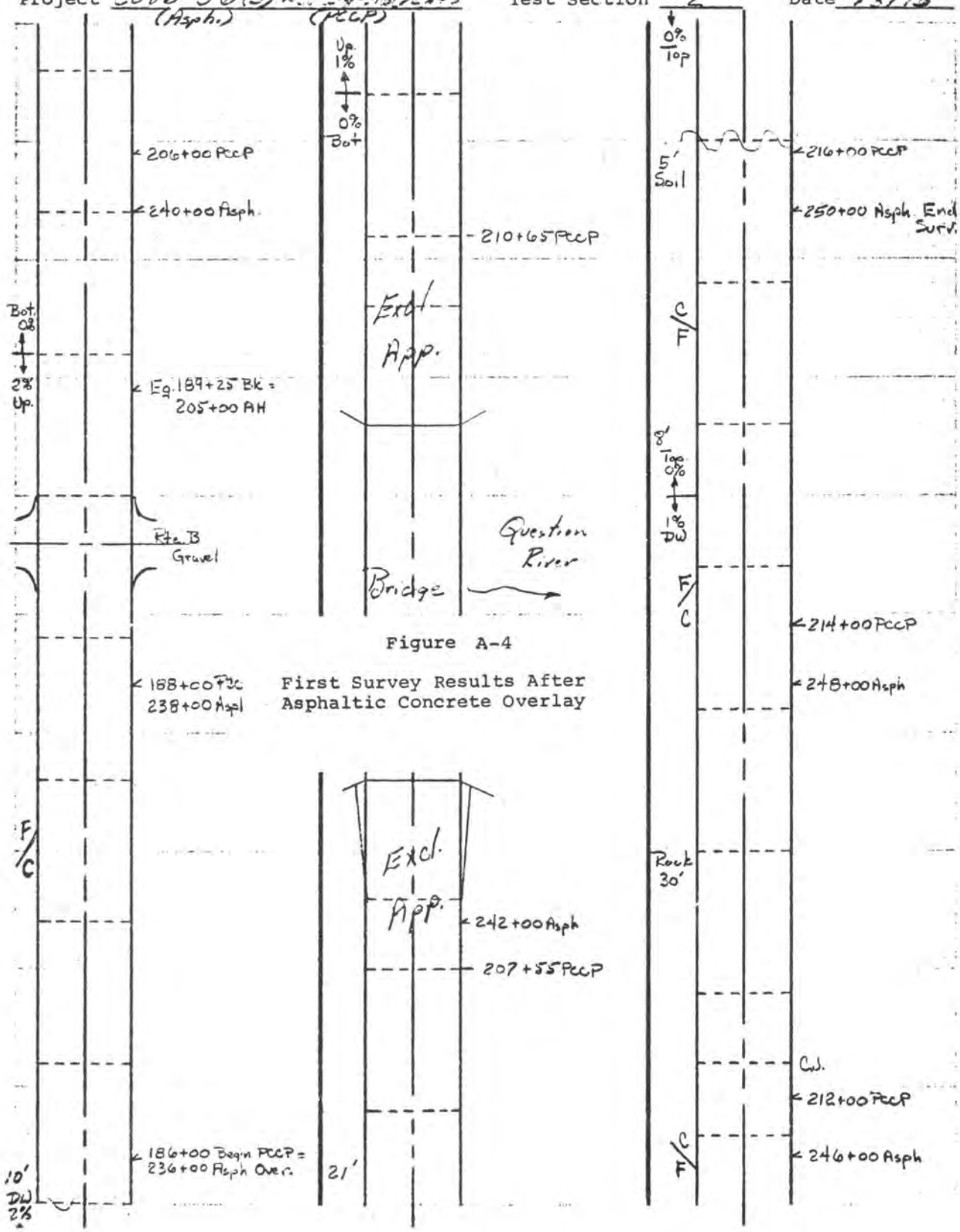
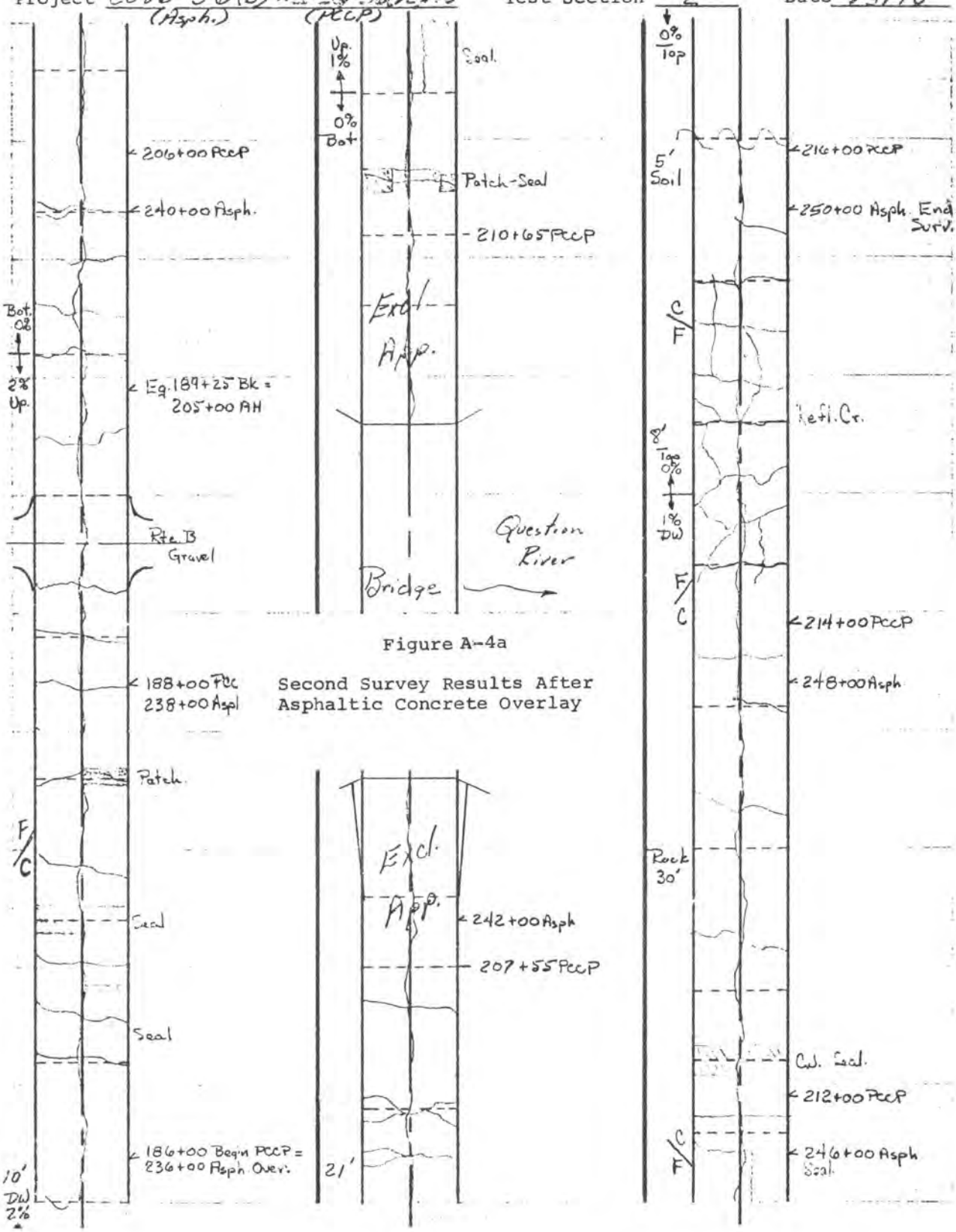


Figure A-4

First Survey Results After Asphaltic Concrete Overlay

Project C083-56(3) ≈ I-26-56(22)40 (Asph.) (PCCP) Test Section 2 Date 2/3/76



Project C083-56(3) ≈ I-26-36(22)40 (Asph.) (PCCP) Test Section 2 Date 12/3/76

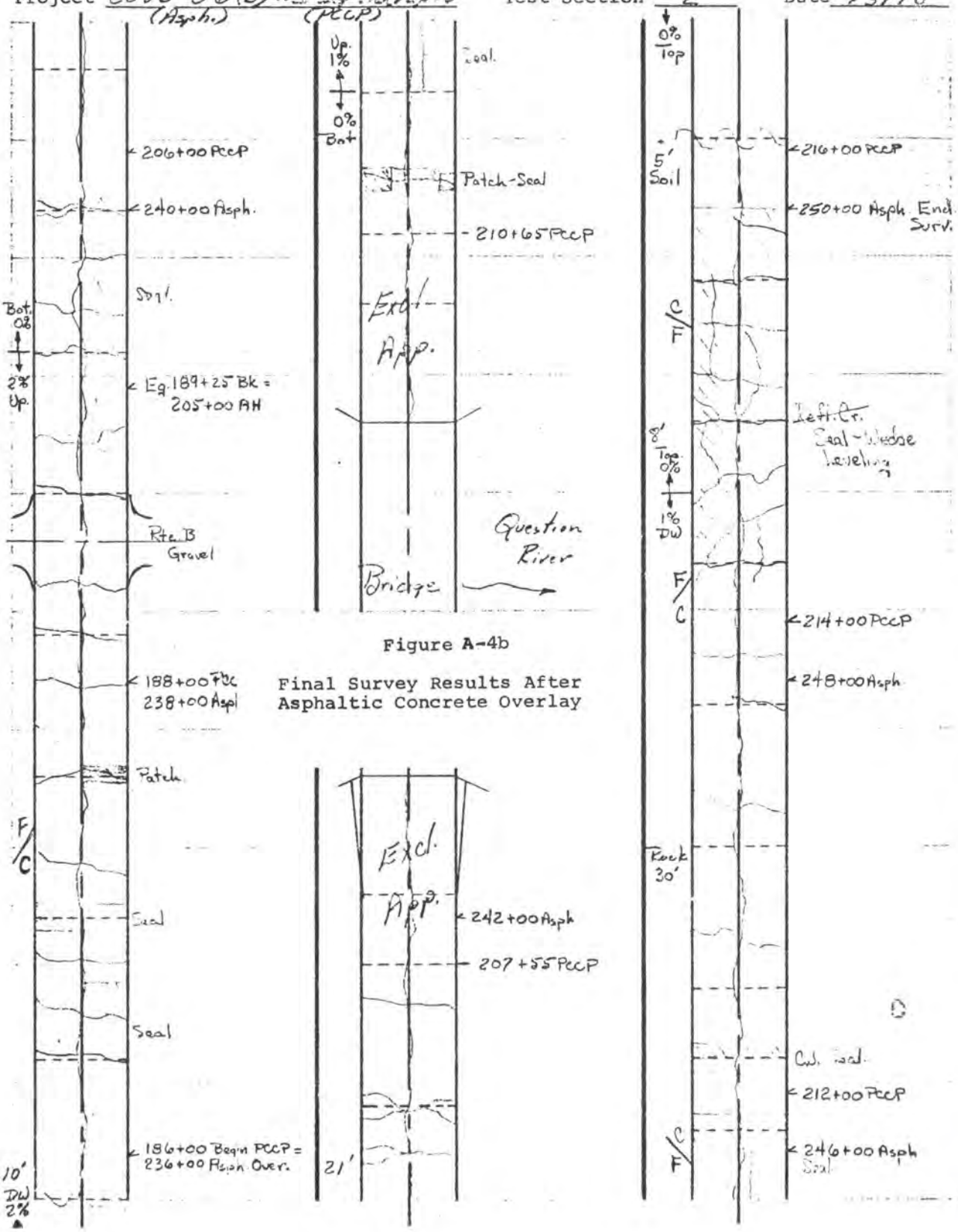
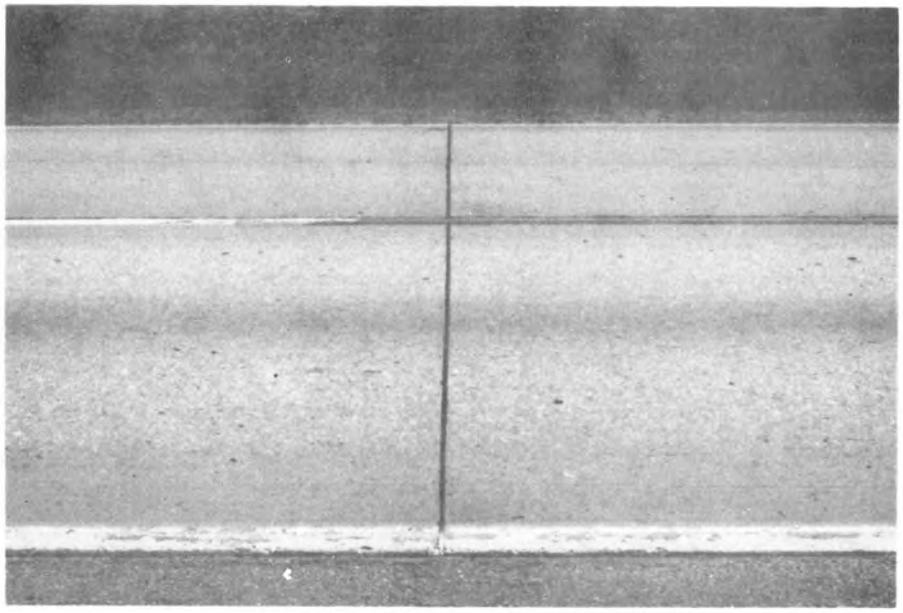


