STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION
DIVISION OF NEW TECHNOLOGY,
MATERIALS AND RESEARCH

AN INVESTIGATION OF AC PAVEMENT DISTRESS ON INTERSTATE 15 FROM CAJON PASS TO THE NEVADA STATE LINE

Final Report No. CA/TL-92/06
Caltrans Study 643394

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16. Abstract

This study pertains to 163 miles of 4 to 8-lane asphalt concrete (AC) pavement that developed a considerable amount of premature distress. Because the pavement on this route is considered to be representative of other routes in Districts 8, 9, and 11, this investigation to try and determine the reasons for the premature distress was conducted. The history, performance, and climatological data for Route 15 from Cajon Pass to the Nevada state line were studied. A considerable amount of coring and testing was done to determine several physical properties of the top 3 inches ± of the AC. Pavement deflection and traffic data were also obtained for this investigation.

It was concluded that most of the factors studied could not be assigned as the cause of the premature distress that occurred. It was recommended that careful attention be given to the amount of minus 200 material in the design mix vs. the job mix, that the target asphalt content not be reduced from that determined in the lab unless supported by job-specific data, and that considerable effort be expended to protect against the placement of moisture sensitive asphalt concrete.

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CONVERSION FACTORS

English to Metric System (SI) of Measurement

Quality	English Unit	Multiply By	To Get Metric Equivalent
Length	inches (in) or (")	25.40	millimetres (mm)
		.02540	metres (m)
	feet (ft) or (')	.3048	metres (m)
	miles (mi)	1.609	kilometres (km)
Area	square inches (in ^{2})	6.432×10^{-4}	square metres (m ^{2})
	square feet (ft ^{2})	.09290	square metres m ^{2})
	acres	.4047	hectares (ha)
Volume	gallons (gal)	3.785	litre (l)
	cubic feet (ft ^{3})	.02832	cubic metres (m ^{3})
	cubic yards (yd ^{3})	.7646	cubic metres (m ^{3})
Volume/Time	cubic feet per		
(Flow)	second (ft ^{3}/s)	28.317	litres per second (l/s)
	gallons per minute (gal/min)	.06309	litres per second (l/s)
Mass	pounds (lb)	.4536	kilograms (kg)
Velocity	miles per hour (mph)	.4470	metres per second (m/s)
	feet per second (fps)	.3048	metres per second (m/s)
Acceleration	feet per second squared (ft/s ^{2})	.3048	metres per second squared (m/s ^{2})
	acceleration due to force of gravity (G)	9.807	metres per second squared (m/s ^{2})
Density	(lb/ft ^{3})	16.02	kilograms per cubic metre (kg/m ^{3})
Force	pounds (lb)	4.448	newtons (N)
	kips (1000 lb)	4448	newtons (N)
Thermal Energy	British thermal unit (Btu)	1055	joules (J)
Mechanical Energy	foot-pounds (ft-lb)	1.356	joules (J)
	foot-kips (ft-k)	1356	joules (J)
Bending Moment or Torque	inch-pounds (in-lb)	.1130	newton metres (Nm)
	foot-pounds (ft-lb)	1.356	newton-metres (Nm)
Pressure	pounds per square inch (psi)	6895	pascals (Pa)
	pounds per square foot (psf)	47.88	pascals (Pa)
Plane Angle	degrees (°)	0.0175	radians (rad)
Temperature	degrees fahrenheit (°)	$\frac{°F - 32}{1.8} = °C$	degrees celsius (° C)
Concentration	parts per million (ppm)	1	milligrams per kilogram (mg/kg)

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INTRODUCTION

During the early 1980's, several reports of premature asphalt concrete (AC) pavement distress on Interstate 15 between Cajon Pass and the Nevada State Line were received from District 8. This roadway is a heavily traveled multi-lane freeway that had been rehabilitated with AC overlays of conventional and recycled hot mix constructed via a series of pavement rehabilitation contracts. The AC surfacing was less than nine years old at the time of this study. The pavement distress had developed throughout this 163 mile segment of I-15 (Figures 1-8). In many locations, this had occurred within four years of construction. A few reports of premature AC pavement distress were also coming in from other Caltrans districts. Although these problems generally involved conventional asphalt mixtures, distress was also being reported in hot recycled mixtures.

The type of cracking on I-15 and at these other locations included longitudinal, transverse or block, and alligator and/or ladder cracking (cracking identified as load associated and directly related to base deficiency). Thus, the District 8 problems appeared to be representative of many of those in the other districts so a decision was made to attempt to identify the reason(s) for the premature distress on I-15 in District 8. Only the asphalt concrete in the upper 3 inches of the pavement was studied. The investigation was limited to only this portion of the structural section because the pavement exhibiting this premature distress had been placed to rehabilitate the underlying structural section. Thus, the problem(s) seemed to be associated with only this most recently placed pavement. The factors selected for this study included the following:

1. Climate.
2. Traffic
3. The composition and condition of the pavement.
4. AC mix design.
5. AC quality.
6. Pavement deflections

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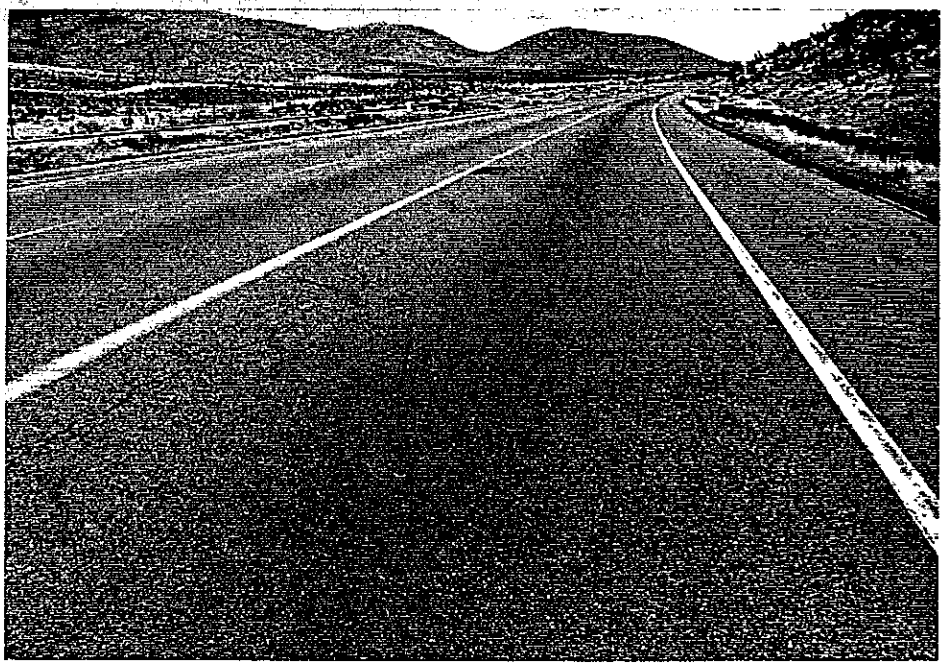

FIGURE 1

FIGURE 2

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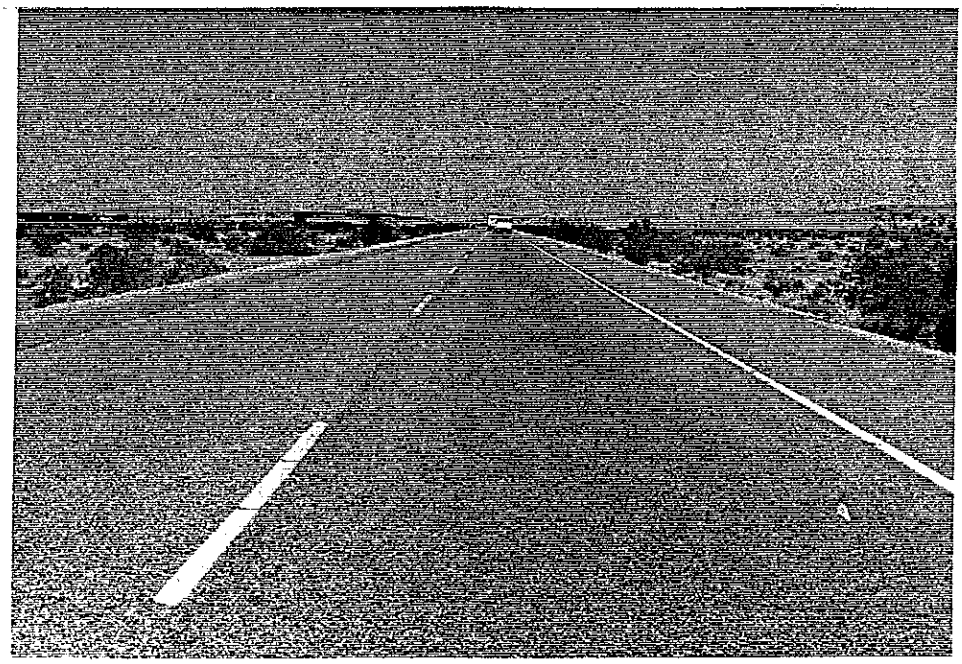

FIGURE 3

FIGURE 4

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CONCLUSIONS AND RECOMMENDATIONS

The findings of this study resulted in the following conclusions and recommendations:

1. The asphalt concrete was "weakened" due to moisture vapor action in this desert climate.

2. The design traffic was exceeded but not at a rate that would cause premature distress of the severity observed within four years or less.

3. The relative compaction of the asphalt concrete pavement was adequate.

4. The gradation of the aggregate used in the asphalt concrete was generally within specifications. The only exception was the minus 200, which was about 2% above that assumed when designing the mix.

5. The other aggregate properties complied with specifications.

6. The asphalt contents were consistently 0.3% - 0.8% below the design amount determined per District 8 laboratory testing. This, in conjunction with the higher then anticipated quantity of minus 200 material, resulted in a dry mix and therefore contributed to the premature distress.

7. The as-built and aged properties of the asphalt did not contribute to the widespread distress that developed.

8. The structural sections after rehabilitation were structurally adequate. Thus, the premature distress was not due to inadequate AC design thickness.

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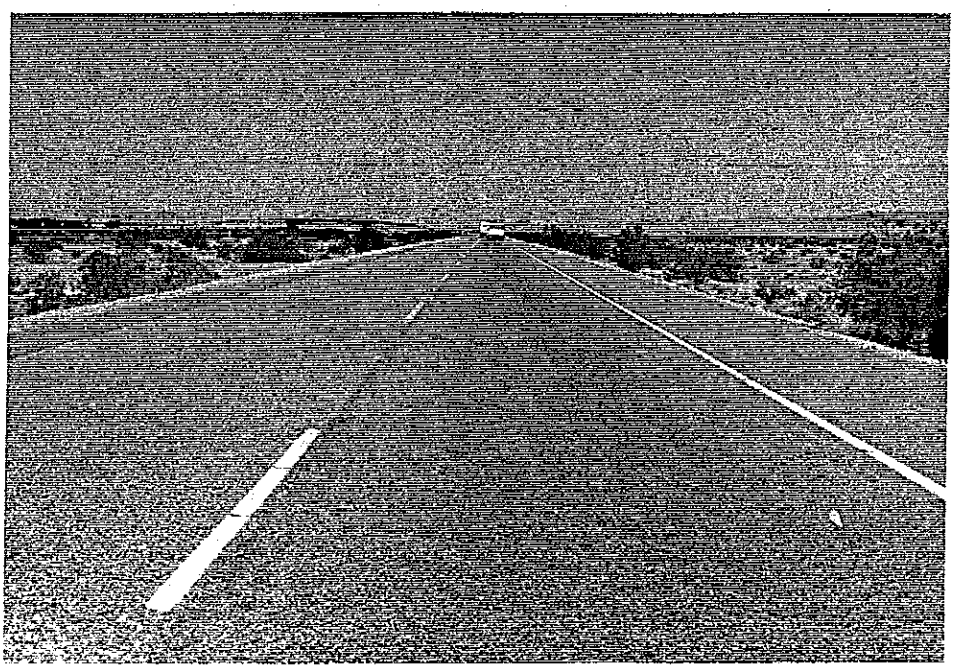

FIGURE 3

FIGURE 4

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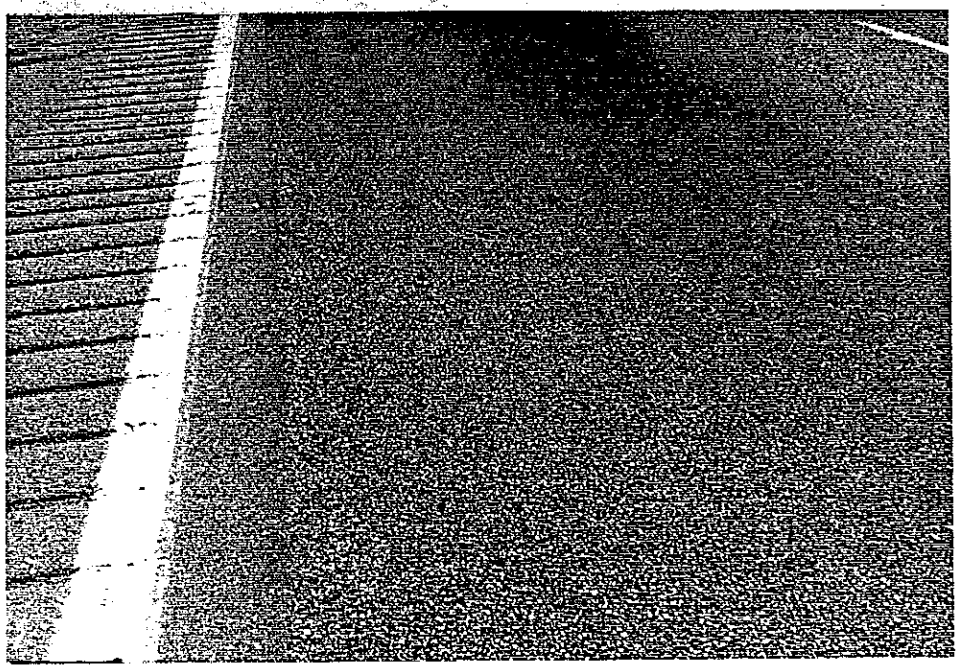

FIGURE 5

FIGURE 6

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9. It is recommended that the design asphalt content, rather than a reduced amount, be used unless job-specific test results dictate a deviation from this amount.

