

REPORT #4
on

Cooperative Investigation of Joint Spacing In Concrete Pavements

Missing:

Page 6 - tables

Photos between 9 & 10

Figure 10 - graph

Page 30

Daily section 6 - 5

" " Standard

Seasonal " 5

Highway Materials Research Laboratory
132 Graham Avenue, Lexington 29, Ky.

August 17, 1949

File: J-1-4-2
D-1-7

Memo. to: Dean D. V. Terrell
Director of Research

Subject: Cooperative Investigation of Joint Spacing in
Concrete Pavements

As you know the Department, in cooperation with the Bureau of Public Roads, has had in service since 1940 an experiment on the Owensboro-Hartford Road for the purpose of investigating joint spacing in concrete pavements. This project designated as FA 125 F(2)S is in Daviess County, and it consists of 14 separate experimental sections some of which duplicate each other.

In June, 1948 measurements and inspections on this road became the responsibility of the Research Division, and the attached report by Mr. S. T. Collier, Senior Research Engineer, is the first report that we have made on the work. You will note that Mr. Collier has been very thorough in the compilation and analysis of all data that have accumulated since the project originated, and he has presented everything in such a way that it can be easily and quickly interpreted. Some information, such as that in Appendix F pertaining to soils, has not been included in any report heretofore and hence it is presented here for the first time.

The conclusions that he has drawn from the 23 listed results more or less substantiate concepts that have developed over the years for design of concrete pavements containing these materials. Even so, this amounts to tangible evidence that will add to the significance of those concepts. Like any other experiment of this nature the results, of course, are confined to a pavement of this type under this given set of circumstances; therefore, they may not hold true elsewhere.

It is not possible to over-emphasize the limitations resulting from the restricted use of this pavement since its construction, particularly with regard to load transfer features and general pavement conditions. For that reason alone, it will be very interesting to watch the developments in coming years after the road has been subjected to considerably heavier traffic.

Dean D. V. Terrell

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August 17, 1949

During the next two or three years, all the measurements and observations on the project will be made as usual, but the reports will consist mostly of tabulations of data until there has been enough change to warrant the preparation of a report as detailed and extensive as this one. I know that everyone concerned with the project will look forward to further developments in the performance of this pavement and to the relative merits of the different sections after the pavement has attained a greater age and has been subjected to more rigorous use.

Respectfully submitted



L. E. Gregg
Associate Director of Research

LG:vk

cc: Research Committee
Bureau of Public Roads (6)

Commonwealth of Kentucky
Department of Highways

Progress Report No. 4

on

COOPERATIVE INVESTIGATION OF JOINT SPACING IN CONCRETE
PAVEMENTS

Owensboro-Hartford Road, Project FA 125 F(2)S

Daviess County, Kentucky

by

~~S. T. Collier~~
Senior Research Engineer

Cooperative Investigation with
Bureau of Public Roads
General Services Administration

Highway Materials Research Laboratory
Lexington, Kentucky

July, 1949

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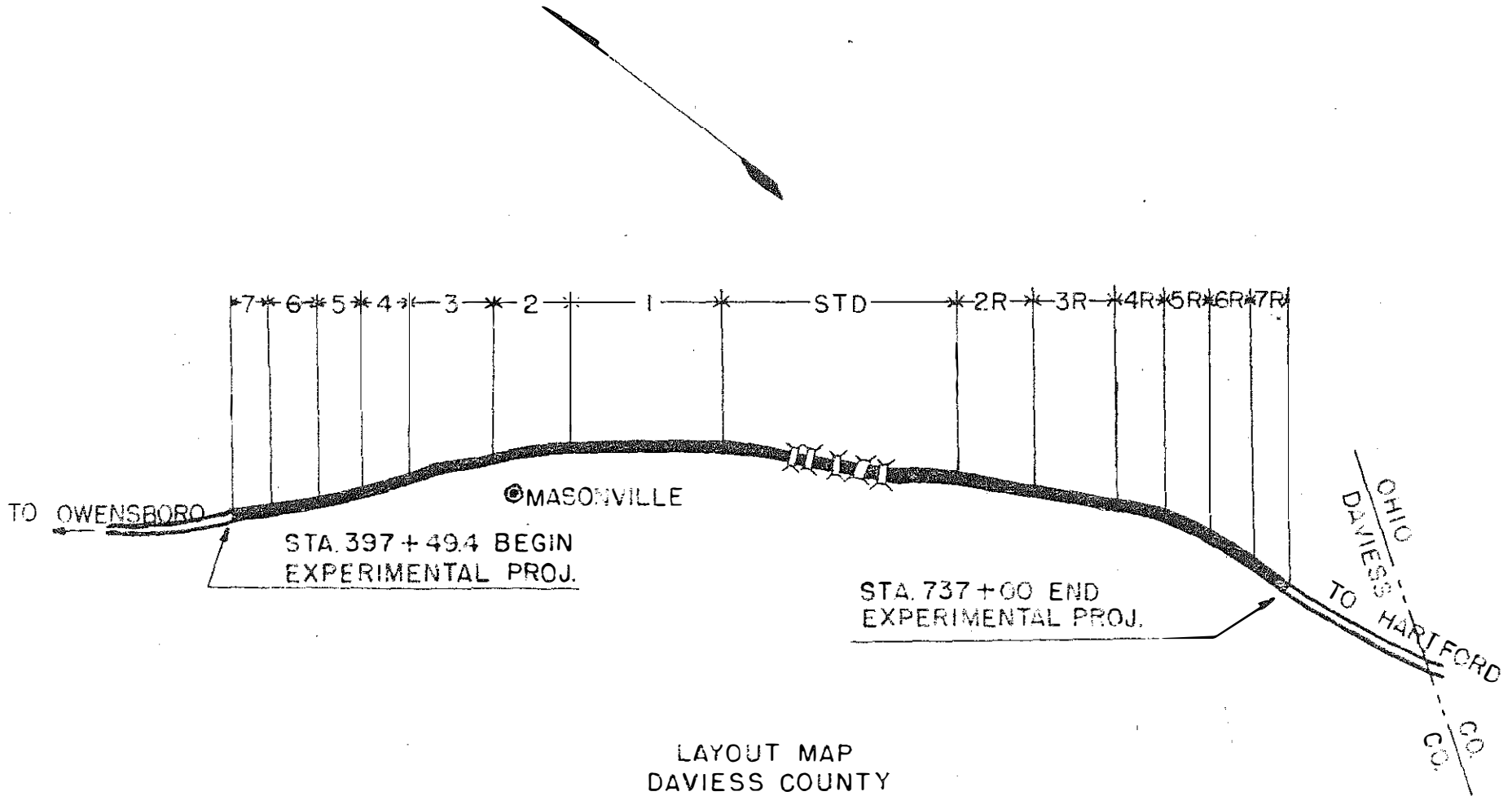
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LAYOUT MAP
 DAVIESS COUNTY
 EXPERIMENTAL SECTIONS
 OWENSBORO-HARTFORD ROAD
 FA. 125 F(2)S

FIG. 1

INTRODUCTION

During the summer of 1940 the Kentucky Department of Highways, with the Public Roads Administration participating, constructed 6.27 miles of investigational pavement as a cooperative research project on joint spacing. This project was one of six planned by the Public Roads Administration and the Portland Cement Association in cooperation with six highway departments. The five other states participating were California, Michigan, Minnesota, Missouri, and Oregon. The project* selected for this jointing study in Kentucky is in Daviess County, approximately six miles southeast of Owensboro, on Kentucky Route No. 71 (Layout map in Figure 1).

The experimental program was outlined for the purpose of evaluating the relative merits of varying intervals in expansion joint spacing and of dummy contraction joints with and without dowel bars for load transfer. A complete discussion of the scope and purpose has been given in a paper by Mr. E. F. Kelly of the Public Roads Administration (1).

The number of experimental sections and the design details of each, summarized in Table I, conform with the original outline of the program with the exception of the added Standard section.

The order of arrangement of the sections in Table I, and elsewhere in this report, is the same as that in which they occur in the project as shown in Figure 1.

Sections 1, 2, 3, and 4 were designed for the purpose of making a direct study of expansion joint spacing in pavements

*Project designation FA 125 F(2)S

TABLE I
DESIGN OF EXPERIMENTAL SECTIONS

Section No.	Length (feet)	Design Section (in.)	Wire Mesh Reinf.	Expansion Joints		Contraction Joints	
				Spacing (feet)	Load Transfer	Spacing (feet)	Load Transfer
7	1,250	7-7-7	None	120	None	20	None
6	1,500	9-7-9	70 lb.	60-alt.	Dowels	60-alt.	Dowels
5	1,500	9-7-9	None	120	Dowels	20	Dowels
4	1,500	9-7-9	None	120	Dowels	20	None
3	2,500	9-7-9	None	400	Dowels	20	None
2	3,000	9-7-9	None	800	Dowels	20	None
1	5,000	9-7-9	None	5040	None	20	None
Std.	7,000	9-7-9	44 lb.	120	Dowels	30	Dowels
2-R	2,500	9-7-9	None	800	Dowels	20	None
3-R	2,500	9-7-9	None	400	Dowels	20	None
4-R	1,500	9-7-9	None	120	Dowels	20	None
5-R	1,500	9-7-9	None	120	Dowels	20	Dowels
6-R	1,500	9-7-9	70 lb.	60-alt.	Dowels	60-alt.	Dowels
7-R	1,200	7-7-7	None	120	None	20	None

with closely spaced dummy contraction joints. They differ only by expansion joint spacing, varying by intervals of 5040 feet, 800 feet, 400 feet, and 120 feet, respectively. The slab design is the thickened edge type, 9-7-9 inches, without reinforcement. The contraction joints are spaced at intervals of 20 feet and do not include dowel bars.

The expansion joint interval scheduled for Section 1 was one mile; but since this section is only 5000 feet long, the interval referred to of 5040 feet is that between the nearest expansion joints in the adjoining sections.

Section 5 is identical in design to Section 4, except that dowel bars are installed in the contraction joints of the former to provide a means for studying the performance of dummy contraction joints with and without dowels.

In Section 6, the jointing interval is 60 feet alternating with expansion and contraction joints. Steel mesh reinforcement was included and dowel bars were installed in all joints. This design was included for the purpose of studying crack control as influenced by joint intervals.

The pavement cross section for Section 7 is of seven inches uniform thickness. This section has the same joint spacing as Sections 4 and 5, but no dowel bars were included in either type of joints.

The Standard Section was a standard design for Kentucky at that time, and was constructed over swampy land unsuitable for experimental pavement, except for approximately 2000 feet between Station 560 + 00 and Station 580 + 00. This length was on the north end of the section and provided a subgrade

comparable to that of the other sections, hence it was selected as a subsection for the jointing study.

Representatives of the Testing Laboratory were assigned the duties of collecting all data from the beginning through 1947. Since that date it has become an assignment of the Research Division.

Previous reports have been submitted by Messrs. Louis Campbell (2), F. P. Anderson II (3), and T. R. Thomas (4), and information from this project was included with those from other states for a comparative study of the data by Sutherland and Cashell (5).

CONSTRUCTION FEATURES

Details of all construction features were covered thoroughly in the initial report on the project by Campbell (2) but a brief summary of that information is included here for the benefit of those dealing with the investigation for the first time or not having access to the original report.

Stationing of Project

<u>Ending Section</u>	<u>Beginning Section</u>	<u>Station</u>
	7	397+49.4
7	6	410+21
6	5	425+21
5	4	440+01
4	3	455+02
3	2	480+00
2	1	510+00
1	Standard	560+00
Standard	2-R	630+00
Sect. 2-R	3-R	655+00
" 3-R	4-R	680+00
" 4-R	5-R	695+00
" 5-R	6-R	710+00
" 6-R	7-R	725+00
" 7-R	End of Project	737+00

Soils and Grading

The grade between stations 397+49 and 565+00, and stations 690+00 and 737+00 was constructed and surfaced with 5 inches of traffic bound river gravel between July 21 and November 3, 1939. These sections were opened to traffic until paving operations were begun, at which time a large amount of this gravel was removed for shoulder material. That portion between stations 565+00 and 690+00 was constructed between April 15 and June 4, 1940, with no surfacing material added. Included in this latter portion are parts of the Standard Section and Section 4R, and all of section 2R and 3R.

Soils throughout the project were quite uniform in textural and plasticity characteristics, as shown by the results of tests on 171 samples tabulated in Appendix F. The samples, according to test reports made in 1940, represented material at subgrade level regardless of cut or fill. The major part of the project lies on general upland terrain where the soils are predominately windblown silt and fine sand.

Apparently residual soils beneath, having a greater percentage of finer particles and higher plasticity characteristics, entered the subgrade at some locations, as evidenced by results such as those representing Station 638+00 and Station 545+00. Even then, the Plasticity Index was unusually low as compared with the Liquid Limit despite the fact that greater than 50 percent of the material was finer than 0.005 millimeter. About the only exception to this was at Station 712+00, where both the Liquid Limit and Plasticity Index were high despite a clay content lower than 50 percent.

The average soil in the Standard Section - a large portion of which lays on a fill about 6-to 8-feet in height across the bottoms of Panther Creek (South Fork) - was texturally about the same as those in the uplands. However, 10 of the 35 samples representing this section had fine-sand contents exceeding 50 percent, whereas there was only one location (Station 678+00) throughout all the sections where there was as much as 50 percent in the fine-sand size and only five cases where this fraction exceeded 40 percent of the total sample.

A slight tendency toward reduction in silt and sand, and an increase in finer particles is evident in the "repeat" or R sections. In sections 2R and 6R inclusive, 30 of the 54 samples have clay contents exceeding 20 percent, whereas in sections 1 to 7 inclusive only 25 of 82 samples had clay contents greater than 20 percent. Even so, this hardly affected the plasticity relationships typical of sorted and windblown materials.

In the determination of moisture-density relations for compaction characteristics, all the samples were divided into six different groups according to their similarities, and group composite samples were made from the individual samples in the groups. Moisture-density relations (standard Proctor) for five of the six composite samples are plotted on the graph in Appendix F. Data for composite sample No. 2 could not be located in the files.

Differences among the five compaction curves are slight, and probably an average density and optimum moisture content was chosen for use in construction in 1940. There is no record of test information applicable to that portion graded in 1939. "All embankments were constructed in successive horizontal layers 12 inches in thickness, and each layer compacted with a sheep's foot roller" (2).

Materials

A single brand of portland cement, which "approached a moderate heat of hydration" (3) was used throughout the project.

The fine and coarse aggregates were from a single source. They were Ohio River sand and gravel procured from the Boone Bar, 8 miles upstream from Owensboro, Kentucky. The gravel ranged in gradation between No. 4 and $1\frac{1}{2}$ inch square sieve sizes.

The filler for the expansion and contraction joints was a premoulded bituminous fiber material with the exception described under the heading of "joint installation". Dowel bars, in all cases, were $\frac{3}{4}$ inch plain rounds.

Mixing Data

The concrete mix was designed by the absolute volume method, meeting the mix requirements of 1.5 barrels of cement per cubic yard of concrete and 5.75 gallons maximum free water per sack of cement, and with a specified slump of from one and one-half inches to three inches. The percentage of fine aggregate varied from 34 to 35 percent by weight of total aggregates (saturated surface dry). Reports indicate that the mix was consistently uniform for the entire project.

Control Tests

One 6-by 12-inch cylinder was made for each 500 linear feet of pavement. The average compressive strength for the 68 specimens at 28 days of age was 4908 pounds per square inch - 71 percent were within 10 percent of the average. Maximum and minimum strengths were 6200 and 3890 pounds per square inch

respectively.

Three 6-by 6-by 42-inch beams were made for each day's pour. The average of all modulus of rupture tests of 28 days of age was 1002 pounds per square inch - 77 percent were within 10 percent of the average. Maximum and minimum values were 1200 and 813 respectively.

One core was drilled from each 1000 linear feet of pavement. The average compressive strength for the 34 specimens, varying from 41 to 80 days of age, was 4856 p.s.i. - 47 percent were within 10 percent of the average. High and low strengths were 6733 and 3243 pounds per square inch respectively.

Joint Installation

Where dowel bars were installed for load transfer they were preassembled in a metal device designed to hold the bars rigidly in proper spacing and alignment.

The filler for expansion joints was a premoulded bituminous fiber material one inch thick and conforming with the pavement section to 1/2 inch below the top surface. This type filler was included in the dowel bar assembly.

Between Stations 737+00 and 630+00 and Stations 560+00 and 450+21 the weakened plane grooves for all contraction joints were filled to one half inch below surface with premoulded bituminous fiber joint filler 1/4-by 1-1/4-inches. For the intervening Standard Section the same type of filler was used but varied in the dimensions of 1/4-inch by 2-inches.

For the remainder of the project, Station 450+21 to Station 397+49.4, the weakened plane groove was formed with 1/4 inch steel strips to a depth of 1-3/4-inches. This entire

depth was then filled by a "hot poured" joint filler, identified as QA-2 crack and joint filler. This same material was used for sealing all other joints. According to Campbell (2), "Due to the rigidity of the steel strips contraction joints constructed in this manner were straight and well formed. The flexible character of the fiber joint filler and caps resulted in many crooked completed joints, and variable distances of the filler below the surface of the pavement".

September 1940

May 1949

Fig. 2. View to North from
Station 635 + 00 to Station 556 + 00

COMPILATION OF DATA

When the project was initiated, certain means of evaluating the pavement over a long period of time were established. Broadly, these consisted of seasonal, daily, and permanent changes in joint widths, measured with a vernier caliper; elevations and elevation changes determined by means of level observations; crack surveys by visual observation; and general condition surveys by visual observation. In doing this, cognizance was taken of traffic and climate - both having considerable influence on performance - and other features such as the value of recording data diagrammatically and photographically .

According to the original plan, measurements for daily and seasonal changes in joint widths were not to extend past one or two years, but data for permanent changes were planned for a long period of time. Daily and seasonal measurements for permanent change were to come each year following completion of the pavement. Level measurements, after the initial and first winter periods, were planned once during a summer "several years" after construction of the project.

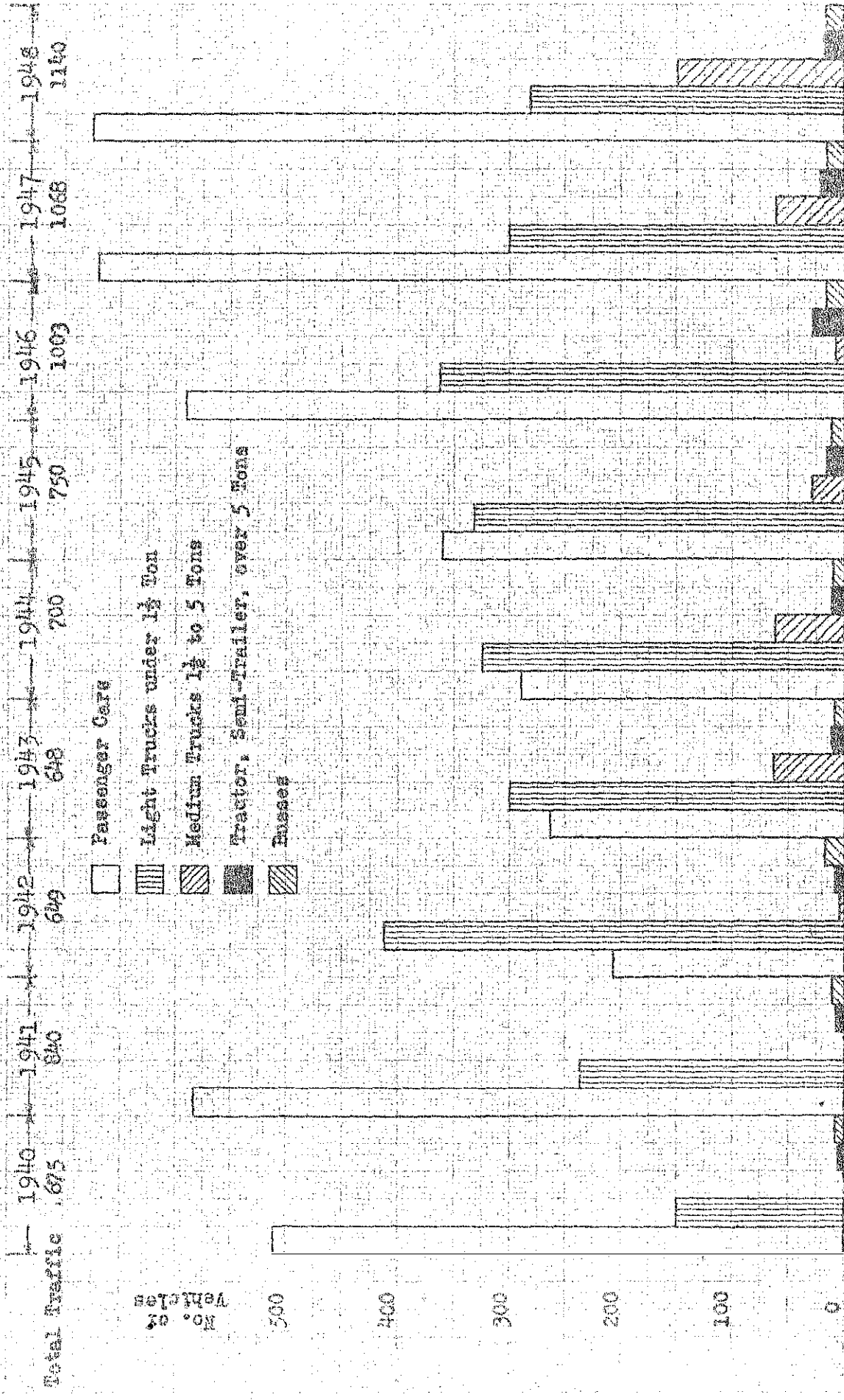
An initial crack survey four to six-weeks after construction was to be followed by surveys twice a year - in the late spring and late fall. Condition surveys, with special emphasis on condition of joints, were planned yearly, preferably in the fall. As evidenced by this report, there was some deviation from this schedule, largely in the direction of more measurements than were originally planned.

Traffic

Traffic data were furnished by the Department's Planning

TABLE II
AVERAGE DAILY TRAFFIC

Year	1940	1941	1942	1943	1944	1945	1946	1947	1948
Passenger Cars	511	584	207	264	290	360	590	670	675
Light Trucks (under 1½ tons)	150	237	413	300	325	333	363	300	282
Medium Trucks (1½ to 5 tons)	0	0	4	64	63	29	7	61	149
Tractor Semi-Trailers (over 5 tons)	6	8	8	11	12	16	28	22	18
Busses	8	11	17	9	10	12	15	15	16
Total Traffic	675	840	649	648	700	750	1003	1068	1140



Average Daily Traffic

FIGURE 1

Division as an average daily traffic count in number and class of vehicles. This information is given in Table II and in graphic form by Fig. 4.

The traffic count does not bear much significance since approximately 90 percent of vehicles borne by this section of highway have been passenger cars and light trucks, and never were there more than 30 vehicles per day greater than 5 tons in weight. The limited use of this route by the heavier vehicles can be attributed to the more or less unimproved section of highway north of this project, in which there were a number of narrow bridges with low load bearing limits prior to 1949. Hence heavily loaded vehicles have been routed over a parallel highway.

Climate

Climatological data presented in this report were procured from the records of the U.S. Weather Bureau's Special Observer Station 1/2 mile west of Owensboro in Daviess County. These data consist of the mean monthly temperatures, the mean of the monthly maximum temperatures, the mean of monthly minimum temperatures, the highest and lowest temperatures observed for each month, and the accumulated monthly precipitation. A complete tabulation of those observations collected over the period from July 1, 1940, through December 31, 1948, are tabulated from Appendix A.

The averages for these monthly temperatures and precipitation data for that period are presented in Table IV and in Fig. 5, together with the highest and lowest recorded monthly accumulation of precipitation and the year in which they occurred

TABLE III
SUMMARY OF TEMPERATURE AND PRECIPITATION DATA
JULY 1940 THROUGH DECEMBER 1948

Month and Years	Mean Temp.			Mean Max. Temps.			Mean Min. Temps.			Highest Recorded Temp. (Year)	Lowest Recorded Temp. (Year)	Inches Rainfall			Inches Snowfall		
	High-est	Low-est	Ave.	High-est	Low-est	Ave.	High-est	Low-est	Ave.			High-est	Low-est	Ave.	High-est	Low-est	Ave.
Jan.	38.7	26.7	34.6	48.3	37.1	44.7	29.5	16.3	25.4	76	-15	5.83	0.57	2.91	7.0	T	3.2
41-48	(44)	(48)		(43)	(48)		(44)	(48)		(43)	(42)	(47)	(43)		(45)	(41)	
Feb.	42.0	28.5	36.3	53.6	39.1	46.1	30.4	17.6	26.4	72	0	5.77	0.20	3.05	10.5	T	2.6
41-48	(46)	(47)		(46)	(41)		(45)	(47)		(48)	(43)	(45)	(47)		(48)	(41-43)	
Mar.	57.0	37.6	47.4	69.1	49.5	58.5	45.5	25.8	36.3	85	0	11.48	1.07	5.73	10.5	0	1.6
41-48	(46)	(47)		(46)	(47)		(45)	(47)		(45)	(47)	(43)	(41)		(47)	(45-46)	
Apr.	60.4	54.2	58.3	73.6	64.3	70.0	49.2	44.1	46.7	90	27	7.43	1.84	4.02	T	0	0
41-48	(46)	(43)		(46)	(43)		(45)	(43)		(46)	(42)	(47)	(41)		(47)		
May	70.1	62.8	65.7	82.5	74.0	77.6	57.7	49.7	53.8	94	33	6.07	1.50	3.90	0	0	0
41-48	(44)	(45-47)		(44)	(45)		(44)	(47)		(44)	(47)	(47)	(41)				
June	79.8	72.6	75.4	93.3	83.7	87.4	67.1	61.2	63.4	107	46	9.33	1.88	4.03	0	0	0
41-48	(44)	(47)		(44)	(45)		(43)	(47)		(44)	(44-46)	(47)	(44)				
July	79.4	73.2	77.4	93.5	86.8	90.4	68.3	59.7	65.0	103	44	5.18	1.67	3.55	0	0	0
40-48	(44)	(47)		(44)	(47)		(43)	(47)		(44)	(47)	(45)	(44)				
Aug.	81.3	71.9	76.9	95.6	84.8	88.8	67.0	62.0	64.2	105	42	4.41	0.44	2.70	0	0	0
40-48	(47)	(46)		(47)	(46)		(47)	(48)		(48)	(46)	(42)	(43)				