Figure A-4b

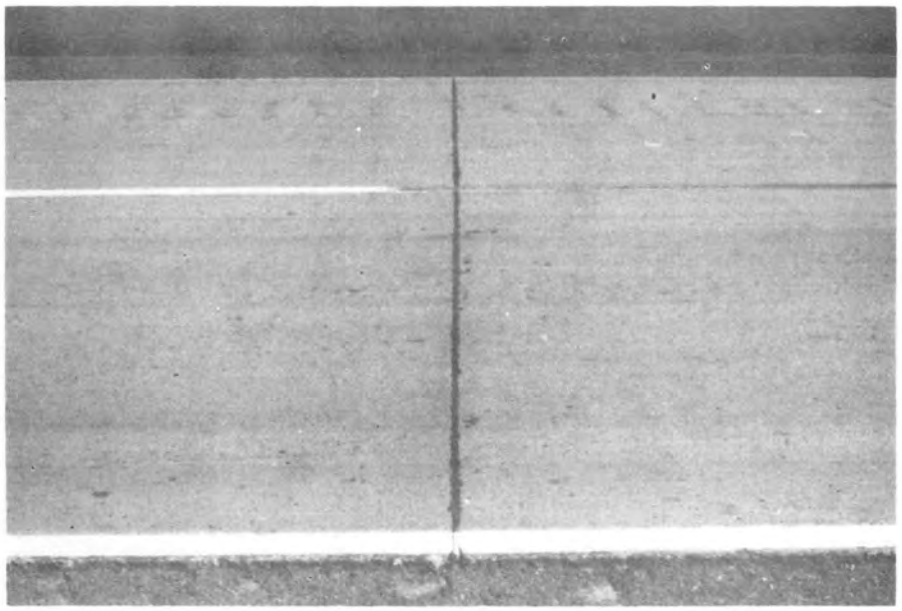
Final Survey Results After Asphaltic Concrete Overlay

Figure A-5

Examples of Visual Ratings Used for Staining and D-cracking

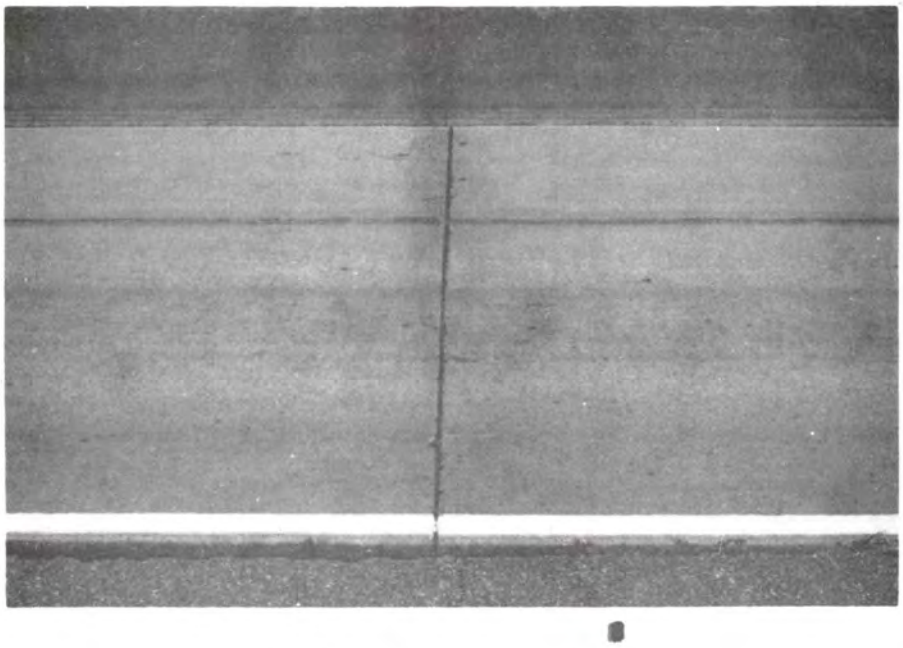


Rating B - Staining

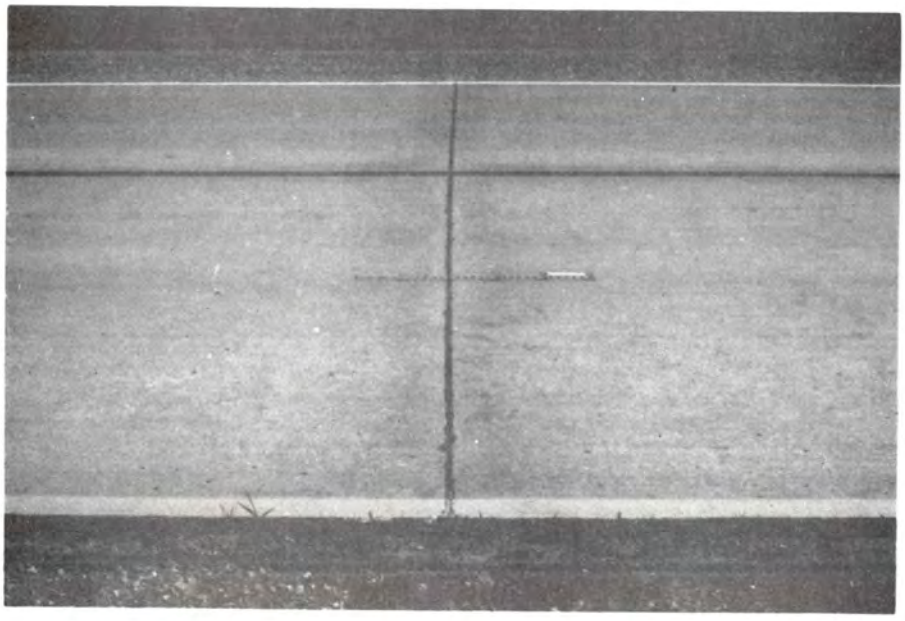


Rating D - Staining

Figure A-5 (Continued)

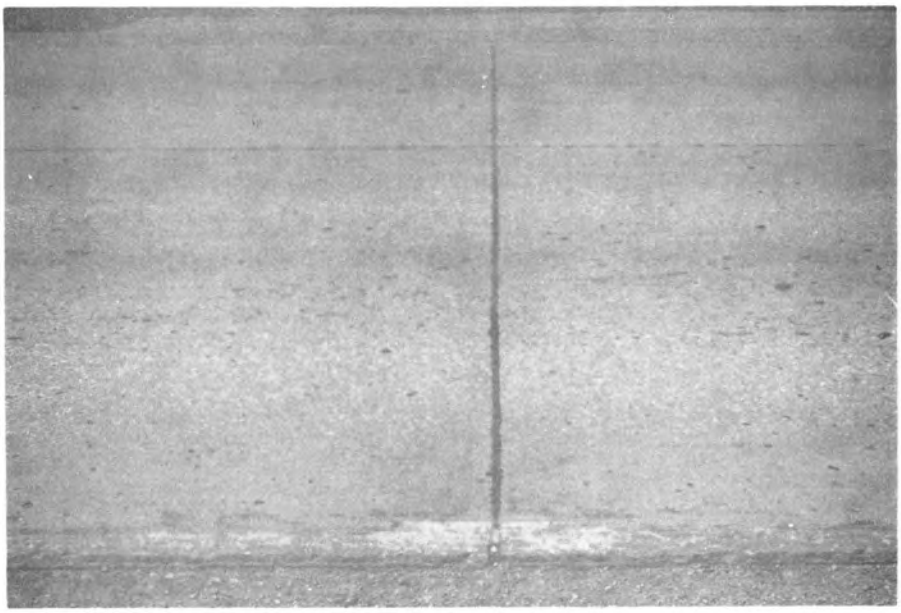


Rating F - Staining

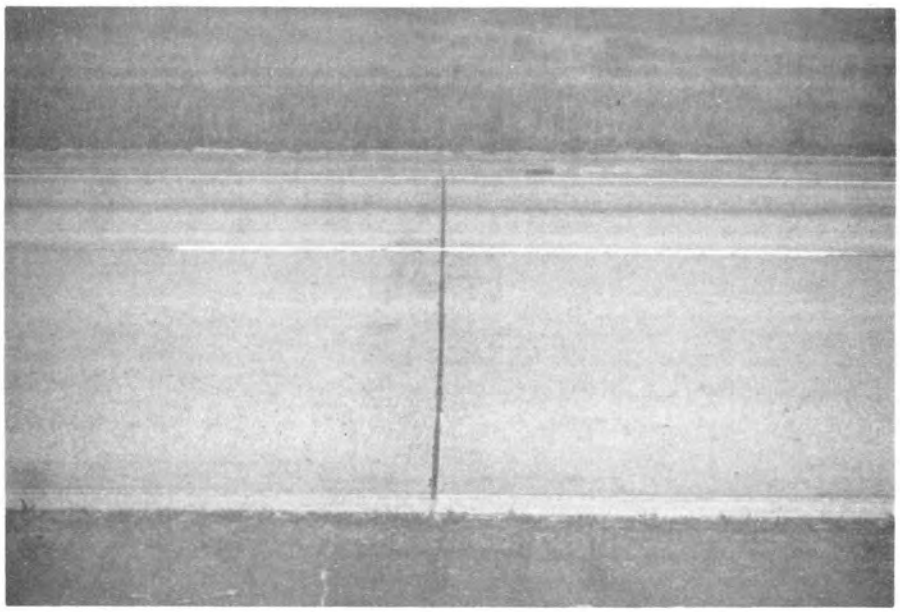


Rating H - Staining

Figure A-5 (Continued)