10. It is recommended that particular attention be given to the amount of minus 200 in the design mix vs the mix as placed.

11. It is recommended that standard and additional tests of AC moisture sensitivity be utilized and that these tests be run frequently to provide a better likelihood that the AC will have good resistance to moisture and moisture vapor.

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IMPLEMENTATION

Copies of this report will be provided to all District Materials Engineers and implementation of the recommendations will be discussed with District 8 personnel. Office of Pavement personnel will assist District 8 personnel in developing necessary procedural changes to ensure a greater likelihood that less moisture sensitive AC will be placed in the desert of this District.

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DISCUSSION

General

One of the first decisions pertaining to the conduct of this study was that of scope. It was first suggested that all the materials from the subgrade to the surface be considered. However, after considerable discussion, it was concluded that because the majority of the distress appeared to be associated with the ingredients and/or properties of the asphalt mix placed as part of the most recent I-15 contracts, it would be appropriate to confine the study to the top 3 inches ± of the dense graded AC. Where the pavement surface was OGAC, this OGAC would be removed prior to testing to assure that only the dense graded AC was being evaluated. It was theorized that the premature AC distress that was occurring might be associated with climate, AC mix design and quality, the composition and/or condition of the underlying pavement, and traffic so, as stated previously, all these factors were included in this study.

History

Interstate 15 between Cajon Pass and the California-Nevada border was constructed to freeway standards between 1959 and 1971 (Table 1). In many cases, the freeway structural sections were constructed at least in part on old existing roadways. The original freeway structural sections contained various combinations of materials. In all cases, a thin OGAC surfacing was placed on new DGAC. The DGAC was placed on existing pavement, CTB (road or plant mixed, Class A or B or C) or AB (various classes). The CTB was placed on AB or ASB in all but one case.

These original structural sections provided fair service. The age at the time of rehabilitation varied from 7 years to 20 years with a mean of 14.1 years (Table 1). The age to first distress of the "rehabilitated" pavements, however, was often four years or less. Although this distress was not severe enough nor extensive enough to warrant another immediate rehab project in most cases, it did indicate that these AC overlays had some deficiencies.

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Table No. 1
Construction Chronology

Post Mile	Original Construction	Rehab		Age at 1st Rehab (years)
		First	Second	
27.3-31.1	1966	1979		13
31.1-34.0	1965	1979		14
34.0-40.6	1966	1979		13
40.6-44.0	1971	1979	1985	8
44.0-53.8	1959	1979		20
53.8-72.7	1959	1969	1981	10
72.7-81.3	1961	1980		19
81.3-104.3	1964	1980		16
104.3-121.9	1964	1983		19
121.9-138.4	1965	1983		18
138.4-163.5	1961	1979	1983	18
	1969*	1979	1983	10
163.5-186.2	1963	1976	1989	13
	1969*	1976	1989	7

* Added a truck climbing lane

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Prior to 1983, District 8 always included an open-graded asphalt concrete (OGAC) surfacing in all its AC projects. This was done to help protect the surface of the DGAC from weathering as well as to provide a good nonskid surface. However, in 1983 a Caltrans Value Engineering study revealed that by restricting the use of OGAC to areas of specific need such as those having high rainfall, an annual savings of nearly 2 million dollars could be realized. This resulted in the elimination of District 8's routine use of OGAC surface courses in the desert.

In a 1965 investigation by Forsyth (1), block cracking from PM 43.5 to 72.8 (near Barstow) was attributed primarily to premature hardening or embrittlement of the asphalt binder. That report states that this was probably the result of:

1) "A paving operation conducted in the late fall when low air and surface temperatures make adequate compaction of the AC mix extremely difficult. Inadequate densification invariably has an adverse effect upon the weathering rate of the mix allowing relatively easy admission of water and air into the intimate part of the AC mix."

and

2. "The use of weathered AC aggregate containing large amounts of blow sand which presented real difficulties in obtaining specification stability requirements during construction. The problem of mix stability undoubtedly resulted in a low recommended asphalt range which probably reduced asphalt film thickness to a critical level."

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A 1979 investigation of a failure on the Baker grade (4) revealed that an AC mix with marginal resistance to moisture failed because of moisture vapor action that occurred due to an unfortunate combination of construction operations and abnormal rainfall.

Within the limits of this study, four different areas had been hot recycled. These were:

1) Barstow, PM 53.8/71.7, 1981
2) Field to Baker, PM 101.0/139.0, 1983
3) Baker Grade PM 139.0/162.7, 1983
4) Victorville, PM 40.2/43.5, 1985

With the exception of a short test section from 71.2 to 71.7, the project from 139.0 to 162.7 was the only project utilizing recycled mix for the surfacing. The Barstow and Field to Baker projects were surfaced with 0.15 feet and 0.20 feet, respectively, of conventional DGAC. Therefore, because only the top AC lift was analyzed in this study, the only recycled mix studied was that placed on the Baker Grade job (PM 139/162.7).

To gather information for this study, the following steps were taken:

1) Climatological data was obtained for a 10-year period.

2) The compositions of the current structural section (including overlays), lab mix design data, and traffic data were provided by the district.

3) A pavement condition survey was completed.

4) Approximately 800 cores were removed from the pavement and tested.

5) Pavement deflections were obtained for the entire length of pavement included in this study.

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Climate

There is no question that weather influences the performance of asphaltic mixtures. Therefore, rainfall and air temperature data were obtained for the period from 1974 to 1984 (Appendix A). These data were obtained from National Oceanic and Atmospheric Administration's (NOAA) climatological reports for Victorville, Barstow, Baker, and Mountain Pass.

In reviewing the data, the first item considered was the total rainfall for the year. Per newspaper and local reports, the annual rainfall totals for this desert region appeared to have been considerably above normal since 1979. However, data obtained from the NOAA files did not support this in that the annual rainfall that had occurred during the period from 1979 to 1984 in this area was both above and below the average rainfall for the period from 1974 to 1984 (Figures 9-12). These data also revealed that the prime construction season July - October rainfall during the 1979-1984 period was actually somewhat less than that from 1974 to 1979 at both the Victorville and Baker stations (Tables 3-6).

Moisture vapor created as a result of high ambient temperatures can cause severe AC distress. As the vapors rise to the surface, they strip the asphalt from the aggregate. This asphalt is then often deposited in the upper portion of the pavement, thereby creating a critical mix in terms of stability. Thus, both of these phenomena (stripping and asphalt migration) often result in pavement rutting even in the most well designed mixes. Previous studies of pavement vs. ambient temperatures by Caltrans (Figure 13) and other organizations reveal that when ambient temperatures reach 70°F, surface temperatures of 100°F can occur. With higher ambient temperatures, pavement temperatures as high as 180°F have been measured. Thus, it is suspected that vapors generated by prolonged ambient temperatures as low as 95°F may cause damage to AC.

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Fig. 9, Annual Rainfall - Victorville, California

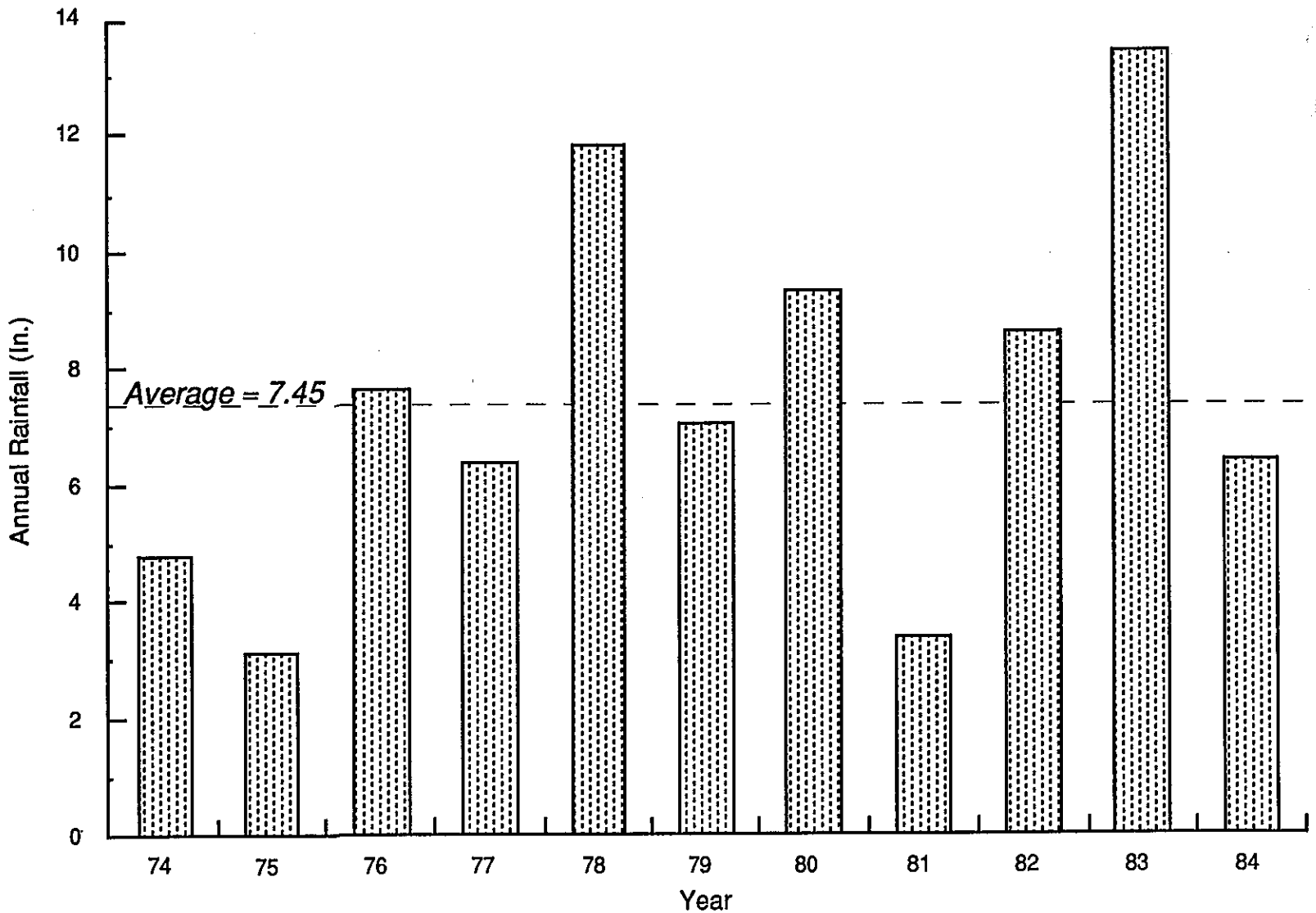

Fig. 10, Annual Rainfall - Barstow, California

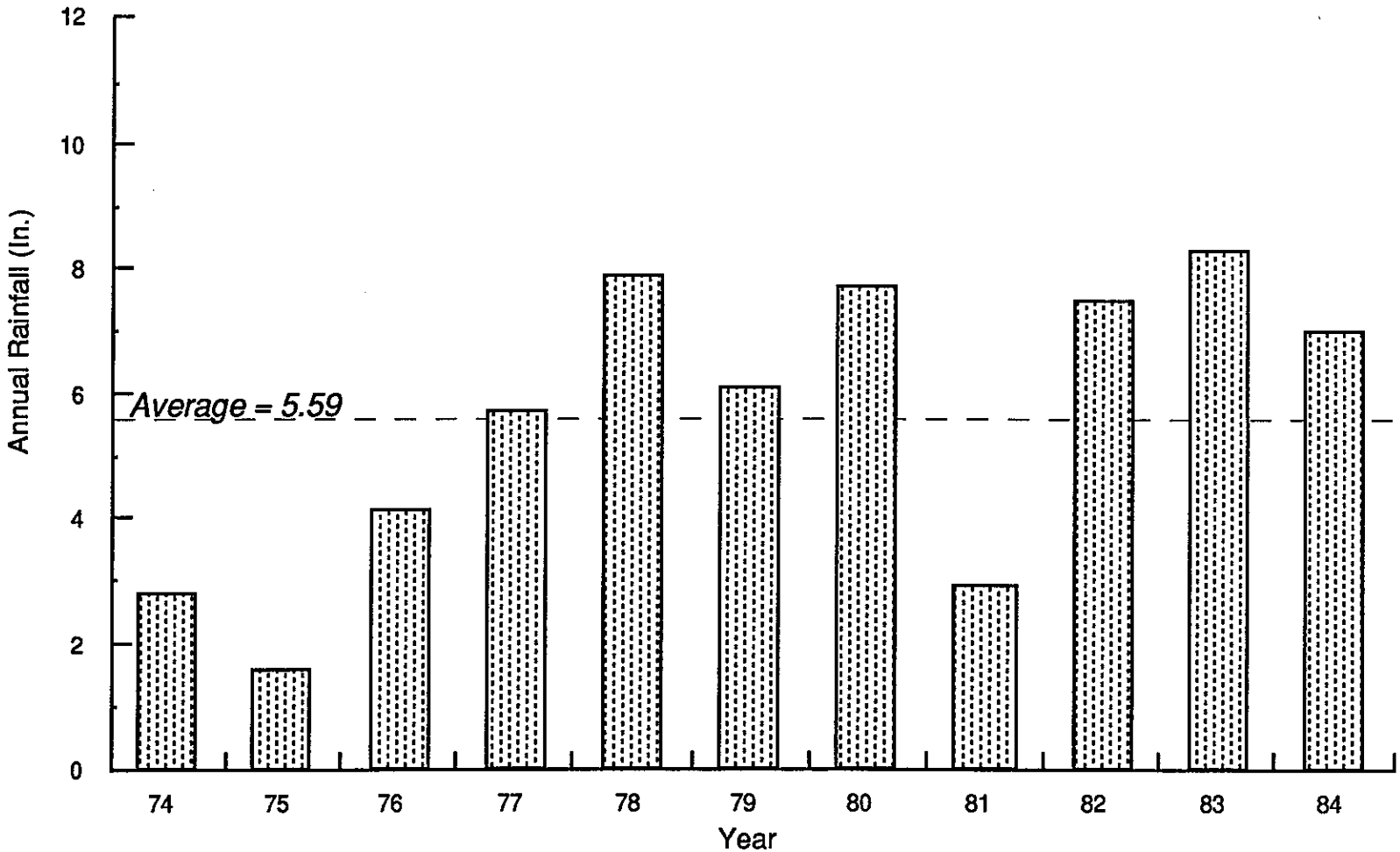

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Fig. 11, Annual Rainfall - Baker, California