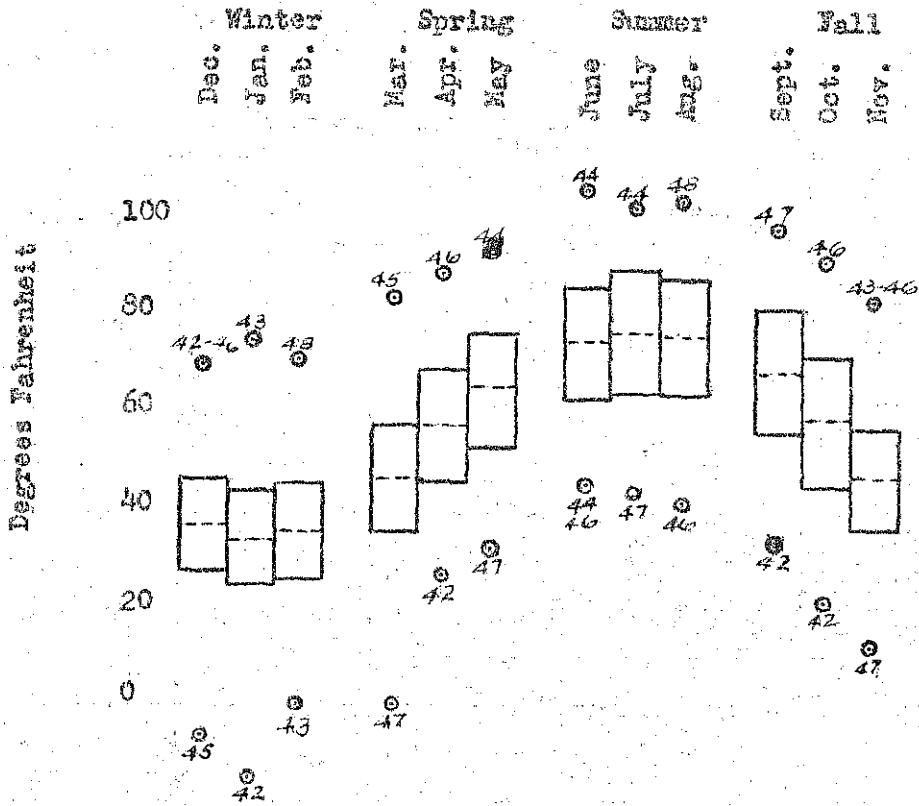
TABLE III

2 of 2

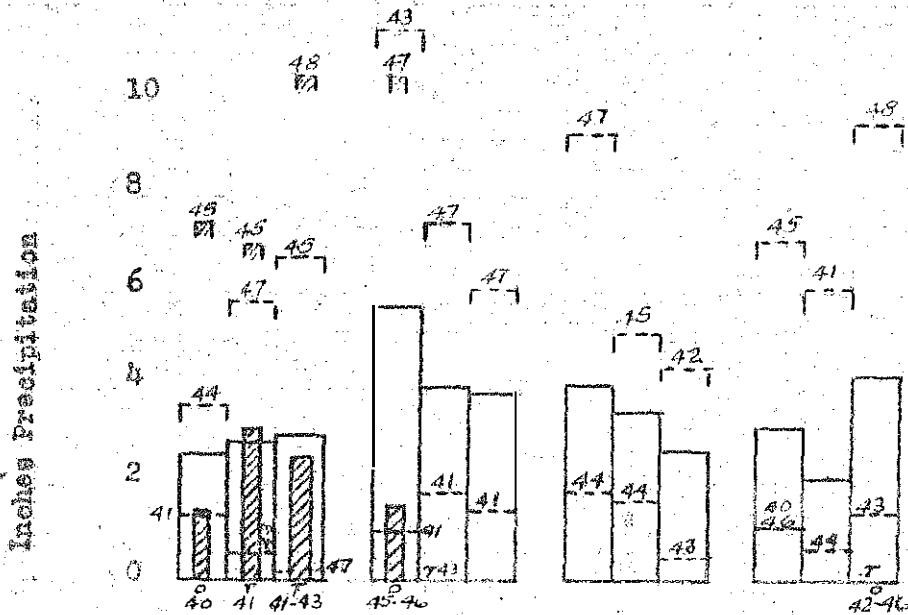
SUMMARY OF TEMPERATURE AND PRECIPITATION DATA
JULY 1940 THROUGH DECEMBER 1948

Month and Years	Mean Temp.			Mean Max. Temps.			Mean Min. Temps.			Highest Recorded Temp (Year)	Lowest Recorded Temp (Year)	Inches Rainfall			Inches Snowfall		
	High-est	Low-est	Ave.	High-est	Low-est	Ave.	High-est	Low-est	Ave.			High-est	Low-est	Ave.	High-est	Low-est	Ave.
Sept. 40-48	72.3 (41)	66.2 (43)	69.5	85.5 (41)	76.9 (43)	82.6	60.8 (45)	53.4 (40-46)	56.5	99 (47)	34 (42)	7.06 (45)	1.16 (40-46)	3.20	0	0	0
Oct. 40-48	64.7 (47)	56.1 (48)	59.5	81.3 (47)	69.7 (48)	72.3	52.0 (41)	42.6 (48)	45.6	92 (46)	21 (42)	6.10 (41)	0.71 (44)	2.16	0	0	0
Nov. 40-48	50.5 (46)	42.7 (47)	47.1	63.4 (46)	52.8 (47)	57.6	41.3 (42)	31.6 (47)	36.4	84 (43-46)	12 (47)	9.55 (48)	1.46 (43)	4.29	T	0 (42-46)	T
Dec. 40-48	43.1 (41)	31.7 (45)	37.9	53.3 (46)	40.8 (44)	47.1	33.8 (40)	22.3 (45)	28.3	71 (42-46)	-6 (45)	3.65 (44)	1.41 (41)	2.67	7.5 (45)	0 (40)	1.5

Climatological Data



Averages of Monthly Mean Maximum, Mean Minimum, and Mean Temperatures, with Highest and Lowest Observed Temperatures and the Years Observed.



Averages of Monthly Rainfall and Snowfall, with the Greatest and Least Measured and the Years of Occurrence.

The extreme temperatures are plotted as points in Fig. 5, whereas the averages of the mean temperature ranges are represented by the bars. As expected, the extreme temperatures do not reflect the generally prevailing condition, but the mean temperatures for the separate years conformed closely with their plotted averages. The extremes are somewhat infrequent and usually of short duration.

Also in Fig. 5 are plotted the averages for the monthly accumulative inches of rainfall and snowfall. The wide bars represent rainfall while the narrower cross-hatched bars represent snowfall. The letter "T" designates a trace of snowfall. This graph is a fair representation of the normal condition, not appreciably influenced by a few extremes and deficiencies which were rare.

Joint Width Measurements

Subsections were selected from each section for measurements of joint movements where there was a minimum of gradient, horizontal curvature, and embankment. In one lane of the pavement, centrally located, and on each side of the selected joints, brass inserts were installed by grouting. These were approximately five inches apart to accommodate a caliper for measurement of linear movement. Joint width measurements were made with a vernier caliper, reading to 0.001 inch. Each section was provided with one thermometer well formed in the concrete. Pavement temperatures were measured by inserting a thermometer in these wells at the time of making joint width measurements. In all cases, elevation points were placed in the lane opposite the joints for joint width measurements, and usually these extend beyond the subsections established for joint measurements.

Measurements of daily, seasonal, and permanent changes in widths were scheduled for a representative number of joints in each of the sections. The daily and seasonal measurements

TABLE IV
NUMBER OF JOINTS SELECTED FOR VARIOUS WIDTH MEASUREMENTS

Section No.	Joint Width Measurements					
	Daily		Seasonal		Permanent	
	Exp.	Contr.	Exp.	Contr.	Exp.	Contr.
7	2	5	4	10	2	5
6	3	2	6	5	4	3
5	2	5	4	10	2	5
4	0*	0*	4	10	0*	0*
3	2	5	3	10	0	7
2	2	8	2	20	2	14
1	0**	8	0**	21	0**	7
Standard	3	6	5	24	3	6

*No measurements scheduled.

**No expansion joints within the section

were made once each season from November 1946 to August 1948 and again in August 1948 and in February 1949. Daily measurements were taken twice on each day selected (in the early morning and early afternoon) to gain the advantage of the greatest temperature difference.

Joints selected for recording permanent change were scheduled to be measured each summer for several years. This was observed each year with the exceptions of 1946 and 1947.

Daily. In Appendix B is a complete tabulation of the daily joint width movements for each joint measured for each section and the averages for the expansion joints and contraction joints by sections for each day measured. With very few

exceptions, the joint movement was quite uniform for all joints of a given type in a section for each date. This takes into account the fact that expansion joints and contraction joints were treated separately, in recognition of the fundamental difference between the two.

Since the averages were well representative of all joints, they were plotted on the bar graph in Fig. 6. The full height of the bars represents the total measured closure in inches. The cross-hatched portion represents the computed closure for 10 degrees (Fahrenheit) increase in temperature, so reduced for better comparison of the relative movement at various seasons as well as between the various sections. Further reductions were computed to movement for 10 degrees change per 20 feet of slab and applied to Sections 6 and the Standard Section, in which the joint intervals were 60 feet and 30 feet respectively. The range in temperature for each section during the period when measurements were taken is shown numerically, and the range in temperature is plotted graphically in each instance.

It will be noted that the unit change* in widths of the contraction joints were relatively uniform with respect to both the dates measured and the different sections. On the surface, some significance can be attached to the fact that Section 6, having the longest slab lengths, had the smallest unit change, and the next smallest average unit change occurred in the Standard Section, which was the only other section with a joint spacing greater than 20 feet.

* Total closure converted to closure per 10° temperature increase per 20 feet of pavement.

However, this does not take into account the fact that Section 6 had by far the greatest frequency of crack development at the time of the last inspection. This is discussed more fully under "Condition Survey" later, but with an average of 98.6 transverse cracks per mile the effective slab length has been reduced from 60 feet to an average of about 28 feet. Possibly the effect of crack development is reflected in the reduction in closure per ten degrees temperature increase measured in 1948 and 1949 as compared with similar data taken in 1942 or earlier when cracking was much more limited.

The daily movements of the expansion joints were considerably less uniform for the individual sections, and were even more at variance by comparison among different sections. The unit movement of expansion joints generally was greater than that of contraction joints in those sections with the 120 foot intervals between expansion joints. The reverse was true in those sections where this interval was 400 feet or greater. This inconsistency may, in part, be due to permanent closure whereby expansion joints in those sections with the long joint intervals reached a "permanent" condition early and retained that closure throughout the intervening years. As a matter of fact, these joint widths showed practically no change by seasons (see Fig. 7), whereas joint widths in all sections with shorter intervals had considerable seasonal variation.

Taken at face value, daily joint-width measurements indicate that an average coefficient of thermal expansion of

In Fig. 10 cracks observed for the entire project up to February 1949, are drawn in plan to show their distribution and location. A count of the cracks (at that time) by type and the frequency of the different types for each section are recorded in Table V. A bar graph illustrating the frequency per mile is plotted in Fig. 9.

Cracking, as a rule, has occurred with greater frequency in the test sections than in their corresponding "repeat" sections, with the exception of the majority of longitudinal cracks.

In Sections 7 and 7-R, cracks of all types were somewhat equally represented. In Sections 6 and 6-R, there was a predominance of transverse cracks which may be a consequence of greater slab lengths. Transverse cracks also occurred rather frequently in Section 4, while in Section 4-R the number was comparable with a general average condition. The frequency of longitudinal cracks in Section 4-R exceeded by an appreciable amount that for the other sections.

Corner breaks, both inside and outside, were outstanding in Section 7. Sections 4 and 7-R were next in order with the number of inside corner breaks, and Section 6 with outside corner breaks. This type of cracking occurred quite infrequently in the remaining sections.

From the standpoint of the crack count in 1949, Sections 3, 2, and 1 had the best over-all record, with Sections 3-R, 5, and Standard next in order. As shown in the Record of Crack and Condition Survey (Appendix G), the rate of crack

development increased in the last 2 years or following the survey in December 1946. Some sections run contrary to this, outstanding examples being Sections 6,5, Standard, and 2-R. Some of the spalling at joints reported from time to time has become obliterated by joint filler applied in recent maintenance operations.

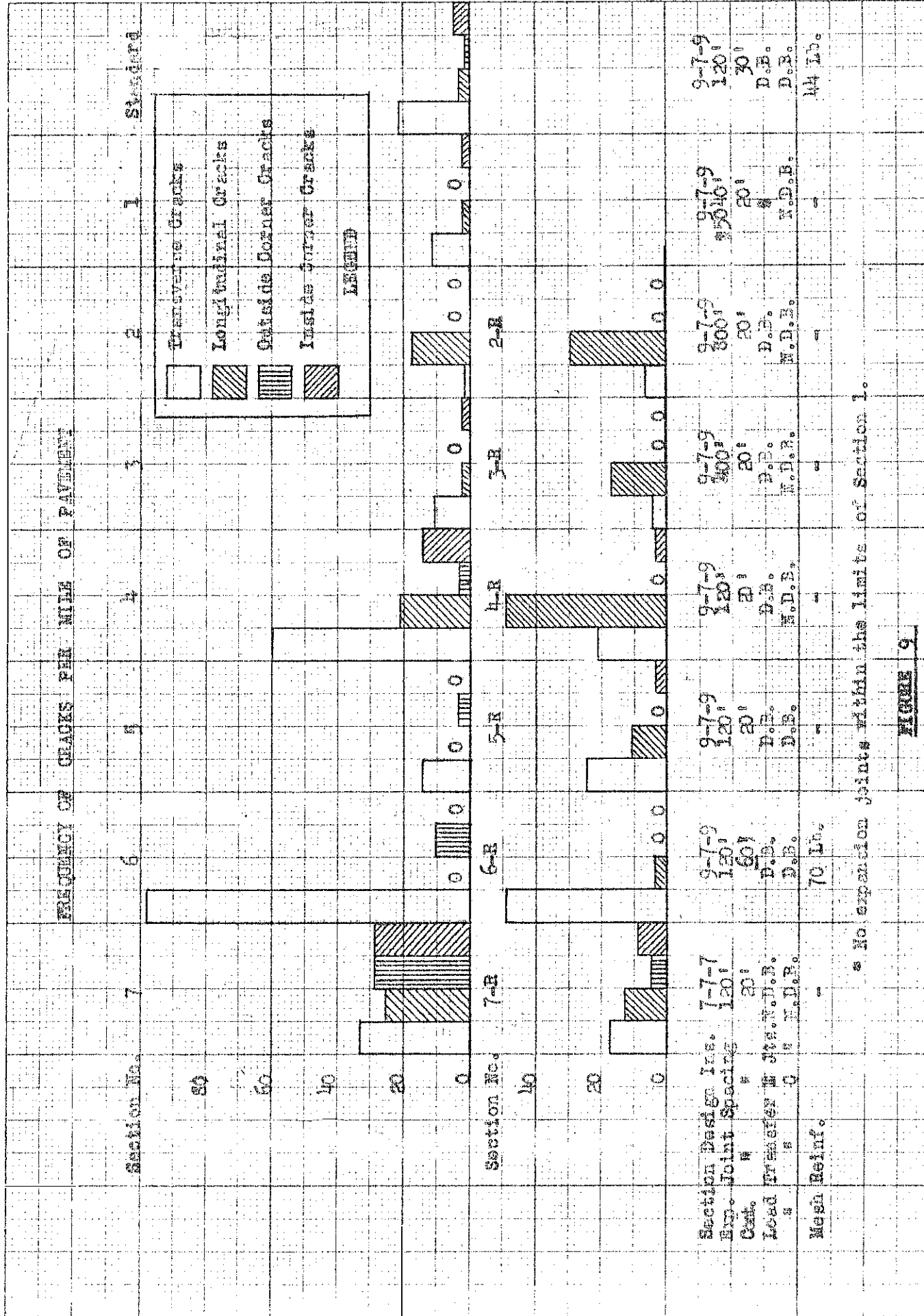
TABLE V
CRACK SUMMARY BY TYPE PER SECTION

Section No.	Length (feet)	No. of Transverse Cracks		No. of Longitudinal Cracks		No. of Outside Corner Cracks		No. of Inside Corner Cracks		No. Spalling Joints
		per Section	per Mile	per Section	per Mile	per Section	per Mile	per Section	per Mile	
7	1270	8	33.2	6	24.9	7	29.1	7	29.1	1
6	1500	28	98.6	0	0.0	3	10.6	0	0.0	1
5	1480	4	14.3	0	0.0	1	3.6	0	0.0	0
4	1500	17	59.8	6	21.1	1	3.5	4	14.1	0
3	2500	5	10.6	1	2.1	0*1	0.0	1	2.1	0
2	3000	1	1.8	10	17.6	0	0.0	0	0.0	0
1	5000	11	11.6	2	2.1	0	0.0	2	2.1	1*2
Std.	7000	30	21.4	4	3.0	1	0.8	6	4.5	5*3
2-R	2500	3	6.3	14	29.6	0	0.0	0	0.0	1
3-R	2500	2	4.2	8	16.9	0	0.0	0	0.0	1
4-R	1500	6	21.1	14	49.3	0	0.0	1	3.5	2
5-R	1500	7	24.6	3	10.6	0	0.0	1	3.5	0
6-R	1500	14	49.3	1	3.5	0	0.0	0	0.0	0
7-R	1200	4	17.6	3	13.2	1	4.4	2	8.8	0

*1 1 diagonal crack

*2 Spalling along centerline, 2 locations

*3 Spalling in slab



* No expansion joints within the limits of Section 1.

FIGURE 9

Fig. 11. One of the More Serious
Examples of Spalling, Station 542 + 90

Fig. 12. Typical of Cracking Where
Drop Inlet is Constructed Near Joint
Installation. Station 686 + 00 in West Lane

Fig. 13. Faulted Joint, Station 686 + 40

Fig. 14. Irregular Transverse
Cracking in East Lane, Station 709 + 52

RESULTS

In some measure, circumstances under which the pavement of this project has existed have limited the results at the present stage. During a large part of that time other sections of the highway have been closed for construction, thus, restricting the number and size of vehicles traveling over the road. Completion of this work in the near future will probably bring the use of these experimental sections up to a level that may be considered "normal" for years to come.

Despite these limitations, several differences among the sections have developed, and the effects of different variables can be analyzed to a considerable degree. These are briefly as follows:

General

1. All expansion joints tended to close and retain a certain amount of closed set within 6 months after construction. Only Section 6, with the longest slab lengths, showed any reversal of this tendency. Trends in joint openings in that section were fluctuating even as late as $8\frac{1}{2}$ years after construction. (see Fig. 7 and Appendix C)

2. Section 7 was unique with respect to progressive change toward closure of expansion joints. Expansion joints in that section started closing almost immediately, whereas expansion joints in all other sections opened a considerable amount during the first period of two to six months before beginning the progressive change to closed set. (see Fig. 7 and Appendix C).

3. With very few exceptions, changes in widths across joints were quite uniform for all joints of a given type measured within each section individually on each date. There were, however, great differences in the changes for the different sections and for expansion joints as compared with contraction joints. (see Appendices B, C and D)

4. Despite the slight trend toward greater plasticity of the subgrade soils in the "repeat" sections as compared with the "test" sections, repeat sections have shown better overall performance than their counterparts among the test sections. Longitudinal cracks, which were much more prevalent in all but one of the repeat sections, constituted an outstanding exception. (see Fig. 9 and 10, and Appendices F and G).

Spacing of Expansion Joints

5. Expansion joint spacing had no appreciable effect on the tendency of these joints to assume and retain a closed set, although the data pertaining to this were very meager. (see Fig. 7 and Appendix D)

6. The influence of temperature variation on changes in width of expansion joints was much greater when the spacing was relatively short - 120 feet or shorter - than when it was 400 feet or greater. After six months of service, the joints in sections with the larger intervals were hardly affected by temperature changes. (see Fig. 7 and Appendix C)

7. The unit movement* (daily) of expansion joints

* Total closure converted to closure per 10° temperature increase per 20 feet of pavement.

generally was greater than that of contraction joints on those sections with the 120 foot intervals between expansion joints. The reverse was true in those sections where this interval was 400 feet or greater. (see Fig. 6)

8. In the sections with the 120 foot or shorter spacing of expansion joints, openings in contraction joints were greater and the tendency for them to remain open was greater than in sections where the expansion joint interval was at least 400 feet. (see Fig. 7 and Appendices C and D)

9. Expansion joint spacing or even the existence of expansion joints as compared with contraction joints had no measurable effect on faulting or differentials in pavement elevations in adjacent slabs. (see Fig. 8 and Appendix E)

10. The longer spacing of expansion joints - or omission of expansion joints - was conducive to fewer cracks of all types developing in slabs of equal length after construction. (see Figs. 9 and 10, and Appendix G)

11. Fewer transverse cracks, and on the whole fewer cracks of all types, developed in the sections with the lengthy expansion joint spacing than in sections having shorter expansion joint spacing and equal slab lengths. This applies to progressive crack development as well as the pavement condition in 1949. (see Fig. 9 and Appendix G)

Spacing of Contraction Joints (Slab Lengths)

Spacing of contraction joints can not be viewed as an entirely separate variable since load transfer and particularly mesh reinforcement were unique in the two sections having greater

than normal joint spacing.

12. In the two sections where the contraction joint spacing was greater than 20 feet, the expansion joints showed the greatest tendency to return to their original widths with reductions in temperature. This was more pronounced in Section 6 with a 60 ft. contraction joint interval than in the Standard section with a 30 foot interval. (see Fig. 7 and Appendix C)

13. The extent of opening of contraction joints increased in approximate proportion with the increase in slab length. Joints in sections with the greatest interval (or greatest slab length) assumed and retained the largest opening regardless of changes in temperature. However, the computed unit change* was smallest in Section 6, which had the greatest slab length. (see Fig. 7, and Appendices C and D)

14. Pavement elevations showed that the greater the slab length the greater the difference in elevation between the ends and centers of slabs where warping occurred. However, the average difference in elevation per foot of slab was about the same regardless of slab lengths. All sections had some warped slabs according to the measurements that were made. In most cases neither the amount nor the direction of warping remained constant year after year, and in many instances the warping reversed from a concave to convex shape. No general increase in tendency toward warping with increase in the years of service was recorded. (see Fig. 8 and Appendix E)

*Total change converted to change per 10° temperature increase per 20 feet of pavement.

15. All sections had tilted slabs, but in Section 6 (60 foot slab lengths) the tendency was less pronounced and there were fewer instances of tilting in relation to the number of slabs than in the other sections with shorter slab lengths. (see Fig. 8 and Appendix E)

16. The data show no definite effect of contraction joint spacing on the development of cracks in the pavement. Not only were there variations among sections having equal joint spacing, but one of the two sections with an extraordinarily long interval had by far the greatest number of transverse cracks, and in contrast the other had no more than an average number of cracks of any type in 1949. (see Fig. 9 and Appendix G)

Load Transfer and Reinforcement

As in the case of slab lengths the presence or absence of mesh reinforcement can not be considered entirely as a separate variable, however, load transfer by dowels at the joints was varied enough to provide a limited basis for separate evaluation.

17. The data show no evidence of resistance on the part of dowels to the closure of contraction joints. (see Fig. 7, and Appendix C)

18. The prevalence of transverse cracks within about five feet of contraction joints in Section 4, as opposed to the almost complete absence of this condition in Section 5, indicates that dowel bars were beneficial in transferring load across contraction joints, even though the joints were open considerably. Similarly, corner breaks were more pronounced

where the dowels were omitted. The same contrast does not exist between Section 4-R and Section 5-R. (see Figs. 9, 10, and 7)

19. No load transfer in either contraction or expansion joints in pavement with normal joint spacing resulted in exceptional deterioration of all types, if the influence of pavement thickness in Section 7 can be discounted. (see Fig. 9 and Appendix G)

20. In the absence of load transfer, closure of contraction joints and accompanying aggregate interlock tends to prevent development of cracks and corner breaks, as shown by the performance of sections 1, 2, and 3 in contrast with sections 4 and 7. (see Figs. 7 and 9)

21. Aside from pronounced faulting at expansion joint No. 19 in section 7 and contraction joint No. 23 in section 4 (both having no dowels for load transfer), there was no noticeable effect of dowels on the tendency for displacement of adjacent slabs at expansion and contraction joints. (see Fig. 8 and Appendix E)

22. Lack of opportunities for comparison obscure the influence of mesh reinforcement on pavement performance. However, the high rate of transverse crack formation in both section 6 and section 6-R is strong evidence that the 70 pound mesh failed to counteract the tendency toward cracking in slabs of 60-foot length. In contrast, the combination of 44 pound mesh and 30-foot slab length resulted in a transverse crack interval that was about average for all sections. (see Figs. 9 and 10)

Pavement Section

23. On the whole, the pavement of uniform 7-inch section had the worst performance record of all pavement in the project. Much of this could possibly be attributed to the absence of load transfer bars at both contraction and expansion joints, for the contrast between section 7 and sections 4, 7-R and 4-R in pavement performance was not extreme despite the fact that sections 4 and 4-R had a 9-7-9 section and dowels at expansion joints. (see Figs. 9 and 10)

CONCLUSIONS

Taken at face value, the results obtained from this experimental pavement (containing certain aggregates and built under certain conditions) to date lead to the conclusion that: expansion joints are of little benefit and are probably detrimental unless installed in at least 400-foot intervals; close intervals (at the most 30 feet) for contraction joints are preferable; dowel bars for load transference at contraction joints are of questionable value except in the case of joints that open considerably and remain open thus being deprived of any advantage that might be gained through interfacial pressure and aggregate interlock; the thickened edge pavement section is superior to that of uniform thickness; and mesh reinforcement alone will not prevent cracking particularly in slabs greater than 30-feet in length.

With due regard to the very narrow margin for differentiation in some cases, over-all performance characteristics by sections were from best to poorest in the following order: 1, 2, 3, 5, Standard, 4, 7, and 6.

ACKNOWLEDGEMENTS

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APPENDIX A

Climatological Data

A tabulation of data covering the period between July 1, 1940, and December 31, 1948, and including the monthly mean temperatures, the monthly means of maximum and minimum temperatures, the highest and lowest temperatures for each month, and the monthly accumulation of inches of rainfall and snowfall.