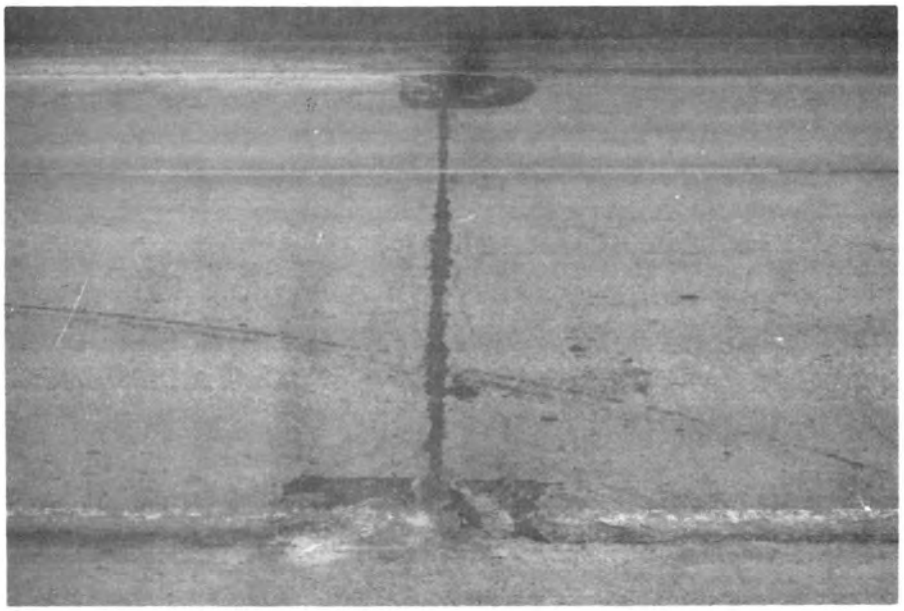


Rating 2 - D-Cracking

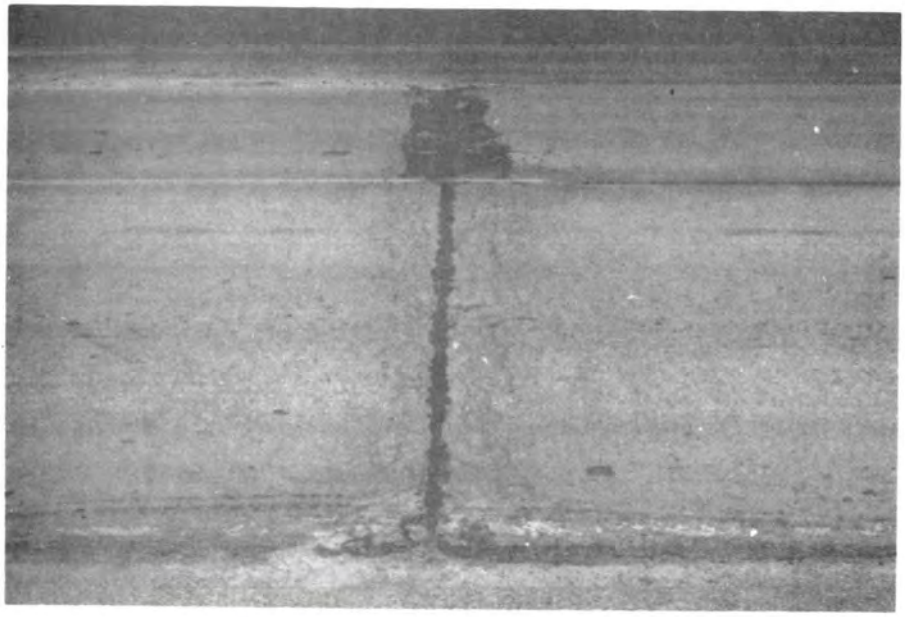


Rating 4 - D-Cracking

Figure A-5 (Continued)



Rating 6 - D-Cracking



Rating 8 - D-Cracking

APPENDIX B

HISTOGRAMS OF YEARLY SURVEYS

FIGURE B-1

PROJECT F-50-2(7), ROUTE 50, JOHNSON COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

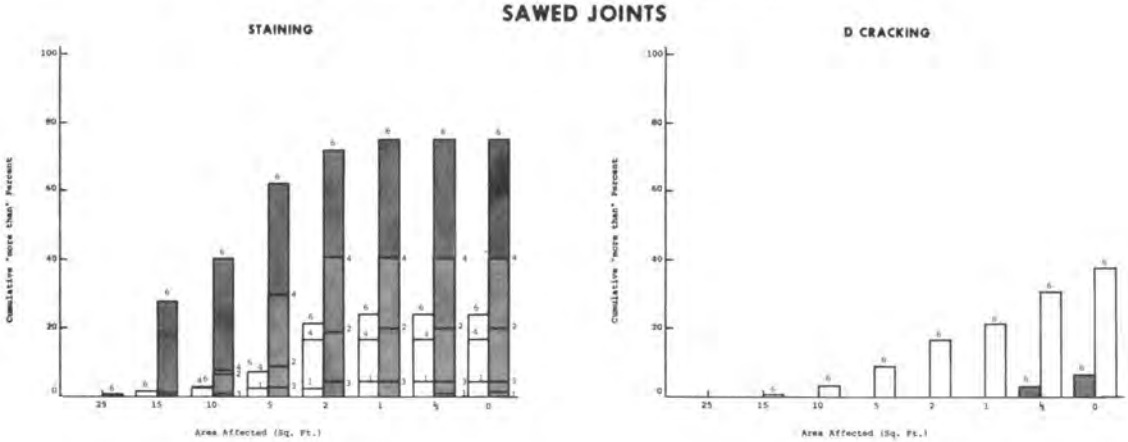


FIGURE B-2

PROJECT F-50-2(11), ROUTE 50, JOHNSON COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

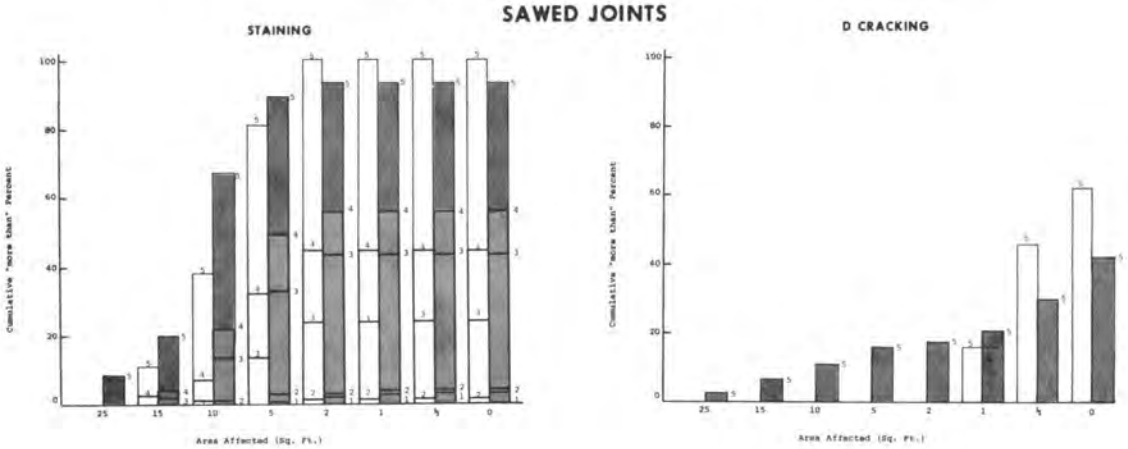


FIGURE B-3

PROJECT CO58-36(9), ROUTE 36, LINN COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

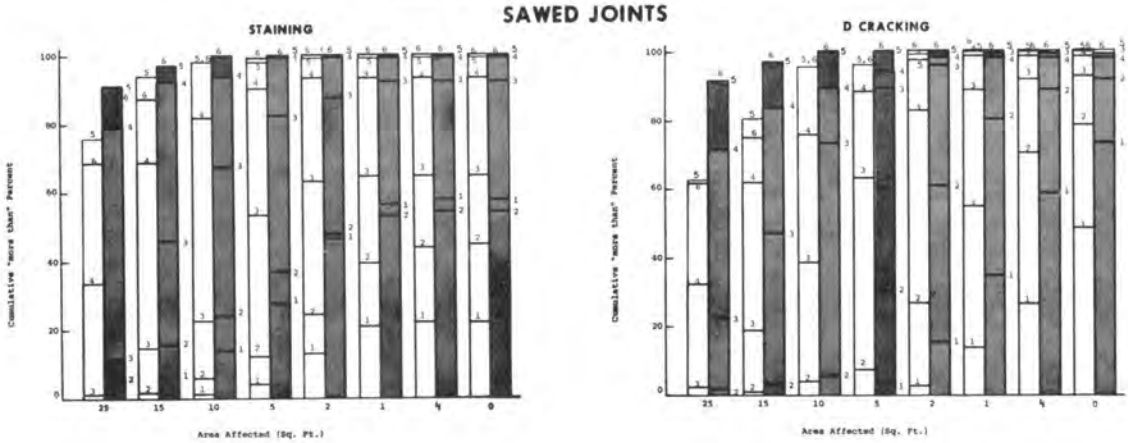


FIGURE B-4

PROJECT F-36-1(16), ROUTE 36, DEKALB COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

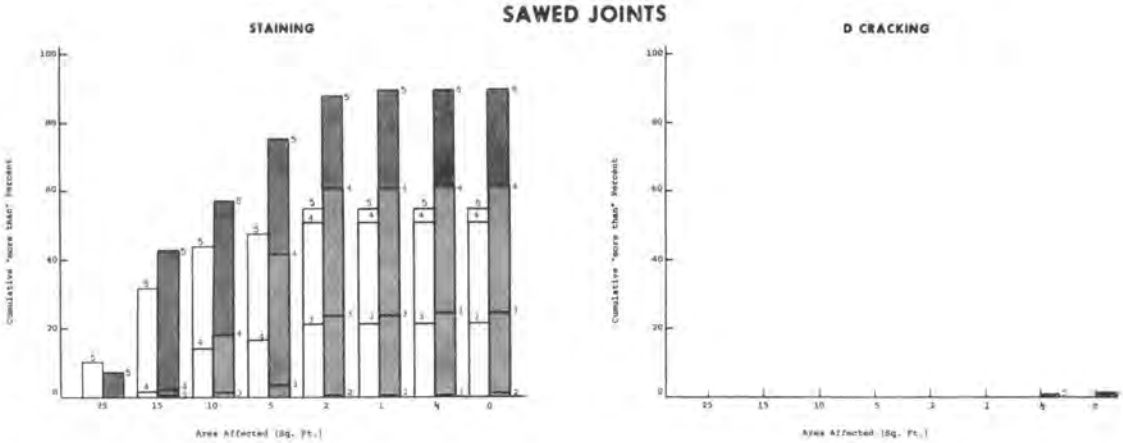


FIGURE B-5

PROJECT CO83-9(2), ROUTE 9, PLATTE COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

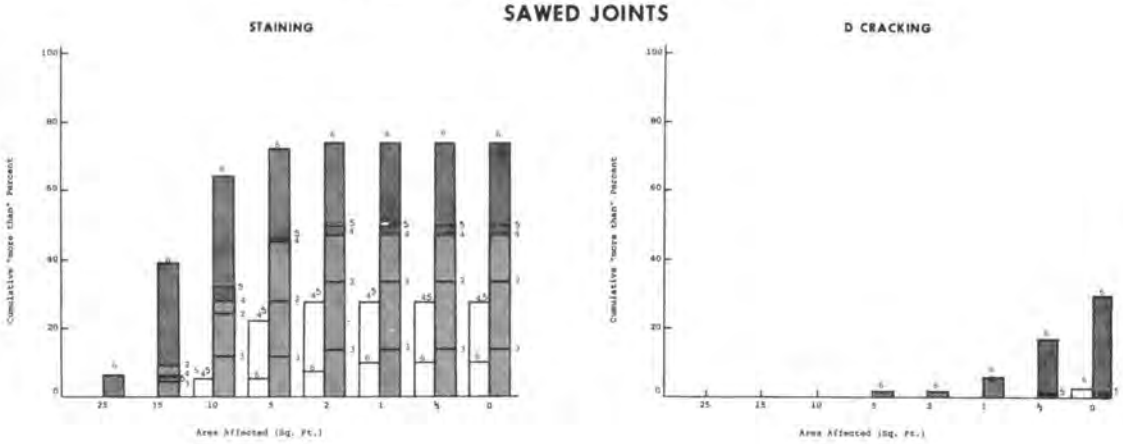


FIGURE B-6

PROJECT I-35-1(11)14, ROUTE I-35, CLAY COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

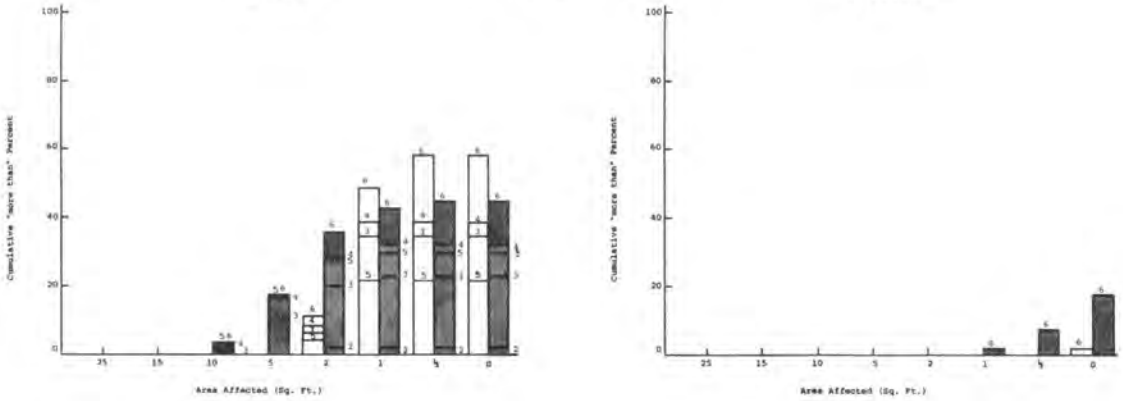


FIGURE B-7

PROJECT I-IG-29-2(46)58, ROUTE I-29, ANDREW COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