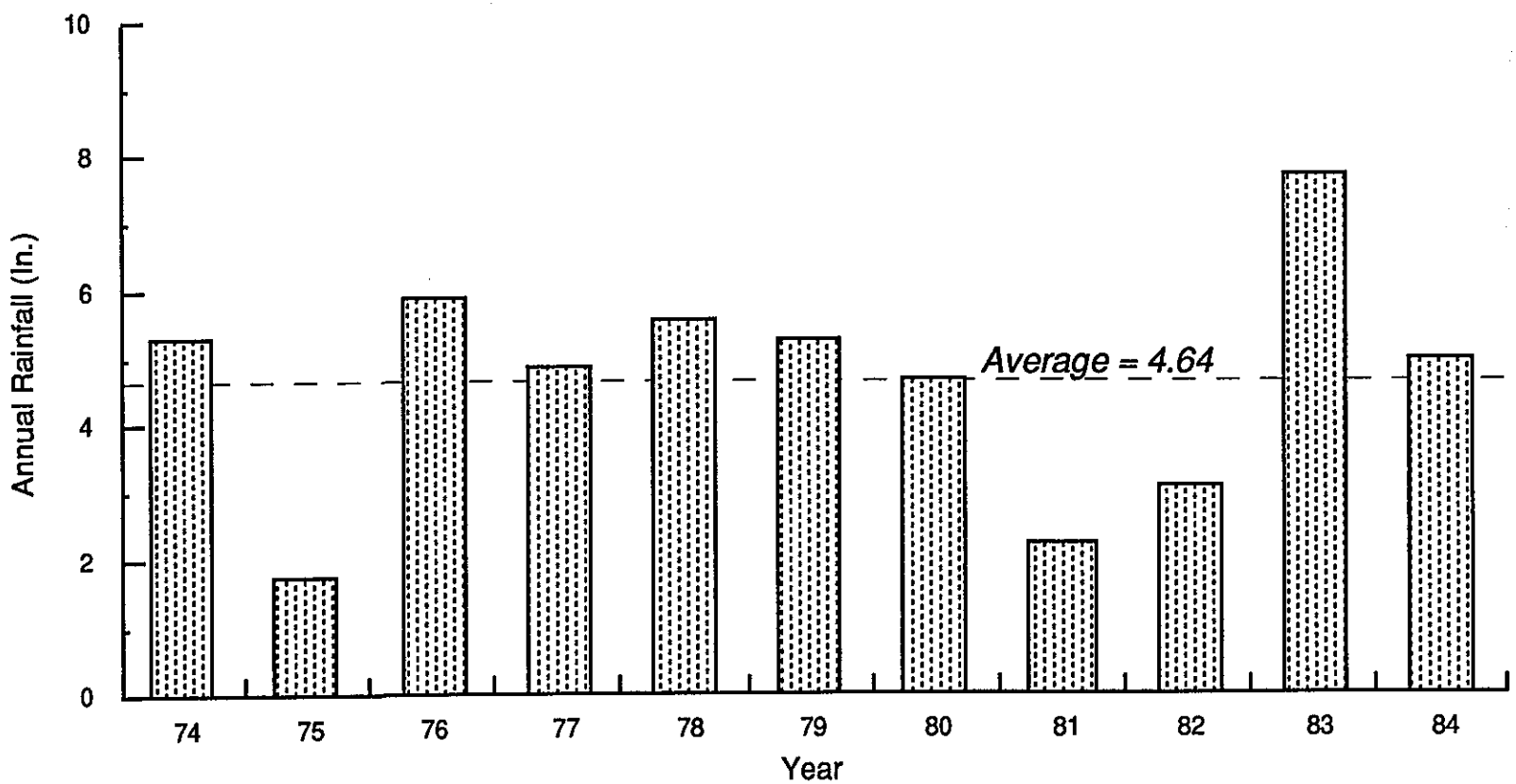

Fig. 12, Annual Rainfall - Mountain Pass, CA

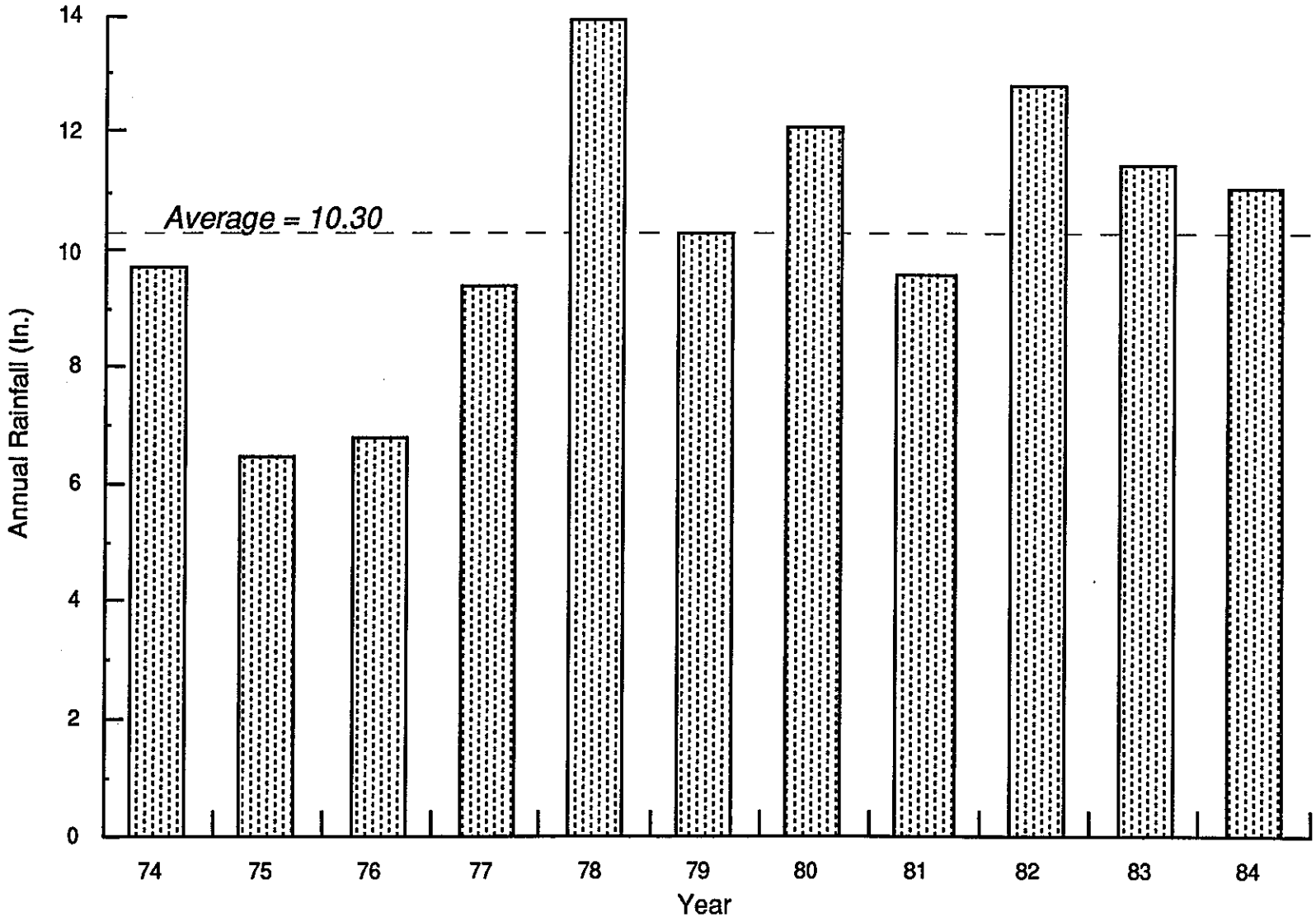

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TABLE 3

Rainfall (July through October)
VICTORVILLE

Year	Total	% of Annual Total (7.45)*	Average Highest Temperature
1974	1.40	18.8	100
1975	0.54	7.2	102
1976	4.75	63.8	100
1977	1.43	19.2	101
1978	1.07	14.4	101
1979	.31	4.2	101
1980	.05	0.7	103
1981	.26	3.5	104
1982	.56	7.5	100
1983	2.52	33.8	101
1984	1.94	26.0	102
Avg.	1.35	18.1	101

* Average annual rainfall for the years 1974 to 1985.

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TABLE 4

Rainfall (July through October)
BARSTOW

Year	Total	% of Annual Total (5.59)*	Average Highest Temperature
1974	0.31	5.5	102
1975	0.40	7.2	104
1976	2.14	37.6	105
1977	1.64	28.8	103
1978	0.52	9.3	103
1979	2.80	50.1	106
1980	0.69	12.2	104
1981	0.86	15.4	100
1982	1.51	27.0	102
1983	2.00	35.8	101
1984	3.57	63.9	103
Avg.	1.48	26.5	103

* Average annual rainfall for the years 1974 to 1985.

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TABLE 5

Rainfall (July through October)
BAKER

Year	Total	% of Annual Total (4.64)*	Average Highest Temperature
1974	2.78	59.9	112
1975	.19	4.1	112
1976	2.77	59.7	111
1977	2.03	43.8	112
1978	0.41	8.8	113
1979	1.12	24.1	112
1980	.36	7.8	117
1981	.55	11.9	112
1982	.69	14.9	111
1983	2.64	56.9	110
1984	2.84	61.2	112
Avg.	1.49	32.1	112

* Average annual rainfall for years 1974 to 1985.

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TABLE 6

Rainfall (July through October)
MOUNTAIN PASS

Year	Total	% of Annual Total (10.30)*	Average Highest Temperature
1974	5.84	56.6	94
1975	2.24	21.7	97
1976	3.93	38.2	97
1977	4.66	45.2	96
1978	1.78	17.3	97
1979	4.72	45.8	98
1980	4.27	41.4	98
1981	4.52	43.8	94
1982	5.16	50.1	99
1983	4.51	43.8	98
1984	7.25	70.3	96
Avg.	4.44	41.4	97

* Average annual rainfall for years 1974 to 1985.

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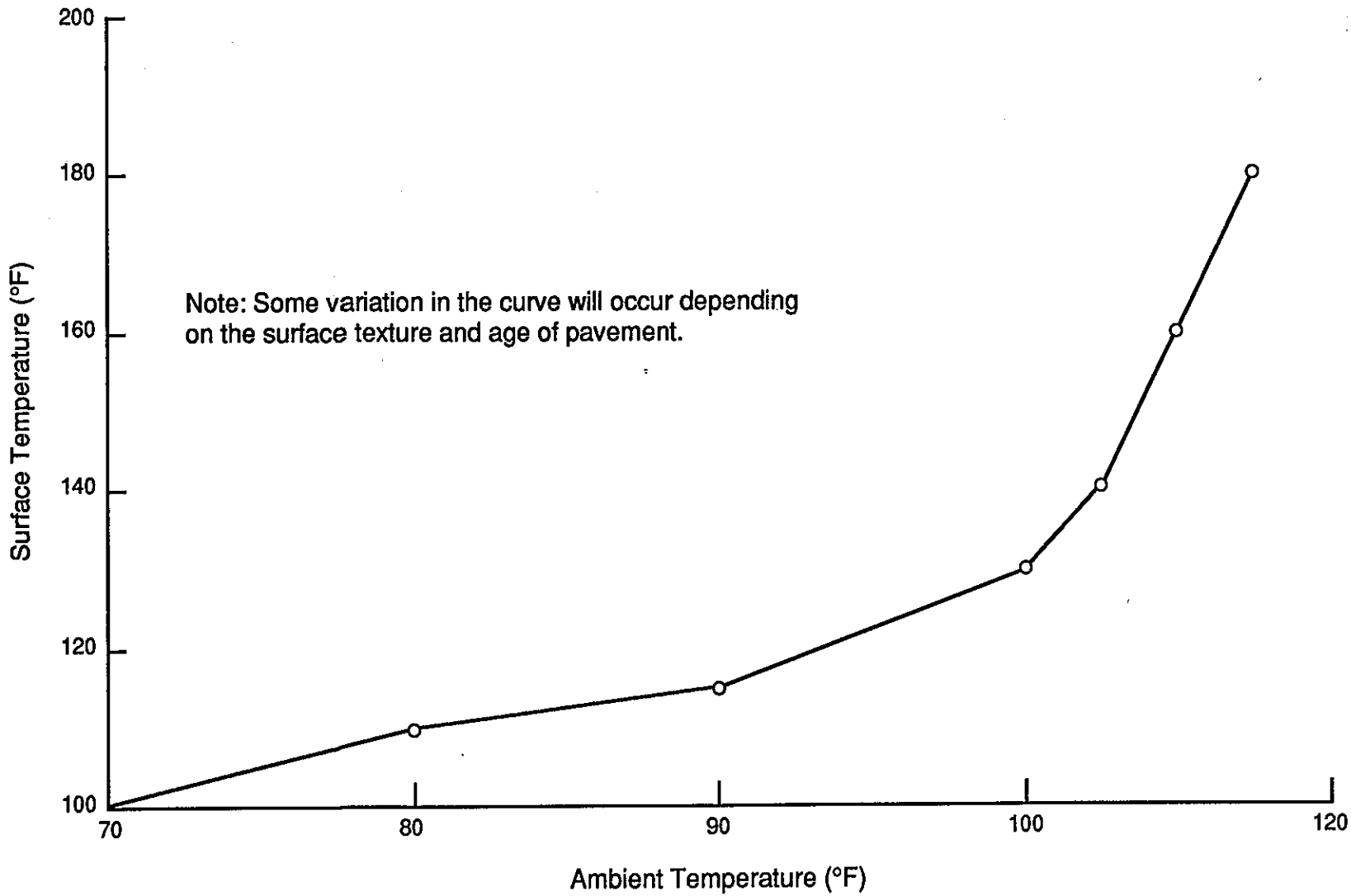
Fig. 13, A.C. Pavement Temperature vs. Ambient Temperature
No Wind



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An average annual index (on a scale ranging from 0-30) for a 10-year period was developed to help identify the potential for moisture vapor distress. An index of zero indicates no likelihood of moisture vapor distress and a value of 30 represents almost certain moisture vapor distress.