TEMPERATURES AND PRECIPITATION DATA
 Monthly, July 1940 - December 1948

Month	YEAR	Monthly Mean Temp.	Mean of		Highest Temp.	Lowest Temp.	Precipitation in Inches	Snowfall in Inches
			Max. Temp.	Min. Temp.				
JULY	1940	76.6	88.3	64.9	99	55	3.12	0
	41	78.0	90.0	66.1	100	59	3.76	0
	42	78.6	90.7	66.5	98	54	1.88	0
	43	78.7	89.1	68.3	96	58	2.99	0
	44	79.4	93.5	65.3	103	53	1.67	0
	45	76.9	89.6	64.2	100	53	5.18	0
	46	77.0	90.2	63.9	99	56	4.52	0
	47	73.2	86.8	59.7	98	44	4.10	0
48	78.6	90.6	66.5	95	53	4.69	0	
AUGUST	40	76.7	88.3	65.1	97	49	2.02	0
	41	78.2	91.1	65.4	100	56	3.01	0
	42	75.0	85.9	64.1	99	51	4.41	0
	43	78.8	91.5	66.1	103	52	0.44	0
	44	77.8	90.0	65.6	101	55	3.37	0
	45	76.0	88.0	63.9	97	49	3.84	0
	46	71.9	84.8	59.0	94	42	4.32	0
	47	81.3	95.6	67.0	103	61	2.13	0
48	76.7	91.4	62.0	105	51	0.78	0	
SEPTEMBER	40	66.8	80.3	53.4	93	39	1.16	0
	41	72.3	85.5	59.1	94	37	1.93	0
	42	68.0	79.9	56.2	90	34	5.30	0
	43	66.2	76.9	55.6	98	42	3.11	0
	44	70.7	83.3	58.1	92	43	2.26	0
	45	72.2	83.7	60.8	93	52	7.06	0
	46	68.8	84.3	53.4	95	39	1.16	0
	47	69.6	84.7	54.4	99	36	3.18	0
48	70.8	84.5	57.1	95	46	3.63	0	
OCTOBER	40	60.0	74.5	45.5	87	31	0.81	0
	41	62.8	73.7	52.0	91	33	6.10	0
	42	57.8	70.3	45.3	83	21	2.07	0
	43	57.4	70.0	44.8	84	27	1.62	0
	44	59.6	74.3	45.0	87	29	0.71	0
	45	57.2	70.1	44.2	82	32	1.64	0
	46	59.8	76.5	43.2	92	30	2.31	0
	47	64.7	81.3	48.1	91	34	2.59	0
48	56.1	69.7	42.6	80	25	1.59	0	
NOVEMBER	40	44.4	54.8	34.1	77	15	4.90	0
	41	44.7	55.9	33.5	76	21	2.33	0
	42	50.4	59.5	41.3	77	23	5.58	0
	43	45.2	57.4	33.1	84	20	1.46	0
	44	48.2	56.8	39.6	80	25	2.63	0
	45	48.6	59.1	38.2	82	19	4.50	0
	46	50.5	63.4	37.6	84	22	4.69	0
	47	42.2	52.8	31.6	65	12	3.00	0
48	48.8	58.6	39.0	75	22	9.55	0	
DECEMBER	40	41.6	49.5	33.8	62	13	2.80	0
	41	43.1	49.9	33.0	67	22	1.41	0
	42	36.2	44.4	28.1	71	6	2.85	0
	43	36.4	46.1	26.8	63	5	2.35	0
	44	32.7	40.8	24.6	59	9	3.65	0
	45	31.7	41.1	22.3	61	6	2.77	0
	46	42.2	53.3	31.2	71	16	3.08	0
	47	36.6	46.5	23.6	65	12	1.80	0
48	40.5	49.5	31.5	67	12	3.28	0	

NO DATA FOR
 YEARS 1940-1948
 EXCEPT WHERE NOTED

TEMPERATURES AND PRECIPITATION DATA
 Monthly, July 1940 - December 1948

YEAR	Monthly Mean Temp.	Mean of		Highest Temp.	Lowest Temp.	Precipitation in Inches	Snowfall in Inches	
		Max. Temp.	Min. Temp.					
JANUARY	1941	36.4	44.3	28.5	56	11	2.30	T
	42	30.6	40.8	20.5	66	-15	3.65	4.0
	43	38.5	48.3	28.7	76	5	0.57	1.5
	44	38.7	47.9	29.5	70	11	1.66	1.5
	45	31.8	40.0	23.6	53	1	3.19	7.0
	46	36.4	46.2	26.7	70	7	3.53	2.0
	47	37.8	46.5	29.0	68	10	5.83	--
	48	26.7	37.1	16.3	62	-2	2.57	6.2
FEBRUARY	41	31.8	39.1	24.4	60	13	0.83	T
	42	34.6	42.3	26.9	64	6	2.55	1.1
	43	40.4	52.7	28.2	69	0	0.92	T
	44	--	--	--	--	--	3.11	2.5
	45	39.2	47.9	30.4	70	1	6.77	1.5
	46	42.0	53.6	29.5	64	5	6.29	3.2
	47	28.6	39.6	17.6	67	3	0.20	2.0
	48	37.5	47.3	27.7	72	5	3.75	10.5
MARCH	41	39.8	50.1	29.6	68	12	1.07	T
	42	48.6	60.3	36.9	79	24	6.55	T
	43	43.6	55.2	32.1	76	3	11.48	1.0
	44	--	--	--	--	--	4.41	1.5
	45	56.6	67.6	45.5	85	27	9.53	0
	46	57.0	69.1	45.0	79	23	3.04	0
	47	37.6	49.5	25.8	69	0	2.35	10.5
	48	48.6	57.8	39.3	79	15	7.40	T
APRIL	41	59.9	71.9	47.9	86	39	1.84	0
	42	58.6	71.8	45.4	88	27	3.26	0
	43	54.2	64.3	44.1	83	28	2.22	T
	44	56.6	67.8	45.3	84	28	5.66	0
	45	59.7	70.2	49.2	81	30	4.20	0
	46	60.4	73.6	47.2	90	31	2.44	0
	47	57.4	69.2	45.7	83	30	7.43	0
	48	59.8	70.9	49.1	83	31	5.14	0
MAY	41	67.7	81.3	54.1	93	37	1.50	0
	42	66.0	77.7	54.4	89	39	4.53	0
	43	66.4	76.5	56.4	87	42	3.86	0
	44	70.1	82.5	57.7	94	34	2.67	0
	45	62.8	74.0	51.6	90	36	3.44	0
	46	64.2	75.4	52.9	86	40	5.75	0
	47	62.8	76.0	49.7	87	33	6.07	0
	48	65.6	77.8	53.5	87	43	3.39	0
JUNE	41	74.6	86.9	62.3	97	50	2.89	0
	42	74.6	86.0	63.1	97	49	2.93	0
	43	77.6	88.2	67.1	95	55	4.09	0
	44	79.8	93.3	66.2	107	46	1.88	0
	45	73.3	83.7	62.9	96	47	6.77	0
	46	74.6	87.3	61.9	96	46	2.76	0
	47	72.6	84.1	61.2	95	50	2.33	0
	48	76.0	89.5	62.4	96	50	1.96	0

APPENDIX B

Daily Joint Width Measurements

A tabulation by sections of all daily joint measurements, recorded as inches of closure between two daily measurements for the observed temperature increases. The averages for expansion joint and contraction joint movements for each section are also included.

DAILY JOINT WIDTH MEASUREMENTS

SECTION 7

Date	11-28-40	2-25-41	5-28-41	8-29-41	11-26-41	3-6-42	6-4-42	8-28-42	8-4-48	2-8-49	
Time A.M.	7:00	7:00	4:15	5:15	6:15	7:15	5:45	6:00	5:15	7:00	
Temp. Air ° F	28	35	68	73	32	29	70	64	73	35	
Temp. Conc. ° F	33	38	81	79	34	38	80	76	75	34	
Time P.M.	2:00	2:00	2:00	2:00	2:00	4:30	3:00	2:15	2:00	1:30	
Temp. Air ° F	39	46	92	94	58	57	88	91	78	65	
Temp. Conc. ° F	45	51	104	102	52	59	102	101	90	63	
Temp. Diff. Conc. ° F	+12	+13	+23	+23	+18	+21	+22	+25	+15	+29	
INCHES CLOSURE FOR TEMPERATURE CHANGE											
Joint No.	Type										
7	E	-.008	-.021	-.073	-.043	-.026	-.045	-.036	-.048	-.010	-.048
8	C	-.018	-.031	-.050	-.043	-.027	-.040	-.039	-.053	-.035	-.040
9	C	-.021	-.024	-.046	-.044	-.030	-.028	-.034	-.051	-.028	-.028
10	C	-.020	-.020	-.044	-.040	-.030	-.032	-.034	-.051	-.011	-.024
11	C	-.019	-.022	-.045	-.041	-.028	-.036	-.037	-.054	-.011	-.024
12	C	-.010	-.028	-.053	-.053	-.030	-.042	-.039	-.052	-.016	-.026
13	E	-.015	-.020	-.075	-.044	-.029	-.045	-.038	-.047	-.006	-.054
Ave. 2 Exp. Jts.		-.0115	-.0205	-.074	-.0435	-.0275	-.0450	-.0370	-.0475	-.008	-.051
Ave. per 1 ° F		-.0010	-.0016	-.0032	-.0019	0.0015	-.0021	-.0017	-.0019	-.0005	-.0018
Ave. 5 Cont. Jts.		-.0176	-.0250	-.0476	-.0442	-.0290	-.0356	-.0366	-.0522	-.0202	-.0236
Ave. per 1 ° F		-.0015	-.0019	-.0021	-.0019	-.0016	-.0017	-.0017	-.0021	-.0016	-.0008

DAILY JOINT WIDTH MEASUREMENTS

SECTION 6

Date	11-28-40	2-25-41	5-28-41	7-29-41	11-26-41	3-6-42	6-4-42	8-28-42	8-4-48	2-8-49	
Time A. M.	7:10	7:10	4:30	5:00	6:30	7:30	6:00	6:25	5:35	9:00	
Temp. Air °F	29	35	68	73	32	29	70	64	75	46	
Temp. Conc. °F	33	38	81	79	34	38	80	76	84	40	
Time P.M.	2:10	2:10	2:15	2:00	2:15	4:20	3:15	2:35	2:15	1:45	
Temp. Air °F	41	46	92	94	58	57	90	91	78	65	
Temp. Conc. °F	45	51	106	104	52	59	103	101	90	63	
Temp. Diff. Conc. °F	+12	+13	+25	+25	+18	+21	+23	+25	+6	+23	
Joint No.	INCHES CLOSURE FOR TEMPERATURE CHANGE										
Type											
3	E	-.040	-.058	-.157	-.131	-.100	-.145	-.139	-.176	-.032	-.144
4	C	-.048	-.054	-.075	-.092	-.056	-.048	-.059	-.070	-.006	-.013
5	E	-.045	-.066	-.141	-.135	-.082	-.130	-.117	-.148	-.008	-.129
6	C	-.044	-.053	-.077	-.089	-.062	-.057	-.073	-.101	-.010	-.021
7	E	-.053	-.060	-.159	-.140	-.086	-.129	-.127	-.157	-.046	-.136
Ave. 3 Exp. Jts.		-.0477	-.0613	-.152	-.135	-.0893	-.135	-.127	-.160	-.029	-.140
Ave. per 1°F		-.0040	-.0047	-.0061	-.0054	-.0050	-.0064	-.0055	-.0064	-.0048	-.0061
" " "20' slab		-.0017	-.0015	-.0020	-.0018	-.0017	-.0021	-.0018	-.0021	-.0016	-.0020
Ave. 2 Cont. Jts.		-.046	-.0535	-.076	-.0905	-.0590	-.0525	-.066	-.0855	-.008	-.017
Ave. per 1°F		-.0038	-.0041	-.003	-.0036	-.0033	-.0025	-.0028	-.0034	-.0013	-.0007
" " "20' slab		-.0013	-.0014	-.001	-.0012	-.0011	-.0008	-.0009	-.0011	-.0004	-.0002

DAILY JOINT WIDTH MEASUREMENTS

SECTION 3

Date	11-28-40	2-25-41	5-28-41	8-29-41	11-26-41	3-6-42	6-4-42	8-28-42	8-4-48	2-8-49	
Time A. M.	7:30	7:30	5:00	6:00	7:15	8:00	6:30	7:00	6:45	7:15	
Temp. Air °F	30	36	68	74	32	30	72	65	75	42	
Temp. Conc. °F	34	38	80	79	36	39	80	75	84	40	
Temp. P.M.	2:30	2:30	2:40	2:30	2:35	4:00	3:45	3:10	3:50	2:20	
Temp. Air °F	40	46	93	94	58	58	88	90	79	68	
Temp. Conc. °F	45	50	106	102	52	59	104	102	90	64	
Temp. Diff. Conc. °F	+11	+12	+26	+23	+16	+20	+24	+27	+6	+24	
Joint No.	Type	INCHES CLOSURE FOR TEMPERATURE CHANGE									
1	E	-.010	-.011	-.038	-.012	-.007	-.003	-.021	-.017	-.015	-.001
2	C	-.021	-.024	-.051	-.058	-.036	-.046	-.037	-.060	-.012	-.031
6	C	-.016	-.018	-.040	-.042	-.029	-.042	-.030	-.046	-.015	-.031
11	C	-.017	-.021	-.027	-.032	-.028	-.045	-.025	-.045	-.011	-.023
16	C	-.020	-.023	-.038	-.041	-.029	-.037	-.026	-.047	-.013	-.024
20	C	-.019	-.030	-.051	-.056	-.052	-.054	-.042	-.069	-.037	-.035
21	E	-.012	-.014	-.057	-.012	-.002	-.004	-.028	-.019	-.003	-.009
Ave. 2 Exp. Jts.		-.011	-.0125	-.0475	-.012	-.0045	-.0035	-.0245	-.018	-.009	-.005
Ave. per 1° F		-.0010	-.0010	-.0018	.0005	-.0005	-.0002	-.0010	-.0007	-.0015	-.0002
Ave. 5 Contr. Jts.		-.0186	-.0232	-.0414	-.0458	-.0348	-.0448	-.032	-.0534	-.0176	-.0288
Ave. per 1° F.		-.0017	-.0019	-.0016	-.0020	-.0022	-.0022	-.0013	-.0020	-.0029	-.0012

DAILY JOINT WIDTH MEASUREMENTS

SECTION 2

Date	11-28-40	2-25-41	5-28-41	8-29-41	11-26-41	3-6-42	6-4-42	8-28-42	8-5-48	2-9-49	
Time A.M.	7:40	7:40	5:15	6:15	7:30	8:20	6:30	7:20	5:45	7:30	
Temp. Air ° F	30	36	68	74	35	31	74	66	67	35	
Temp. Conc. ° F	34	38	79	78	36	40	81	75	73	39	
Time P.M.	2:40	2:40	2:50	2:45	2:45	3:50	4:00	3:25	1:45	2:20	
Temp. Air ° F	40	47	94	94	58	58	67	90	82	67	
Temp. Conc. ° F	45	52	106	104	54	60	104	102	103	64	
Temp. Diff. Conc. ° F	+11	+14	+27	+26	+18	+20	+23	+27	+30	+25	
INCHES CLOSURE FOR TEMPERATURE CHANGE											
Joint No.	Type										
1	E	-.018	-.016	-.052	-.041	-.007	-.008	-.025	-.029	-.013	-.001
2	C	-.015	-.020	-.037	-.035	-.034	-.054	-.014	-.044	-.028	-.035
6	C	-.011	-.022	-.029	-.033	-.031	-.040	-.022	-.039	-.040	-.028
11	C	-.016	-.021	-.033	-.032	-.029	-.029	-.013	-.032	-.028	-.034
20	C	-.013	-.019	-.029	-.033	-.032	-.035	-.011	-.033	-.028	-.029
22	C	-.019	-.024	-.033	-.028	-.027	-.035	-.014	-.035	-.035	-.031
31	C	-.014	-.022	-.032	-.032	-.031	-.038	-.025	-.037	-.035	-.025
36	C	-.023	-.031	-.044	-.042	-.039	-.046	-.019	-.045	-.039	-.054
40	C	-.022	-.030	-.048	-.049	-.042	-.049	-.026	-.049	-.048	-.037
41	E	-.011	-.012	-.048	-.022	-.003	-.004	-.019	-.022	-.008	-.009
Ave. 2 Exp. Jts.		-.0145	-.0140	-.050	-.0315	-.005	-.006	-.022	-.0255	-.0105	-.0005
Ave. per 1° F		-.00132	-.00100	-.0019	-.0012	-.0003	-.0003	-.0010	-.0009	-.0004	-.0000
Ave. 8 Cont. Jts.		-.0166	-.0236	-.0356	-.0355	-.0331	-.0407	-.018	-.0393	-.0351	-.03412
Ave. per 1° F		-.0015	-.0017	-.0013	-.0014	-.0018	-.0020	-.0008	-.0015	-.0012	-.0014

DAILY JOINT WIDTH MEASUREMENTS

SECTION 1

Date	1-28-40	2-25-41	5-28-41	8-29-41	11-26-41	3-6-42	6-4-42	8-28-42	8-4-48	2-8-49	
Time A.M.	7:50	7:55	5:45	6:30	7:45	8:40	7:20	7:40	6:15	7:50	
Temp. Air ° F	30	37	72	76	35	34	76	68	68	35	
Temp. Conc. ° F	34	38	79	78	36	29	81	75	73	39	
Time P.M.	2:50	2:50	3:10	3:00	2:55	3:10	4:15	3:40	2:00	3:20	
Temp. Air ° F	40	47	94	92	56	58	88	91	82	65	
Temp. Conc. ° F	45	52	106	104	53	60	103	103	104	63	
Temp. Diff. Conc. ° F	+11	+14	+27	+26	+17	+21	+22	+28	+31	+24	
INCHES CLOSURE FOR TEMPERATURE CHANGE											
Joint No.	Type										
1	C	-.024	-.025	-.054	-.053	-.041	-.050	-.035	-.053	-.040	-.013
5	C	-.019	-.021	-.040	-.031	-.024	-.038	-.020	-.037	-.044	-.029
10	C	-.016	-.022	-.027	-.030	-.029	-.045	-.013	-.035	-.018	-.036
29	C	-.016	-.017	-.031	-.033	-.022	-.033	-.019	-.034	-.034	-.033
33	C	-.017	-.021	-.042	-.044	-.026	-.034	-.032	-.056	-.031	-.024
56	C	-.014	-.015	-.032	-.026	-.023	-.031	-.013	-.036	-.032	-.053
61	C	-.014	-.019	-.036	-.037	-.028	-.036	-.022	-.038	-.040	-.029
65	C	-.016	-.019	-.035	-.039	-.028	-.041	-.017	-.037	-.037	-.024
No Expansion Joints											
Ave. 8 Cont. Jts.		-.0147	-.0199	-.0371	-.0366	-.0276	-.0385	-.0214	-.0408	-.0345	-.0301
Ave. per 1° F		-.0013	-.0014	-.0014	-.0014	-.0016	-.0018	-.0010	-.0014	-.0011	-.0013

APPENDIX C

Seasonal Joint Width Measurements

Tabulations and graphs by sections of all seasonal joint width measurements recorded and plotted as differentials in inches to the original measurements made September 1940. Included in the tables are the observed temperatures and computed averages of the measurements for both expansion and contraction joints for each section.

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 7

Date	11-27-40	2-24-41	5-27-41	8-28-41	11-25-41	3-6-42	6-3-42	8-28-42	8-4-48	2-8-49	
Temp. Air ° F	32	41	88	86	34	58	92	91	83	65	
Temp. Conc. ° F	40	42	98	99	39	52	106	101	86	63	
Time	12:00 N	12:00 N	12:00 N	12:00 N	12:00 N	12:15 PM	1:30 PM	2:15 PM	11:00 AM	8:45 AM	
INCHES PLUS OR MINUS THE ORIGINAL MEASUREMENTS											
Joint No.	Type										
7	E	-.017	-.072	-.423	-.476	-.393	-.399	-.513	-.479	-.732	-.734
8	C	+.034	+.075	+.063	+.073	+.151	+.128	+.044	+.049	+.155	+.163
9	C	+.065	+.059	+.041	+.065	+.139	+.118	+.057	+.058	+.130	+.152
10	C	+.032	+.031	+.009	+.033	+.093	+.070	+.008	+.012	+.086	+.103
11	C	+.067	+.068	+.043	+.058	+.130	+.097	+.028	+.039	+.142	+.153
12	C	+.078	+.083	+.055	+.071	+.150	+.141	+.059	+.067	+.183	+.209
13	E	-.006	-.052	-.404	-.464	-.389	-.393	-.516	-.487	-.704	-.710
19	E	+.005	-.026	-.378	-.393	-.325	-.356	-.488	-.450	-.695	-.695
20	C	+.076	+.076	+.083	+.101	+.178	+.169	+.113	+.117	+.238	+.273
21	C	+.041	+.056	+.038	+.037	+.117	+.093	+.034	+.040	+.197	+.226
22	C	+.055	+.030	+.016	-.007	+.103	+.043	-.027	-.023	+.103	+.148
23	C	+.062	+.070	+.047	+.064	+.132	+.102	+.124	+.040	+.114	+.162
24	C	+.075	+.090	+.060	+.068	+.135	+.114	+.034	+.047	+.080	+.116
25	E	+.013	-.024	-.333	-.349	-.260	-.291	-.403	-.370	-.753	-.765
Ave. 4	E	-.001	-.044	-.384	-.421	-.342	-.360	-.480	-.446	-.721	-.726
Ave. 10	C	+.052	+.064	+.046	+.056	+.133	+.108	+.047	+.045	+.143	+.171

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 6

Date	11-27-40	2-24-41	5-27-41	8-28-41	11-25-41	3-6-42	6-3-42	8-28-42	8-4-48	2-8-49	
Temp. Air °F	32	41	90	86	34	59	96	91	84	46	
Temp. Conc. °F	40	42	99	96	40	53	108	101	87	40	
Time	12:30 PM	12:30 PM	12:15 PM	12:15 PM	12:20 PM	12:40 PM	2:00 PM	2:35 PM	11:30 AM	9:00 AM	
Joint No.	Type	INCHES PLUS OR MINUS THE ORIGINAL MEASUREMENTS									
1	E	+0.220	+0.194	-0.186	-0.181	+0.126	+0.032	-0.318	-0.268	-0.432	-0.172
2	C	+0.154	+0.142	+0.082	+0.112	+0.214	+0.185	+0.106	+0.112	+0.206	+0.250
3	E	+0.195	+0.177	-0.200	-0.228	+0.065	-0.023	-0.373	-0.338	-0.311	+0.047
4	C	+0.170	+0.170	+0.100	+0.128	+0.278	+0.267	+0.147	+0.146	+0.229	+0.274
5	E	+0.179	+0.148	-0.188	-0.180	+0.070	-0.032	-0.322	-0.268	-0.400	-0.131
6	C	+0.153	+0.157	+0.090	+0.133	+0.289	+0.249	+0.145	+0.142	+0.270	+0.370
7	E	+0.196	+0.174	-0.220	-0.242	+0.046	-0.046	-0.383	-0.340	-0.622	-0.354
8	C	+0.155	+0.152	+0.078	+0.088	+0.217	+0.200	+0.081	+0.088	+0.263	+0.391
9	E	+0.194	+0.179	-0.182	-0.182	+0.106	+0.022	-0.307	-0.261	-0.512	-0.353
10	C	+0.158	+0.152	+0.102	+0.142	+0.266	+0.249	+0.150	+0.144	+0.395	+0.588
11	E	+0.198	+0.109	-0.211	-0.241	+0.052	-0.044	-0.364	-0.330	-0.346	-0.200
Ave. 6	E	+0.197	+0.164	-0.198	-0.209	+0.078	-0.015	-0.344	-0.301	-0.437	-0.194
Ave. 5	C	+0.158	+0.155	+0.090	+0.121	+0.253	+0.230	+0.126	+0.126	+0.273	+0.375

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 4

Date	11-27-40	2-24-41	5-27-41	8-28-41	11-25-41	3-6-42	6-3-42	8-28-42	8-4-48	2-8-49	
Temp. Air ° F	34	42	90	86	38	60	91	91	80	55	
Temp. Conc. ° F	40	42	100	97	43	56	110	102	92	47	
Time	1:00 PM	1:30 PM	1:20 PM	1:00 PM	1:05 PM	1:25 PM	2:50 PM	2:55 PM	3:15 PM	10:00 AM	
		INCHES PLUS OR MINUS THE ORIGINAL MEASUREMENTS									
Joint No.	Type										
7	E	+0.079	+0.047	-.233	-.305	-.306	-.307	-.347	-.359	-.525	-.533
8	C	+0.069	+0.076	+0.052	+0.084	+0.200	+0.187	+0.058	+0.089	+0.071	+0.147
9	C	+0.080	+0.071	+0.039	+0.051	+0.129	+0.094	+0.035	+0.043	+0.045	+0.096
10	C	+0.034	+0.020	-.015	-.015	+0.053	+0.013	-.026	-.020	+0.110	+0.030
11	C	+0.060	+0.063	+0.030	+0.056	+0.127	+0.094	+0.041	+0.047	+0.049	+0.092
12	C	+0.106	+0.124	+0.068	+0.108	+0.228	+0.220	+0.084	+0.112	+0.079	+0.158
13	E	+0.046	+0.013	-.224	-.331	-.331	-.344	-.341	-.339	-.567	-.579
19	E	+0.074	+0.048	-.195	-.293	-.288	-.294	-.355	-.368	-.575	-.578
20	C	+0.080	+0.078	+0.030	+0.054	+0.162	+0.142	+0.050	+0.062	+0.102	+0.174
21	C	+0.068	+0.064	+0.021	+0.023	+0.088	+0.056	+0.019	+0.038	+0.058	+0.113
22	C	+0.059	+0.062	-.011	-.022	+0.034	+0.089	-.023	-.011	+0.005	+0.089
23	C	+0.065	+0.064	+0.023	+0.050	+0.108	+0.070	+0.028	+0.033	+0.032	+0.081
24	C	+0.079	+0.076	+0.055	+0.083	+0.190	+0.168	+0.065	+0.076	+0.070	+0.147
25	E	+0.066	+0.042	-0.289	-0.361	-0.349	-0.352	-0.443	-0.440	-0.535	-0.548
Ave. 4	E	+0.066	+0.038	-.235	-.323	-.319	-.322	-.371	-.376	-.550	-.560
Ave. 10	C	+0.070	+0.070	+0.030	+0.047	+0.132	+0.113	+0.033	+0.047	+0.062	+0.113

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 3

Date	11-27-40	2-24-41	5-27-41	8-28-41	11-25-41	3-6-42	6-3-42	8-28-42	8-4-48	2-8-49	
Temp. Air °F	34	41	90	86	42	59	90	90	79	68	
Temp. Conc. °F	40	42	100	96	42	57	110	102	90	64	
Time	2:00 PM	2:00 PM	1:30 PM	1:30 PM	1:30 PM	1:50 PM	3:10 PM	3:10 PM	4:15 PM	2:20 PM	
INCHES PLUS OR MINUS THE ORIGINAL MEASUREMENTS											
Joint No.	Type										
1	E	+ .102	+ .072	- .433	- .461	- .460	- .457	- .493	- .476	- .516	- .510
2	C	+ .071	+ .072	+ .015	+ .023	+ .130	+ .106	+ .005	+ .006	+ .027	+ .071
4	C	+ .420	+ .418	+ .368	+ .372	+ .438	+ .419	+ .368	+ .369	+ .375	+ .410
6	C	+ .062	+ .046	+ .003	+ .012	+ .073	+ .083	+ .006	+ .013	+ .023	+ .053
8	C	+ .068	+ .056	+ .012	+ .016	+ .080	+ .027	+ .011	+ .011	+ .022	+ .052
10	C	+ .062	+ .064	+ .010	+ .012	+ .072	+ .049	+ .008	+ .012	+ .019	+ .055
12	C	+ .071	+ .056	- .004	- .001	+ .064	+ .762	- .012	- .008	+ .002	+ .031
14	C	+ .060	+ .049	.000	+ .010	+ .063	+ .048	.000	+ .002	+ .012	+ .031
16	C	+ .065	+ .044	- .014	- .019	+ .050	+ .019	- .023	- .022	- .001	+ .025
18	C	+ .065	+ .056	+ .001	+ .001	+ .073	+ .044	- .013	- .007	+ .037	+ .065
20	C	+ .077	+ .076	+ .013	+ .021	+ .145	+ .145	+ .016	+ .017	+ .043	+ .086
21	E	+ .182	+ .084	- .443	- .481	- .476	- .472	- .519	- .500	- .563	- .563
41	E	+ .060	+ .037	- .491	- .499	- .471	- .465	- .525	- .511	- .500	- .555
Ave. 3	E	+ .115	+ .064	- .456	- .480	- .469	- .465	- .512	- .496	- .526	- .543
Ave. 10	C	+ .102	+ .094	+ .040	+ .045	+ .119	+ .170	+ .037	+ .039	+ .056	+ .088

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 2

Date	11-27-40	2-24-41	5-27-41	8-28-41	11-25-41	3-6-42	6-3-42	8-28-42	8-4-48	2-8-49	
Temp. Air ° F	34	42	92	86	42	58	90	90	78	67	
Temp. Conc. ° F	40	42	102	98	43	59	108	102	72	64	
Time	2:30 PM	2:30 PM	2:00 PM	2:00 PM	1:45 PM	2:20 PM	3:30 PM	3:25 PM	9:45 AM	3:00 PM	
INCHES PLUS OR MINUS THE ORIGINAL MEASUREMENTS											
Joint No.	Type										
1	E	+ .111	+ .094	- .316	- .339	- .281	- .277	- .353	- .357	- .376	- .370
2	C	+ .053	+ .073	+ .006	+ .008	+ .080	+ .075	+ .008	+ .009	+ .021	+ .041
4	C	+ .062	+ .048	- .011	+ .012	+ .046	+ .015	- .039	- .038	- .038	- .018
6	C	+ .051	+ .033	+ .022	- .027	+ .031	+ .005	- .046	- .050	- .051	- .030
8	C	+ .064	+ .057	+ .007	+ .012	+ .071	+ .059	+ .032	+ .036	+ .057	+ .084
10	C	+ .039	+ .031	+ .017	- .012	+ .043	+ .031	+ .008	+ .010	+ .016	+ .027
12	C	+ .059	+ .054	+ .009	+ .021	+ .083	+ .073	+ .062	+ .067	+ .044	+ .076
14	C	+ .059	+ .054	+ .009	+ .023	+ .086	+ .085	+ .068	+ .072	+ .043	+ .062
16	C	+ .062	+ .050	+ .002	+ .010	+ .065	+ .021	+ .003	+ .011	+ .025	+ .051
18	C	+ .048	+ .054	- .005	+ .002	+ .066	+ .035	+ .001	+ .005	+ .009	+ .019
20	C	+ .057	+ .055	- .002	+ .007	+ .065	+ .043	+ .003	+ .009	+ .019	+ .038
22	C	+ .061	+ .046	- .002	+ .005	+ .062	+ .032	+ .004	+ .010	+ .019	+ .038
24	C	+ .059	+ .055	+ .001	+ .006	+ .071	+ .045	+ .010	+ .015	+ .029	+ .043
26	C	+ .064	+ .056	.000	+ .010	+ .068	+ .048	+ .005	+ .010	+ .028	+ .052
28	C	+ .066	+ .056	+ .004	+ .012	+ .070	+ .058	+ .008	+ .014	+ .032	+ .056
30	C	+ .053	+ .041	- .029	- .024	+ .039	+ .008	- .033	- .027	- .019	- .005
32	C	+ .058	+ .054	- .003	+ .002	+ .064	+ .043	+ .004	+ .007	+ .028	+ .047
34	C	+ .075	+ .064	+ .004	+ .009	+ .085	+ .054	+ .007	+ .012	+ .024	+ .052
36	C	+ .079	+ .068	- .010	- .006	+ .092	+ .053	- .006	+ .002	+ .016	+ .046
38	C	+ .056	+ .043	- .023	- .023	+ .054	+ .030	- .032	- .033	- .020	- .012
40	C	+ .076	+ .070	+ .004	+ .005	+ .114	+ .090	+ .006	+ .008	+ .043	+ .076
41	E	+ .087	+ .194	- .464	- .497	- .485	- .484	- .517	- .516	- .525	- .508
Ave. 2	E	+ .099	+ .144	- .390	- .418	- .383	- .380	- .435	- .437	- .451	- .439
Ave. 20	C	+ .060	+ .053	.000	+ .0026	+ .068	+ .045	+ .0036	+ .0075	+ .016	+ .037