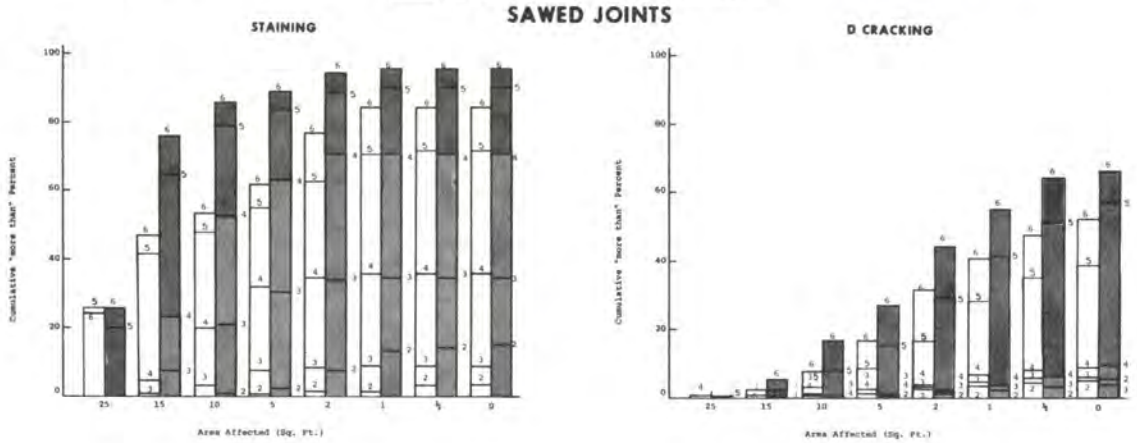


FIGURE B-8

PROJECT F-6-1(1), ROUTE 6, DAVIESS COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

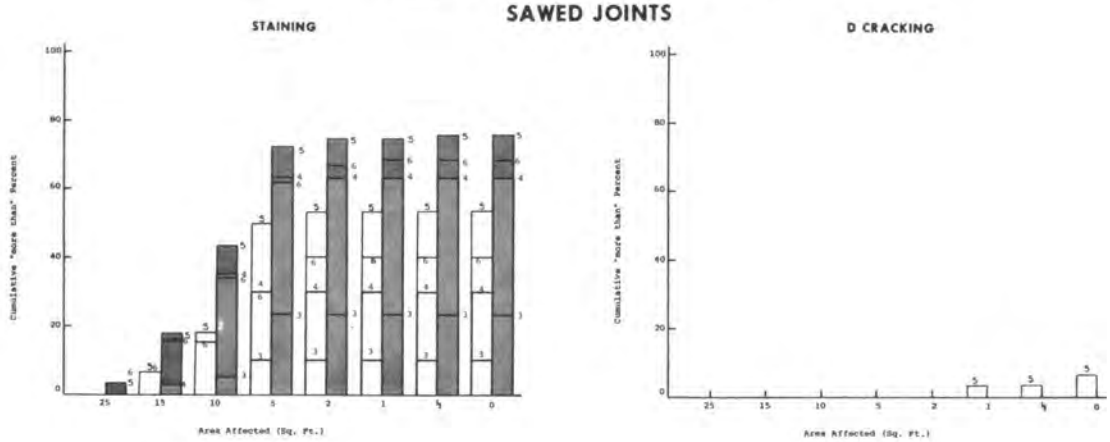


FIGURE B-9

PROJECT CO31-6(8), ROUTE 6, DAVIESS COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

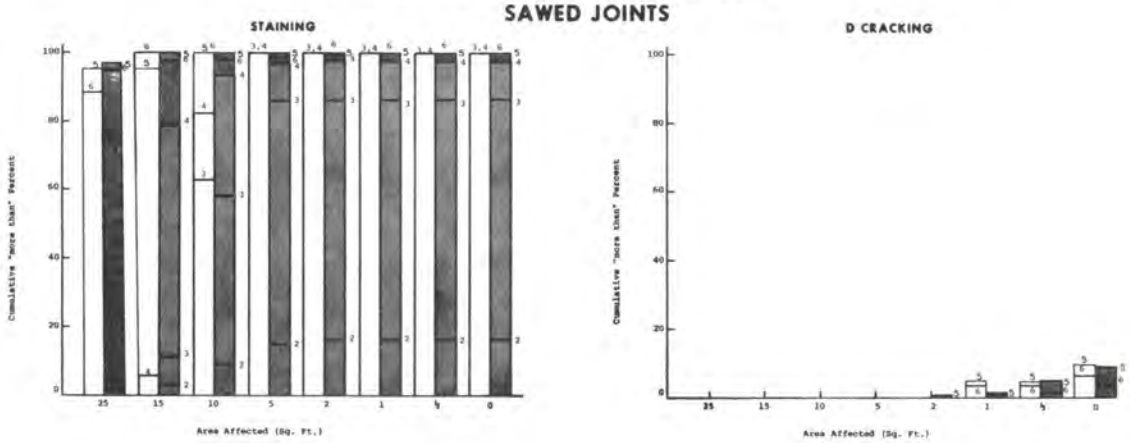


FIGURE B-10

PROJECT U-45-1(3), ROUTE 9, PLATTE COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

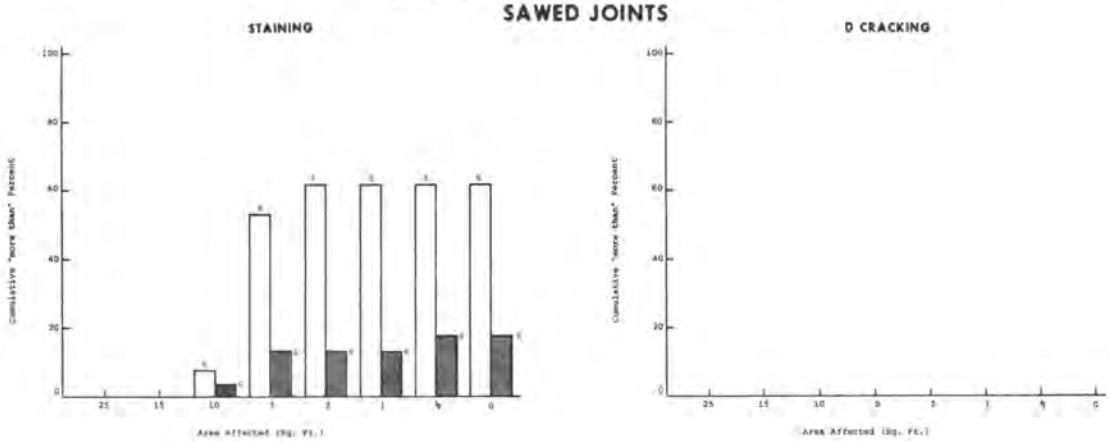


FIGURE B-11

PROJECT U-45-1(6), ROUTE 9, CLAY COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

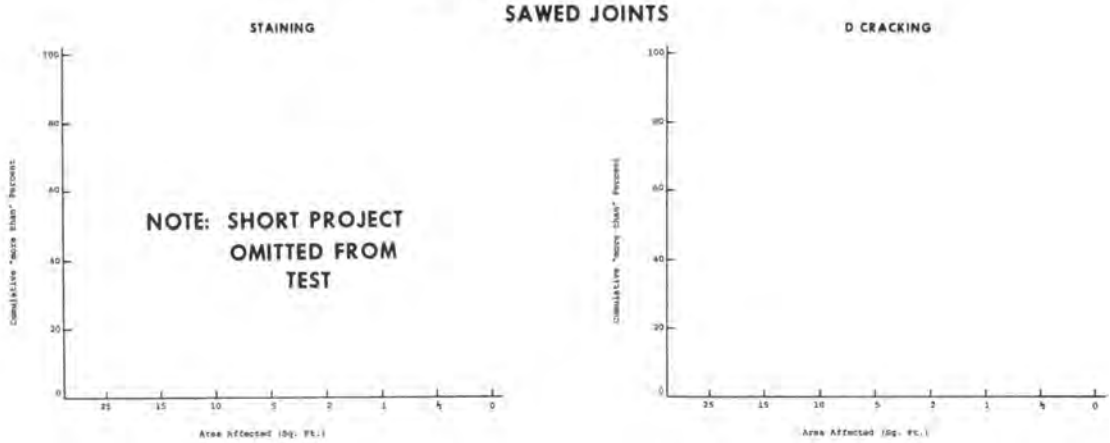


FIGURE B-12

PROJECT U-71-5(6), ROUTE 291, JACKSON COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

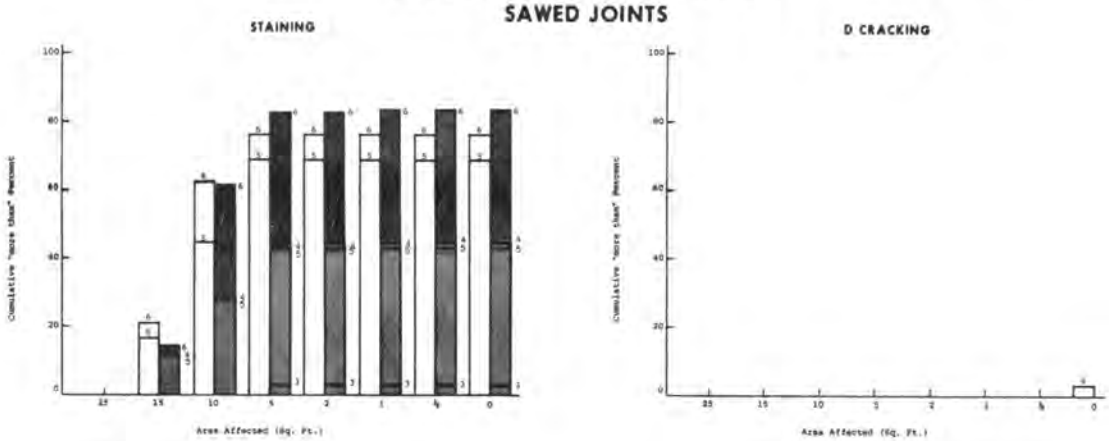


FIGURE B-13

PROJECT C025-BB(1), ROUTE BB, CLINTON COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

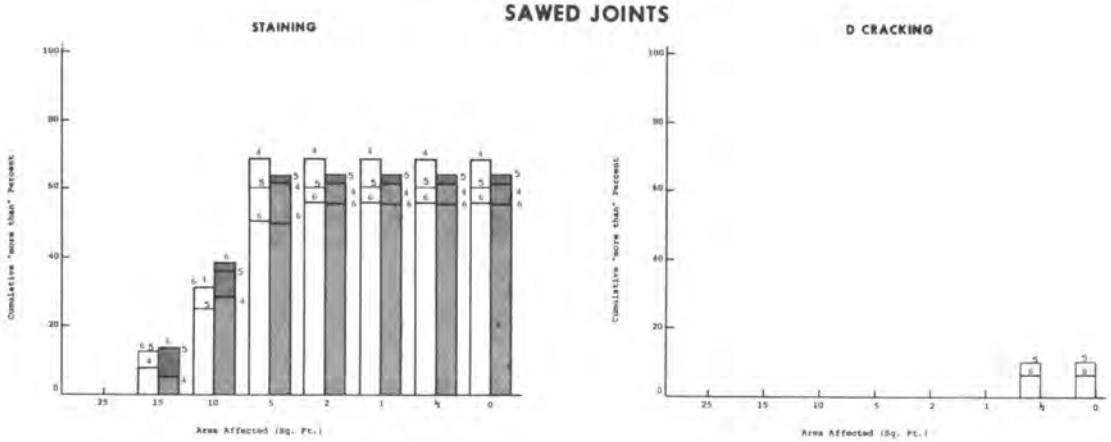


FIGURE B-14

PROJECT F-71-4(9), ROUTE 71, CASS COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