To establish this average annual index, an eleven year period was studied (1974 through 1984). Within a given year, the number of times 0.3" or more of rain was followed within five days by ambient temperatures exceeding 80, 90, and 100°F were tallied. Each tallied number was then multiplied by the MVS Factor established for the corresponding temperature (Table 7). The sum of these products is defined as the Moisture Vapor Index. For example, assume that at a given station, rainfall $\geq$0.3" fell on five days and that all of the next five days had temperatures 80°F or above. However, three of the five days were 90°F or above and one day was 100°F or above. The index would be:

Days		Factor		
5	x	1	=	5.0
3	x	1.2	=	3.6
1	x	1.8	=	1.8
Moisture Vapor Index (MVI)			=	10.4

The average index (AMVI) is the sum of 11 annual indexes (1974 thru 1984) divided by 11.

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TABLE 7

MVS FACTORS

Ambient Temperature, °F	Factor (Emperical)
>80	1.0
>90	1.2
>95	1.5
>100	1.8
>115	2.0

MVI Index = Factor x No. of Days at a temperature ≥80 °F following 0.3" of rain.

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The results of these calculations are shown in Table 8. These calculations indicate that the Baker area, with an average index of 6.6 (Table 8), was almost twice as likely to have moisture vapor pavement problems as Barstow, Mountain Pass or Victorville even though it had the least annual rainfall.

To further study the effect of moisture vapor on pavement performance, it became necessary to arbitrarily assign post-mile limits for each weather station. Thus, the following limits were selected:

Station	Post-Mile Limits	Annual Rainfall (1979-1984)	AMVI
Victorville	31/52.5	5.00	3.1
Barstow	52.5/99.5	7.25	3.5
Baker	99.5/170.5	4.50	6.6
Mt. Pass	170.5/186.2	10.50	3.6

These limits were later used to analyze deflection data.

Traffic

An under-estimation of the design traffic (the amount and vehicle mix that will use the pavement during the 10-year design period) is sometimes the reason for the development of premature pavement distress. To examine this possibility, the 10-year Design Traffic for I-15 from post mile 162.7 to 186.2 was compared with the actual traffic. The actual number of one-way ESALs was 3,649,140 (TI of 10.5) whereas the design values were 1,143,506 (TI of 9.0). Similar comparisons at other locations within the limits of this study revealed TI estimates that were 0.5 to 1.0 below the TI's representing actual traffic at almost every location. This suggests that greater then anticipated traffic may have contributed somewhat to the development of premature distress. However, this apparent underestimation of traffic was not "off" enough to result in the "design" traffic occurring within the period of less than four years during which the premature distress developed at many of the I-15 locations studied.

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TABLE 8

MOISTURE VAPOR INDEX (MVI)

	BAKER				BARSTOW			
Year	Above 80°	Above 90°	Above 100°	MVI [1]	Above 80°	Above 90°	Above 100°	MVI
1974	4	1	1	7.0	0	0	0	0
1975	0	0	0	0	1	1	0	2.2
1976	2	2	0	4.4	1	1	0	2.2
1977	4	3	3	18.0	1	1	0	2.2
1978	2	2	1	6.4	1	0	0	1.0
1979	0	0	0	0	3	2	1	7.2
1980	3	2	2	9.0	1	1	0	2.2
1981	1	1	1	5.0	1	1	0	2.2
1982	1	1	1	5.0	1	1	1	2.2
1983	5	3	1	10.4	3	1	0	4.2
1984	3	3	3	12.0	4	4	2	12.4
Average (11 yr.)	MVS	Index	(AMVI)	= 6.6			AMVI	= 3.5

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TABLE 8 (Continued
MOISTURE VAPOR INDEX (MVI)

Year	MOUNTAIN PASS				VICTORVILLE			
	Above 80°	Above 90°	Above 100°	MVI	Above 80°	Above 90°	Above 100°	MVI
1974	2	2	0	4.4	2	2	2	8.0
1975	0	0	0	0.0	0	0	0	0.0
1976	1	0	0	2.0	3	0	0	3.0
1977	5	4	0	9.8	1	1	0	3.2
1978	0	0	0	0.0	1	0	0	1.0
1979	5	1	0	6.2	0	0	0	0.0
1980	2	1	0	3.2	1	0	0	1.0
1981	1	0	0	1.0	0	0	0	0.0
1982	2	0	0	2.0	0	0	0	0.0
1983	1	0	0	1.0	4	3	1	9.4
1984	6	3	0	9.6	2	2	2	8.0
Average (11 yr)	MVS	Index	(AMVI)	= 3.6			(AMVI)	= 3.1

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Field Condition Survey

In October 1985, a pavement field condition survey was made by a team consisting of Tom Scrimsher and Jack Van Kirk from the Office of Pavement, Dean Pitts, formerly of District 8, and Ken Mori from Headquarters Design. At this time coring locations were selected, the limits of each project were identified, and comments concerning the physical appearance of the pavement were recorded (Appendix C). Ratings were assigned corresponding to criteria presented in Table 9. These findings are summarized in Table 10. There is the expected relationship between rating and age of pavement in that newer pavements were in better condition. The findings indicated that premature cracking started after about four years and that the hot recycled jobs were performing about the same as the conventional jobs. The surface around Mt. Pass appeared to be in the poorest condition. This area receives the highest rainfall and contained one of the oldest projects evaluated. District reports indicated that this pavement had been cracking badly for five years. This also supports the observation that premature cracking had been occurring after only four years of service.

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TABLE 9

Rating Criteria for AC Pavements

Rating	
A = Excellent	Minimal amount of cracking with nothing over 1/4" wide; no raveling, rutting, flushing, or potholing.
B = Good	Minimal amount of cracking with nothing over 1/4" wide and/or slight raveling or rutting with no flushing or potholes.
C = Fair	Moderate amount of cracking with some over 1/4" wide and/or moderate traveling, rutting or flushing with no potholes.
D = Poor	Considerable cracking and/or raveling, or rutting, or flushing, or occasional potholes, and/or considerable patching.
F = Failed	In immediate need of maintenance work due to extensive cracking, or rutting, or flushing, or potholing, or raveling, or any combination thereof.

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TABLE 10

SUMMARY OF ROADWAY CONDITION (VISUAL)

Project		Overall Rating*			
		Direction			
Limits	PM	NB	SB	Age (yrs)	Type Mix
A) Oakhill Rd. to Palmdale Rd.	31.0/40.5	B	B	6	Conv
B) Palmdale Rd. to "D" St.	40.5/45.5	A	A	<1	Conv
C) "D" St. to Boulder Rd.	45.5/52.5	D	C	6	Conv
D) Boulder Rd. to Barstow	52.5/71.5	B	C	4	Recy
E) Barstow to Yermo	71.5/82.5	B	A	5	Conv
F) Yermo to Field	82.5/102.5	A	C	5	Conv
G) Field to Baker	102.5/133.5	A	A	2	Recy
H) Baker to Cima Rd.	133.5/161.5	A	A	2	Recy
I) Cima Rd. to State Line	161.5/186.2	D	C	9	Conv
J) Victorville	31.0/42.5	B	A	6	Conv
	42.5/52.5	C	D	6	Conv
K) Barstow	52.5/99.5	B	B	5	Recy
L) Baker	99.5/161.5	A	A	2	Recy
	161.5/170.5	D	D	9	Conv
M) Mt. Pass	170.5/186.2	D	C	9	Conv

* Per October 1985 survey

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Pavement Core Test Data

1. Relative Compaction

The term "relative compaction" in this study refers to a target density established in the laboratory using: 1) the California Kneading compactor, 2) a 230°F compaction temperature, and 3) 150 applications of a 500 psi load. The target density so established is then compared to the in situ density of the AC pavement. Densities are measured in the laboratory using Method A of Calif. Test 308. In situ densities for this study were determined by measuring the densities of the cores using Method A of Calif. Test 308.

The relative compaction ranged from 96 to 100% (Table 11). Some of these values were somewhat higher than anticipated so some check testing was done. However, all the check tests verified the original data. These values indicate that the AC compaction at the time of construction was probably adequate in at least most cases.

2. Aggregate and Asphalt Content

a. Aggregate

The AC aggregates used throughout this area (PM 29± to PM 186±) for the rehabilitation contracts were obtained from nearby alluvial deposits. Although not considered highly absorbent, they had K values that were generally above 1.0 (Table 12). Aggregate gradation was determined using the aggregate remaining after determining the asphalt content per Calif. Test 310. The gradings selected by District 8 for the projects studied were 3/4 inch max. medium, 1/2 inch max. coarse, and 1/2 inch max. medium as per the Standard Specifications. The grade of asphalt used for all the projects was AR-4000.

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TABLE 11

RELATIVE COMPACTION DATA

Location			Specific Gravity		
P.M.	Lane Direction	Lane* No.	(A) Core	(B) Lab Recomp	A/B = Relative Compaction (%)
32.20	NB	3	2.30	2.36	97.5
37.00	SB	3	2.40	2.40	100.0
39.66	NB	2	2.36	2.36	100.0
39.66	SB	3	2.35	2.40	97.9
41.35	NB	1	2.21	2.30	96.1
42.55	SB	2	2.23	2.29	97.4
46.17	NB	1	2.29	2.35	97.0
46.80	SB	2	2.31	2.33	99.1
48.52	NB	1	2.33	2.39	97.5
52.20	SB	1	2.37	2.42	97.9
58.13	SB	2	2.26	2.34	96.6
60.0	NB	2	2.28	2.34	97.4
69.9	NB	2	2.26	2.32	97.4
71.13	SB	2	2.23	2.30	97.0
72.0	NB	2	2.26	2.29	98.7
72.5	SB	2	2.30	2.31	99.6
76.25	SB	2	2.24	2.29	97.8
80.0	SB	2	2.25	2.31	97.4
83.0	NB	2	2.28	2.32	98.3
83.0	SB	2	2.27	2.34	97.0
90.0	NB	1	2.27	2.35	96.5
99.8	SB	2	2.28	2.33	97.8

* The lane closest to the median is lane number 1.

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TABLE 12

DISTRICT AC MIX DESIGN DATA

	Sp. Gr.		LA Rattler		Absorption (K-value)	
Post Mile	C.	F.	(500 Rev.)	SE	C.	F.
29.0/53.8	2.62	2.69	13.0	66	1.2	1.2
"	2.60	2.63	17.0	64	1.1	1.1
"	2.60	2.63		64	1.1	1.1
"	2.62	2.68		57	1.1	1.0
53.8/71.1	2.60	2.65		64	1.2	1.1
"	2.60	2.64	18.0	65	1.2	1.1
80.3/101.00	2.68	2.66	25.0	63	1.1	1.0
"	2.60	2.67		60	1.3	1.1
"	2.60	2.65		57	1.2	1.0
101.0/139.0	2.55	2.58	26.0	65	1.4	1.0
"	2.56	2.69	26.0	63	1.2	1.1
"	2.56	2.69	26.0	63	1.2	1.1
139.0/162.0	2.57	2.61	27.9	59	1.1	1.1
162.0/187.0	2.60	2.69	24.0	51	1.3	1.0

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It appeared that the grading selected most frequently was the 1/2-inch max. medium (Table 12). In all cases, the gradation of the aggregate in the cores complied with the gradation specifications and was very close to the gradation used in the District 8 lab for design (Figures 14-22).

The gradations were also very uniform and revealed no tendency toward humps or sags on the passing No. 30 that often create mixture performance problems. However, a slight increase in fines in the passing #50, 100, and 200 fraction was noted in several cases. The amount of minus 200 used in design was about 4.0% less than that found in the cores. Studies of cores during the pavement audit program in the 1960's revealed that about a 2.0% increase in the minus 200 fraction was common for mixtures cored about three months after construction (Figure 23). This increase was attributed to the coring operation. The slightly higher increase in minus 200 indicated in this study was therefore probably indicative of an actual difference between the gradation placed and the gradation used for design. An analysis of the gradings in "good" areas vs. the "poor" areas did not, however reveal any relationship between gradation and performance ratings.

A cursory examination of the extracted material revealed crushed aggregate contents ranging from 50 to 100%. District design reports (Table 12) revealed the aggregate specific gravity ranged from 2.55 to 2.68 for the coarse aggregate and 2.58 to 2.69 for the fine aggregate. This is close to the 2.65 generally considered to be representative of most California aggregates. The soundness, as measured by the Los Angeles Rattler test, ranged from 13.0 to 27.9. This indicates good sound aggregate that will resist degradation. The sand equivalent ranged from 51 to 66, which is also indicative of good quality aggregate. The K-values ranged from 1.0 to 1.3. This is well within specs. According to District personnel, moisture vapor susceptibility test results (Calif. Test 307) did not reveal a problem aggregate. Thus, the aggregate used for these projects appears to have been in compliance with Caltrans specs. However, mixes in this area have been susceptible to moisture damage as indicated by asphalt film stripping. Thus, the aggregate used for these projects may have in fact been marginal regarding moisture vapor resistance.