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 1

Date	11-27-40	2-24-41	5-27-41	8-28-41	11-25-41	3-6-42	6-3-42	8-28-42	8-4-48	2-8-49	
Temp. Air ° F	34	42	92	86	44	58	89	91	78	65	
Temp. Conc. ° F	40	43	104	100	43	60	108	103	72	63	
Time	3:00 PM	3:00 PM	2:30 PM	2:30 PM	2:00 PM	2:50 PM	3:45 PM	3:40 PM	10:30 AM	3:20 PM	
Joint No.	Type	INCHES PLUS OR MINUS THE ORIGINAL MEASUREMENTS									
1	C	+0.084	+0.073	-.004	-.005	+0.108	+0.096	-.008	-.007	+0.052	+0.112
3	C	+0.068	+0.056	+0.006	+0.014	+0.071	+0.033	+0.003	+0.006	+0.012	+0.044
5	C	+0.078	+0.065	+0.006	+0.016	+0.074	+0.050	+0.007	+0.012	+0.026	+0.060
7	C	+0.072	+0.068	+0.011	+0.015	+0.087	+0.061	+0.008	+0.010	+0.014	+0.033
9	C	+0.076	+0.069	+0.009	+0.019	+0.090	+0.071	+0.005	+0.009	+0.014	+0.018
13	C	+0.054	+0.042	+0.002	+0.010	+0.077	+0.052	+0.006	+0.016	+0.017	+0.026
17	C	+0.076	+0.058	-.003	+0.014	+0.086	+0.079	+0.002	+0.007	+0.002	+0.006
21	C	+0.070	+0.060	+0.005	+0.018	+0.093	+0.063	+0.011	+0.019	+0.018	+0.048
25	C	+0.072	+0.068	-.001	+0.013	+0.073	+0.033	+0.006	+0.012	+0.009	+0.041
29	C	+0.054	+0.040	-.021	-.009	+0.051	+0.036	-.011	-.004	-.010	+0.014
33	C	+0.058	+0.052	-.024	-.016	+0.062	+0.045	-.013	-.013	-.038	+0.011
37	C	+0.078	+0.062	+0.004	+0.014	+0.072	+0.038	+0.012	+0.014	+0.012	+0.035
41	C	+0.060	+0.048	-.020	-.019	+0.043	+0.015	-.050	-.036	-.041	-.025
45	C	+0.077	+0.067	+0.009	+0.018	+0.081	+0.056	+0.012	+0.018	+0.013	+0.032
49	C	+0.062	+0.056	+0.017	+0.017	+0.043	+0.021	+0.022	-.018	+0.029	+0.006
53	C	+0.071	+0.070	+0.005	+0.013	+0.078	+0.064	+0.012	+0.022	+0.044	+0.083
57	C	+0.061	+0.056	+0.006	+0.016	+0.071	+0.048	+0.007	+0.012	-.003	+0.036
59	C	+0.075	+0.060	.000	+0.017	+0.074	+0.054	+0.027	+0.034	+0.037	+0.050
61	C	+0.077	+0.065	+0.002	+0.016	+0.080	+0.058	+0.025	+0.033	+0.043	+0.080
63	C	+0.061	+0.073	+0.010	+0.020	+0.085	+0.075	+0.045	+0.056	+0.065	+0.093
65	C	+0.073	+0.059	-.003	+0.013	+0.075	+0.038	+0.005	+0.011	+0.020	+0.055
Ave. 21	C	+0.069	+0.063	+0.0008	+0.010	+0.075	+0.052	+0.006	+0.010	+0.016	+0.041

SEASONAL JOINT WIDTH MEASUREMENTS

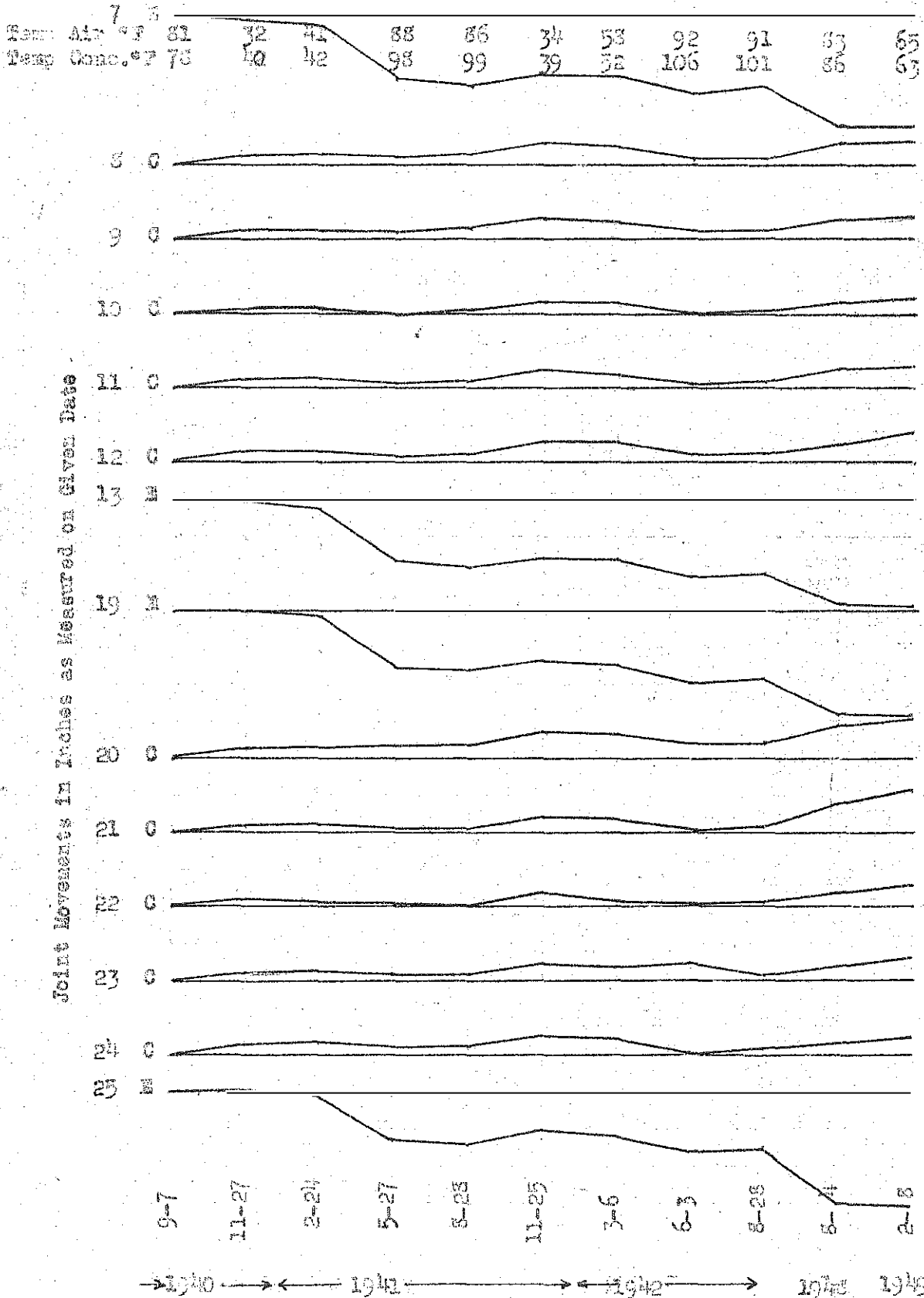
SECTION Standard

Date	11-27-40	2-24-41	5-27-41	8-28-41	11-25-41	3-6-42	6-3-42	8-28-42	8-4-48	2-9-49	
Temp. Air ° F	34	43	93	88	44	57	76	91	83	50	
Temp. Conc. ° F	42	43	102	100	44	61	83	104	100	56	
Time	3:00 PM	3:30 PM	2:45 PM	3:00 PM	2:45 PM	3:00 PM	8:00 AM	4:05 PM	2:25 PM	1:15 PM	
INCHES PLUS OR MINUS THE ORIGINAL MEASUREMENTS											
Joint No.	Type										
1	E	+ .160	+ .139	- .235	- .281	- .128	- .131	- .365	- .420	- .619	- .621
2	C	- .003	- .004	- .009	+ .001	+ .001	- .004	+ .004	.000	+ .001	0.000
4	C	+ .095	+ .105	+ .090	+ .142	+ .241	+ .225	+ .212	+ .225	+ .148	+ .218
6	C	+ .044	+ .045	+ .025	+ .053	+ .098	+ .090	+ .094	+ .075	+ .193	+ .305
8	C	+ .086	+ .094	+ .055	+ .094	+ .188	+ .168	+ .147	+ .102	+ .203	+ .318
10	C	+ .067	+ .060	+ .037	+ .078	+ .163	+ .157	+ .157	+ .127	+ .233	+ .350
11	C	+ .107	+ .113	+ .049	+ .095	+ .190	+ .173	+ .164	+ .136	+ .136	+ .180
12	C	+ .090	+ .078	+ .048	+ .092	+ .184	+ .167	+ .143	+ .103	+ .118	+ .206
14	C	+ .064	+ .062	+ .025	+ .046	+ .144	+ .107	+ .096	+ .069	+ .061	+ .128
16	C	+ .092	+ .091	+ .052	+ .076	+ .178	+ .154	+ .124	+ .088	+ .064	+ .097
17	E	+ .121	+ .104	- .231	- .294	- .157	- .178	- .384	- .452	- .647	- .641
18	C	+ .094	+ .089	+ .052	+ .058	+ .167	+ .141	+ .120	+ .082	+ .137	+ .330
19	C	+ .096	+ .085	+ .028	+ .056	+ .138	+ .115	+ .113	+ .077	+ .081	+ .148
20	C	+ .116	+ .124	+ .080	+ .131	+ .239	+ .227	+ .229	+ .195	+ .260	+ .410
21	E	+ .121	+ .107	- .250	- .345	- .220	- .232	- .429	- .491	- .645	- .642
22	C	+ .095	+ .067	+ .043	+ .109	+ .197	+ .194	+ .196	+ .165	+ .174	+ .259
23	C	+ .123	+ .115	+ .049	+ .073	+ .184	+ .152	+ .148	+ .104	+ .081	+ .127
24	C	+ .029	+ .033	+ .006	+ .029	+ .084	+ .066	+ .082	+ .047	+ .193	+ .289
25	E	+ .172	+ .169	- .194	- .251	- .080	- .071	- .347	- .410	- .668	- .652
26	C	+ .074	+ .069	+ .031	+ .046	+ .136	+ .101	+ .098	+ .059	+ .072	+ .121
28	C	+ .078	+ .071	+ .039	+ .074	+ .161	+ .148	+ .138	+ .094	+ .152	+ .251
30	C	+ .072	+ .071	+ .037	+ .064	+ .155	+ .133	+ .136	+ .094	+ .151	+ .256
31	C	+ .101	+ .089	+ .029	+ .043	+ .141	+ .094	+ .092	+ .067	+ .124	+ .209
32	C	+ .076	+ .075	+ .036	+ .056	+ .163	+ .121	+ .114	+ .072	+ .096	+ .160
34	C	+ .076	+ .080	+ .047	+ .072	+ .162	+ .131	+ .132	+ .090	+ .182	+ .243
36	C	+ .049	+ .043	+ .015	+ .035	+ .128	+ .080	+ .091	+ .057	+ .147	+ .245
38	C	+ .063	+ .058	+ .030	+ .072	+ .155	+ .134	+ .138	+ .106	+ .115	+ .142
40	C	+ .010	+ .012	- .005	+ .008	+ .020	+ .020	+ .026	+ .019	+ .008	+ .006
41	E	+ .166	+ .141	- .230	- .264	- .086	- .115	- .314	- .350	- .555	- .540
Ave. 5	E	+ .14	+ .132	- .228	- .287	- .134	- .145	- .368	- .425	- .627	- .619
Ave. 24	C	+ .075	+ .072	+ .037	+ .071	+ .151	+ .129	+ .125	+ .099	+ .126	+ .208

SEASONAL JOINT WIDTH MEASUREMENTS
SECTION 7

Jt. No.
1770

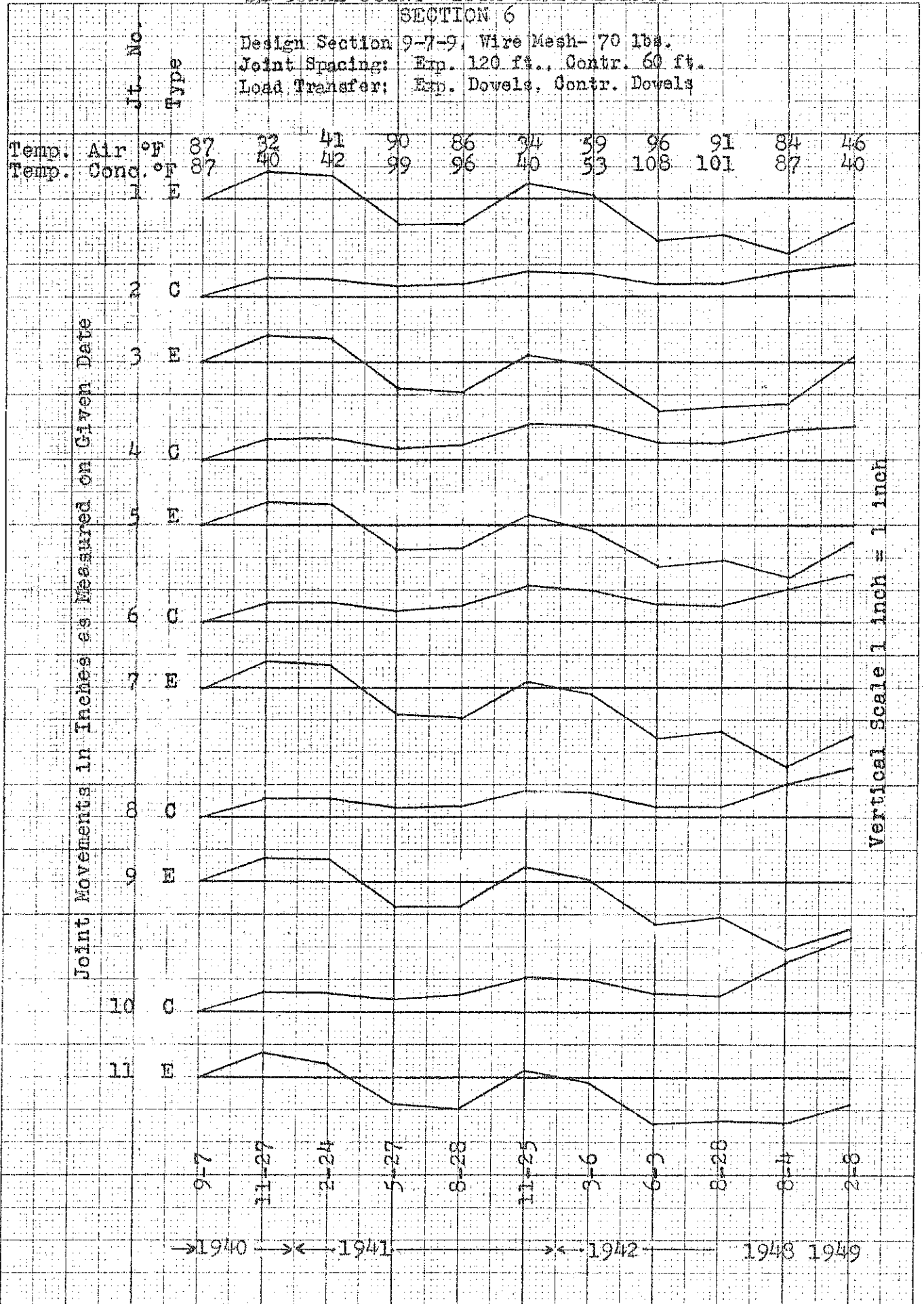
Design Section 7-7-7- , Wire Mesh- None
Joint Spacing: Exp. 120 ft., Contr. 20 ft.
Load Transfer: Exp. None , Contr. None



SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 6

Design Section 9-7-9, Wire Mesh- 70 lbs.
 Joint Spacing: Exp. 120 ft., Contr. 60 ft.
 Load Transfer: Exp. Dowels, Contr. Dowels



Vertical Scale 1 inch = 1 inch

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20 X 20 PER INCH

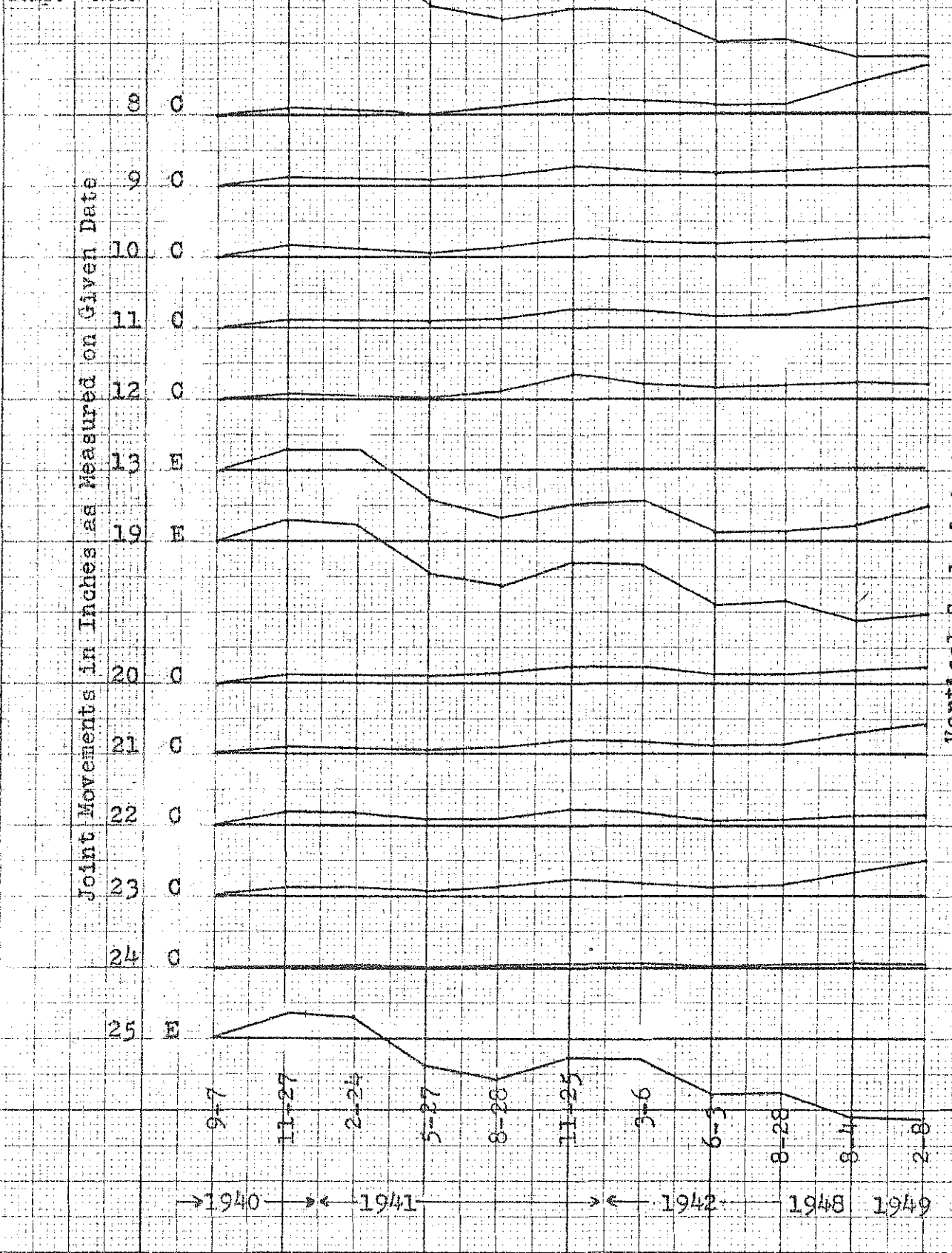
SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 5

Design Section 9-7-9, Wire Mesh-None
 Joint Spacing: Exp. 120 ft., Contr. 20 ft.
 Load Transfer: Exp. Dowels, Contr. Dowels

Temp. Air	90	84	82	88	84	88	60	93	90	77	66
Temp. Conc.	98	40	42	100	97	42	56	110	102	90	67

Joint Movements in Inches as Measured on Given Date



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20 x 20 PER INCH

1940 ← → 1941 ← → 1942 ← → 1948 1949

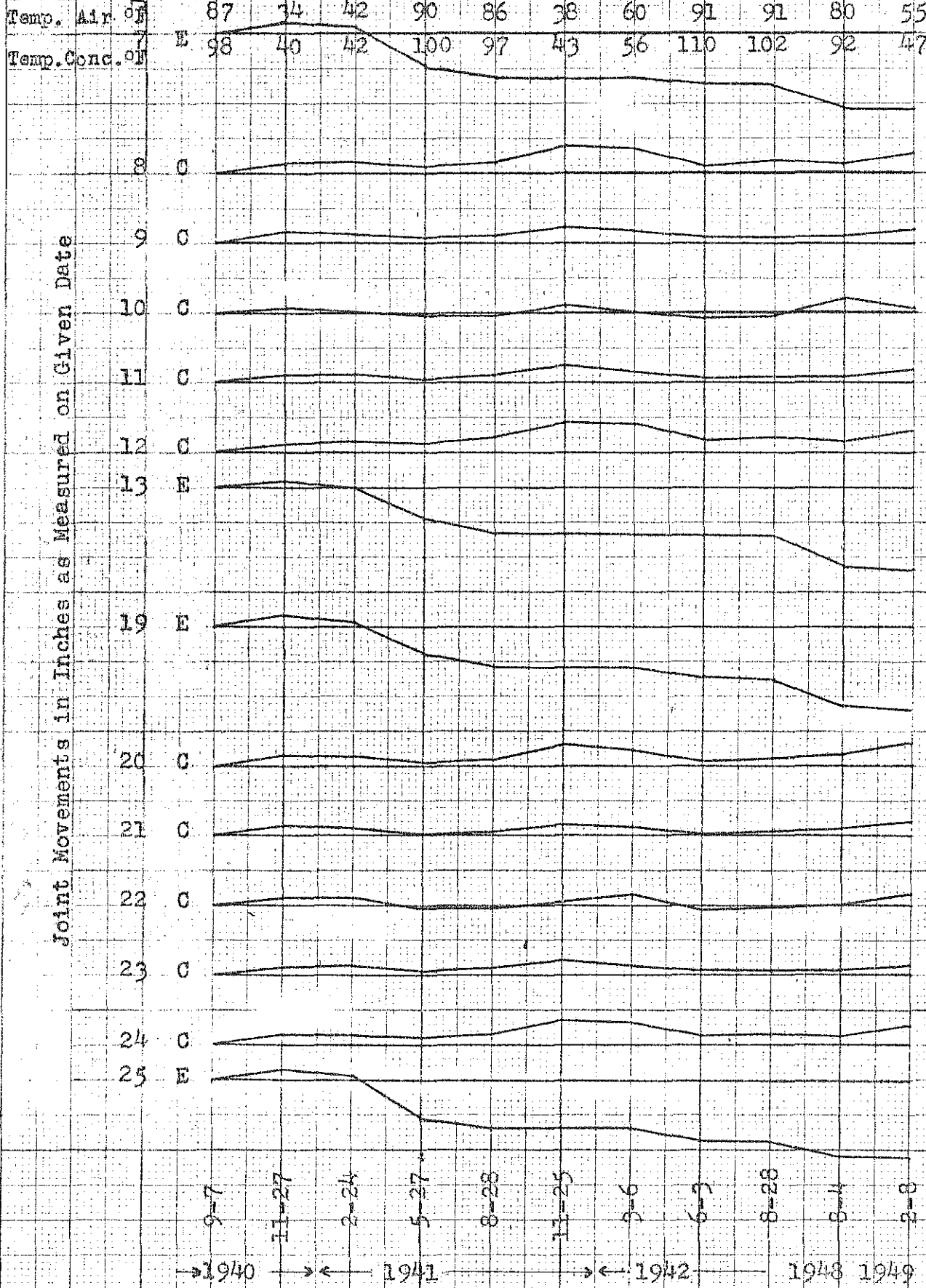
SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 4

Design Section 9-7-9, Wire Mesh- None
 Joint Spacing: Exp. 120 ft., Contr. 20 ft.
 Load Transfer: Exp. Dowels, Contr. None

Temp. Air	87	74	42	90	86	38	60	91	91	80	55
Temp. Conc.	98	40	42	100	97	43	56	110	102	92	47

Joint Movements in Inches as Measured on Given Date



Vertical Scale 1 inch = 1 inch

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MILWAUKEE, WIS.