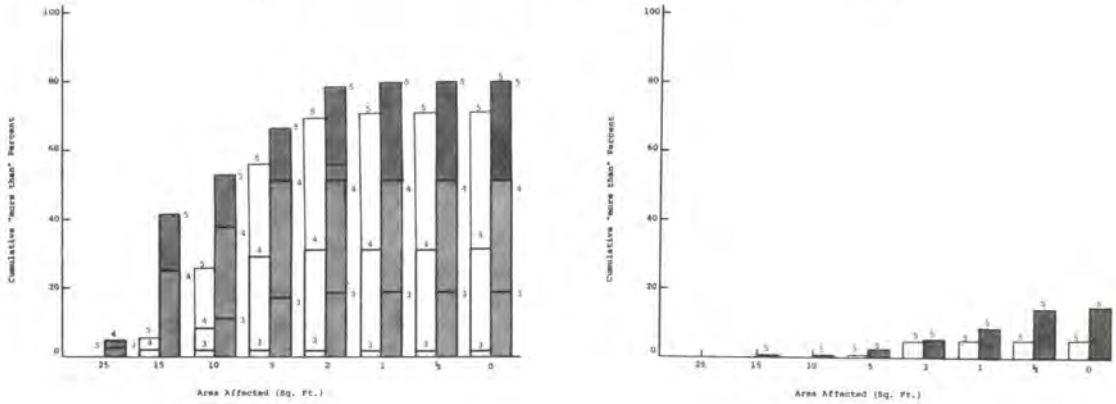


FIGURE B-15

PROJECT I-435-1(61)16UA, ROUTE I-435, JACKSON COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

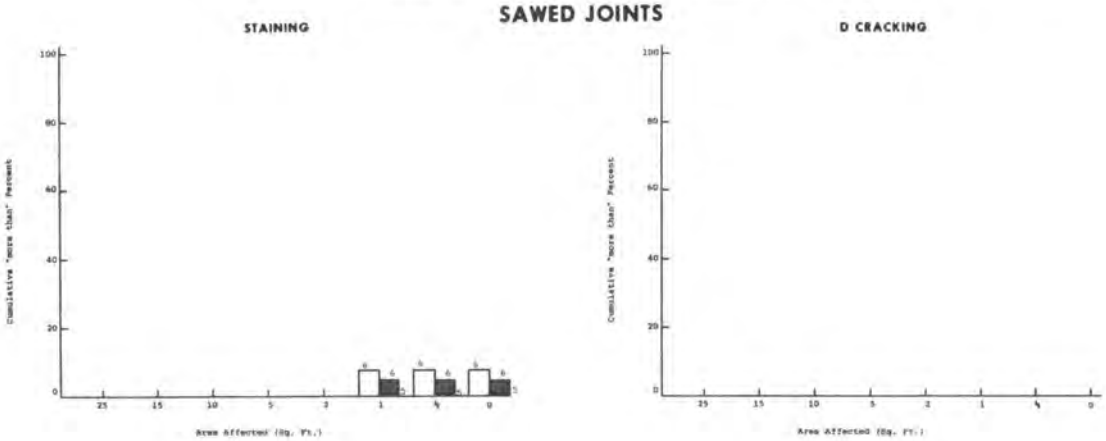


FIGURE B-16

PROJECT I-29-1(12)13 SEC. C, ROUTE I-29, PLATTE COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

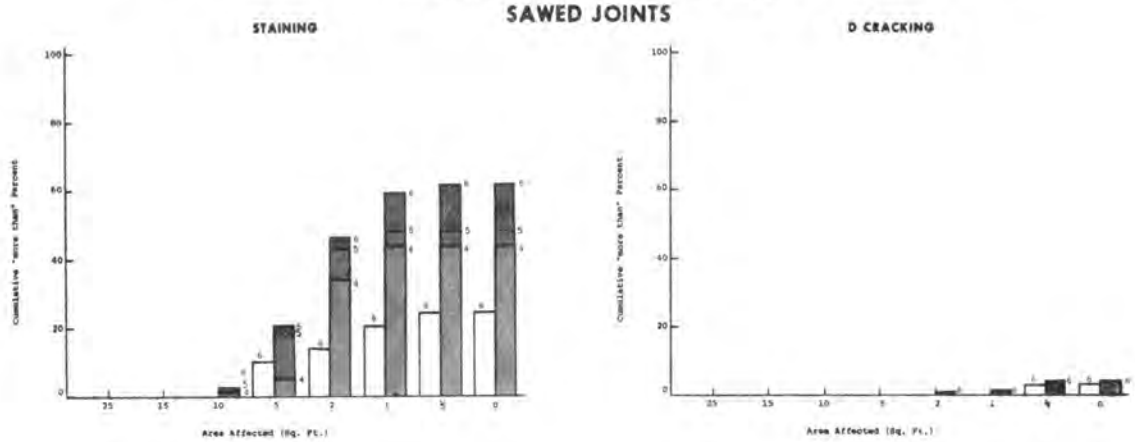


FIGURE B-17

PROJECT I-29-1(12)13 SEC. A & B, ROUTE I-29, PLATTE COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS

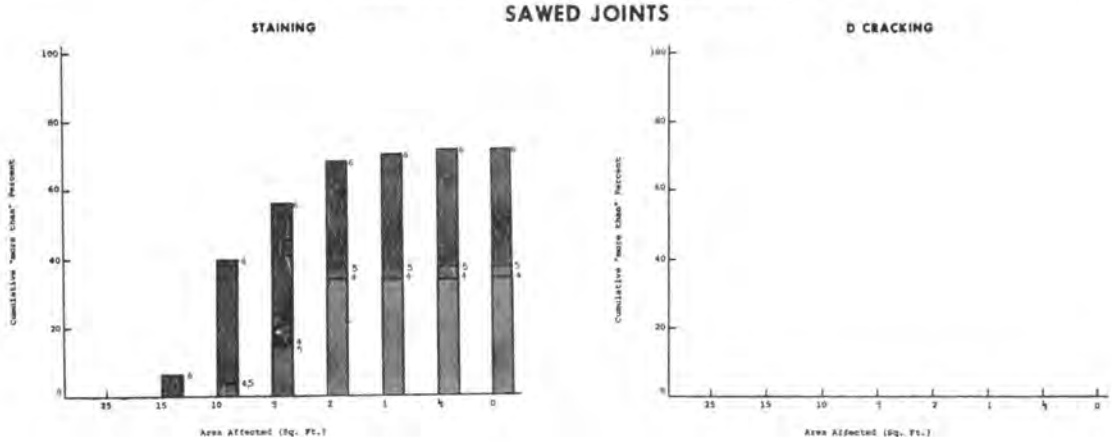


FIGURE B-18

PROJECT I-35-2(27)105, ROUTE I-35, HARRISON COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS

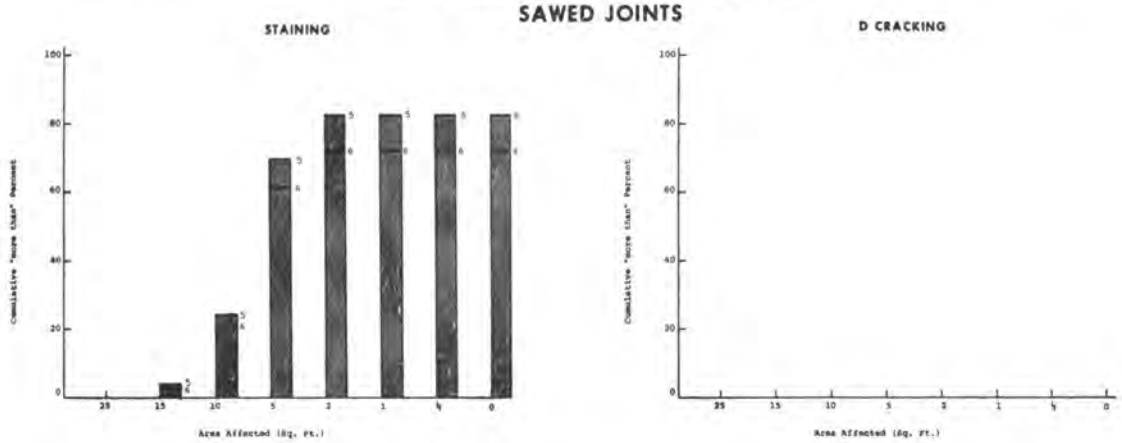


FIGURE B-19

PROJECT CO48-W(4), ROUTE W, JACKSON COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS

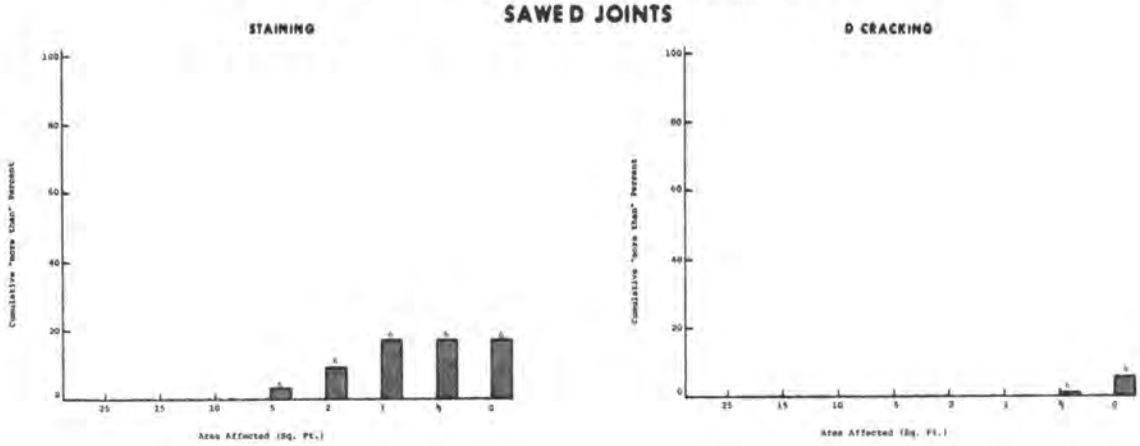


FIGURE B-20

PROJECT F-71-4(10), ROUTE 71, CASS COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

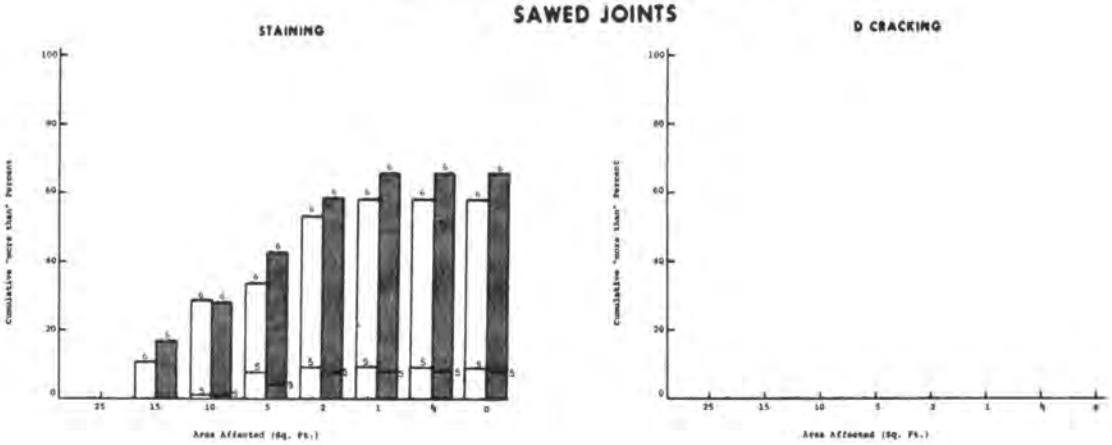


FIGURE B-21

PROJECT I-IG-435-1(59), ROUTE I-435, JACKSON COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