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Fig. 14, Oakdale Road to Palmdale Road

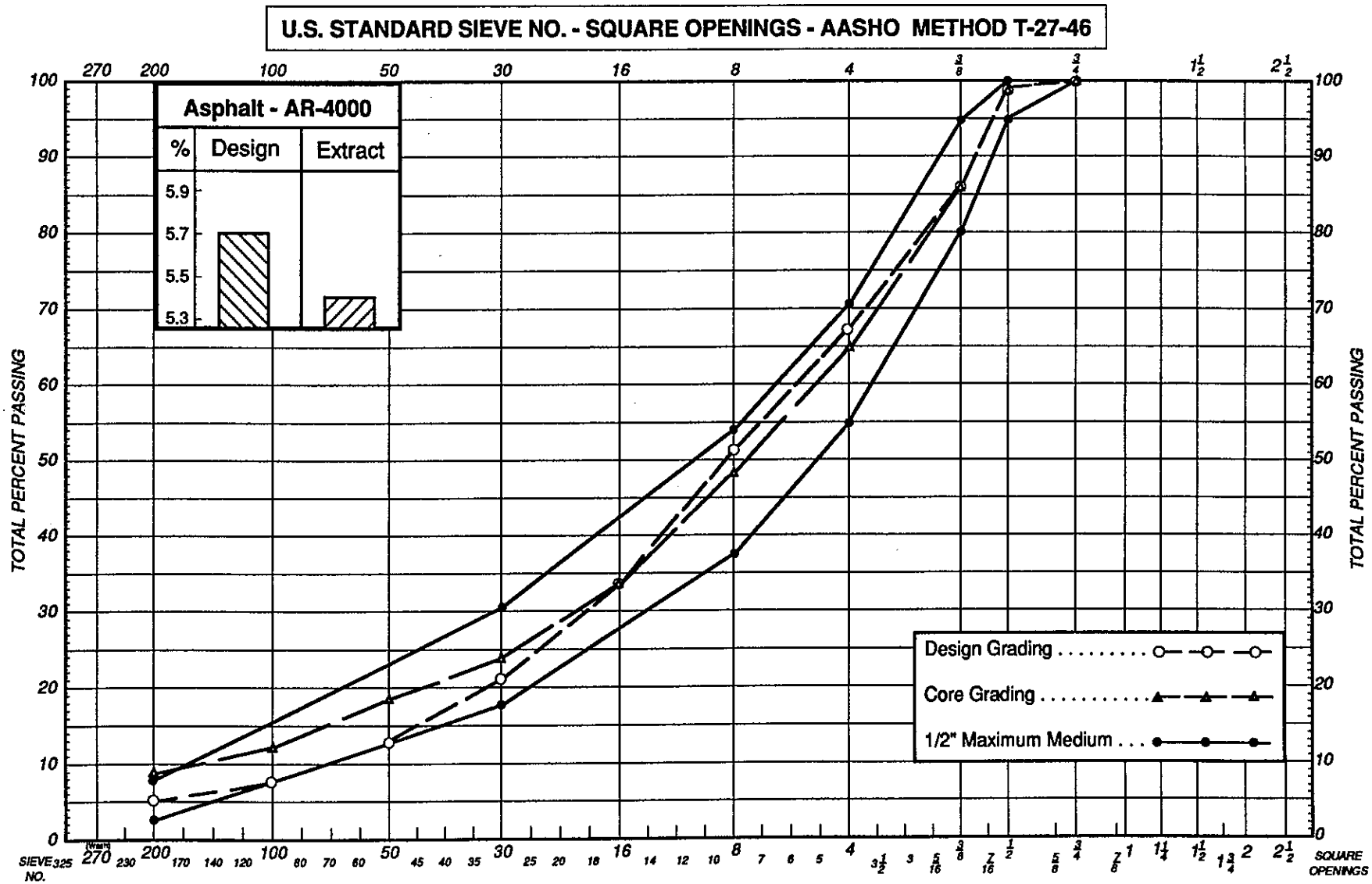

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Fig. 15, Palmdale Road to "D" Street

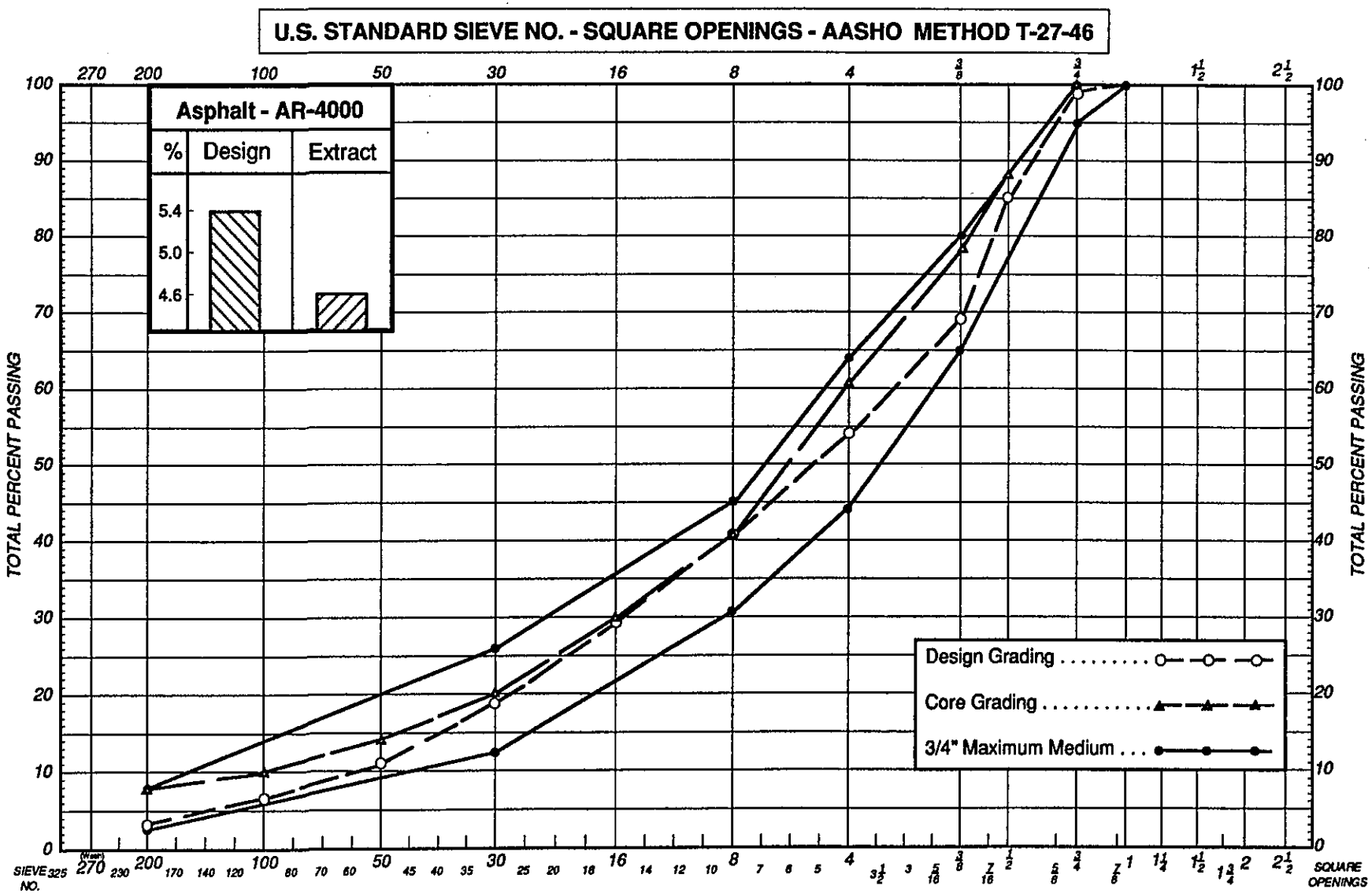

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Fig. 16, "D" Street to Boulder Road

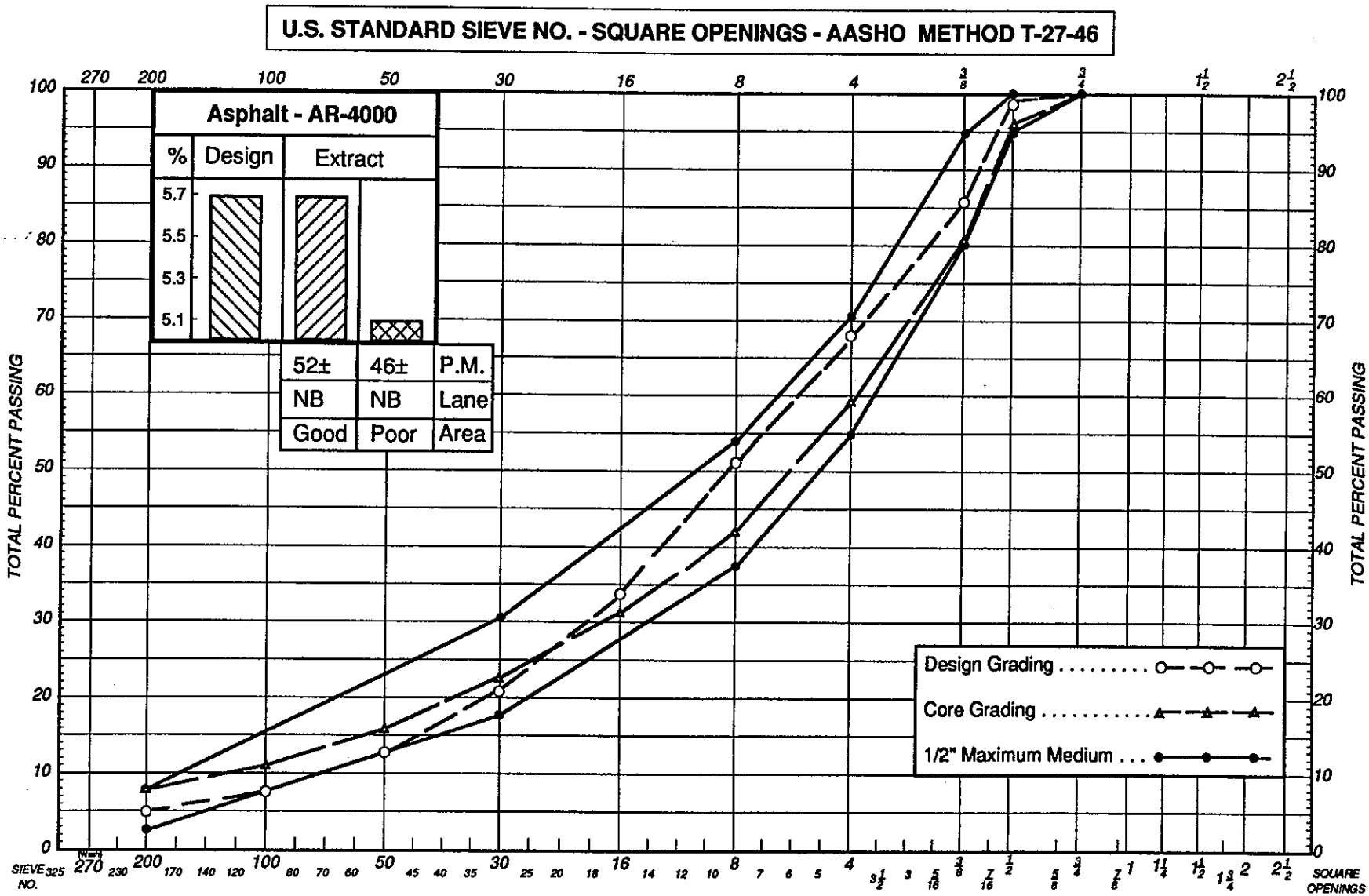

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Fig. 17, Boulder Road to Barstow

Conventional A.C.