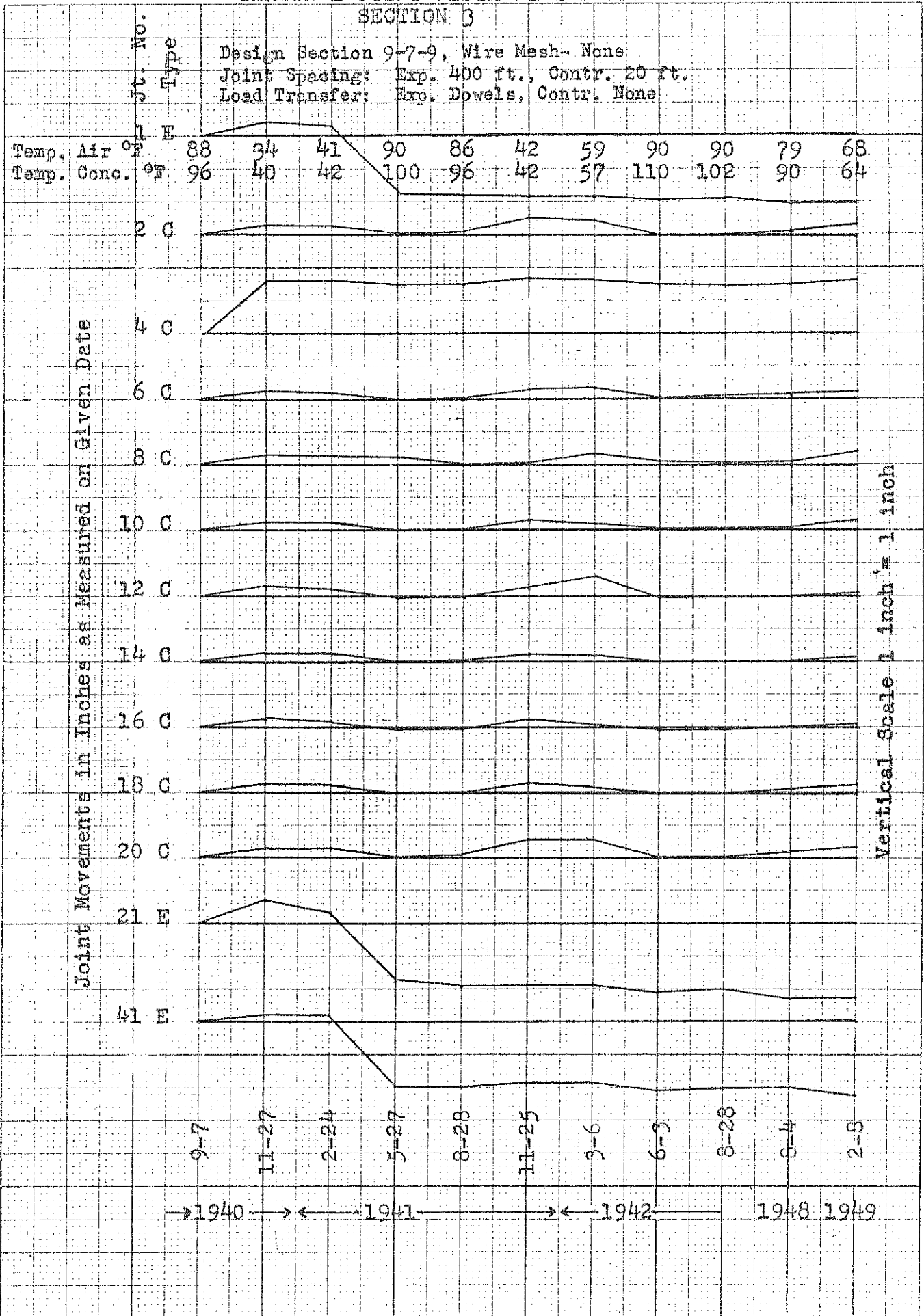
NO. 340 -20 DIETZGEN GRAPH PAPER
20 X 20 PER INCH

9-7-1940 11-27 2-24 5-27 8-28 11-25 3-6 6-5 8-28 8-11 3-0
 ← 1940 ← 1941 ← 1942 ← 1943 ← 1944 ← 1945 ← 1946 ← 1947 ← 1948 ← 1949

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 3

Design Section 9-7-9, Wire Mesh- None
 Joint Spacing: Exp. 400 ft., Contr. 20 ft.
 Load Transfer: Exp. Dowels, Contr. None



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20 X 20 PER INCH

Vertical Scale 1 inch = 1 inch

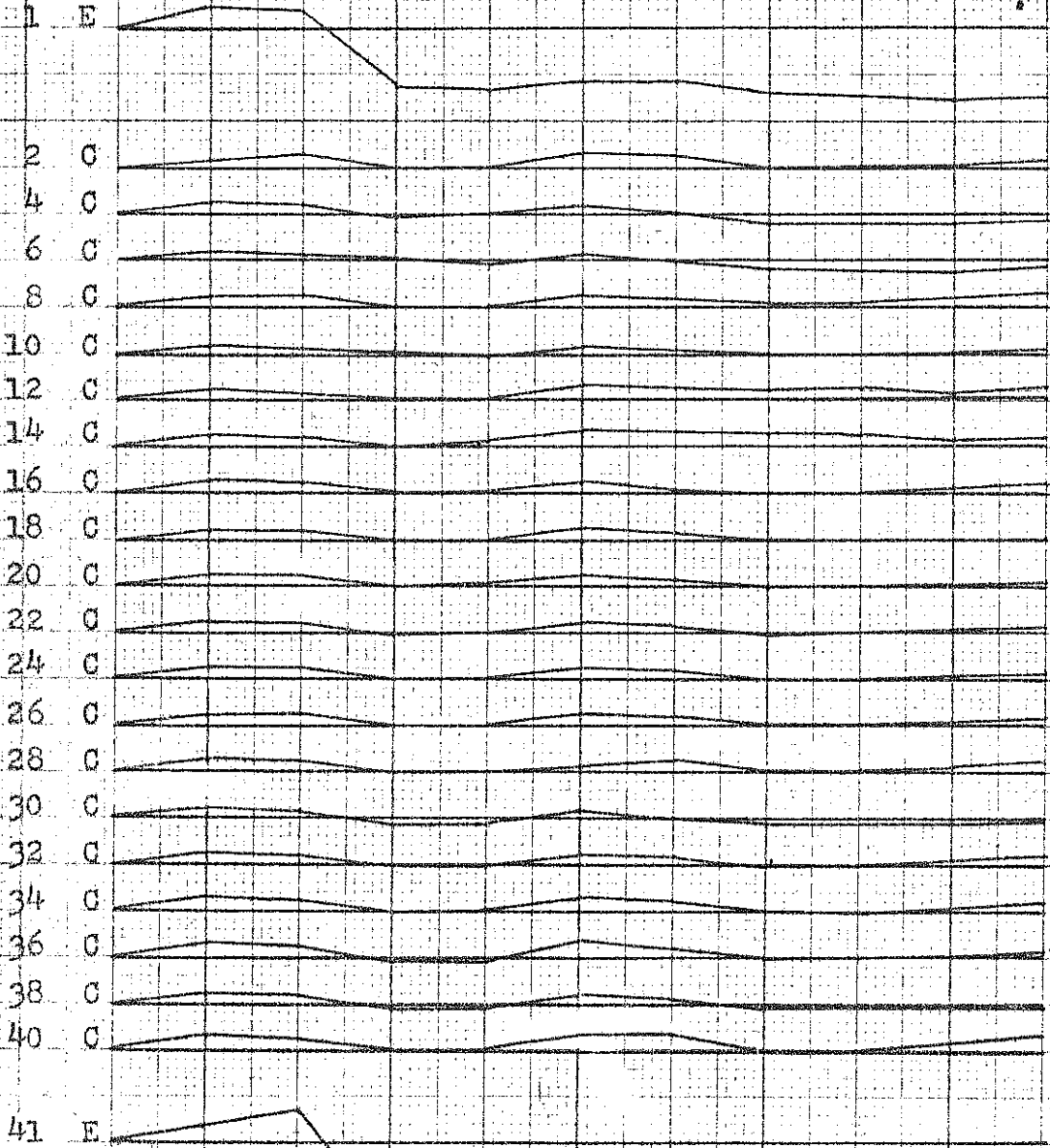
SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 2

Design Section 9-7-9, Wire Mesh - None
 Joint Spacing: Exp. 800 ft., Contr. 20 ft.
 Load Transfer: Exp. Dowels, Contr. None

Temp. Air	°F	89	34	42	92	86	42	58	90	90	78	67
Temp. Conc.	°F	96	40	42	102	98	43	59	108	102	72	64

Joint Movements in Inches as Measured on Given Date



Vertical Scale 1 inch = 1 inch

9-7 11-27 2-24 5-27 8-28 11-25 3-6 6-3 6-28 6-14 2-8
 ← 1940 → ← 1941 → ← 1942 → 1948 1949

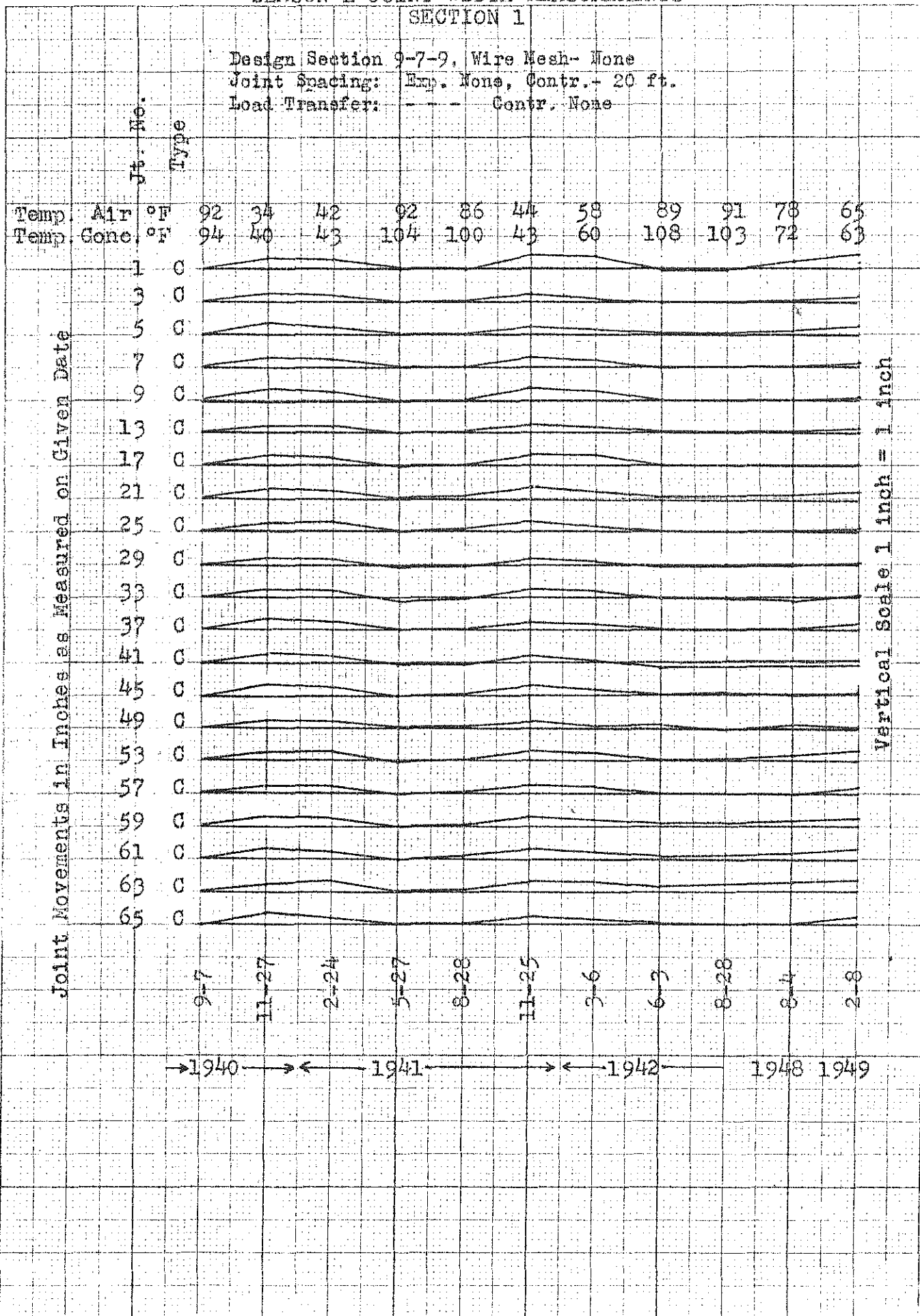
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20 X 20 PER INCH

SEASONAL JOINT WIDTH MEASUREMENTS

SECTION 1

Design Section 9-7-9, Wire Mesh- None
 Joint Spacing: Exp. None, Contr. + 20 ft.
 Load Transfer: --- Contr. None



Joint Movements in Inches as Measured on Given Date

Vertical Scale 1 inch = 1 inch

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20 X 20 PER INCH

→ 1940 ← ← 1941 ← ← 1942 ← 1948 1949

APPENDIX D

Permanent Joint Width Measurements

Tabulations and graphs of all permanent joint width measurements for each section, recorded and plotted as differentials in inches with respect to the original measurements of September 1940. Temperature observations are also included in the tabulation.

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION NO. 7

Date:		July 29, 1941	June 30, 1942	Aug. 11, 1943	July 25, 1944	Aug. 21, 1945	Aug. 4, 1948
Time:		12:00 M.	2:30 P.M.	11:10 A.M.	11:00 A.M.	12:06 P.M.	11:00 A.M.
Temp. Conc. °F.		110	108	108	108	108	86
Temp. Air °F.		96	96	92	95	92	83
Joint No.	Type	DIFFERENTIAL IN INCHES TO ORIGINAL MEASUREMENTS					
7	E	-.521	-.510	-.529	-.596	-.666	-.632
8	C	+.066	+.044	+.025	+.050	+.045	+.155
9	C	+.048	+.064	+.065	+.069	+.045	+.130
10	C	+.012	+.009	+.021	+.003	-.003	+.086
11	C	+.037	+.030	+.054	+.034	+.028	+.142
12	C	+.050	+.060	+.085	+.087	+.080	+.183
13	E	-.512	-.514	-.544	-.586	-.626	-.704

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION NO. 6

Date:	July 29, 1941	June 30, 1942	Aug. 11, 1943	July 25, 1944	Aug. 21, 1945	Aug. 4, 1948	
Time:	12:25 PM	3:10 PM	11:25 AM	12:15 PM	12:15 PM	11:30 AM	
Temp. Conc. °F.	111	109	108	108	110	87	
Temp. Air °F.	96	96	92	96	93	84	
Joint No.	Type	DIFFERENTIAL IN INCHES TO ORIGINAL MEASUREMENTS					
3	E	--	--	--	--	-.109	-.311
4	C	--	--	--	--	-.388	+.229
5	E	-.277	-.328	-.536	-.597	-.660	-.400
6	C	+.104	+.140	+.548	+.540	+.536	+.270
7	E	-.355	-.404	+.006	-.068	-.127	-.622
8	C	--	--	--	--	+.103	+.263
9	E	--	--	--	--	-.955	+.512

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION NO. 5

Date:	July 29, 1941	June 30, 1942	Aug. 11, 1943	July 25, 1944	Aug. 21, 1945	Aug. 4, 1948	
Time:	12:40 PM	3:20 PM	11:45 AM	12:30 PM	12:30 PM	2:45 PM	
Temp. Conc. °F.	112	109	110	112	111	90	
Temp. Air °F.	97	95	96	100	93	97	
Joint No.	Type	DIFFERENTIAL IN INCHES TO ORIGINAL MEASUREMENTS					
7	E	-.390	-.484	-.540	-.559	-.566	-.578
8	C	+.038	+.070	+.133	+.123	+.089	+.234
9	C	+.055	+.098	+.138	+.132	+.136	+.139
10	C	+.050	+.092	+.123	+.125	+.119	+.132
11	C	+.060	+.087	+.112	+.098	+.107	+.156
12	C	+.038	+.077	+.128	+.111	+.117	+.120
13	E	-.378	-.444	-.473	-.509	-.496	-.374

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION NO. 3

Date:		July 29, 1941	June 30, 1942	Aug. 11, 1943	July 25, 1944	Aug. 21, 1945	Aug. 4, 1948
Time:		12:55 PM	3:30 PM	12:05 PM	12:45 PM	12:45 PM	4:15 PM
Temp. Conc. °F.		110	110	108	110	110	90
Temp. Air °F.		96	94	97	102	92	79
Joint No.	Type	DIFFERENTIAL IN INCHES TO ORIGINAL MEASUREMENTS					
8	C	+0.012	+0.012	+0.010	-0.011	-0.002	+0.022
9	C	+0.007	+0.010	+0.012	+0.001	+0.009	--
10	C	+0.008	+0.007	+0.008	-0.006	+0.008	+0.008
11	C	+0.009	+0.011	+0.015	+0.005	+0.006	+0.037
12	C	-0.006	-0.012	-0.014	-0.029	-0.021	+0.002
13	C	+0.005	+0.012	+0.011	-0.004	+0.008	--
14	C	.000	.000	-0.006	-0.012	-0.010	+0.012

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION NO. 2

Date:	July 29, 1941	June 30, 1942	Aug. 11, 1943	July 25, 1944	Aug. 21, 1945	Aug. 4, 1948	
Time:	1:05 PM	3:45 PM	12:20 PM	1:00 PM	1:00 PM	9:45 AM	
Temp. Conc. °F.	112	111	109	110	110	72	
Temp. Air °F.	97	88	96	100	92	78	
Joint No.	Type	DIFFERENTIAL IN INCHES TO ORIGINAL MEASUREMENTS					
1	E	-.355	-.357	-.369	-.388	-.376	-.376
2	C	+.005	+.006	+.009	-.003	+.003	+.021
4	C	-.021	-.038	-.044	-.057	-.048	-.038
6	C	-.027	-.047	-.056	-.077	-.070	-.051
8	C	.000	+.035	+.062	+.036	+.033	+.057
10	C	-.019	+.011	-.035	-.038	+.033	-.016
12	C	+.014	+.064	+.088	+.091	+.074	+.044
14	C	+.009	+.072	+.098	+.065	+.043	+.043
16	C	+.005	+.010	+.012	-.004	+.009	+.025
18	C	.000	+.002	+.003	-.011	+.002	+.009
19	C	-.027	-.031	-.033	-.043	-.036	--
20	C	+.003	+.006	+.008	-.005	+.001	+.019
21	C	-.003	+.002	+.002	-.006	+.001	--
22	C	+.005	+.008	+.007	-.008	+.006	+.019
23	C	-.036	-.037	-.040	-.048	-.042	--
24	C	+.006	+.014	+.013	+.005	+.011	+.029

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION NO. 1

Date:		July 29, 1941	June 30, 1942	Aug. 11, 1943	July 25, 1944	Aug. 21, 1945	Aug. 4, 1948
Time:		1:55 PM	4:00 PM	12:40 PM	1:45 PM	1:35 PM	10:30 PM
Temp. Conc. °F.		116	112	109	111	110	71
Temp. Air °F.		97	92	95	101	91	78
Joint No.	Type	DIFFERENTIAL IN INCHES TO ORIGINAL MEASUREMENTS					
30	C	-.027	-.025	-.024	-.043	-.037	---
31	C	+.009	+.019	+.012	-.004	+.003	---
32	C	+.006	+.009	+.010	-.012	.000	---
33	C	-.026	-.016	-.016	-.044	-.040	-.038
34	C	-.003	+.006	+.005	-.004	+.003	---
35	C	+.012	+.013	+.011	-.007	+.002	---
36	C	+.001	+.008	-.003	-.023	-.007	---

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION STANDARD

Date:	July 29, 1941	June 30, 1942	Aug. 11, 1943	July 25, 1944	Aug. 21, 1945	Aug. 4, 1948	
Time:	2:05 PM	4:20 PM	1:05 PM	2:05 PM	2:00 PM	2:25 PM	
Temp. Conc. °F.	112	111	110	112	108	100	
Temp. Air °F.	97	90	98	101	90	83	
Joint No.	Type	DIFFERENTIAL IN INCHES TO ORIGINAL MEASUREMENTS					
17	E	-.341	-.474	-.561	-.664	-.601	-.647
18	C	+.049	+.071	+.091	+.034	+.044	+.137
19	C	+.041	+.070	+.092	+.076	+.090	+.081
20	C	+.109	+.190	+.202	+.190	+.212	+.260
21	E	-.385	-.521	-.545	-.605	-.607	-.645
22	C	+.083	+.156	+.170	+.164	+.182	+.174
23	C	+.064	+.100	+.107	+.099	+.099	+.081
24	C	+.016	+.031	+.043	+.045	+.093	+.182
25	E	-.301	-.448	-.506	-.518	-.611	-.618

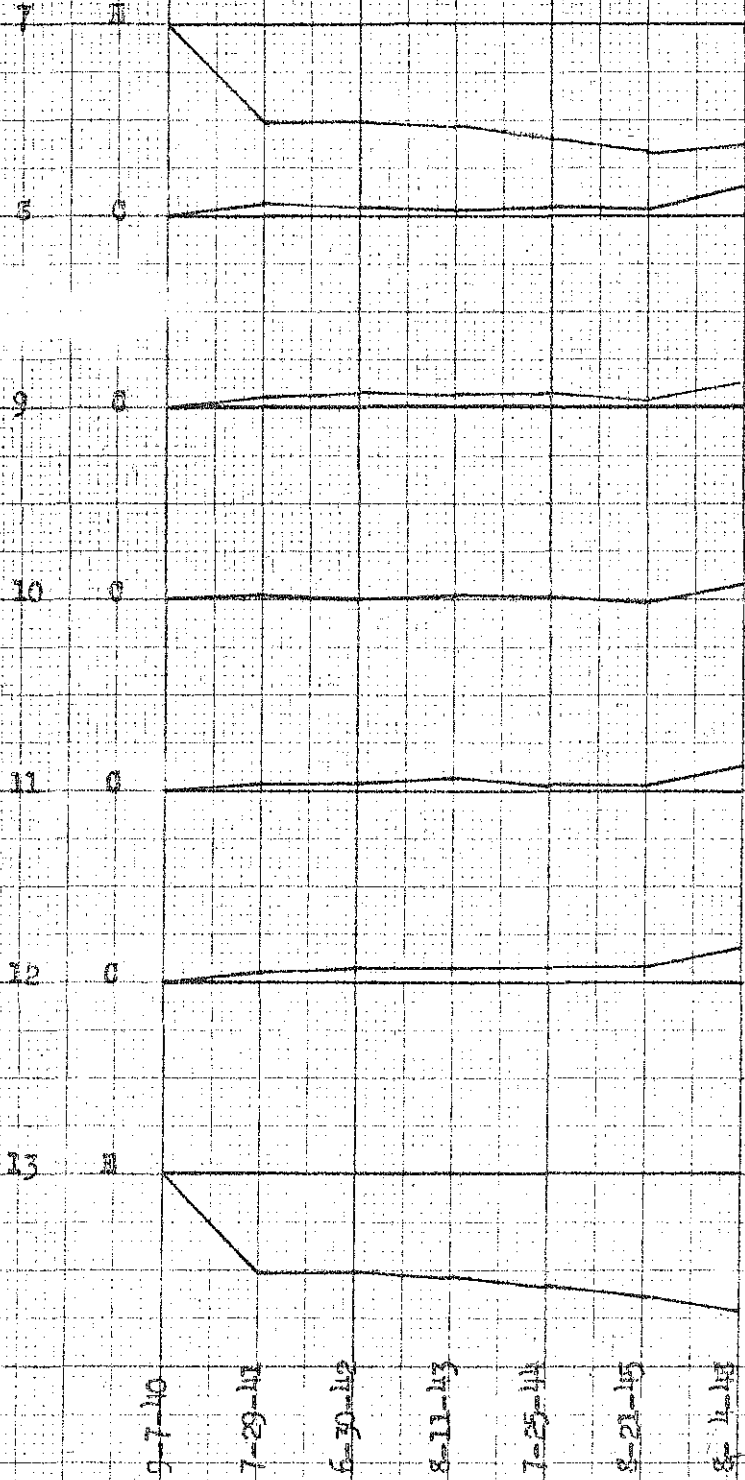
PERMANENT JOINT WIDTH MEASUREMENTS

SECTION 7

Temp. Air °F	81	96	96	92	95	92	83
Temp. Conc. °F/°C	110	108	108	108	108	108	86

Jt. No. Type

Vertical Scale - 1 inch = 1 inch



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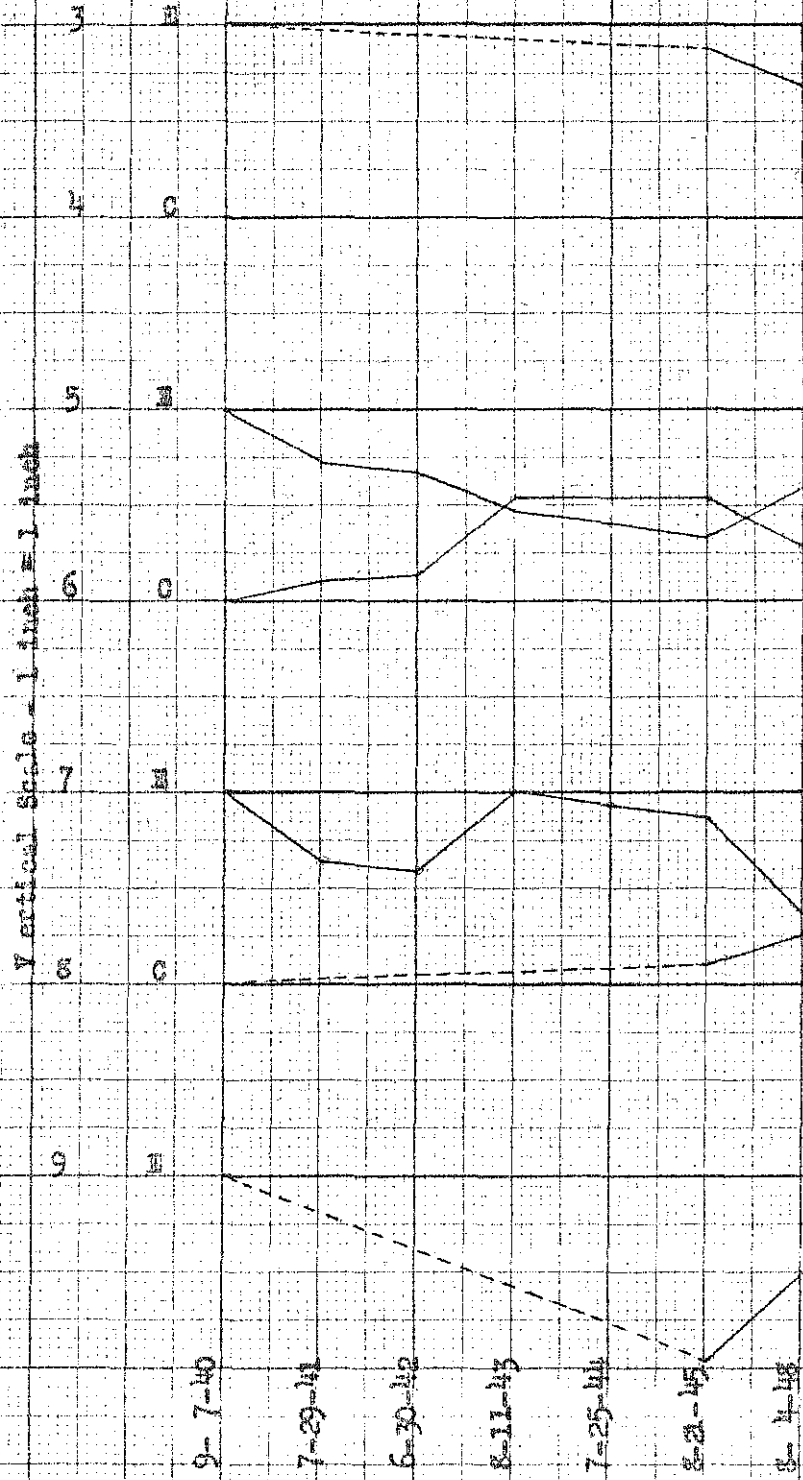
NO 340-20 DIETZGEN GRAPH PAPER
11 X 20 PER INCH