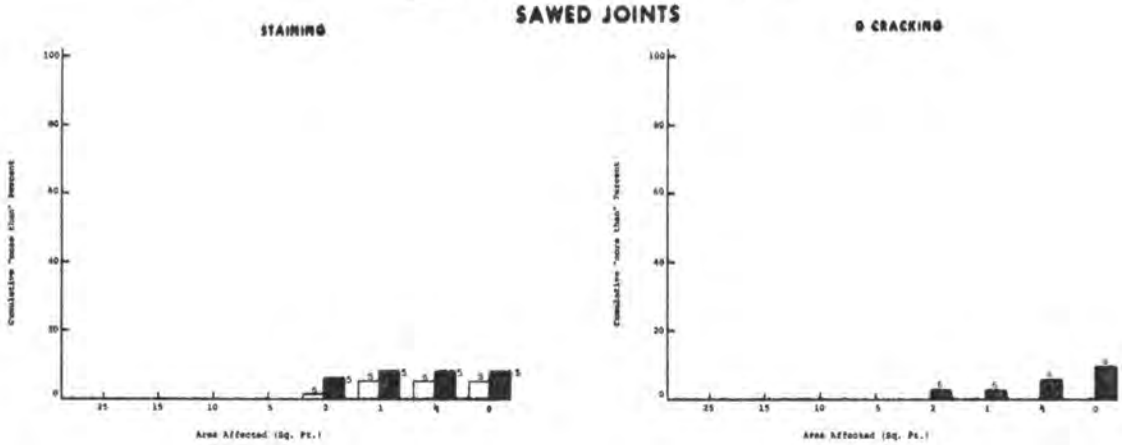


FIGURE B-22

PROJECT SU-SUG-647(7), ROUTE 210, CLAY-JACKSON COUNTIES

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS

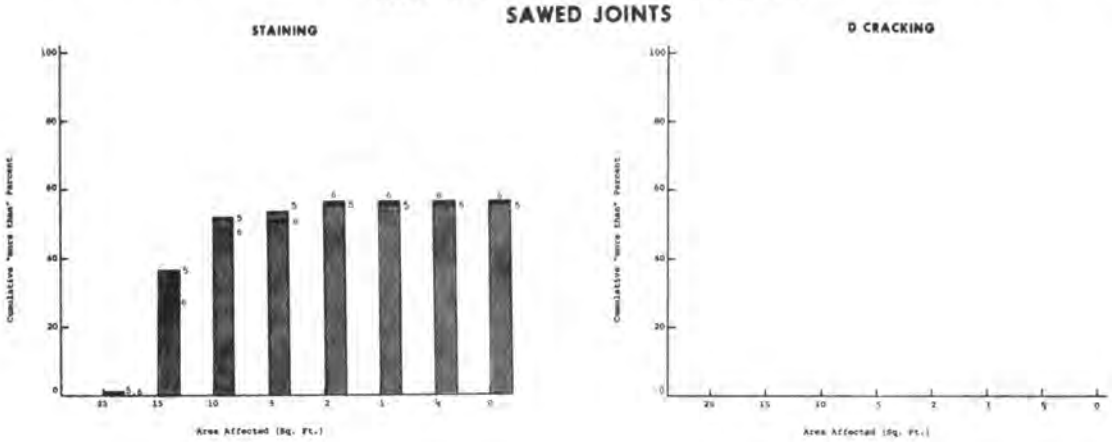


FIGURE B-23

PROJECT CO24-210(1)U, ROUTE 210, CLAY COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

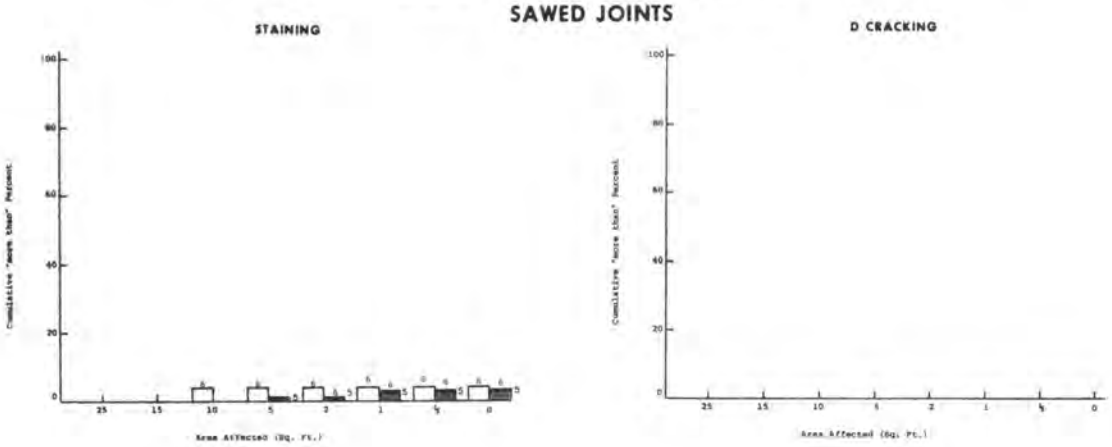


FIGURE B-24

PROJECT I-29-2(56)70, ROUTE I-29, HOLT COUNTY

NO POLYETHYLENE POLYETHYLENE

SAWED JOINTS

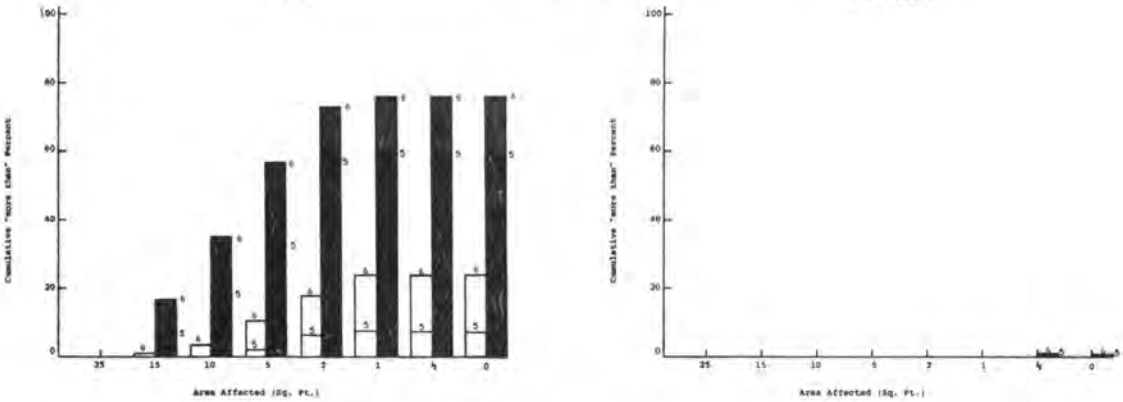


FIGURE B-25

PROJECT I-29-2(45)70, ROUTE I-29, HOLT COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS

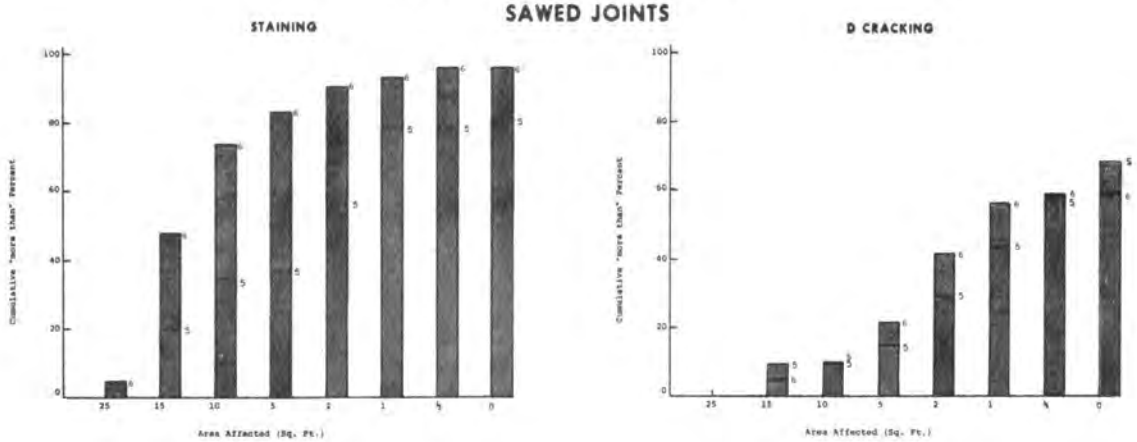


FIGURE B-26

PROJECT I-29-2(18)53, ROUTE I-29, BUCHANAN COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

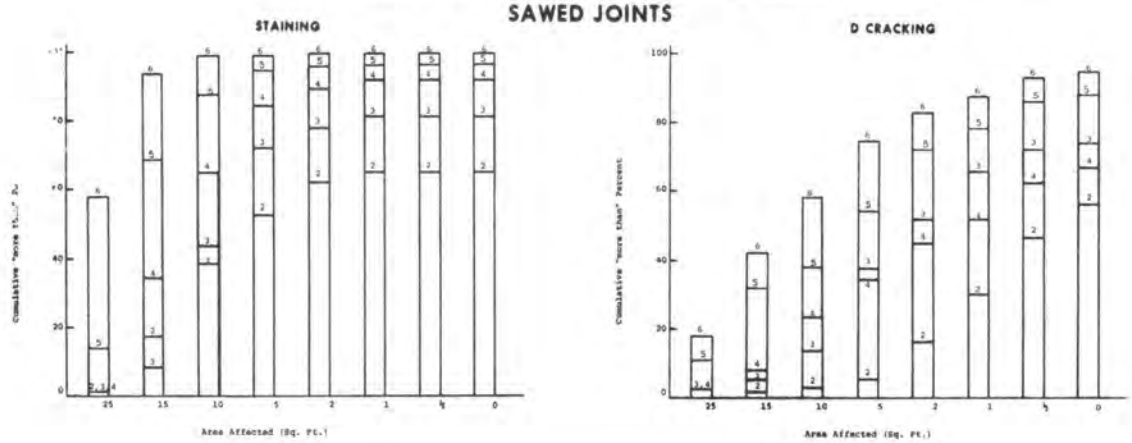


FIGURE B-27

PROJECT I-29-2(9)55, ROUTE I-29, ANDREW COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

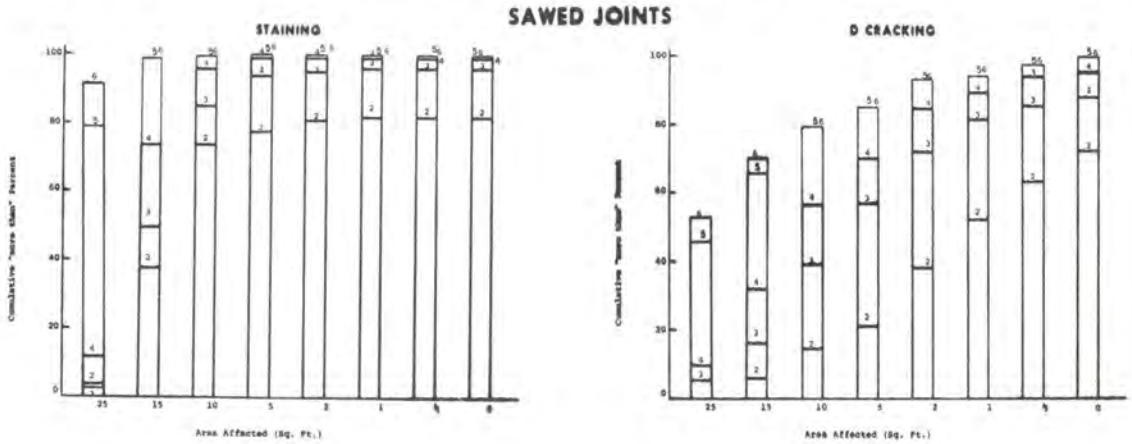


FIGURE B-28

PROJECT I-IG-35-2(18)61, ROUTE I-35 & 69, DAVIESS COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