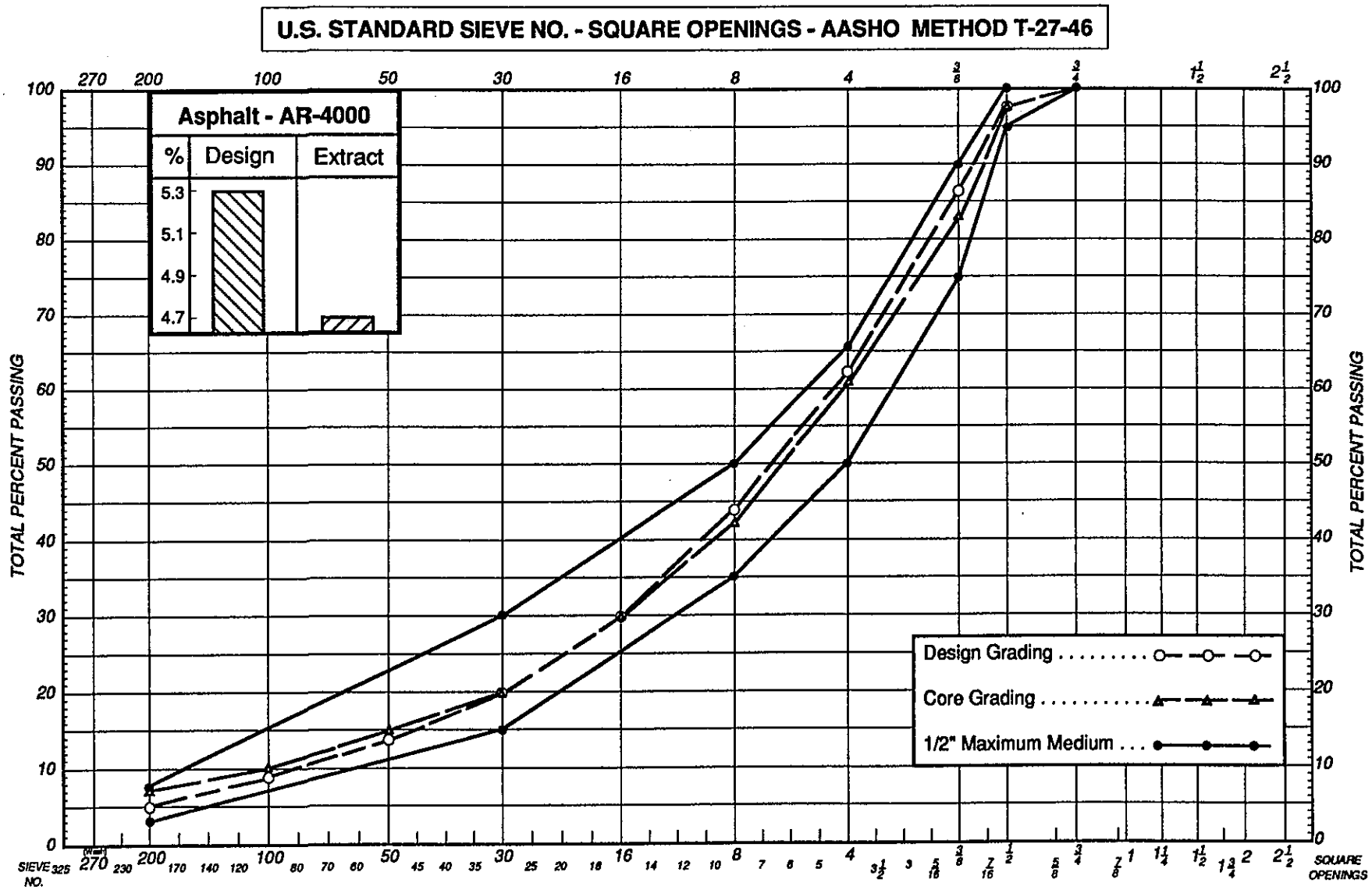

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Fig. 18, Bartsow to Yermo

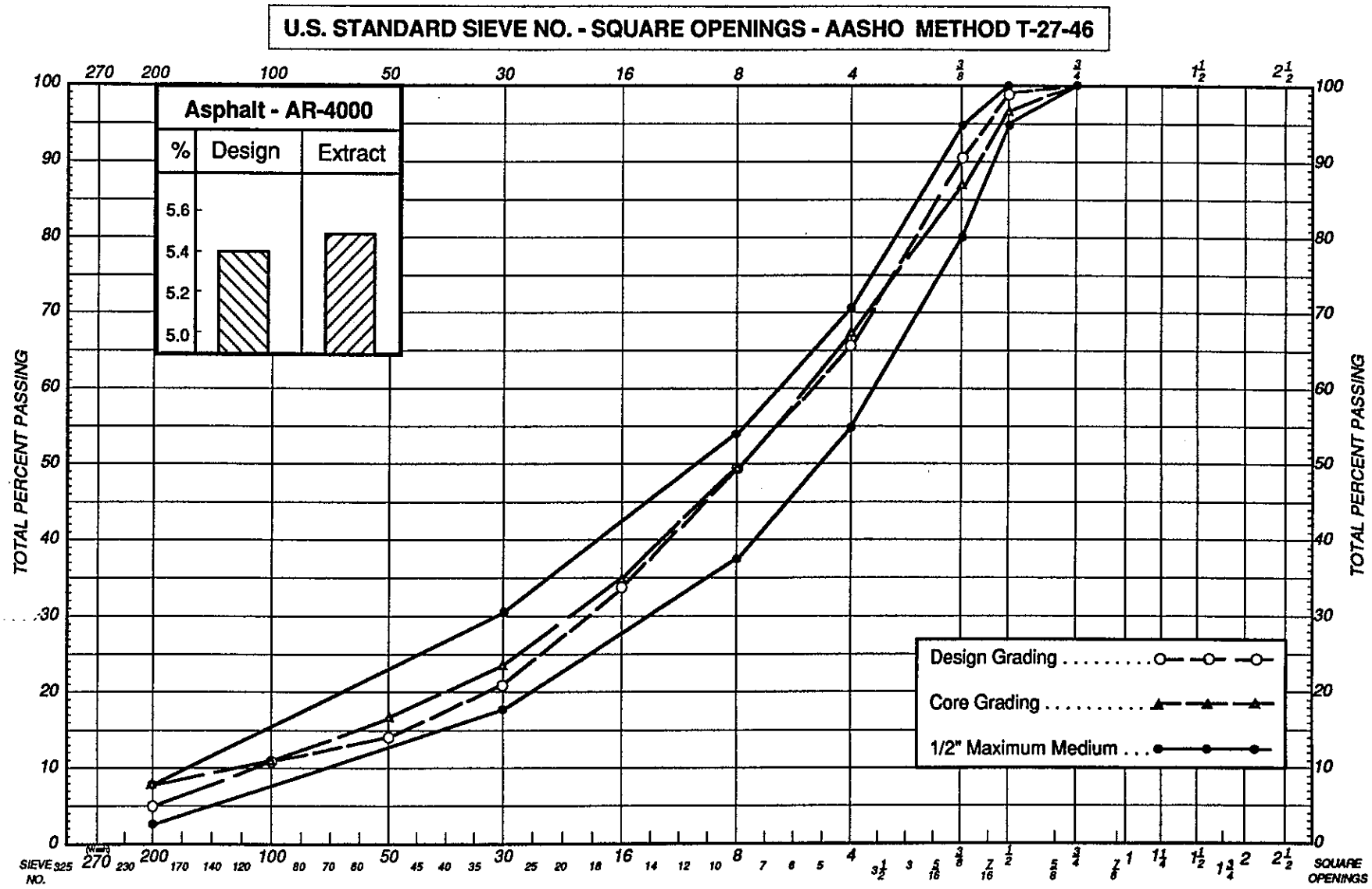

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Fig. 19, Yermo to Field

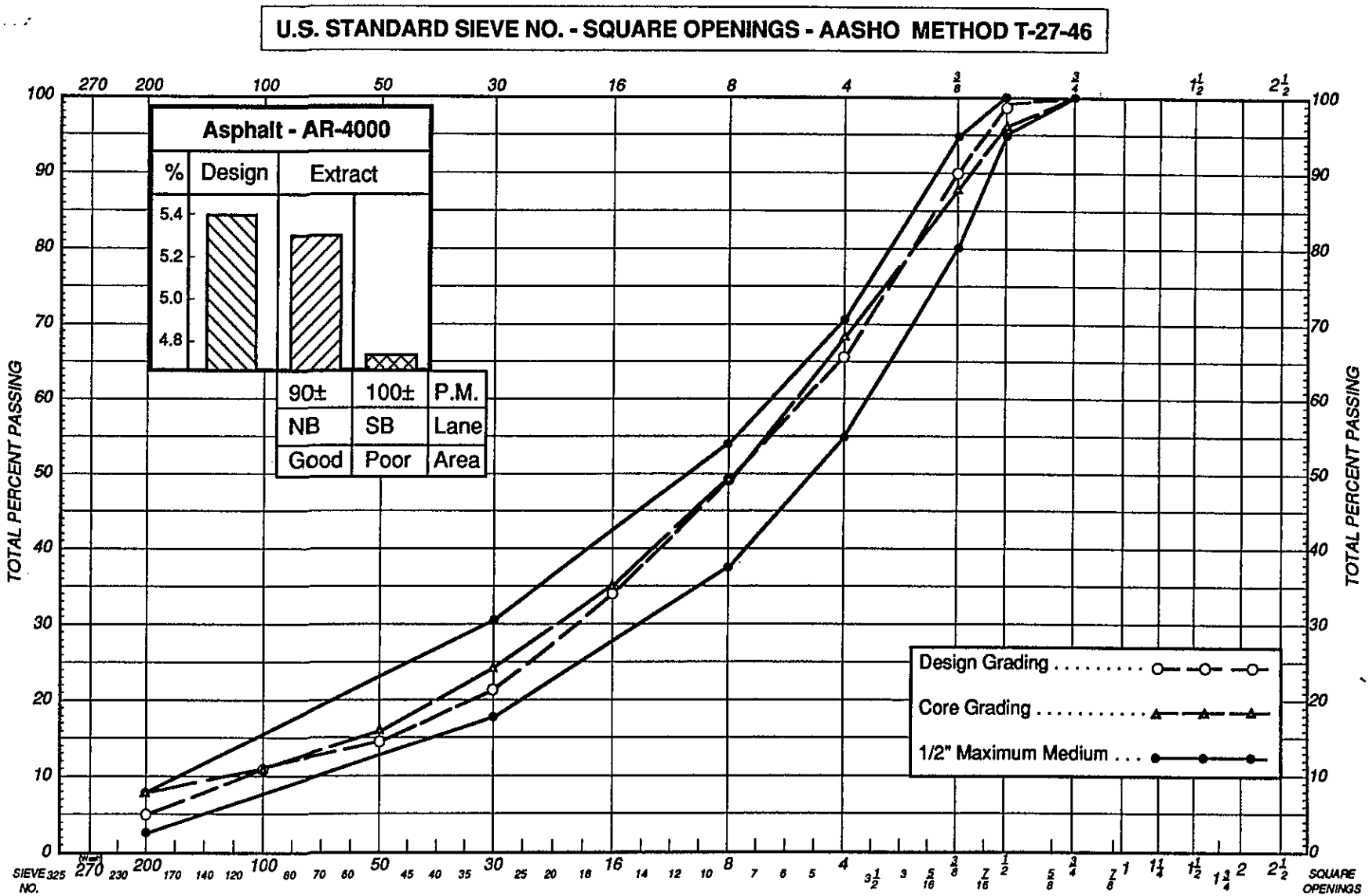

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Fig. 20, Field to Baker

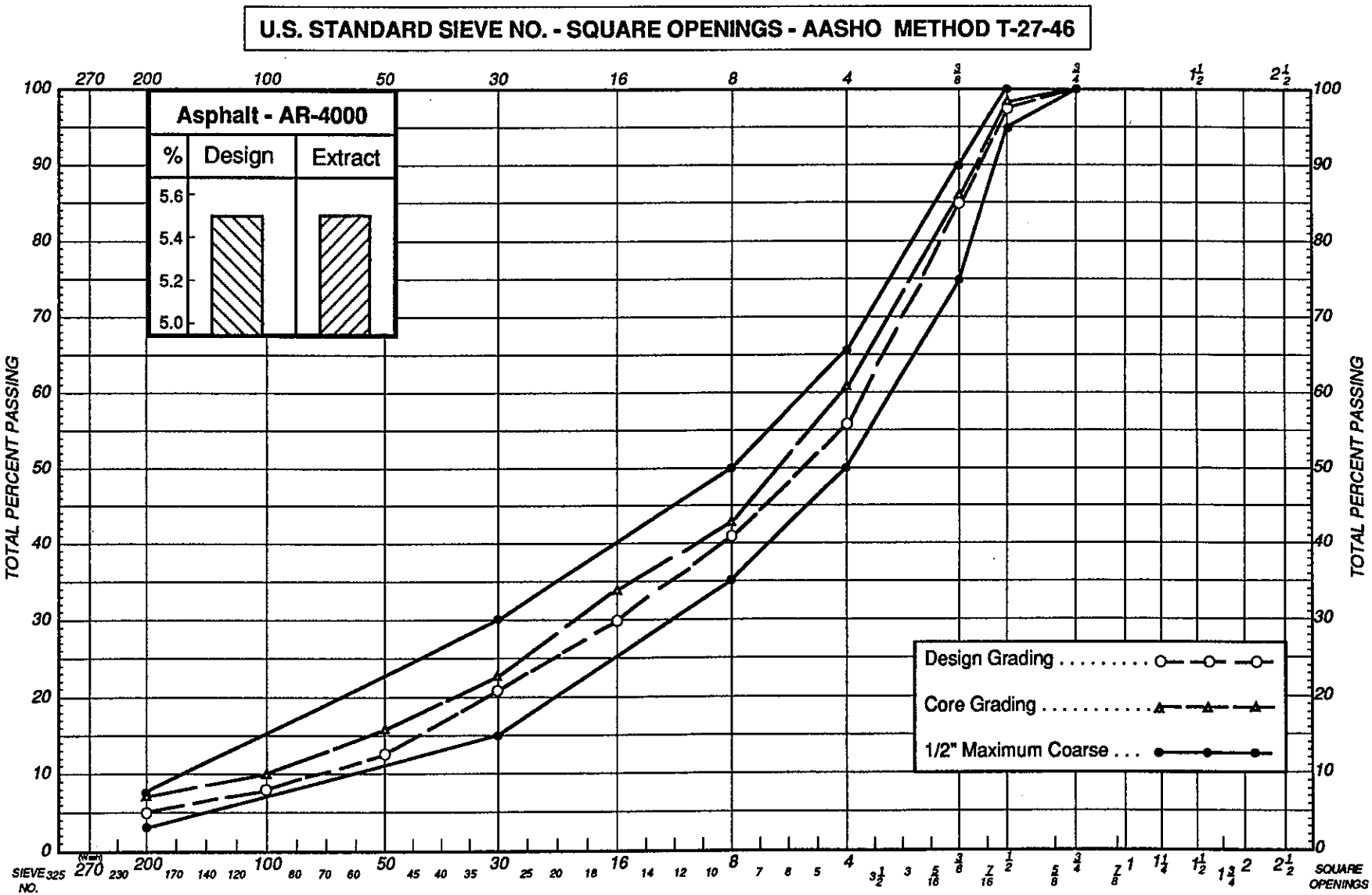

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Fig. 21, Baker to Cima Road

50/50 Hot Recycle

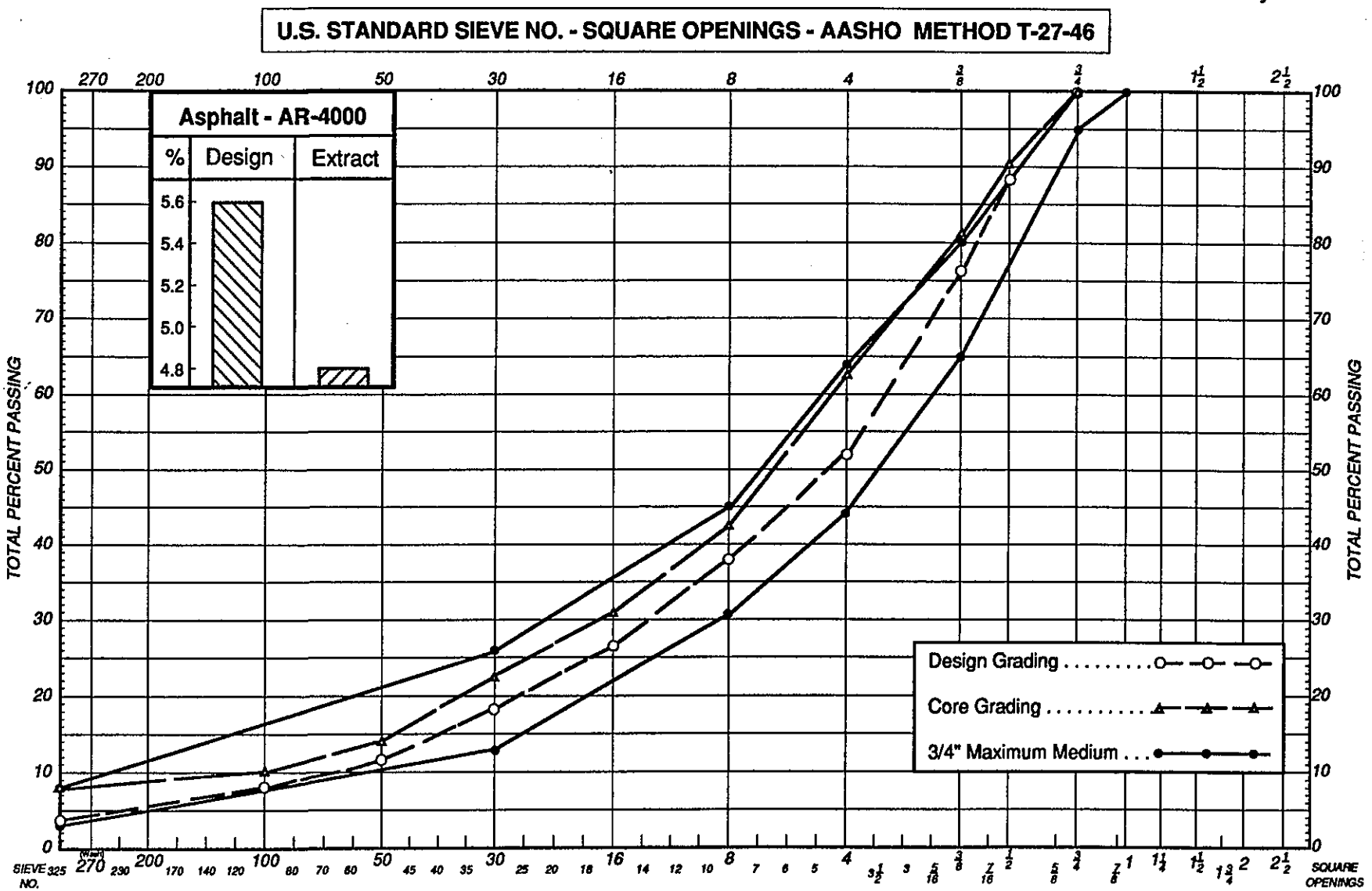

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Fig. 22, Cima Road to State Line

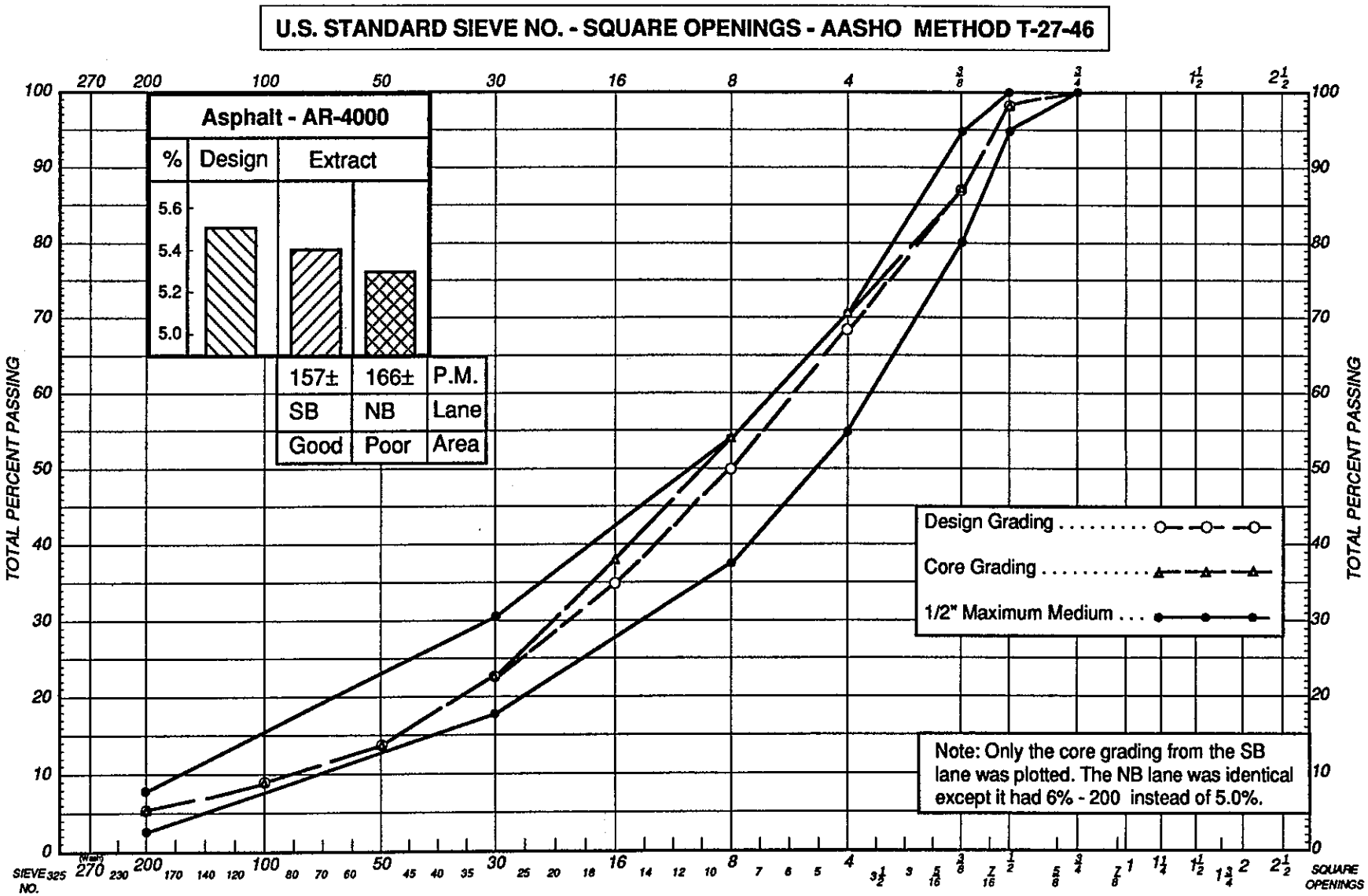

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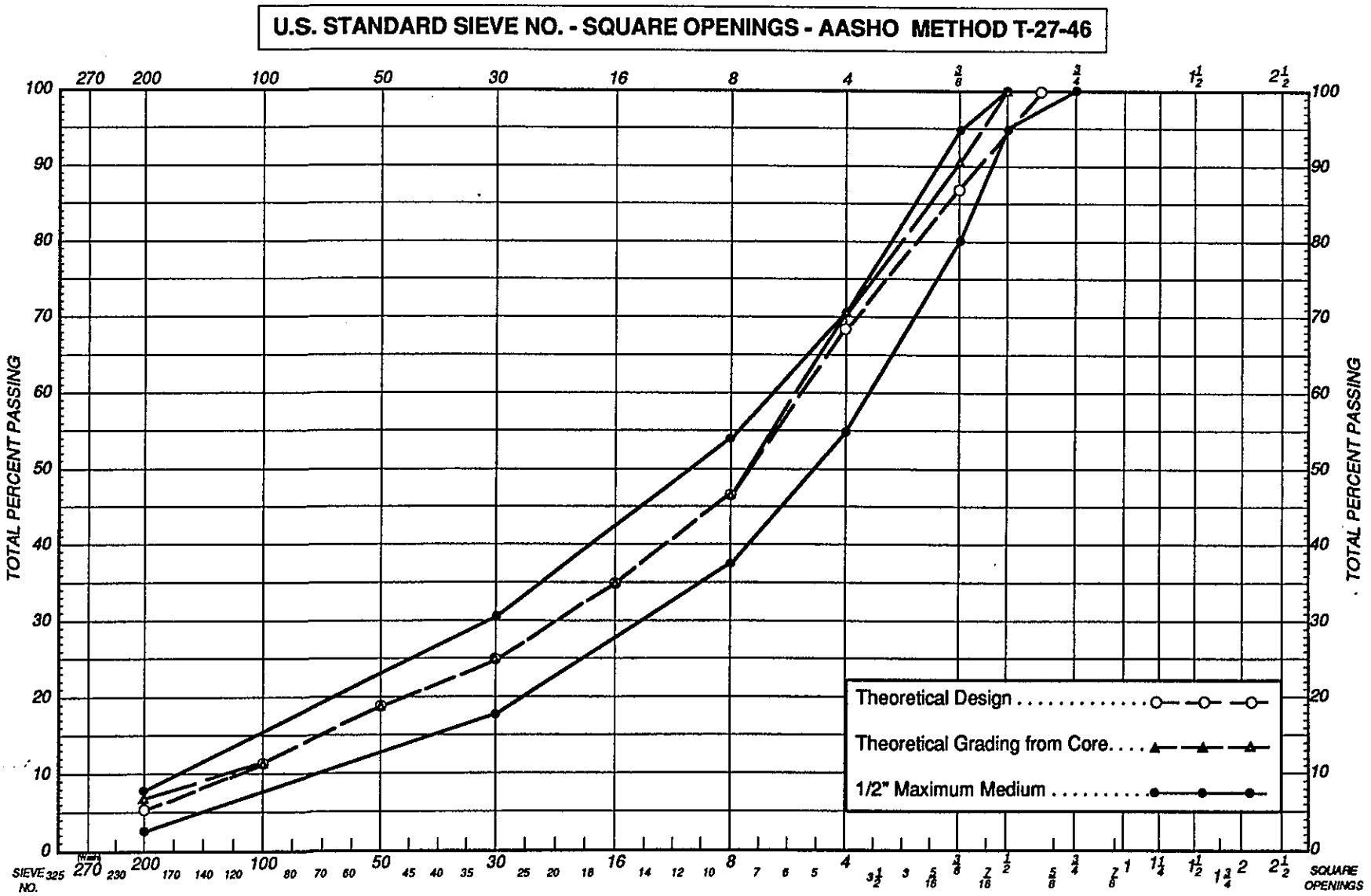
Fig. 23, Change in Gradation Due to Coring



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b. Asphalt Content

The amount actually required by laboratory design was consistently 0.3% to 0.8% higher than the amount used in the field (Figures 14-22). On two projects, "D St. to Boulder Rd." and "Yermo to Field", the areas classified as "poor" also had a lower asphalt content than both lab design and the area specified as "good". The bitumen index also reflected a lower value (a thinner film thickness) in the poor areas.

Deficiencies in asphalt content often result in surface raveling. However, in this case OGAC was placed on the "dry" DGAC as a wearing surface, thereby preventing DGAC raveling. Asphalt deficiencies can also have a direct and significant effect in DGAC fatigue strength. Because the measured asphalt content of the cores was consistently below the design amount, it is probable that an asphalt deficiency contributed to the development of the premature distress that occurred.

3. Tests on Recovered Asphalt

Asphalt was recovered from 40 of the cores. The viscosity, penetration, softening point, and ductility of the recovered asphalt was determined. The results of this testing are presented in Table 13. Although the various properties for any given core are consistent with each other, there does not appear to be any relationship between these recovered asphalt properties and the pavement age or condition. There were some locations such as numbers 7, 16, and 17 in Table 13 where the expected relationship was evident but there were numerous locations such as numbers 5, 6, 10, 24, 27, and 32 where the expected relationship between asphalt properties and pavement condition wasn't evident. Thus, the premature distress that occurred does not seem to be related to the asphalt that was used for the pavement rehabilitation projects studied.