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION 6

Temp. Air °F	87	96	96	92	96	93	84
Temp. Conc. °F	87	111	109	108	108	110	87

Jt. No. Type



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20 X 20 PER INCH

PERMANENT JOINT WIDTH MEASUREMENTS

SECTION 5

Temp. Air °F	90	97	95	96	100	93	97
Temp. Cond. °F	96	112	109	110	112	111	90

Jt. No. Type

7

H

8

O

9

O

10

O

11

O

12

O

13

H

Vertical Scale - 1 inch = 1 inch

6-7-10

7-29-11

6-30-12

8-11-13

7-25-14

8-21-15

8-1-18

PERMANENT JOINT TEMPERATURE MEASUREMENTS

SECTION 3

Temp.	Air °F	96	94	97	102	92	79
Temp.	Cond. °F	110	110	108	110	110	90

Jc.No. Type

8 C

9 C

10 C

11 C

12 C

13 C

14 C

9-7-40

7-29-42

6-30-42

6-11-43

7-25-44

7-21-45

8-4-46

Vertical Scale - 1 inch = 1 inch

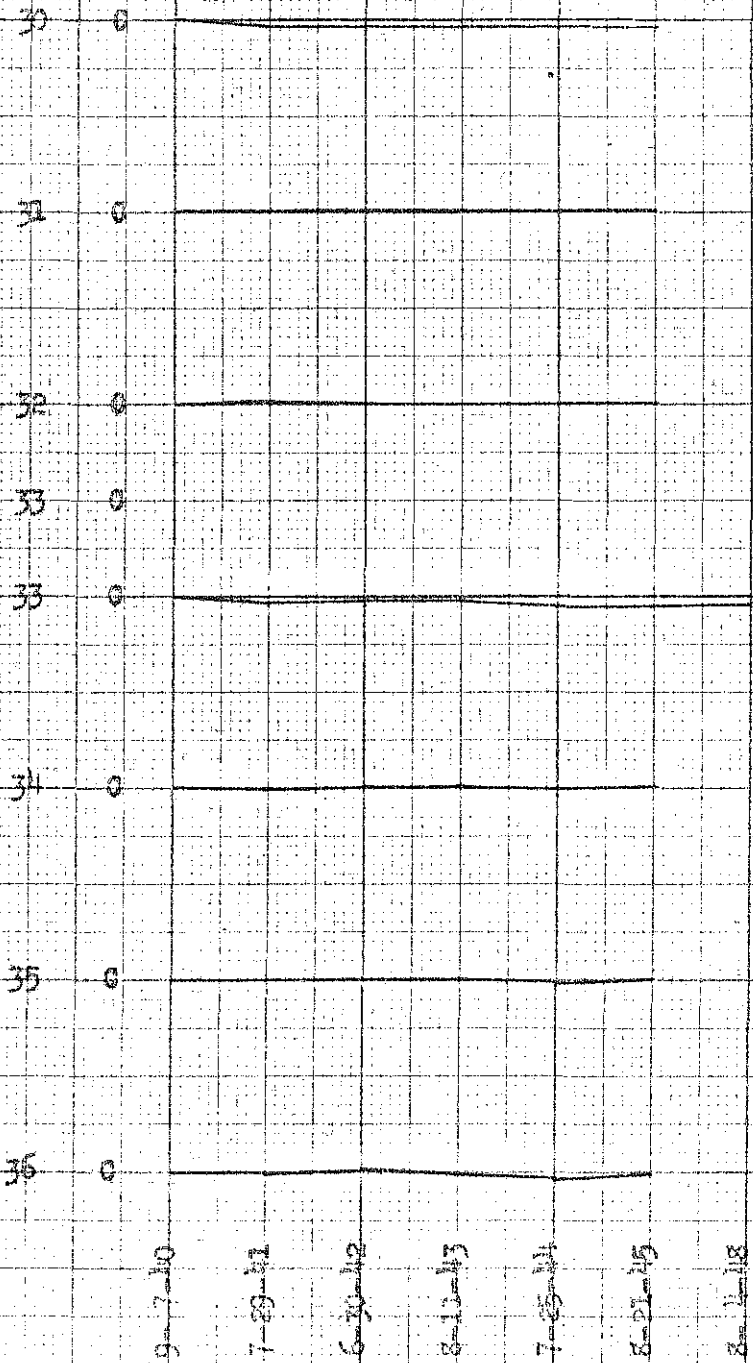
PERMANENT JOINT WIDTH MEASUREMENTS

SECTION 1

Temp. Air °F	92	97	92	95	101	91	75
Temp. Conc. °F	91	116	112	109	111	110	71

St. No. Type

Vertical Scale - 1 inch = 1 inch

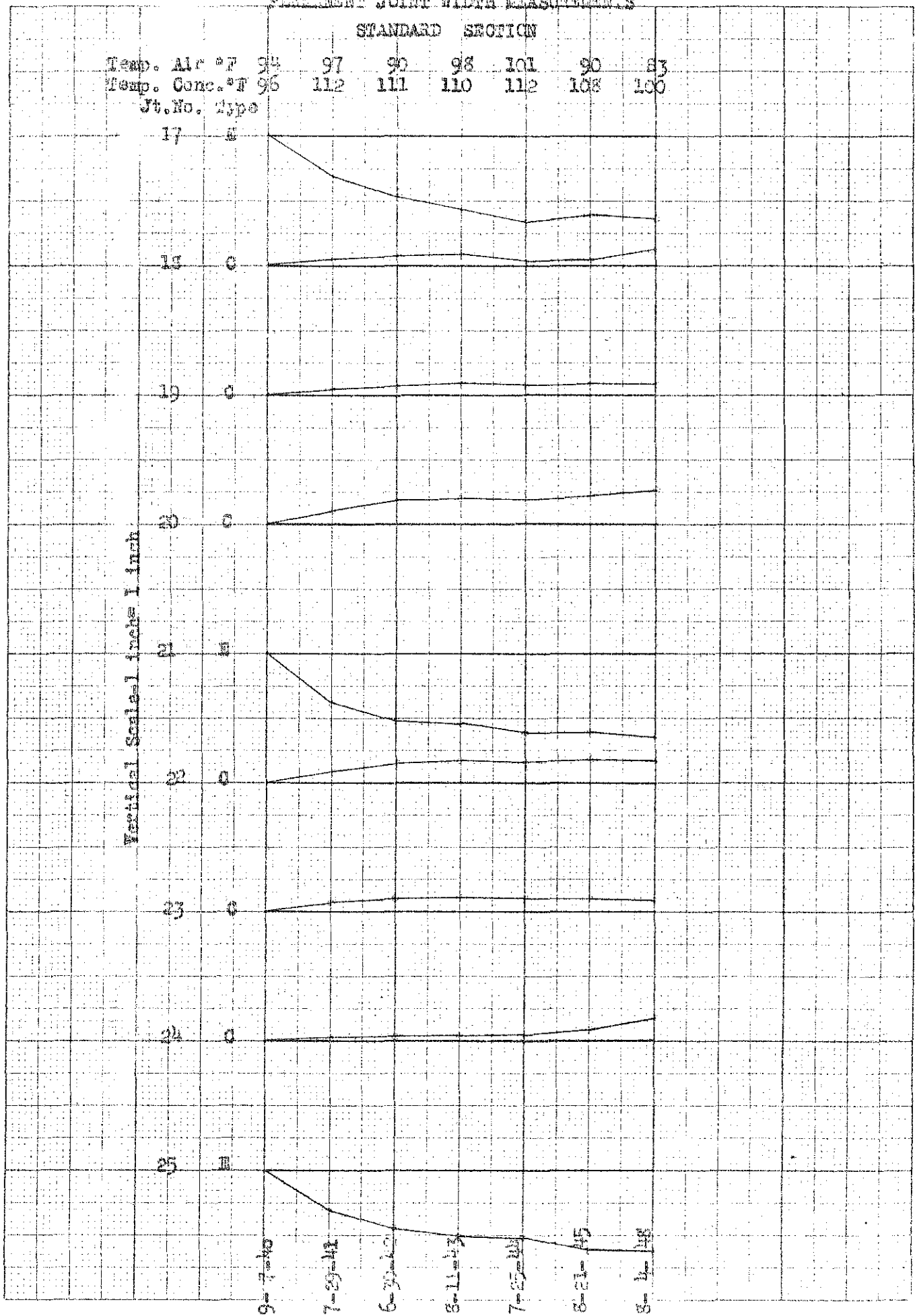


PERMANENT JOINT WIDTH MEASUREMENTS

STANDARD SECTION

Temp. Air °F 94 97 90 98 101 90 83
 Temp. Conc. °T 96 112 111 110 112 108 100
 Jt. No. Type

Vertical Scale - 1 inch = 1 inch



EUGENE DIEZEL CO.
 20 X 20 PER INCH

INC. 340 20 DIEZEL GRAPH PAPER
 20 X 20 PER INCH

APPENDIX E

Pavement Elevations

A tabulation of all elevations observed subsequent to the original observations of September 1940, and expressed as differentials in feet with respect to the original elevations.

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 7

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
1 A	+0.005	+0.005	+0.030	+0.005	10 A	+0.020	+0.015	+0.040	+0.035
1 B	.000	+0.005	+0.020	+0.010	10 B	+0.020	+0.020	+0.045	+0.035
2 A	-0.005	-0.010	+0.010	+0.010	11 A	+0.010	+0.005	+0.035	+0.025
2 B	.000	-0.005	+0.015	+0.005	11 B	+0.010	.000	+0.035	+0.010
3 A	+0.015	+0.005	+0.025	+0.005	12 A	.000	-0.015	+0.015	-0.005
3 B	+0.010	+0.005	+0.020	+0.005	12 B	.000	-0.010	+0.015	.000
4 A	+0.010	+0.005	+0.025	+0.005	13 A	+0.005	.000	+0.035	+0.010
4 B	+0.015	+0.010	+0.030	+0.015	13 B	+0.010	+0.005	+0.040	+0.015
5 A	+0.020	+0.010	+0.040	+0.025	13 C	.000	.000	+0.030	+0.005
5 B	+0.025	+0.015	+0.035	+0.030	14 A	+0.005	+0.005	+0.030	+0.015
6 A	+0.025	+0.015	+0.040	+0.025	14 B	+0.015	+0.015	+0.030	+0.025
6 B	+0.030	+0.020	+0.035	+0.035	14 C	.000	+0.005	+0.035	+0.015
7 A	+0.025	+0.015	+0.045	+0.025	15 A	+0.015	+0.015	+0.050	+0.025
7 B	+0.025	+0.015	+0.040	+0.020	15 B	+0.015	+0.010	+0.045	+0.025
8 A	+0.030	+0.020	+0.045	+0.030	15 C	.000	+0.005	+0.025	-0.005
8 B	+0.030	+0.020	+0.045	+0.035	16 A	.000	-0.005	+0.005	.000
9 A	+0.020	+0.015	+0.040	+0.025	16 B	-0.005	-0.015	-0.010	-0.010
9 B	+0.020	+0.015	+0.040	+0.025	16 C	-0.015	-0.030	-0.025	-0.040

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 7

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
17 A	-.010	-.020	-.010	-.020	24 A	+.020	+.020	+.030	+.030
17 B	-.015	-.030	-.015	-.030	24 B	+.020	+.020	+.025	+.030
17 C	-.010	-.025	-.025	-.035	25 A	+.025	+.020	+.025	+.025
18 A	-.010	-.020	-.015	-.025	25 B	+.020	+.020	+.025	+.025
18 B	-.010	-.020	-.005	-.015	26 A	+.025	+.020	+.025	+.025
18 C	-.010	-.030	-.045	-.045	26 B	+.020	+.020	+.025	+.020
19 A	-.010	-.030	-.055	-.060	27 A	+.020	+.020	+.030	+.020
19 B	+.005	-.020	-.045	-.040	27 B	+.025	+.020	+.030	+.025
20 A	+.015	+.005	+.015	+.010	28 A	+.010	+.015	+.025	+.015
20 B	+.015	+.005	+.005	+.005	28 B	+.010	+.015	+.020	+.015
21 A	+.015	+.015	+.020	+.020	29 A	+.010	+.015	+.020	+.020
21 B	+.020	+.015	+.020	+.035	29 B	+.015	+.020	+.030	+.025
22 A	+.030	+.025	+.030	+.035	30 A	+.005	+.005	+.015	+.005
22 B	+.030	+.030	+.035	+.030	30 B	+.005	.000	+.015	+.005
23 A	+.030	+.020	+.030	+.035	31 A	+.005	.000	+.015	.000
23 B	+.030	+.025	+.025	+.035	31 B	+.005	+.005	+.025	+.010

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 6

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
1 A	+.015	+.010	+.005	-.020	7 A	+.035	+.030	+.045	+.015
1 B	+.015	+.010	+.010	-.010	7 B	+.030	+.025	+.040	+.010
1 C	+.015	+.010	+.025	+.010	7 C	+.015	+.020	+.030	.000
2 A	+.035	+.035	+.040	+.030	8 A	+.020	+.025	+.040	+.010
2 B	+.035	+.030	+.040	+.030	8 B	+.020	+.025	+.040	+.010
2 C	+.020	+.020	+.035	+.025	8 C	+.010	+.010	+.030	.000
3 A	+.035	+.025	+.040	+.030	9 A	.000	-.010	.000	-.030
3 B	+.035	+.030	+.040	+.035	9 B	.000	-.010	-.005	-.030
3 C	+.015	+.025	+.035	+.030	9 C	-.005	-.005	+.030	-.025
4 A	+.025	+.025	+.040	+.030	10 A	-.010	-.015	-.010	-.060
4 B	+.030	+.030	+.050	+.035	10 B	-.010	-.015	-.015	-.050
4 C	-.005	+.010	+.025	+.015	10 C	-.020	-.015	.000	-.030
5 A	+.025	+.040	+.040	+.030	11 A	-.020	-.010	-.010	-.050
5 B	+.020	+.035	+.040	+.025	11 B	-.015	-.005	-.005	-.030
5 C	-.005	+.010	+.020	+.010					
6 A	+.030	+.035	+.045	+.030					
6 B	+.030	+.040	+.050	+.030					
6 C	+.010	+.020	+.030	+.010					

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 5

JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
1 A	+.020	+.015	+.065	+.080	10 A	+.035	+.025	+.085	+.100
1 B	+.020	+.015	+.065	+.075	10 B	+.030	+.025	+.080	+.090
2 A	+.030	+.035	+.075	+.090	11 A	+.030	+.025	+.090	+.095
2 B	+.030	+.030	+.075	+.085	11 B	+.030	+.030	+.085	+.095
3 A	+.030	+.030	+.080	+.090	12 A	+.030	+.030	+.090	+.100
3 B	+.030	+.030	+.080	+.085	12 B	+.030	+.025	+.080	+.100
4 A	+.035	+.025	+.075	+.095	13 A	+.020	+.005	+.075	+.085
4 B	+.030	+.025	+.075	+.090	13 B	+.025	+.015	+.075	+.090
5 A	+.035	+.035	+.080	+.100	13 C	+.025	+.020	+.075	+.085
5 B	+.035	+.030	+.085	+.105	14 A	+.025	+.015	+.080	+.090
6 A	+.040	+.030	+.085	+.100	14 B	+.025	+.015	+.075	+.090
6 B	+.040	+.025	+.085	+.095	14 C	+.025	+.015	+.090	+.090
7 A	+.030	+.025	+.080	+.090	15 A	+.010	+.005	+.070	+.080
7 B	+.030	+.030	+.080	+.090	15 B	+.010	+.005	+.060	+.075
8 A	+.025	+.020	+.075	+.080	15 C	+.010	+.005	+.075	+.070
8 B	+.025	+.020	+.070	+.085	16 A	+.010	+.005	+.065	+.075
9 A	+.030	+.020	+.075	+.085	16 B	+.015	+.015	+.080	+.075
9 B	+.030	+.025	+.075	+.090	16 C	+.015	+.015	+.075	+.075

DIFFERENTIAL IN PAVEMENT ELEVATIONS

SECTION 5

JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
17 A	+.010	+.010	+.065	+.080	24 A	+.025	+.015	+.075	+.085
17 B	+.015	+.015	+.070	+.080	24 B	+.025	+.015	+.075	+.085
17 C	+.010	+.010	+.065	+.075	25 A	+.010	+.005	+.065	+.075
18 A	+.020	+.015	+.075	+.080	25 B	+.010	+.005	+.065	+.070
18 B	+.015	+.010	+.070	+.085	26 A	+.025	+.010	+.075	+.075
18 C	+.020	+.015	+.070	+.080	26 B	+.025	+.010	+.070	+.075
19 A	+.020	+.015	+.080	+.090	27 A	+.020	+.005	+.075	+.075
19 B	+.025	+.015	+.075	+.090	27 B	+.020	+.010	+.070	+.065
20 A	+.025	+.020	+.075	+.095	28 A	+.015	+.010	+.075	+.070
20 B	+.030	+.020	+.080	+.100	28 B	+.020	+.010	+.075	+.075
21 A	+.025	+.025	+.080	+.095	29 A	+.015	+.015	+.075	+.075
21 B	+.025	+.025	+.080	+.105	29 B	+.015	+.010	+.065	+.070
22 A	+.030	+.025	+.085	+.095	30 A	+.005	+.005	+.055	+.055
22 B	+.025	+.025	+.085	+.090	30 B	+.005	+.005	+.055	+.055
23 A	+.025	+.025	+.080	+.085	31 A	+.005	+.005	+.055	+.055
23 B	+.030	+.030	+.095	+.095	31 B	+.010	+.010	+.060	+.065

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 4

JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
1 A	+0.025	+0.015	+0.040	+0.010	10 A	+0.040	+0.025	+0.045	+0.030
1 B	+0.030	+0.020	+0.040	+0.005	10 B	+0.045	+0.025	+0.050	+0.030
2 A	+0.035	+0.030	+0.045	+0.045	11 A	+0.040	+0.015	+0.040	+0.030
2 B	+0.035	+0.025	+0.050	+0.040	11 B	+0.045	+0.025	+0.050	+0.040
3 A	+0.040	+0.025	+0.045	+0.040	12 A	+0.045	+0.015	+0.040	+0.030
3 B	+0.045	+0.030	+0.050	+0.050	12 B	+0.040	+0.020	+0.035	+0.025
4 A	+0.040	+0.020	+0.045	+0.030	13 A	+0.030	+0.010	+0.030	+0.015
4 B	+0.040	+0.025	+0.050	+0.030	13 B	+0.035	+0.010	+0.030	+0.015
5 A	+0.035	+0.020	+0.040	+0.020	13 C	+0.035	+0.010	+0.025	+0.015
5 B	+0.040	+0.020	+0.045	+0.025	14 A	+0.040	+0.010	+0.030	+0.020
6 A	+0.040	+0.015	+0.035	+0.020	14 B	+0.035	+0.010	+0.035	+0.025
6 B	+0.040	+0.015	+0.035	+0.015	14 C	+0.035	+0.010	+0.025	+0.015
7 A	+0.040	+0.015	+0.045	+0.040	15 A	+0.030	+0.005	+0.025	+0.010
7 B	+0.040	+0.025	+0.050	+0.040	15 B	+0.025	+0.005	+0.030	+0.015
8 A	+0.040	+0.015	+0.040	+0.025	15 C	+0.030	+0.005	+0.020	+0.010
8 B	+0.040	+0.015	+0.040	+0.025	16 A	.000	-.025	.000	-.020
9 A	+0.045	+0.025	+0.050	+0.030	16 B	.000	-.025	.000	-.015
9 B	+0.045	+0.025	+0.050	+0.035	16 C	+0.005	-.020	-.005	-.025

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 4

2 of 2

JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
17 A	-.005	-.025	-.005	-.025	24 A	+.015	+.005	+.020	+.010
17 B	.000	-.025	-.005	-.030	24 B	+.015	+.005	+.020	+.005
17 C	-.005	-.030	-.020	-.035	25 A	+.015	+.005	+.015	+.005
18 A	-.015	-.045	-.030	-.050	25 B	+.020	+.005	+.020	+.005
18 B	-.005	-.045	-.025	-.040	26 A	+.025	+.010	+.025	+.010
18 C	-.010	-.035	-.030	-.045	26 B	+.025	+.010	+.025	+.015
19 A	-.010	-.035	-.020	-.035	27 A	+.025	+.005	+.030	+.010
19 B	-.005	-.030	-.020	-.035	27 B	+.025	+.005	+.030	+.015
20 A	-.005	-.005	-.015	-.005	28 A	+.025	.000	+.030	+.010
20 B	-.005	.000	-.015	+.005	28 B	+.025	.000	+.035	+.010
21 A	.000	+.055	+.070	+.065	29 A	+.025	.000	+.030	-.040
21 B	.000	+.055	+.070	+.060	29 B	+.025	-.005	+.030	-.040
22 A	+.005	+.055	+.085	+.075	30 A	+.020	-.005	+.020	-.040
22 B	+.010	+.070	+.080	+.080	30 B	+.020	-.010	+.025	-.040
23 A	+.015	+.070	+.035	+.020	31 A	+.020	.000	+.030	-.030
23 B	+.015	+.020	+.035	+.020	31 B	+.020	-.005	+.035	-.015

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 3

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
1 A	+.025	+.020	+.075	+.010	11 A	+.045	+.025	+.055	+.040
1 B	+.020	+.015	+.065	+.010	11 B	+.045	+.020	+.060	+.040
1 C	+.020	+.005	+.055	+.005	12 A	+.040	+.025	+.050	+.035
2 A	+.020	-.005	+.030	.000	12 B	+.050	+.025	+.055	+.040
2 B	+.020	-.005	+.030	.000	13 A	+.050	+.025	+.045	+.040
3 A	+.025	+.005	+.025	.000	13 B	+.045	+.025	+.050	+.040
3 B	+.025	+.005	+.030	.000	14 A	+.035	+.020	+.045	+.040
4 A	+.030	+.010	+.035	+.025	14 B	+.040	+.020	+.050	+.040
4 B	+.030	+.010	+.035	+.015	15 A	+.030	+.005	+.030	+.010
5 A	+.030	.000	+.030	+.005	15 B	+.030	+.005	+.030	+.015
5 B	+.025	-.005	+.030	.000	16 A	+.035	+.015	+.030	+.020
6 A	+.030	+.010	+.045	+.015	16 B	+.035	+.015	+.035	+.020
6 B	+.030	+.015	+.040	+.020	17 A	+.030	+.015	+.030	+.020
7 A	+.035	.000	+.005	-.005	17 B	+.035	+.015	+.035	+.030
7 B	+.025	-.005	+.005	.000	17 C	+.035	+.015	+.030	+.020
8 A	+.005	-.025	-.005	-.025	18 A	+.030	+.015	+.030	+.015
8 B	+.005	-.030	-.005	-.030	18 B	+.040	+.025	+.040	+.025
9 A	+.025	-.005	+.010	-.005	19 A	+.045	+.035	+.045	+.040
9 B	+.030	.000	+.020	+.005	19 B	+.035	+.025	+.045	+.035
9 C	+.040	+.005	+.030	-.010	20 A	+.040	+.025	+.045	+.040
10 A	+.040	+.015	+.045	+.020	20 B	+.035	+.030	+.045	+.040
10 B	+.040	+.015	+.045	+.020					

DIFFERENTIAL IN PAVEMENT ELEVATIONS

2 of 2

SECTION 3

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
21 A	+0.035	+0.025	+0.040	+0.030	32 A	+0.040	+0.035	+0.045	+0.045
21 B	+0.030	+0.025	+0.040	+0.030	32 B	+0.045	+0.040	+0.040	+0.055
22 A	+0.025	+0.015	+0.020	+0.020	32 C	+0.045	+0.035	+0.045	+0.045
22 B	+0.015	+0.010	+0.015	+0.020	33 A	+0.055	+0.035	+0.060	+0.050
23 A	+0.025	+0.015	+0.025	+0.020	33 B	+0.055	+0.040	+0.060	+0.050
23 B	+0.030	+0.015	+0.025	+0.025	34 A	+0.040	+0.030	+0.050	+0.040
24 A	+0.035	+0.025	+0.025	+0.020	34 B	+0.035	+0.030	+0.050	+0.040
24 B	+0.030	+0.020	+0.025	+0.030	35 A	+0.035	+0.020	+0.040	+0.030
24 C	+0.030	+0.020	+0.025	+0.020	35 B	+0.035	+0.025	+0.050	+0.035
25 A	+0.030	+0.025	+0.030	+0.030	36 A	+0.030	+0.020	+0.035	+0.025
25 B	+0.030	+0.025	+0.030	+0.030	36 B	+0.035	+0.020	+0.050	+0.030
26 A	+0.025	+0.025	+0.025	+0.015	37 A	+0.040	+0.030	+0.060	+0.040
26 B	+0.030	+0.030	+0.035	+0.020	37 B	+0.040	+0.025	+0.055	+0.035
27 A	+0.040	+0.030	+0.040	+0.030	38 A	+0.030	+0.015	+0.055	+0.035
27 B	+0.045	+0.030	+0.040	+0.035	38 B	+0.030	+0.020	+0.055	+0.030
28 A	+0.035	+0.030	+0.035	+0.030	39 A	+0.035	+0.020	+0.050	+0.010
28 B	+0.040	+0.030	+0.040	+0.040	39 B	+0.035	+0.025	+0.050	+0.020
29 A	+0.035	+0.025	+0.035	+0.025	40 A	+0.030	+0.030	+0.040	+0.010
29 B	+0.040	+0.030	+0.040	+0.030	40 B	+0.030	+0.025	+0.040	+0.005
30 A	+0.045	+0.040	+0.045	+0.035	40 C	+0.025	+0.020	+0.030	+0.030
30 B	+0.040	+0.040	+0.045	+0.035	41 A	+0.020	+0.020	+0.030	+0.030
31 A	+0.045	+0.040	+0.050	+0.040	41 B	+0.020	+0.015	+0.035	+0.025
31 B	+0.045	+0.040	+0.050	+0.040					

DIFFERENTIAL IN PAVEMENT ELEVATIONS

SECTION 2

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
1 A	+0.030	+0.020	+0.050	+0.005	9 A	+0.040	+0.025	+0.045	+0.015
1 B	+0.030	+0.025	+0.050	.000	9 B	+0.040	+0.025	+0.045	+0.020
1 C	+0.025	+0.020	+0.035	.000	9 C	+0.045	+0.025	+0.050	+0.015
2 A	+0.030	+0.025	+0.030	+0.010	10 A	+0.050	+0.025	+0.055	+0.015
2 B	+0.030	+0.030	+0.040	+0.010	10 B	+0.050	+0.030	+0.060	+0.025
3 A	+0.035	+0.025	+0.035	+0.015	11 A	+0.065	+0.050	+0.085	+0.045
3 B	+0.030	+0.020	+0.035	+0.010	11 B	+0.070	+0.060	+0.095	+0.055
4 A	+0.040	+0.030	+0.045	+0.010	12 A	+0.065	+0.050	+0.090	+0.055
4 B	+0.040	+0.025	+0.040	+0.020	12 B	+0.065	+0.045	+0.085	+0.045
5 A	+0.030	+0.020	+0.035	+0.010	13 A	+0.065	+0.050	+0.085	+0.045
5 B	+0.040	+0.025	+0.035	+0.015	13 B	+0.070	+0.055	+0.090	+0.055
6 A	+0.030	+0.010	+0.025	+0.010	14 A	+0.055	+0.035	+0.065	+0.035
6 B	+0.030	+0.020	+0.035	+0.010	14 B	+0.055	+0.045	+0.075	+0.025
7 A	+0.035	+0.015	+0.035	+0.005	15 A	+0.050	+0.030	+0.060	+0.030
7 B	+0.035	+0.020	+0.035	+0.005	15 B	+0.040	+0.025	+0.060	+0.025
8 A	+0.040	+0.025	+0.040	+0.015	16 A	+0.040	+0.020	+0.050	+0.005
8 B	+0.035	+0.020	+0.040	+0.020	16 B	+0.040	+0.020	+0.050	+0.010

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 2

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
17 A	+.030	+.020	+.040	.000	25 A	+.025	+.010	+.035	.000
17 B	+.025	+.015	+.040	+.005	25 B	+.025	+.015	+.035	.000
17 C	+.025	+.010	+.030	.000	26 A	+.030	+.015	+.035	-.010
18 A	+.030	+.020	+.040	.000	26 B	+.030	+.015	+.030	-.005
18 B	+.030	+.015	+.035	.000	27 A	+.025	+.010	+.030	.000
19 A	+.025	+.020	+.035	+.005	27 B	+.030	+.015	+.035	.000
19 B	+.025	+.015	+.035	+.005	28 A	+.025	+.015	+.035	+.005
20 A	+.025	+.015	+.040	+.010	28 B	+.025	+.015	+.035	.000
20 B	+.030	+.020	+.045	-.005	29 A	+.025	+.015	+.035	+.005
21 A	+.030	+.020	+.045	-.010	29 B	+.025	+.015	+.035	.000
21 B	+.035	+.025	+.050	.000	30 A	+.025	+.010	+.040	.000
22 A	+.030	+.010	+.035	+.020	30 B	+.030	+.015	+.045	+.010
22 B	+.030	+.010	+.035	+.015	31 A	+.035	+.025	+.045	+.010
23 A	+.020	+.005	+.025	-.015	31 B	+.035	+.020	+.045	+.010
23 B	+.025	+.010	+.035	-.015	32 A	+.035	+.025	+.045	+.015
24 A	+.025	+.010	+.025	-.010	32 B	+.035	+.025	+.050	+.020
24 B	+.020	+.005	+.020	-.015	32 C	+.035	+.025	+.040	+.010
24 C	+.025	+.010	+.025	-.015					