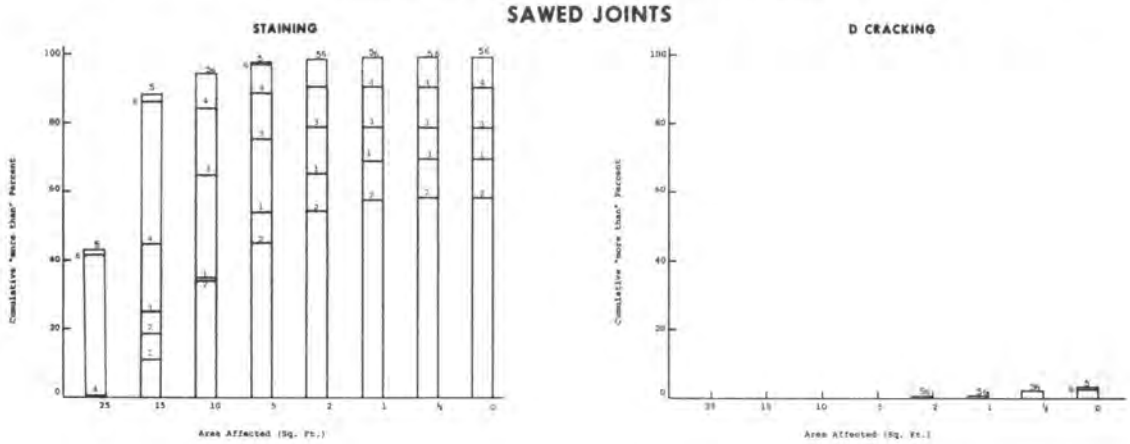


FIGURE B-29

PROJECT SEC. 31(1), ROUTE 6, DAVIESS COUNTY

UNTREATED CEMENT BASE TREATED CEMENT BASE

SAWED JOINTS

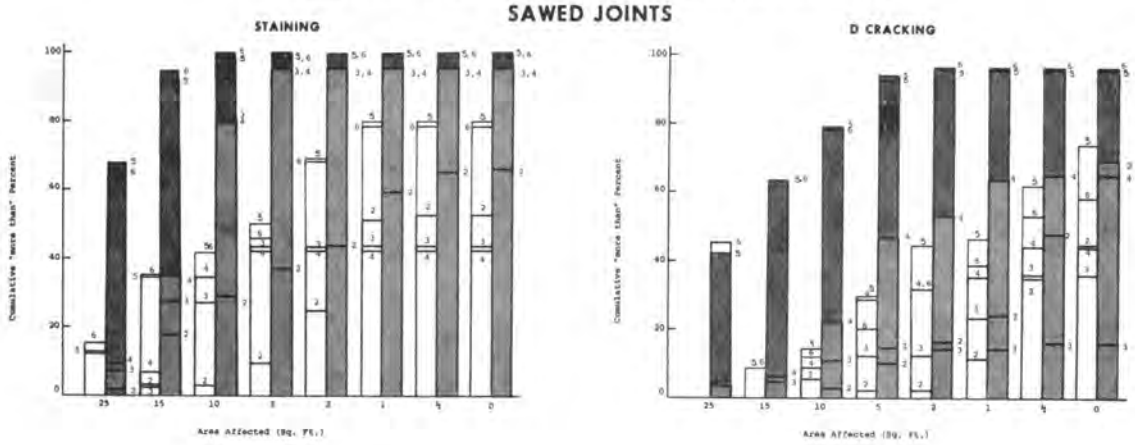


FIGURE B-30

PROJECT F-71-3(12), ROUTE 71, BATES COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

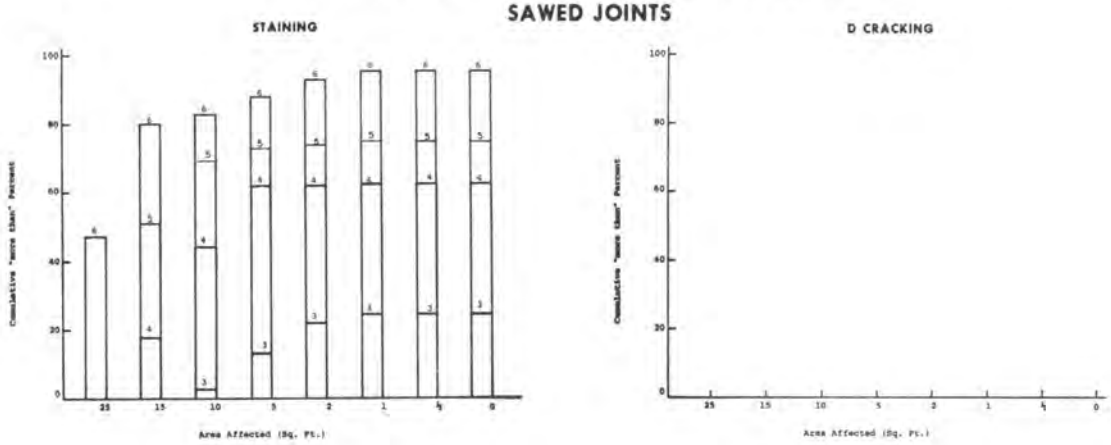


FIGURE B-31

PROJECT SEC. 61(2), ROUTE 36, MACON COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

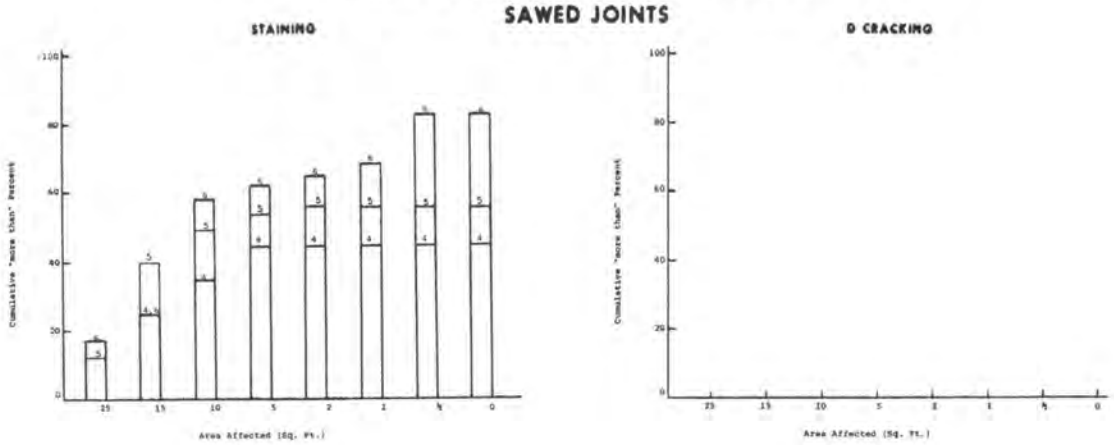


FIGURE B-32

PROJECT CO20-32(4), ROUTE 32, CEDAR COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

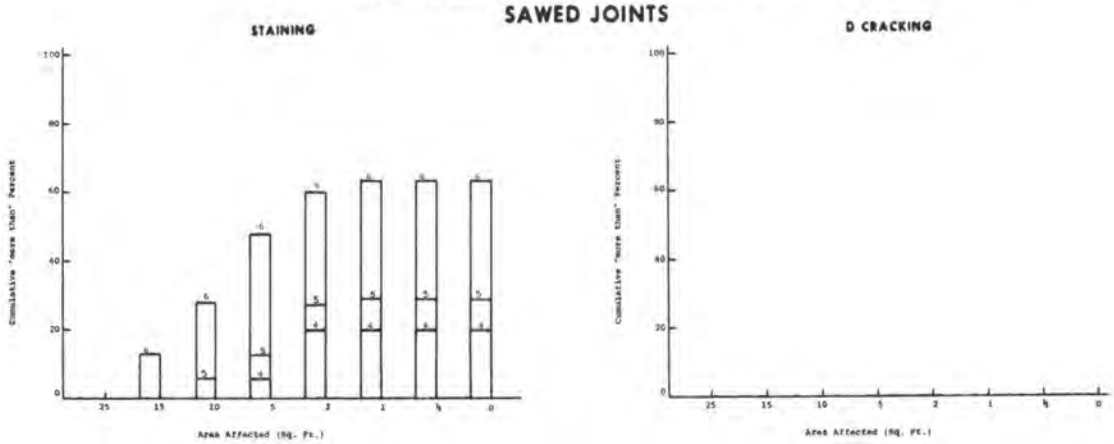


FIGURE B-33

PROJECT SEC. 48(6), ROUTE 50, JACKSON COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

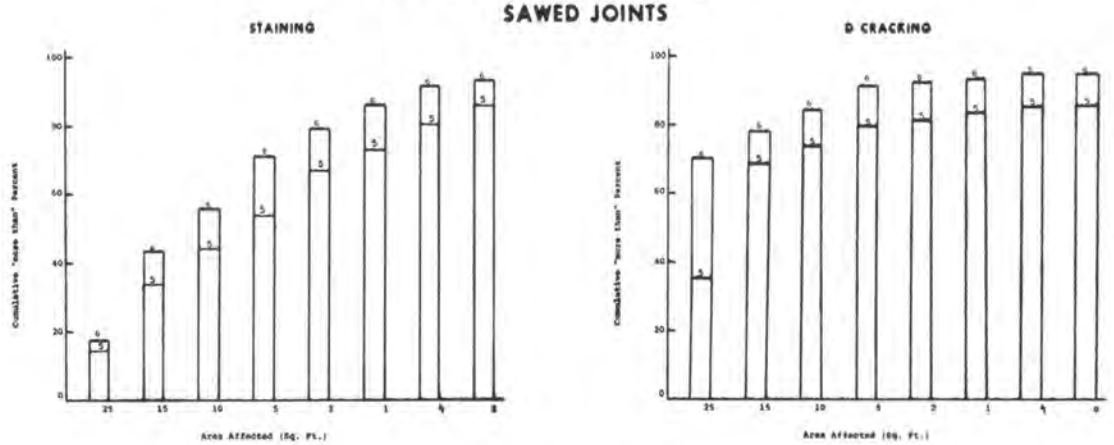


FIGURE B-34

PROJECT F-50-1(2), ROUTE 50, JACKSON COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

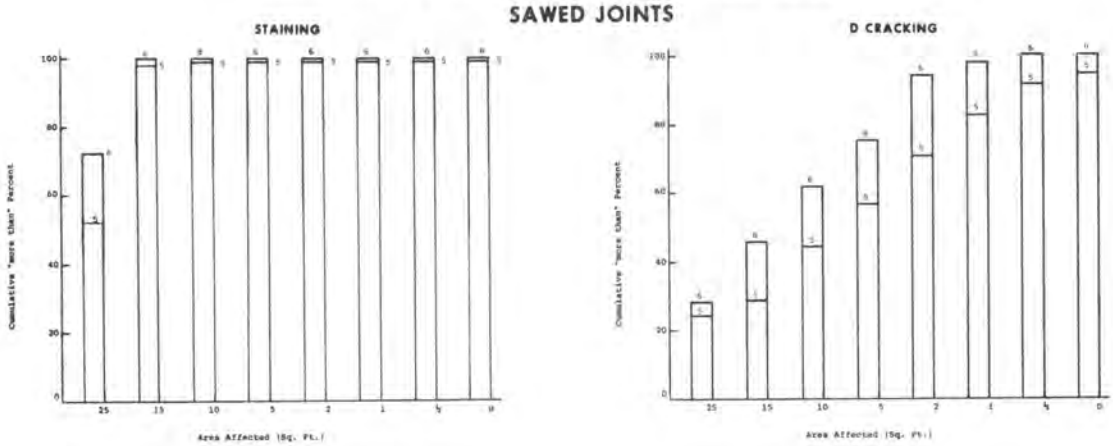


FIGURE B-35

PROJECT CO51-50(7), ROUTE 50, JOHNSON COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