DIFFERENTIAL IN PAVEMENT ELEVATIONS

SECTION 2

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
33 A	+0.030	+0.020	+0.040	-.005	38 A	+0.020	+0.020	+0.030	.000
33 B	+0.025	+0.015	+0.035	.000	38 B	+0.025	+0.020	+0.035	+0.010
34 A	+0.030	+0.020	+0.035	+0.010	39 A	+0.015	+0.020	+0.015	-.010
34 B	+0.025	+0.020	+0.035	+0.005	39 B	+0.015	+0.020	+0.015	-.010
35 A	+0.025	+0.020	+0.035	+0.005	40 A	+0.010	+0.010	+0.005	-.025
35 B	+0.020	+0.010	+0.025	-.005	40 B	+0.010	+0.010	+0.010	+0.025
36 A	+0.025	+0.020	+0.030	.000	40 C	+0.005	.000	.000	-.040
36 B	+0.025	+0.015	+0.025	.000	41 A	+0.005	+0.005	+0.010	-.030
37 A	+0.030	+0.020	+0.030	+0.010	41 B	.000	+0.005	+0.005	-.035
37 B	+0.025	+0.020	+0.030	+0.010					

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 1

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
18 A	+0.055	+0.040	+0.070	+0.035	26 A	+0.060	+0.040	+0.065	+0.040
18 B	+0.060	+0.035	+0.070	+0.035	26 B	+0.055	+0.040	+0.080	+0.040
18 C	+0.055	+0.025	+0.060	+0.030	27 A	+0.065	+0.050	+0.075	+0.060
19 A	+0.050	+0.030	+0.055	+0.040	27 B	+0.065	+0.050	+0.075	+0.060
19 B	+0.055	+0.030	+0.055	+0.035	28 A	+0.060	+0.045	+0.065	+0.055
20 A	+0.055	+0.030	+0.060	+0.040	28 B	+0.060	+0.050	+0.065	+0.060
20 B	+0.050	+0.030	+0.065	+0.035	29 A	+0.060	+0.050	+0.065	+0.060
21 A	+0.050	+0.040	+0.070	+0.055	29 B	+0.065	+0.050	+0.070	+0.065
21 B	+0.060	+0.040	+0.075	+0.055	30 A	+0.045	+0.030	+0.045	+0.040
22 A	+0.065	+0.040	+0.065	+0.040	30 B	+0.045	+0.030	+0.050	+0.040
22 B	+0.065	+0.040	+0.065	+0.045	30 C	+0.045	+0.030	+0.050	+0.045
23 A	+0.075	+0.035	+0.055	+0.050	31 A	+0.040	+0.030	+0.055	+0.040
23 B	+0.070	+0.040	+0.075	+0.040	31 B	+0.040	+0.040	+0.060	+0.040
24 A	+0.070	+0.045	+0.070	+0.050	32 A	+0.040	+0.045	+0.055	+0.055
24 B	+0.070	+0.050	+0.075	+0.050	32 B	+0.040	+0.040	+0.055	+0.050
24 C	+0.070	+0.040	+0.070	+0.050	33 A	+0.035	+0.040	+0.045	+0.045
25 A	+0.070	+0.050	+0.075	+0.050	33 B	+0.035	+0.040	+0.045	+0.045
25 B	+0.075	+0.050	+0.075	+0.050					

DIFFERENTIAL IN PAVEMENT ELEVATIONS
SECTION 1

JOINT No.	March 1942	July 1944	Aug. 1948	Feb. 1949	JOINT No.	March 1942	July 1944	Aug. 1948	Feb. 1949
34 A	+0.040	+0.040	+0.045	+0.045	42 A	+0.035	+0.030	+0.065	+0.030
34 B	+0.040	+0.040	+0.045	+0.045	42 B	+0.035	+0.025	+0.060	+0.030
35 A	+0.040	+0.030	+0.045	+0.045	43 A	+0.035	+0.025	+0.070	+0.035
35 B	+0.045	+0.040	+0.050	+0.050	43 B	+0.030	+0.025	+0.070	+0.040
35 C	+0.035	+0.030	+0.040	+0.040	44 A	+0.030	+0.025	+0.065	+0.030
36 A	+0.035	+0.030	+0.035	+0.040	44 B	+0.030	+0.030	+0.070	+0.030
36 B	+0.035	+0.025	+0.035	+0.040	45 A	+0.035	+0.030	+0.065	+0.040
37 A	+0.045	+0.035	+0.040	+0.050	45 B	+0.035	+0.030	+0.070	+0.040
37 B	+0.045	+0.035	+0.040	+0.050	46 A	+0.020	+0.020	+0.055	+0.020
38 A	+0.035	+0.030	+0.040	+0.045	46 B	+0.015	+0.020	+0.060	+0.020
38 B	+0.040	+0.030	+0.035	+0.050	47 A	+0.010	+0.010	+0.050	+0.010
39 A	+0.040	+0.035	+0.040	+0.040	47 B	+0.020	+0.020	+0.055	+0.010
39 B	+0.040	+0.030	+0.040	+0.045	47 C	+0.010	+0.010	+0.050	+0.010
40 A	+0.035	+0.030	+0.080	+0.040	48 A	+0.010	+0.015	+0.050	.000
40 B	+0.040	+0.035	+0.080	+0.045	48 B	+0.010	+0.010	+0.050	+0.010
41 A	+0.035	+0.025	+0.060	+0.030					
41 B	+0.035	+0.025	+0.060	+0.025					
41 C	+0.035	+0.020	+0.060	+0.030					

DIFFERENTIAL IN PAVEMENT ELEVATIONS

STANDARD SECTION

JOINT NO.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
1 A	-.005	+.005	-.015	-.035	11 A	-.005	+.005	+.010	.000
1 B	-.005	+.005	-.015	-.035	11 B	-.005	+.005	+.005	.000
1 C	+.010	+.005	-.005	-.020	12 A	+.030	+.010	+.035	+.035
2 A	.000	-.005	-.005	-.035	12 B	+.025	+.010	+.030	+.035
2 B	.000	+.005	-.010	-.035	13 A	+.020	+.005	+.030	+.025
3 A	+.005	+.005	+.005	-.025	13 B	+.010	+.005	+.030	+.015
3 B	.000	+.005	.000	-.015	14 A	+.025	+.020	+.040	+.045
4 A	+.025	+.025	+.030	+.025	14 B	+.035	+.015	+.035	+.045
4 B	+.025	+.025	+.030	+.025	15 A	+.025	+.025	+.050	+.040
5 A	+.025	+.025	+.035	+.025	15 B	+.025	+.030	+.050	+.040
5 B	+.025	+.030	+.035	+.025	16 A	+.030	+.030	+.050	+.050
6 A	+.025	+.030	+.025	+.010	16 B	+.030	+.030	+.050	+.050
6 B	+.030	+.035	+.025	+.010	17 A	+.040	+.045	+.050	+.055
7 A	+.025	+.020	+.030	+.010	17 B	+.040	+.045	+.060	+.055
7 B	+.020	+.020	+.025	+.015	17 C	+.040	+.045	+.060	+.055
8 A	+.025	+.020	+.025	+.020	18 A	+.040	+.040	+.055	+.060
8 B	+.015	+.015	+.020	+.010	18 B	+.045	+.045	+.060	+.065
9 A	+.010	+.010	+.025	+.010	19 A	+.040	+.050	+.050	+.060
9 B	+.010	+.010	+.020	+.005	19 B	+.055	+.050	+.055	+.065
9 C	+.015	+.015	+.025	+.025	20 A	+.050	+.045	+.050	+.055
10 A	+.015	+.015	+.020	+.025	20 B	+.050	+.050	+.050	+.055
10 B	+.010	+.010	+.020	+.025					

DIFFERENTIAL IN PAVEMENT ELEVATIONS

2 of 2

STANDARD SECTION

JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949	JOINT No.	MARCH 1942	JULY 1944	AUG. 1948	FEB. 1949
21 A	+0.030	+0.040	+0.035	+0.040	32 A	+0.030	+0.010	+0.015	.000
21 B	+0.030	+0.035	+0.035	+0.035	32 B	+0.025	+0.015	+0.020	+0.005
22 A	+0.020	+0.025	+0.010	+0.020	32 C	+0.035	+0.020	+0.035	.000
22 B	+0.020	+0.020	+0.010	+0.015	33 A	+0.030	+0.015	+0.035	+0.025
23 A	+0.015	+0.015	+0.010	+0.015	33 B	+0.030	+0.020	+0.035	+0.030
23 B	+0.015	+0.015	+0.010	+0.015	34 A	+0.030	+0.015	+0.035	+0.025
24 A	+0.005	.000	-.010	-.010	34 B	+0.035	+0.020	+0.040	+0.025
24 B	+0.005	.000	-.010	-.005	35 A	+0.025	+0.010	+0.045	+0.020
24 C	+0.015	+0.010	.000	+0.010	35 B	+0.030	+0.015	+0.045	+0.025
25 A	+0.010	+0.010	.000	+0.010	36 A	+0.030	+0.020	+0.055	+0.010
25 B	+0.005	+0.010	.000	+0.010	36 B	+0.030	+0.020	+0.055	+0.015
26 A	+0.015	+0.020	+0.015	+0.020	37 A	+0.040	+0.025	+0.075	+0.040
26 B	+0.015	+0.020	+0.025	+0.020	37 B	+0.040	+0.030	+0.080	+0.030
27 A	+0.020	+0.025	+0.030	+0.025	38 A	+0.045	+0.030	+0.080	+0.030
27 B	+0.020	+0.025	+0.030	+0.025	38 B	+0.050	+0.030	+0.080	+0.035
28 A	+0.030	+0.030	+0.050	+0.040	39 A	+0.035	+0.015	+0.065	+0.010
28 B	+0.020	+0.030	+0.035	+0.040	39 B	+0.035	+0.010	+0.055	+0.020
29 A	+0.025	+0.025	+0.030	+0.030	40 A	+0.040	+0.010	+0.065	+0.020
29 B	+0.025	+0.025	+0.030	+0.030	40 B	+0.040	+0.010	+0.065	+0.015
30 A	+0.030	+0.020	+0.010	+0.020	40 C	+0.050	+0.025	+0.070	+0.025
30 B	+0.025	+0.020	+0.005	+0.020	41 A	+0.035	+0.025	+0.065	+0.030
31 A	+0.035	+0.015	+0.025	+0.035	41 B	+0.030	+0.025	+0.065	+0.030
31 B	+0.030	+0.015	+0.025	+0.035					

APPENDIX F

A tabulation of results of tests on soil samples for Liquid Limit, Plasticity Index, and Texture. Samples represent the subgrade at the stations shown. General groupings under gradation refer to commonly accepted designations:

<u>Classification</u>	<u>Grain Size</u>
Fine Sand	Passing No. 40 sieve, coarser than 0.05 mm.
Silt	0.05 mm. to 0.005 mm.
Clay	Finer than 0.005 mm.

TABULATION OF SOIL TEST DATA

Section Number	Station	Liquid Limit	Plasticity Index	Gradation		
				Fine Sand	Silt	Clay
7	398+06	22.3	8.1	42.7	40.0	15.8
	400+08	26.8	9.3	33.7	49.1	14.2
	402+10	30.8	9.2	27.6	58.4	13.3
	404+12	24.6	5.3	36.0	51.6	11.7
	406+14	32.9	10.7	33.4	47.5	17.5
	408+16	29.2	8.3	29.8	50.0	19.2
	410+15	35.9	18.5	27.3	49.2	22.5
6	412+20	27.2	8.2	33.3	51.6	14.2
	414+22	29.0	7.4	27.6	55.0	16.7
	416+24	32.2	10.5	34.2	49.2	15.8
	418+26	26.5	10.0	32.4	50.9	15.8
	420+28	31.0	9.5	27.8	50.9	20.8
	422+30	32.1	10.3	20.9	55.8	15.0
	424+32	30.5	9.0	27.3	56.7	15.0
5	426+34	27.6	7.1	35.0	51.6	11.7
	426+36	27.1	6.8	32.2	53.8	11.7
	430+38	27.9	6.1	30.1	53.4	15.8
	432+40	33.5	13.6	30.1	52.5	16.7
	434+42	32.3	10.0	26.6	53.4	16.3
	436+44	32.2	8.5	32.0	52.5	14.2
	438+46	25.2	3.9	31.0	49.1	19.2
4	440+48	31.6	11.4	27.0	50.0	20.8
	442+50	31.7	11.5	32.4	40.9	15.8
	444+32	32.3	12.2	32.6	49.2	15.0
	446+54	40.0	14.8	20.0	35.8	39.2
	448+56	34.5	11.8	30.3	35.9	20.8
	450+58	20.0	1.3	32.0	50.9	15.8
	452+60	28.4	10.5	31.3	50.9	15.8
	454+62	28.4	7.8	31.8	50.8	16.7
3	456+64	33.4	12.4	29.7	49.2	20.0
	458+66	25.9	12.2	31.2	50.9	17.5
	460+68	30.3	9.1	28.8	53.3	16.7
	462+70	33.8	11.5	30.7	49.1	19.2
	464+72	32.0	10.3	29.0	51.7	18.3
	466+74	32.8	11.2	31.1	50.0	18.3
	468+76	33.4	11.0	19.0	50.8	19.2
	470+78	26.6	7.0	27.6	51.7	20.0
	472+80	30.3	11.1	27.0	53.4	18.3
	474+82	28.0	4.9	15.5	60.0	17.5
	476+84	28.4	13.7	29.2	54.2	15.8
478+86	31.9	9.6	25.4	51.7	20.8	
2	480+88	31.7	11.1	20.0	50.0	23.3
	482+90	34.1	9.3	21.5	33.3	32.5
	484+92	29.9	10.4	42.7	29.1	24.2
	486+94	29.9	10.7	25.2	49.2	23.3
	488+96	29.5	8.4	31.0	47.5	20.0
	490+98	37.7	14.4	29.0	54.1	16.7
	493+22	35.7	15.7	30.6	30.0	16.7
	495+00	28.3	11.5	28.7	43.3	25.0

TABULATION OF SOIL TEST DATA (contd.)

Section Number	Station	Liquid Limit	Plasticity Index	Gradation		
				Fine Sand	Silt	Clay
2	497+00	29.1	7.9	29.3	48.4	20.2
	499+00	33.6	10.9	29.5	40.0	30.0
	501+00	25.0	6.8	29.0	55.0	15.0
	503+00	24.6	8.3	28.4	53.3	17.5
	505+00	27.2	8.2	31.7	50.0	15.8
	507+00	24.3	6.9	32.0	51.7	15.0
	509+00	24.9	6.6	30.0	52.5	16.7
1	511+00	34.7	14.6	27.0	36.6	31.7
	513+00	27.1	9.5	24.4	45.8	25.0
	515+00	37.6	14.4	23.0	43.4	28.3
	517+00	37.0	12.6	24.2	31.6	44.2
	519+00	30.6	10.8	21.0	37.5	37.5
	521+00	24.3	5.1	30.5	50.9	13.3
	523+00	29.7	7.8	29.1	33.4	15.8
	525+00	27.0	6.9	32.4	51.6	14.2
	527+00	25.9	5.8	31.8	51.7	15.0
	529+00	23.6	4.7	32.3	55.0	11.7
	531+00	30.0	9.5	27.8	46.7	22.5
	533+00	32.5	10.2	29.1	41.7	25.0
	535+00	30.0	11.3	30.0	44.1	24.2
	537+00	28.4	7.7	30.5	49.1	19.2
	541+00	44.1	12.3	30.4	46.3	20.0
	543+00	27.5	9.0	33.2	47.5	18.3
	545+00	44.8	15.2	19.5	17.5	53.8
	546+00	37.2	16.3	23.6	30.0	40.8
	547+00	27.1	9.1	29.3	50.8	16.7
	548+00	30.0	9.4	31.3	50.0	16.7
549+00	30.0	11.1	27.2	54.1	16.7	
551+00	32.0	15.0	29.0	38.3	27.5	
555+00	29.6	10.2	26.7	51.7	20.0	
557+00	28.6	11.7	29.2	44.2	23.3	
558+00	23.3	9.6	33.8	44.2	17.5	
559+00	24.5	9.7	35.6	45.0	16.7	
Std.	561+00	24.0	3.7	31.5	55.0	12.5
	563+00	28.6	9.3	30.1	41.3	24.2
	565+00	29.3	8.3	33.0	45.0	19.2
	567+00	26.0	8.5	32.8	47.5	16.7
	569+00	22.8	3.5	44.2	38.3	16.7
	571+00	22.2	7.0	53.0	28.4	15.8
	573+00	21.7	5.7	53.9	24.1	16.7
	575+00	32.5	10.5	26.8	54.2	18.3
	576+00	25.9	7.4	29.2	50.0	20.0
	578+00	26.7	6.4	26.7	52.5	20.0
	580+00	28.3	9.1	30.9	50.8	17.5
	582+00	30.2	10.6	27.0	44.1	28.3
	584+00	31.4	10.7	24.4	56.7	18.3
	586+00	30.0	9.4	31.9	48.3	19.2

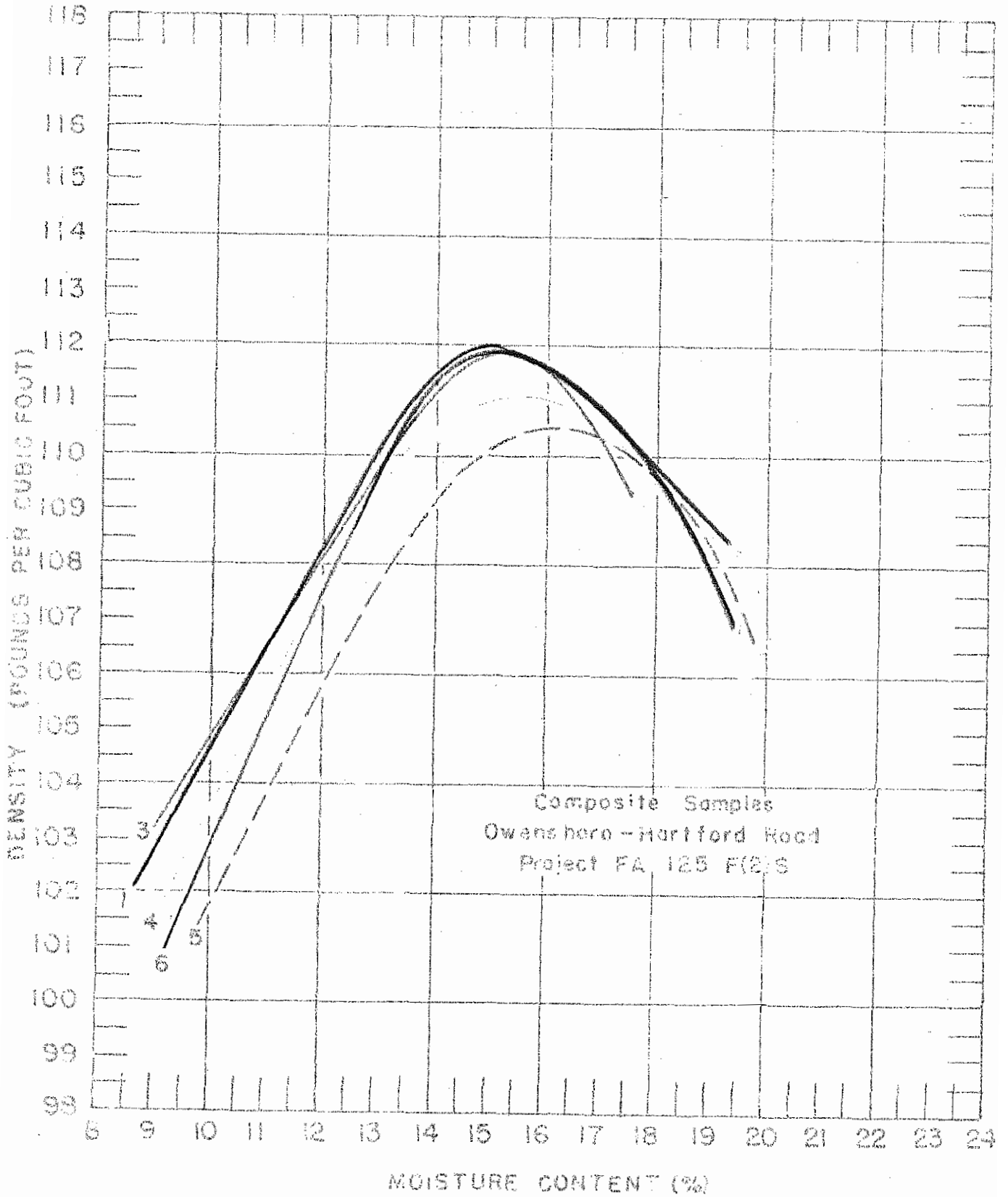
TABULATION OF SOIL TEST DATA (contd.)

Section Number	Station	Liquid Limit	Plasticity Index	Gradation			
				Fine Sand	Silt	Clay	
Std.	588+00	26.6	8.5	45.0	34.1	19.2	
	590+00	24.9	7.7	36.9	41.6	19.2	
	592+00	23.0	4.7	65.8	15.9	15.8	
	594+00	22.5	6.7	57.3	23.4	18.3	
	596+00	19.5	0.0	66.3	17.5	15.0	
	598+00	0.0	0.0	80.5	8.3	10.0	
	600+00	21.2	None	72.2	14.2	10.8	
	603+00	27.8	9.8	26.7	45.0	25.0	
	604+00	36.8	17.9	21.2	35.8	40.0	
	606+00	40.1	16.3	25.9	29.2	40.0	
	608+00	28.3	7.7	25.8	44.2	27.5	
	610+00	24.7	7.9	39.6	35.0	21.7	
	612+00	25.5	5.5	51.6	25.9	18.3	
	614+00	23.3	5.2	60.1	19.1	16.7	
	616+00	25.6	7.7	38.7	41.7	18.3	
	618+00	19.2	2.6	43.3	35.9	18.3	
	620+00	22.8	6.6	47.5	32.5	16.7	
	622+00	25.7	6.8	36.3	42.5	19.2	
	624+00	25.4	7.1	51.4	28.3	15.1	
	626+00	25.8	5.9	34.8	44.2	18.3	
	628+00	27.7	8.3	35.7	44.2	18.3	
	2R	630+00	32.2	9.4	34.2	40.8	24.2
		632+00	31.1	10.7	25.3	54.2	20.0
634+00		29.6	8.5	26.5	52.5	19.2	
636+00		27.1	6.9	28.7	52.5	18.3	
638+00		41.4	17.2	6.5	32.5	54.2	
640+00		32.0	12.2	25.2	44.2	28.3	
642+00		25.1	9.8	41.4	30.0	23.3	
644+00		34.2	10.3	26.7	42.8	30.5	
646+00		31.4	10.2	26.2	50.0	22.5	
648+00		28.4	9.5	25.0	52.5	19.2	
650+00		24.1	6.3	32.1	50.0	14.2	
652+00		28.3	8.5	26.0	54.1	19.2	
654+00		24.5	7.4	34.1	45.9	18.3	
3R	656+00	37.5	14.6	14.5	37.5	47.5	
	658+00	32.0	6.7	25.5	52.5	20.0	
	660+00	28.5	8.9	26.0	50.8	21.7	
	662+00	28.8	7.8	26.8	53.3	19.2	
	664+00	34.2	10.6	22.6	51.7	25.0	
	666+00	34.9	14.5	29.1	45.0	24.2	
	668+00	28.7	7.4	26.5	50.8	21.7	
	670+00	31.2	13.2	28.4	51.6	19.2	
	672+00	30.4	10.4	24.8	53.4	20.8	
	674+00	29.2	5.8	27.6	50.0	19.2	
	676+00	30.6	11.8	27.7	53.3	17.5	
	678+00	24.2	7.8	51.7	25.8	21.7	

TABULATION OF SOIL TEST DATA (contd.)

Section Number	Station	Liquid Limit	Plasticity Index	Gradation		
				Fine Sand	Silt	Clay
4R	680+00	29.8	9.3	29.5	49.2	20.0
	682+00	27.1	8.9	34.5	45.8	17.5
	684+00	28.8	9.2	28.8	45.9	23.3
	686+00	32.1	13.6	32.2	39.1	26.7
	688+00	28.0	11.3	36.3	42.5	19.2
	690+00	31.8	10.9	26.0	51.7	20.8
	692+00	35.4	13.7	21.5	52.5	25.0
	694+00	29.5	9.9	25.5	51.7	20.8
	5R	696+00	33.3	14.1	24.8	44.2
698+00		29.2	10.9	29.0	44.1	24.2
700+00		30.5	11.3	25.2	41.6	26.7
702+00		25.8	10.8	28.2	37.5	28.3
704+00		28.4	9.5	27.9	45.0	23.3
706+00		27.2	11.3	27.6	39.2	27.5
708+00		31.9	11.7	28.3	40.0	25.0
6R		710+00	35.7	13.1	16.7	31.7
	712+00	52.4	29.3	16.8	32.5	47.5
	714+00	25.1	7.3	33.2	45.0	15.0
	716+00	25.6	6.0	33.8	35.0	27.5
	718+00	22.8	6.0	43.8	31.7	20.8
	720+00	25.8	9.0	36.7	34.1	24.2
	722+00	22.9	7.6	44.5	25.8	24.2
	724+00	24.8	6.9	34.1	35.0	24.2
7R	726+00	34.4	15.0	30.0	49.1	16.7
	728+00	31.2	11.4	30.5	42.5	25.0
	730+00	28.0	7.7	26.6	55.0	16.7
	732+00	27.8	6.3	30.7	50.0	17.5
	734+00	28.3	8.0	27.9	52.5	18.3
	736+00	25.4	7.7	27.7	53.3	16.7

MOISTURE DENSITY CURVES
by
Standard Proctor Compaction



APPENDIX G

Record of Crack and Condition Survey

A record of crack and condition survey by sections in order of stationing and including the dates when first observed to February 2, 1949.

SECTION 7. Sta. 397+49.4 to Sta. 410+21

Expansion Joints spaced 120 ft. Contraction Joints spaced 20 ft. No load transfer - Uniform 7" Section.

- 397+90 - Transverse crack across entire slab: Four feet from edge of the west slab the crack splits and forms a "Y" to the center line, the prongs of the "Y" being 14" apart at the center line. October 27, 1942.
- 397+92 - Semi-circular crack starts at edge of west slab; forks four feet from edge; one prong intersects joint three feet from center line and the other prong intersects edge of west slab ten feet from the beginning. August 6, 1947.
- 398+20 - Two interior corner breaks three feet long, one in each slab on south side of joint. August 8, 1948.
- 399+12 - Irregular longitudinal crack starts four feet from edge of west slab; forks sixteen feet from the beginning; the west prong two feet long ends two feet from edge of west slab; the east prong seven feet long ends one foot from edge of west slab. August 6, 1947.
- 399+21 - Two exterior corner breaks three feet long on west side north and south of joint; both corner breaks intersect longitudinal crack shown at Sta. 399+12. August 6, 1947.
- 401+01 - Interior corner break two and one-half feet long in east lane south of joint. February 2, 1949.
- 401+21 - Exterior corner break four feet from west edge and eleven feet long to west edge of slab south of joint. August 6, 1947.
- 402+90 - Transverse crack begins at outside edge of west slab curves inward four feet and intersects the joint ahead three feet from edge. February 2, 1949.
- 403+01. - Exterior corner break in west slab three feet long and north of the joint. February 2, 1949.
- 406+81 - Transverse crack starts at center line, 6 inches south of contraction joint this station, and extends five feet into west slab, where it runs into contraction joint. Settled slightly. June 9, 1943.

- 406+81 - Transverse crack starts at joint in west slab three feet from centerline and curves to edge of slab three feet south of joint. February 2, 1949.
- 407+17 - Transverse crack starts at west edge of slab and extends five feet into slab. February 2, 1949.
- 407+20 - Two internal corner breaks four feet long south of joint. December 1, 1947.
- 408+40 - Fine transverse crack starts at the edge of west slab and extends to the centerline. August 6, 1947. Opened February 2, 1949. Longitudinal crack extends north from center of above crack four feet. December 1, 1947. Extends north ten feet. August 8, 1948.
- 408+48 - Fine transverse crack starts one foot from edge of west slab, extends four feet toward center line. December 1, 1947. Extended to full width of west slab. February 2, 1949.
- 408+40 - Longitudinal crack starts at joint three feet east of centerline and extends north four feet. 2-2-49.
- 408+40 - Longitudinal crack starts at joint five feet west of centerline and extends five feet south. 2-2-49.
- 409+56 - Transverse crack starts edge of west slab, extends to centerline. December 1, 1947. Continues into east slab curving to joint ahead five feet east of centerline. February 2, 1949.
- 409+60 - Longitudinal crack three feet from edge of west slab, extends three inches north and 12 inches south. December 1, 1947.
- 409+66 - Transverse crack starts edge of west slab, extends to centerline. December 1, 1947.
- 409+95 - Transverse crack starts edge of west slab, extends five feet toward centerline. December 1, 1947.
- SECTION 6. Sta. 410+21 to Sta. 425+21.