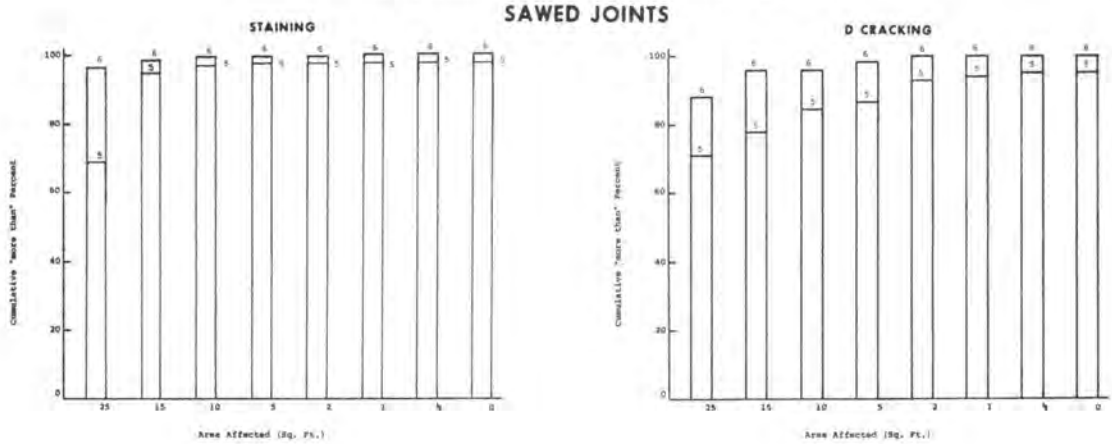


FIGURE B-36

PROJECT SEC. 40(2), ROUTE 6, GRUNDY COUNTY

PROJECTS CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS

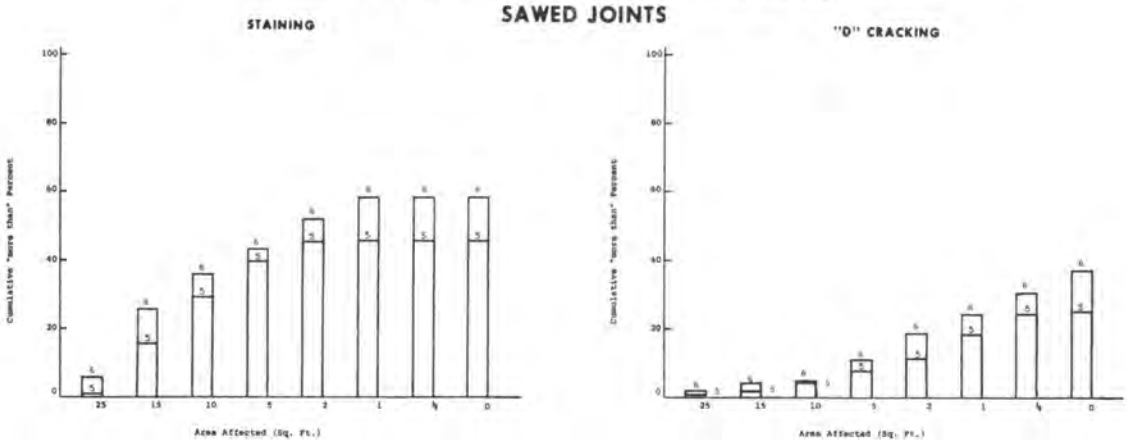
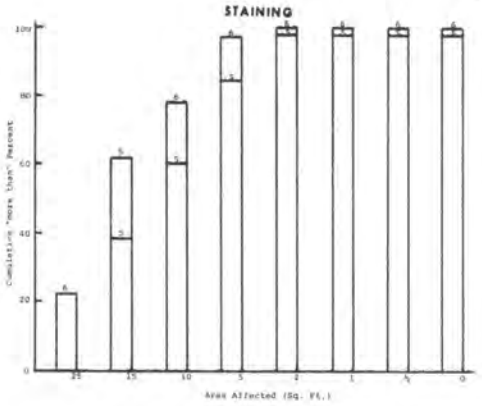


FIGURE B-37

PROJECT I-29-2(49), ROUTE I-29, ANDREW COUNTY

PROJECT CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS



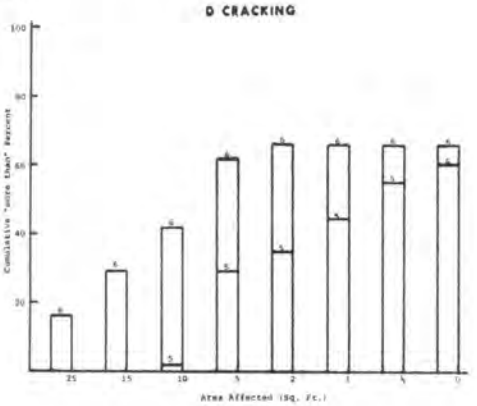
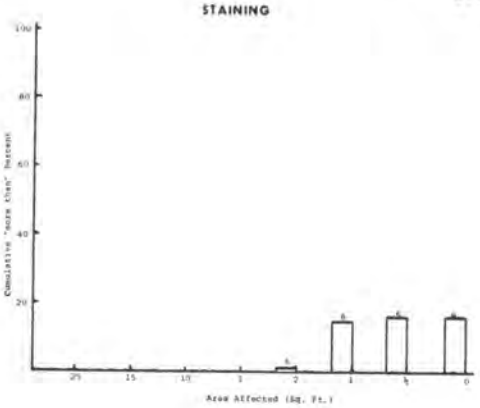


FIGURE B-38

PROJECT I-29-2(59)111, ROUTE I-29, ATCHISON COUNTY

PROJECT CONSTRUCTED WITHOUT POLYETHYLENE SHEETING

SAWED JOINTS



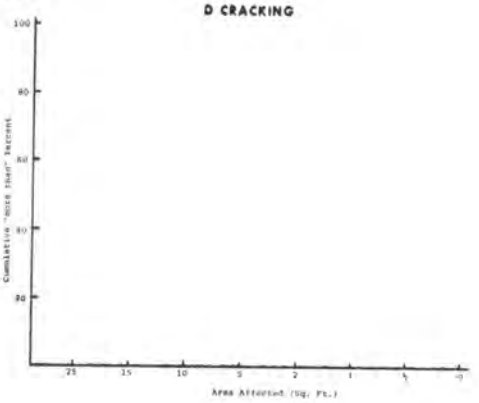
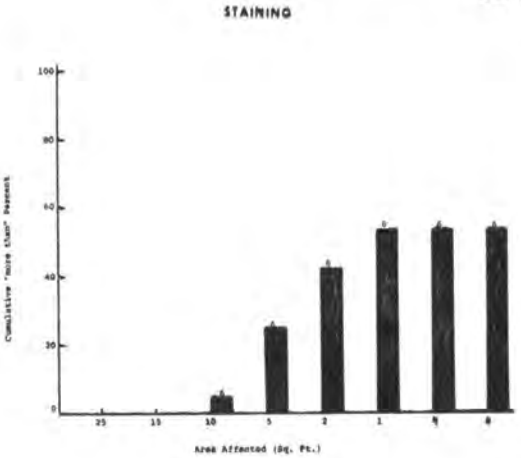


FIGURE B-39

PROJECT F-65-5(1), ROUTE 65, GRUNDY COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS



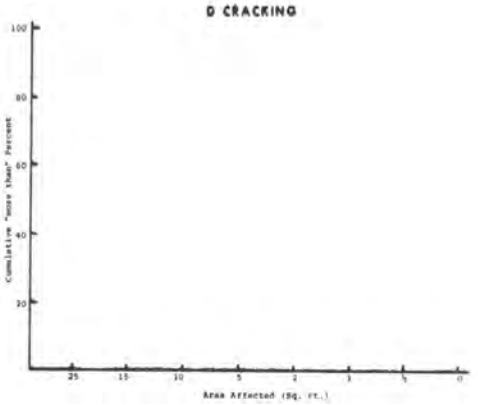
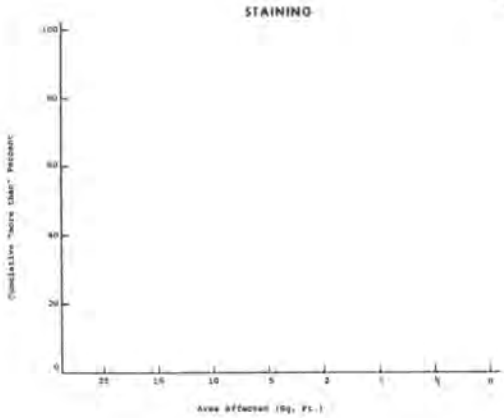


FIGURE B-40

PROJECT CO24-71B(4)U, ROUTE 291, CLAY COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS



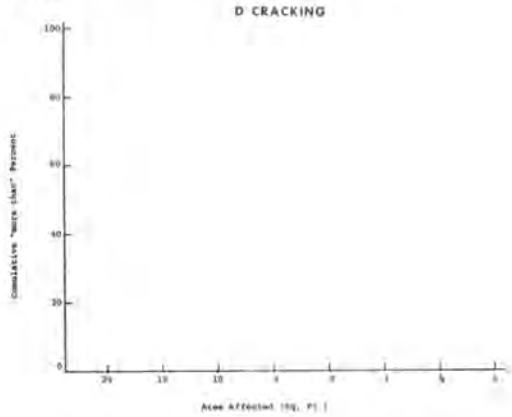
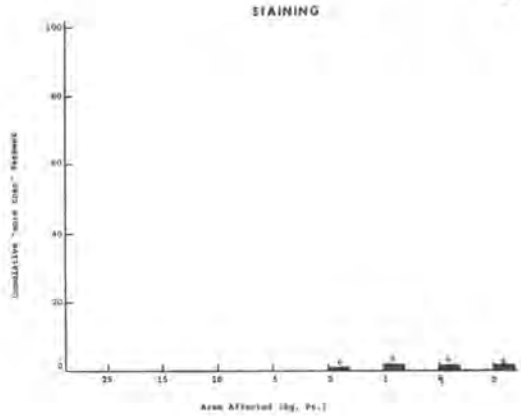


FIGURE B-41

PROJECT I-435-1(8), ROUTE I-435, CLAY COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS



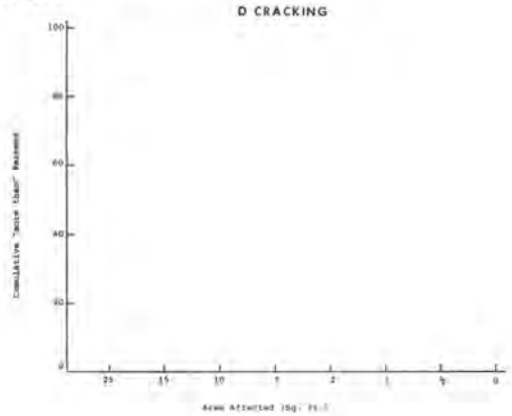
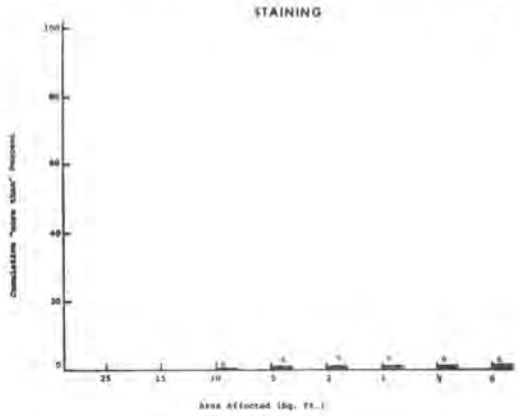


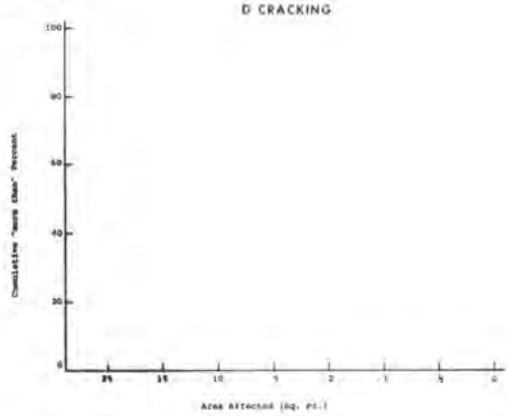
FIGURE B-42

PROJECT I-IG-435-1(9), ROUTE I-435, JACKSON COUNTY

PROJECT CONSTRUCTED WITH POLYETHYLENE SHEETING

SAWED JOINTS





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