Expansion and Contraction Joints spaced 60 ft. alternately. Load transfer in both - 70# wire fabric reinforcement 9"-7"-9" section.

- 411+60 - Fine transverse crack starts edge west slab, extends to centerline. November 2, 1944.
- 412+01 - Exterior corner crack three feet long in west slab and north of the joint. February 2, 1949.
- 412+05 - Transverse crack starts at edge of west slab and extends three feet diagonally into slab. February 2, 1949.

- 414+88 - Fine transverse crack starts edge west slab, extends diagonally five feet into slab. October 4, 1945.
- 415+15 - Fine transverse crack starts edge east slab, extends five feet into west slab. November 2, 1944.
- 416+57 - Fine transverse crack starts edge west slab, extends five feet toward centerline. June 27, 1946. Extended to full width of pavement, August 8, 1948.
- 417+16 - Fine transverse crack starts edge west slab, extends four feet into slab. November 2, 1944. Extends seven feet into slab, August 8, 1948.
- 417+22 - Fine transverse crack starts edge east slab, extends to centerline. November 2, 1944.
- 417+68 - Fine transverse crack starts edge east slab, extends to centerline. November 2, 1944.
- 417+74 - Transverse crack across entire width of pavement. November 2, 1944.
- 418+47 - Fine transverse crack starts centerline, extends two feet into east slab. December 9, 1946.
- 418+60 - Scaling area of one square foot, southeast corner of slab. December 1, 1947.
- 418+79 - Transverse crack starts edge east slab, extends to centerline. November 2, 1944.
- 418+98 - Transverse crack starts edge east slab and extends four feet into pavement. June 9, 1943. Extends to centerline, August 8, 1948.
- 419+38 - Fine transverse crack starts centerline, extends four and one-half feet into east slab. June 27, 1947. Autogenous healing, December 1, 1947.
- 420+03 - Transverse crack starts edge east slab and extends to centerline. October 5, 1943.
- 420+11 - Fine transverse crack starts four feet from west edge and extends four feet toward centerline. August 6, 1947. Extends to centerline, February 2, 1949.
- 420+12 - Fine transverse crack starts edge west slab and extends five feet into slab. October 4, 1945.
- 420+26 - Fine transverse crack starts edge west slab, extends seven feet into slab. November 2, 1944. Extends to centerline. December 1, 1947.

- 420+65 - Fine transverse crack starts edge west slab, extends eight feet into slab. November 2, 1944.
- 420+66 - Fine transverse crack starts edge east slab, extends to centerline. November 2, 1944.
- 420+79 - Fine transverse crack starts edge of west slab, extends to centerline. August 6, 1947.
- 421+39 - Transverse crack starts edge of east slab and extends to center line. October 5, 1943. Extends two feet into west slab. February 2, 1949.
- 422+02 - Fine transverse crack starts edge east slab, extends five feet into slab. October 4, 1945. Extends to centerline. December 1, 1947.
- 422+97 - Fine transverse crack starts three feet from edge of east slab and extends five feet into west slab. August 6, 1947. Extends to full width of pavement. February 2, 1949.
- 423+03 - Transverse crack starts three feet from edge of east slab, extends two feet diagonally toward centerline. December 1, 1947.
- 423+51 - Transverse crack across entire width of pavement (over 5' x 3' box culvert.) June 9, 1943.
- 424+27 - Fine transverse crack starts one foot from edge of west slab, extends four feet into slab. October 4, 1945.
- 424+82 - Transverse crack across entire width of pavement. November 2, 1944.
- 424+91 - Transverse crack starts edge east slab, extends to centerline. November 2, 1944.
- SECTION 5. Sta. 425+21 to Sta. 440+01.
- Expansion Joints spaced 120 ft. Contraction Joints spaced 20 ft. Load transfer in both. 9"-7"-9" Section.
- 429+30 - Fine transverse crack starts edge east slab, extends eight feet into slab. November 2, 1944. Extends to centerline. August 8, 1948.
- 431+71 - Transverse crack across entire width of pavement over box culvert. (2.5' x 2.5'). October 5, 1943.
- 432+01 - Exterior corner break two feet north of joint in west slab and extends to joint three west of centerline. February 2, 1949.

434+96 - Fine transverse crack starts at edge of west slab and extends four feet into slab. Autogenous healing progressing. February 2, 1949.

SECTION 4. Sta. 440+01 to Sta. 455+02.

Expansion Joints spaced 120 ft. Contraction Joints spaced 20 ft. Load transfer in Expansion Joints only. 9"-7"-9" Section.

442+95 - Transverse crack across entire width of pavement over 2.5' x 2.5' box culvert. October 5, 1943. New crack joins near centerline extends full width of west slab to two feet south of first crack. August 8, 1948.

445+81 - Transverse crack starts at west edge of pavement and extends seven feet into slab. February 2, 1949.

446+15 - Transverse crack starts edge of west slab, extends to centerline. December 1, 1947.

446+17 - Transverse crack starts edge of west slab, extends to centerline. December 1, 1947.

446+21 - Three foot interior corner break east slab, south of joint. December 1, 1947.

446+34 - Transverse crack starts edge west slab, extends to centerline with three foot interior corner break north of joint. August 6, 1947.

446+36 - Transverse crack starts at west edge of slab and extends to centerline intersecting older crack. Longitudinal crack intersects transverse crack four feet from centerline and extends seven feet south -- two feet into next slab. Exterior break 2' x 3' south of joint. February 2, 1949.

446+48 - Transverse crack starts at west edge of slab and extends seven feet toward centerline. February 2, 1949.

446+48 - Transverse crack starts edge west slab, extends to centerline. August 6, 1947.

446+53 - Transverse crack starts edge west slab, extends to centerline. August 6, 1947. Longitudinal starts at center of transverse crack and extends ten feet south, crossing joint two feet. February 2, 1949.

446+75 - Transverse crack starts edge west slab, extends to centerline. December 1, 1947.

- 447+01 - Interior corner break two feet long, east slab south of contraction joint. August 6, 1947.
- 447+06 - Fine transverse crack full width of west slab. February 2, 1949.
- 447+21 - Longitudinal crack starts three feet from edge of west slab, and extends south four feet. August 6, 1947.
- 447+21 - Interior break 3' x 3' east of centerline and south of joint. February 2, 1949.
- 447+27 - Fine transverse crack starts edge of west slab and extends to centerline. August 6, 1947.
- 447+81 - Longitudinal crack starts at joint two feet west of centerline and extends five feet north. Longitudinal crack starts at joint three feet west of centerline and extends ten feet south to construction joint. August 8, 1948.
- 447+91 - Interior break 1' x 1' in east slab and north of construction joint. August 8, 1948.
- 448+17 - Transverse crack starts at west edge and extends seven feet toward centerline. February 2, 1949.

SECTION 3. Sta. 455+02 to Sta. 480 +00.

Expansion Joints spaced 400 ft. Contraction Joints spaced 20 ft. Load transfer in Expansion Joints only. 9"-7"-9" Section.

- 473+11 - Fine transverse crack starts at edge of west slab and extends back at slight angle to centerline. August 6, 1947.
- 473+23 - Longitudinal crack begins in west slab two feet from and paralleling west edge for fifteen feet. February 2, 1949.
- 473+27 - Transverse crack across west slab. February 2, 1949.
- 473+30 - Transverse crack starts at east edge of slab and extends five feet toward centerline. February 2, 1949.
- 473+31.5- Transverse crack across entire width of pavement. June 9, 1943.
- 473+40.5- Transverse crack starts four inches from joint at edge east slab and extends two feet where it runs into joint. Settled slightly. June 9, 1943.

- 473+56 - Longitudinal cracks starts three feet from west edge and extends south four feet to joint at one foot from west edge. February 2, 1949.

SECTION 2. Sta. 480+00 to Sta. 510+00.

Expansion Joints spaced 800 ft. Contraction Joints spaced 20 ft. Load transfer in Expansion Joints only. 9"-7"-9" Section.

- 485+80 - Fine longitudinal crack across joint one and one-half feet from edge of east slab, extends two feet north and two feet south. Autogenous healing progressing. June 27, 1946.
- 488+31 - Transverse crack starts edge east slab, extends to centerline. December 1, 1947.
- 489+00 - Fine longitudinal crack four from east edge of pavement and extending one foot north and two feet south of joint. February 2, 1949.
- 494+21 - Longitudinal crack three feet from edge of west slab, extends three feet north and three feet south from joint. December 1, 1947.
- 494+21 - Longitudinal crack in east slab two feet from centerline and extending four feet north and five feet south of joint. August 8, 1948.
- 501+00 - Longitudinal crack five feet from edge west slab, extends four feet south from joint, and four feet north. December 1, 1947.
- 503+80 - Fine longitudinal crack on east slab two feet from centerline and extending three feet south from joint. August 8, 1948.
- 504+20 - Fine longitudinal crack in the east slab three feet from centerline and extending one and one-half feet north and two feet south of the joint. August 8, 1948.
- 504+80 - Longitudinal crack beginning at joint in west slab four feet from centerline and extending south full length of slab and six feet into the next slab. August 8, 1948.

SECTION 1. Sta. 510+00 to Sta. 560+00.

No Expansion Joints. - Contraction Joints spaced 20 ft. No load transfer. 9"-7"-9" Section.

- 510+12 - Transverse crack starts edge west slab, extends through west slab and two feet six inches into east slab. August 28, 1942.

- 512+75 - Fine transverse crack full width of west slab.
February 2, 1949.
- 512+80 - Transverse crack extends entire width of pavement,
north end of triple eight foot culvert.
December 1, 1947.
- 513+09 - Transverse crack across entire width of pavement.
August 8, 1948.
- 517+98 - Transverse crack starts edge west slab, extends
seven feet into slab. October 5, 1945. Extends
to center line, December 1, 1947.
- 518+14 - Transverse crack starts edge west slab, extends
five feet toward centerline. December 1, 1947.
- 519+04 - Longitudinal crack 18 inches from edge east slab,
extends one foot north from joint. December 1,
1947.
- 529+74 - Transverse crack full width of west slab.
February 2, 1949.
- 523+47 - Spalling at centerline approximately one square
foot area. February 2, 1949.
- 533+23 - Spalling at joint at centerline, approximately
one square foot area, north of joint and east
of centerline. August 8, 1948.
- 539+28 - Surface crack two feet long in east slab.
October 4, 1945.
- 539+94 - Transverse crack starts edge west slab and extends
across west slab and four feet into east slab.
October 5, 1943. Extends seven feet into east
slab. February 2, 1949.
- 540+03 - Fine longitudinal crack in east slab two and one-half
feet from centerline, and extending two feet
north and four feet south of joint. August 8,
1948.
- 542+22 - Longitudinal cracks, one foot from edge of west
slab, across contraction joint one and one-half
feet north, two feet south. Autogenous healing
begun. October 4, 1945.
- 542+83 - Nine square feet. Map cracking around center
joint, patched with black top, where surface has
disintegrated. May 22, 1945.
- 547+15 - Transverse crack across entire width of pavement.
June 9, 1943.

560+00 - Longitudinal crack four feet from west edge of slab extending seven feet north and four feet south of joint. February 2, 1949.

STANDARD SECTION. Sta. 560+00 to Sta. 630+00.

Expansion Joints spaced 120 ft. Contraction Joints spaced 30 ft. Load transfer in both - 44# wire fabric reinforcement. 9"-7"-9" Section.

- 560+53 - Transverse crack across full width of west slab and extending three feet into east slab. August 8, 1948.
- 561+31 - Longitudinal crack three feet from west edge of slab and extending three feet north and south of joint. February 2, 1949.
- 565+30 - Transverse crack starts edge east slab, extends to centerline. November 2, 1944. Extends three feet into west slab. February 2, 1949.
- 565+38 - Fine transverse crack starts edge west slab, extends to center line. October 4, 1945.
- 567+48 - Transverse crack starts edge west slab, extends to center line. October 5, 1943.
- 567+78 - Fine transverse crack five feet long in east slab. May 22, 1945.
- 567+80 - Transverse crack starts edge west slab, extends to centerline. October 5, 1943.
- 568+80 - Fine transverse crack starts centerline, extends two feet into west slab. June 27, 1946. Full width of west slab. February 2, 1949.
- 569+34 - Approximately one square foot spalled area mid-way of west slab. August 8, 1948.
- 572+71 - Irregular cracking south of joint and on each side of centerline over an area of approximately 25 square feet. August 8, 1949.
- 572+85 - Closed transverse crack starts edge east slab, extends three feet. November 2, 1944.
- 573+30 - Closed longitudinal crack two and one-half feet from edge east slab, extends eight inches south from joint. Surface crack eighteen inches long, just south of this crack. June 27, 1946.
- 573+60 - Longitudinal crack from contraction joint, six inches east of centerline, extends two feet north to centerline. October 4, 1945. Spalled out, August 6, 1947.

- 577+39 - Transverse crack across entire width of pavement (over pipe culvert). August 28, 1942.
- 577+98 - Fine transverse crack starts edge east slab, extends five feet into slab. October 4, 1945.
- 579+42 - Transverse crack across entire width of pavement. Straight crack; believed that construction joint was made, then broken down and paving operations continued. August 28, 1942.
- 580+36 - Transverse crack starts edge east slab, extends three feet into slab. October 4, 1945.
- 583+12 - Closed transverse crack starts two feet from edge east slab. Autogenous healing begun. October 5, 1943.
- 584+17 - Transverse crack full width west slab. February 2, 1949.
- 585+36 - Transverse crack starts edge east slab, extends seven feet into slab. October 4, 1945. Extends to center line, December 1, 1947.
- 586+11 - Spalling in east slab along centerline and south of joint. February 2, 1949.
- 590+45 - Transverse crack starts edge east slab, extends three feet into west slab. October 27, 1942.
- 593+02 - Slight spalling at intersection of joint and centerline. August 8, 1948.
- 593+56 - Spalling 1' x 1/2' one foot west of centerline caused by wood block. August 6, 1947.
- 594+07 - Fine transverse crack starts one foot from edge east slab, extends seven feet into slab. October 4, 1945.
- 594+25 - Spalling along centerline begun and extends for approximately twenty feet. August 8, 1948.
- 603+60 - Transverse crack full width of west slab. February 2, 1949.
- 604+52 - Transverse crack full width of west slab. February 2, 1949.
- 604+70 - Fine transverse crack starts at west edge of slab and extends three feet toward centerline. August 8, 1948.
- 604+73 - Interior break, 2' x 2', east of centerline and north of construction joint. August 8, 1948.

- 605+48 - Transverse crack extends from west edge of slab eight feet toward centerline. February 2, 1949.
- 607+98 - Transverse crack starts at west edge of slab and extends five feet toward centerline. February 2, 1949.
- 611+72 - Transverse crack starts edge west slab and extends to centerline. October 5, 1943.
- 611+97 - Transverse crack starts edge east slab and extends to centerline. October 27, 1942.
- 612+55 - Fine transverse crack starts edge west slab, extends five feet into slab. October 4, 1945.
Extends eight feet into slab. February 2, 1949.
- 616+50 - Fine longitudinal crack in west slab four feet from edge and extends three feet north and south from joint. August 8, 1948.
- 616+95 - Transverse crack across full width of east slab. August 8, 1948.
- 618+18 - Fine transverse crack starts edge west slab, extends seven feet through core hole. October 4, 1945. Full width of west slab. August 8, 1948.
- 618+46 - Transverse crack starts edge west slab and extends to centerline. May 16, 1944. Full width of pavement. February 2, 1949.
- 619+06 - Transverse crack starts edge west slab and extends to centerline. October 5, 1943.
- 628+07 - Fine transverse crack starts edge east slab, extends four feet into slab. November 2, 1944.
- 629+23 - Fine transverse closed crack starts centerline, extends one foot into west slab. December 6, 1946. Extends three feet into west slab. August 6, 1947.
- 629+30 - Fine longitudinal starts at construction joint at center of west slab and extends six feet south. February 2, 1949.

REPEAT SECTIONS

SECTION 1. Omitted in repeat sections.

SECTION 2. Sta. 630+00 to Sta. 655+00.

Expansion Joints spaced 800 ft. Contraction Joints spaced 20 ft. Load transfer in Expansion Joints only. 9"-7"-9" Section.

- 630+20 - Longitudinal crack four feet from edge west slab, extends six feet south and five feet north from joint. August 6, 1947. Extends twenty feet south to next joint. December 1, 1947. Extends twenty feet south and fifteen feet north. February 2, 1949.
- 630+20 - Longitudinal crack in east slab four feet from centerline extends ten feet north and five feet south from joint. August 8, 1948.
- 630+43 - Longitudinal crack in east slab two and one-half feet from centerline extends seven feet south. February 2, 1949.
- 633+20 - Fine longitudinal crack one foot from west edge of slab extends one and one-half feet north from joint. Autogenous healing in progress. February 2, 1949.
- 636+60 - Longitudinal crack three feet from edge of east slab, extends two feet north and two feet south from joint. December 1, 1947.
- 638+08 - Crack starts edge east slab and extends to centerline. October 27, 1942.
- 640+00 - Longitudinal crack four feet from edge of east slab, extends three feet north and two and one-half feet south. Autogenous healing progressing. June 9, 1943.
- 640+20 - Closed longitudinal crack three feet from edge of east slab, extends 18 inches north and 16 inches south of contraction joint. Autogenous healing progressing. October 27, 1942.
- 640+60 - Longitudinal crack three feet four inches from edge of east slab, extends six inches north and 12 inches south of contraction joint. November 2, 1944.
- 640+60 - Longitudinal crack leaves above crack eight inches south of joint, extends diagonally toward centerline four feet. October 4, 1945. Above cracks have joined.. February 2, 1949.

- 641+00 - Longitudinal crack in center of west slab extends eight feet north from joint. August 8, 1948.
- 641+88 - Closed crack starts two feet from edge of east slab, extends four feet into west slab. October 4, 1945. Across full width of east slab. February 2, 1949.
- 650+00 - Longitudinal crack in center of west slab extends six feet north and seven feet south of joint. February 2, 1949.
- 650+20 - Closed longitudinal crack three feet from edge west slab, extends one foot south. October 4, 1945. Extends four feet south. February 2, 1949.
- 652+80 - Closed longitudinal cracks at contraction joint. October 27, 1942.
 No. 1 - 36 inches from edge west slab, extends 20 inches south.
 No. 2 - 41 inches from edge west slab, extends 24 inches north.
 Autogenous healing progressing.
- SECTION 3. Sta. 655+00 to Sta. 680+00.
- Expansion Joints spaced 400 ft. Contraction Joints spaced 20 ft. Load transfer in Expansion Joint only. 9"-7"-9" Section.
- 661+60 - Closed longitudinal crack across contraction joint, three feet from edge east slab, extends 22 inches north, 16 inches south. Autogenous healing progressing. June 9, 1943.
- 664+40 - Fine longitudinal crack in west slab three feet from the edge and extends ten feet south from joint. February 2, 1949.
- 664+40 - Small amount of spalling at corner of drop inlet and joint. February 2, 1949.
- 665+88 - Crack across entire width of pavement over box culvert. May 16, 1944.
- 676+20 - Longitudinal crack in center of east slab extending two feet north and three and one-half feet south of joint. August 8, 1948.
- 676+40 - Longitudinal crack two feet from edge of east slab, extends one foot north from joint. December 1, 1947.
- 677+00 - Longitudinal crack across contraction joint, six feet from edge east slab, extends 8 inches north, 11 inches south. Closed. June 9, 1943.

- 677+80 - Closed longitudinal cracks, 2 feet 4 inches from edge east slab, extends five feet north, four feet south. October 4, 1945. Extends five feet north, six feet south. August 6, 1947.
- 677+80 - Closed longitudinal crack five feet from edge of west slab, extends two feet south. August 6, 1947.
- 678+00 - Closed longitudinal crack five feet from edge of west slab, extends four and one-half feet north and four and one-half feet south of contraction joint. August 6, 1947.
- 678+40 - Longitudinal crack four feet from west edge of slab and extends two and one-half feet south from joint. February 2, 1949.

SECTION 4. Sta. 680+00 to Sta. 695+00.

Expansion Joints spaced 120 ft. Contraction Joints spaced 20 ft. Load transfer in Expansion Joints only. 9"-7"-9" Section.

- 680+93 - Transverse crack extending from centerline three feet into east slab. February 2, 1949.
- 681+01 - Interior break 4' x 4', in east slab north of joint. August 8, 1948.
- 682+01 - Longitudinal crack in west slab two feet from edge, and extending three feet south of joint. August 8, 1948.
- 682+07 - Transverse crack across full width of west slab. August 8, 1948.
- 682+40 - Longitudinal crack across contraction joint, 30 inches from edge east slab, extends 21 inches north, 8 inches south. Closed. November 2, 1944.
- 686+40 - Slab south side of joint settled one inch over culvert. December 1, 1947.
- 687+60 - Longitudinal crack in center of west slab extending six feet north from joint. Longitudinal crack in east slab three feet from centerline and extending six inches north and 18 inches south. August 8, 1948.
- 688+00 - Closed longitudinal crack five feet from edge of west slab, extends four feet north. August 6, 1947.
- 688+40 - Closed longitudinal crack five feet from edge of west slab, extends three feet north, three feet south. August 6, 1947.

- 688+60 - Closed longitudinal crack five feet from edge of west slab, extends two feet south. August 6, 1947.
- 689+00 - Closed longitudinal crack five feet from edge of west slab, extends one foot north. August 6, 1947. Extends five feet south. August 8, 1948.
- 690+20 - Expansion joint cracked and spalled at centerline. October 27, 1942.
- 691+20 - Closed longitudinal crack five feet from edge of west slab, extends two feet north. August 6, 1947.
- 691+60 - Closed longitudinal crack five feet from edge of west slab, extends three feet north, four feet south. August 6, 1947.
- 692+26 - Crack starts three feet from edge of east slab and extends to centerline. August 6, 1947.
- 692+80 - Surface spalling in east slab. June 27, 1946.
- 692+92 - Closed surface crack starts centerline, extends two and one-half feet into west slab. October 4, 1945.
- 693+19 - Crack across entire width of pavement. June 30, 1942.
- 693+60 - Closed longitudinal crack five feet from edge of west slab, extends two and one-half feet north and three feet south. August 6, 1947. Longitudinal crack three feet from centerline in east slab extends two feet north. July 8, 1948.
- 694+00 - Closed longitudinal crack five feet from edge of west slab, extends six feet north. August 6, 1947. Extends eight feet north.
- 694+08 - Transverse crack extending from centerline five feet into west slab. August 8, 1948.
- 694+20 - Closed longitudinal crack five feet from edge of west slab, extends two and one-half feet north. August 6, 1947.
- 694+80 - Longitudinal crack in east slab two and one-half feet from centerline, and extending two and one-half feet south of joint. August 8, 1948.

SECTION 5. Sta. 695+00 to Sta. 710+00.

Expansion Joints spaced 120 ft. Contraction Joints spaced 20 ft. Load transfer in both. 9"-7"-9" Section.

- 700+60 - Closed longitudinal crack 18 inches from edge east slab, extends from joint eight inches south. June 27, 1946. Extends one foot north. August 8, 1948.
- 700+80 - Fine transverse crack one and one-half feet from edge east slab, and extending one and one-half feet north and south of joint. August 8, 1948.
- 701+40 - Closed longitudinal crack 18 inches from edge of east slab, extends 16 inches north. August 6, 1947.
- 701+92 - Crack starts at edge of east slab and extends to centerline. August 6, 1947.
- 705+55 - Crack starts edge west slab, extends to centerline. December 1, 1947.
- 708+12 - Transverse crack across full width of pavement. February 2, 1949.
- 709+00 - Interior break, 3' x 5' in west slab south of joint. February 2, 1949.
- 709+03 - Transverse crack across east slab joining corner break and extending diagonally to east edge. February 2, 1949.
- 709+50 - Crack across east slab to centerline. October 27, 1942.
- 709+50 - Two foot fork south of crack, extends to edge of east slab, and longitudinal crack three feet from edge of east slab, extends three feet north from above crack. December 1, 1947.
- 709+80 - Two exterior breaks, 4' x 3' north and south of joint in east slab. Longitudinal crack starting at junction of corner breaks with joint and extending six feet south of joint and curving to east edge of slab. August 8, 1948.
- 709+92 - Crack starts edge east slab, extends to centerline. October 5, 1943.

SECTION 6. Sta. 710+00 to Sta. 725+00.

Expansion Joints and Contraction Joints spaced alternately. Load transfer in both. - 70# wire fabric reinforcement. 9"-7"-9" Section.

- 711+60 - Fine crack starts edge east slab, extends four feet into slab. December 9, 1946. Extends to centerline. February 2, 1949.

- 711+85 - to 713+00 - Fine surface cracks in west slab.
October 4, 1945.
- 711+95 - Transverse crack in west slab starting one foot from edge of slab and extending five feet toward centerline. February 2, 1949.
- 712+10 - Transverse crack in west slab extending from edge five feet toward centerline. February 2, 1949.
- 712+20 - Closed fine crack starts edge east slab, extends four feet into slab. October 4, 1945.
- 712+40 - Closed longitudinal crack eighteen inches from edge west slab, extends one foot north, six inches south. August 6, 1947.
- 713+42 - Closed fine crack starts edge west slab, extends five feet into slab. October 4, 1945. Extends to centerline.
- 714+42 - Fine closed crack starts centerline, extends 14 inches into west slab. June 27, 1946.
- 718+75 - Fine closed crack starts centerline, extends three feet into east slab. June 27, 1946.
- 719+36 - Fine closed crack starts centerline, extends six feet into east slab. June 27, 1946.
- 719+43 - Fine closed crack starts edge west slab, extends three feet into slab. December 9, 1946.
- 720+65 - Crack starts edge west slab, extends eight feet into slab. October 27, 1942.
- 721+15 - Crack starts edge east slab, extends six feet into slab. October 27, 1942. Extends to centerline. February 2, 1949.
- 721+04 - Transverse crack full width of west slab.
August 8, 1948.
- 721+15 - Transverse crack in east slab extending from edge of slab six feet toward centerline. February 2, 1949.
- 721+72 - Closed fine crack starts edge west slab, extends four and one-half feet into slab. October 4, 1945. Extends to centerline. February 2, 1949.
- 721+75 - Crack starts edge east slab, extends to centerline. October 27, 1942.
- 722+92 - Fine closed crack starts centerline, extends 18 inches into east slab. June 27, 1946.

724+80 - Crack starts edge west slab, extends one foot into east slab. October 4, 1945. Extends to centerline. December 1, 1947.

SECTION 7. Sta. 725+00 to Sta. 737+00. - End of Project.

Expansion Joints spaced 120 ft. Contraction Joints spaced 20 ft. No load transfer - Uniform 7" Section.

725+20 - Fine longitudinal cracks in west slab six inches from the edge and extending thirty inches north and south from joint. August 8, 1948.

725+36 - Irregular transverse crack, begins at west edge and extends to centerline. August 8, 1948.

725+40 - Exterior corner break, 3' x 4', in west slab north of joint. Longitudinal crack in west slab three feet from edge extending four feet north and one foot south of joint. August 8, 1948.

729+18 - Crack starts edge of west slab and extends to centerline. December 1, 1947.

729+20 - Interior break, 1' x 1', in east slab north of joint. February 2, 1949.

730+60 - Fine longitudinal crack in west slab four feet from the edge, and extending two feet north and south of joint. February 2, 1949.

732+30 - Crack across entire width of pavement. (over box culvert). May 16, 1944.

737+00 - Irregular cracking at end of pavement. August 8, 1948.

Note: Lip curb box inlets at Sta. 619+80, 668+00, 683+00, 686+00 all placed within two feet of joints, have developed cracks from outer corner, over to joints.

Lip curb box inlets at St. 422+97, 692+27, and 717+03 have developed cracks parrallel to edges and extending into the pavement to form transverse cracks.