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TABLE NO. 13
PROPERTIES OF RECOVERED ASPHALT

Loc No.	Post Mile	Pavement Age (Yrs)	Viscosity at 140°F (poise)	Viscosity at 275°F (cs)	Pen at 77°F	Soft Point °F	Duct. at 77°F	Pavement Condition Rating
1	32.2	6	20,500	430	22	143	55	B
2	37.0	6	3800	460	64	128	100	B
3	39.7	6	35300	1040	16	147	11	B
4	39.7	6	3700	420	68	129	100	B
5	41.3	<1	51,000	1070	12	149	8	A
6	42.6	<1	38,000	930	16	146	8	A
7	46.2	6	32,500	922	15	144	12	D
8	46.8	6	24,800	874	18	142	16	C
9	48.6	6	14,400	752	21	137	100	D
10	52.2	6	9,100	630	23	142	100	D
11	58.1	4	4,600	360	41	132	100	B
12	60.0	4	7,650	455	29	136	100	C
13	69.9	4	11,200	535	33	139	81	B
14	71.1	4	29,700	811	18	148	22	C
15	72.0	5	7,900	600	38	137	100	B
16	72.5	5	4,900	540	50	130	100	A
17	76.3	5	6,600	562	41	136	100	A
18	80.0	5	17,000	920	20	143	100	A
19	83.0	5	29,200	902	14	149	12	A
20	90.0	5	35,000	950	16	151	11	A
21	90.0	5	25,200	906	18	148	13	C
22	99.8	5	48,000	1,080	13	153	8	C
23	102	5	32,800	871	12	150	8	A
24	103	2	52,500	1,040	10	155	7	A
25	103	2	9,370	576	23	140	100	A

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APPENDIX A
MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

VICTORVILLE
TABLE A-1

Year Month	Southwest Desert Basin Vol.	Page	Temperature Av. May Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in.)	Remarks
1974	78										Average = 7.45
Jan.	✓	12	53.1	30.4	41.8	66	15	0	20	2.0	
Feb.	✓	6	62.4	28.9	45.7	72	24	0	23	0	
Mar.	✓	7	66.7	37.7	52.2	82	25	0	6	0.29	
Apr.	✓	✓	70.9	38.3	54.6	81	29	0	4	0.07	
May	✓	✓	*80.6	*45.2	*62.9	*95	*38	*3	*0	*0.08	
June	✓	✓	94.8	55.7	75.3	104	48	23	0	0	
July	✓	✓	95.3	62.7	79.0	105	50	27	0	0.46	
Aug.	✓	✓	95.6	58.1	76.9	101	50	31	0	0.78	
Sept.	✓	✓	94.8	58.5	76.7	100	52	27	0	0	
Oct.	✓	✓	79.4	45.5	62.6	95	36	4	0	0.16	
Nov.	✓	✓	67.8	33.6	50.7	78	23	0	12	0	
Dec.	✓	6	56.3	28.4	42.2	72	18	0	24	0.93	
									Total	4.77	
1975	79										Average = 7.45
Jan	✓	6	60.3	28.3	44.3	79	17	0	22	0.17	
Feb.	✓	✓	59.9	31.1	45.5	75	18	0	15	0.21	
Mar	✓	✓	61.9	35.4	48.7	79	26	0	10	1.04	
Apr.	✓	✓	61.8	36.9	49.4	75	29	0	4	0.75	
May	✓	✓	81.5	46.7	64.1	93	5	6	0	0	
June	✓	✓	90.3	54.3	72.3	102	45	20	0	0	
July	✓	✓	95.7	60.7	78.2	109	51	24	0	0.22	
Aug.	✓	✓	94.3	58.2	76.3	106	50	24	0	0	
Sept.	✓	✓	92.5	57.3	74.9	102	49	24	0	0.24	
Oct.	✓	✓	77.2	43.4	60.3	93	28	6	3	0.08	
Nov.	✓	✓	*67.0	*35.5	*51.3	*80	*23	*0	*10	*0.20	
Dec.	✓	✓	62.7	29.7	46.2	76	18	0	22	0.21	
									Total	3.12	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

VICTORVILLE

TABLE A-1 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature Av. May Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in)	Remarks
1976	80										Average = 7.45
Jan.	✓	6	62.6	27.6	45.1	74	14	0	22	0	
Feb.	✓	✓	62.1	34.7	48.4	74	25	0	9	1.84	
Mar.	✓	✓	64.6	35.5	50.1	81	25	0	11	0.44	
Apr.	✓	✓	69.5	39.1	54.3	86	29	0	3	0.05	
May	✓	✓	84.3	50.3	67.3	97	41	10	0	0.07	
June	✓	✓	89.5	54.3	71.9	105	44	16	0	0	
July	✓	✓	96.5	61.5	79.0	104	53	31	0	0	
Aug.	✓	✓	89.3	55.2	72.3	105	49	16	0	0	
Sept.	✓	✓	84.5	57.3	70.9	107	49	8	0	3.62	
Oct.	✓	✓	77.9	49.8	61.4	87	33	0	0	1.13	
Nov.	✓	✓	70.2	37.3	53.8	82	21	0	4	0.46	
Dec.	✓	✓	61.5	26.2	43.9	67	20	0	30	0	
									Total	7.63	
1977	81										Average = 7.45
Jan	✓	6	55.7	31.0	43.4	67	22	0	18	1.15	
Feb.	✓	✓	67.9	32.4	50.2	86	25	0	14	0.04	
Mar	✓	✓	66.9	32.8	46.5	77	24	0	19	0.52	
Apr.	✓	✓	76.8	42.1	59.5	87	28	0	1	0	
May	✓	✓	69.4	45.2	57.3	93	36	1	0	1.35	
June	✓	✓	92.6	57.0	74.8	103	45	21	0	6.04	
July	✓	5	97.0	61.0	79.0	106	52	28	0	0	
Aug.	✓	✓	95.8	63.7	79.3	108	55	27	0	1.43	
Sept.	✓	✓	88.1	54.8	71.5	101	44	11	0	0	
Oct.	✓	✓	83.1	46.4	64.8	91	35	4	0	0	
Nov.	✓	✓	71.3	36.2	53.8	83	27	0	8	0.08	
Dec.	✓	✓	64.7	36.6	50.7	81	28	0	5	1.77	
									Total	6.38	

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

VICTORVILLE

TABLE A-1 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature: Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-fall Total (")	Remarks
1978	82										Average=7.45
Jan.	✓	6	56.0	34.9	45.4	66	24	0	10	1.93	
Feb.	✓	✓	60.2	35.8	48.0	70	28	0	12	3.35	
Mar.	✓	✓	66.5	41.4	54.0	79	32	0	2	3.63	
Apr.	✓	✓	66.8	40.6	53.7	80	29	0	1	0.61	
May	✓	✓	80.8	46.7	63.8	97	38	5	0	0.09	
June	✓	✓	92.8	55.7	73.9	103	43	20	0	0	
July	✓	✓	97.7	58.9	78.3	105	49	27	0	0	
Aug.	✓	✓	95.8	58.5	77.2	106	45	24	0	0.11	
Sept.	✓	✓	86.0	52.5	69.3	98	38	12	0	0.80	
Oct.	✓	✓	85.5	48.4	67.0	96	36	11	0	0.16	
Nov.	✓	✓	62.7	33.9	48.3	81	24	0	11	0.36	
Dec.	✓	✓	55.0	26.2	40.6	71	12	0	26	0.79	
									Total	11.83	
1979	83										Average=7.45
Jan	✓	6	51.0	30.5	40.8	66	18	0	18	3.44	
Feb.	✓	✓	57.5	29.3	43.4	70	17	0	18	1.39	
Mar	✓	✓	63.8	36.1	50.0	80	17	0	5	1.76	
Apr.	✓	✓	72.6	40.8	56.7	85	33	0	0	0	
May	✓	✓	82.3	48.4	65.4	95	38	8	0	0.15	
June	✓	✓	93.9	54.6	74.3	103	45	26	0	0	
July	✓	✓	97.2	59.3	78.3	109	49	24	0	0	
Aug.	✓	✓	93.7	58.0	75.9	106	50	21	0	0.18	
Sept.	✓	✓	95.5	57.2	76.4	104	51	26	0	0	
Oct.	✓	✓	80.1	47.1	63.6	94	33	6	0	0.13	
Nov.	✓	✓	65.8	32.3	49.1	74	18	0	16	0	
Dec.	✓	✓	63.1	30.3	46.7	74	20	0	17	0	
									Total	7.05	

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

VICTORVILLE

TABLE A-1 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-fall Total (in)	Remarks
1980	84										Average=7.45
Jan.	✓	6	60.4	35.8	48.1	70	25	0	12	1.89	
Feb.	✓	✓	63.7	36.9	50.3	76	25	0	5	4.45	
Mar.	✓	✓	61.5	36.7	49.1	74	30	0	5	2.06	
Apr.	✓	✓	72.8	41.7	57.3	90	34	2	0	0.39	
May	✓	✓	74.0	46.5	60.3	92	38	3	0	0.42	
June	✓	✓	87.4	52.4	69.9	101	45	13	0	0.04	
July	✓	✓	98.5	62.1	80.3	107	54	29	0	0	
Aug.	✓	✓	94.7	60.9	77.8	109	52	23	0	0	
Sept.	✓	✓	90.4	53.2	71.8	98	46	17	0	0.05	
Oct.	✓	✓	82.7	45.0	63.9	101	41	11	1	0	
Nov.	✓	✓	71.8	35.6	53.7	88	21	0	12	0	
Dec.	✓	✓	67.1	31.8	49.5	76	22	0	6	0.02	
									Total	9.32	
1981	85										Average = 7.45
Jan	✓	6	62.7	34.8	48.8	74	24	0	10	0.76	
Feb.	✓	✓	65.5	34.7	50.1	84	25	0	10	0.52	
Mar	✓	✓	63.9	38.3	51.1	78	30	0	1	1.88	
Apr.	✓	✓	76.9	44.2	60.6	97	33	2	0	0.01	
May	✓	✓	83.0	50.3	66.7	100	39	5	0	0.06	
June	✓	✓	97.6	59.0	78.3	107	49	25	0	0	
July	✓	✓	97.6	60.8	79.2	104	56	30	0	0	
Aug.	✓	✓	100.4	62.7	81.6	111	52	31	0	0.13	
Sept.	✓	✓	92.6	57.5	75.1	99	48	24	0	0	
Oct.	✓	✓	74.6	42.8	58.7	85	29	0	1	0.13	
Nov.	✓	✓	70.5	38.1	54.3	80	28	0	4	0.30	
Dec.	✓	✓	64.9	33.5	49.2	77	21	0	13	0	
									Total	3.39	

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

VICTORVILLE

TABLE A-1 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Temperature Av. May Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days May 90°F or above	Days Min. 32°F or below	Precip. Rain-fall Total (in)	Remarks
1982	86										Average = 7.45
Jan.	✓	9	55.6	29.0	42.3	71	19	0	24	1.41	
Feb.	✓	✓	62.6	36.3	49.5	78	26	0	8	0.52	
Mar.	✓	✓	61.4	36.7	49.1	75	26	0	9	2.25	
Apr.	✓	✓	70.1	41.7	55.9	85	31	0	3	1.12	
May	✓	✓	80.7	49.2	65.0	96	32	5	1	0.16	
June	✓	✓	87.1	52.9	70.0	97	44	16	0	0	
July	✓	✓	93.2	60.5	76.9	109	48	21	0	0.03	
Aug.	✓	✓	95.1	62.3	78.7	108	53	28	0	0.13	
Sept.	✓	✓	86.0	56.1	71.1	105	34	11	0	0.04	
Oct.	✓	✓	75.8	42.7	59.3	85	33	0	0	0.36	
Nov.	✓	✓	61.3	35.3	48.3	75	28	0	14	1.48	
Dec.	✓	✓	54.9	31.2	43.1	70	19	0	22	1.12	
									Total	8.62	
1983	87										
Jan	✓	9	*57.4	*30.8	*45.1	*68	*20	*0	*21	*2.39	Average = 7.45
Feb.	✓	✓	60.0	36.4	48.2	73	27	0	7	1.61	
Mar	✓	✓	61.2	39.9	50.6	78	29	0	2	4.80	
Apr.	✓	✓	63.5	38.8	51.2	75	29	0	4	0.93	
May	✓	✓	81.0	47.5	64.3	99	37	10	0	0	
June	✓	✓	87.8	53.0	70.4	96	45	15	0	0	
July	✓	✓	92.9	57.5	75.2	105	50	19	0	0	
Aug.	✓	✓	92.2	62.3	77.3	105	51	21	0	0.83	
Sept.	✓	✓	91.7	59.4	75.6	102	48	21	0	0.49	
Oct.	✓	✓	76.6	47.3	62.0	84	43	0	0	1.20	
Nov.	✓	✓	65.2	37.7	51.5	83	22	0	9	0.57	
Dec.	✓	✓	60.5	34.9	47.7	74	23	0	11	0.60	
									Total	13.42	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

VICTORVILLE

TABLE A-1 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Temperature: Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in)	Remarks
1984	88										Average = 7.45
Jan.	✓	9	61.0	30.3	45.7	71	22	0	20	0	
Feb.	✓	✓	64.8	31.7	48.3	73	23	0	20	0.01	
Mar.	✓	✓	71.4	38.2	54.8	80	27	0	3	0	
Apr.	✓	✓	71.8	40.5	56.2	90	32	3	1	0	
May	✓	✓	89.6	53.1	71.4	104	39	19	0	0	
June	✓	✓	90.5	55.9	73.2	104	47	18	0	0	
July	✓	✓	97.5	65.6	81.6	109	56	27	0	1.45	
Aug.	✓	✓	*94.7	*60.8	*77.4	*107	*51	*24	*0	*0.36	
Sept.	✓	✓	93.3	60.3	76.8	105	47	22	0	0.13	
Oct.	✓	✓	73.7	42.4	58.1	84	29	0	1	0	
Nov.	✓	✓	63.4	35.2	49.3	80	22	0	11	0.11	
Dec.	✓	✓	50.8	30.3	40.6	61	20	0	20	4.36	
									Total	6.42	

* Data Missing — Used 1974 - 84 avg.

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BARSTOW

TABLE A-2

Year Month	Southwest Desert Data Vol.	Page	Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in)	Remarks
1974	78										Average 5.59
Jan.	✓	11	56.1	33.5	44.8	71	31	0	14	1.23	
Feb.	✓	6	66.5	33.1	49.8	76	25	0	14	0	
Mar.	✓	7	72.5	42.4	57.5	82	27	0	2	0.48	
Apr.	✓	✓	76.5	41.5	59.0	86	28	0	1	0	
May	✓	✓	*84.9	*52.7	*68.8	*99	*37	*11	*0	*.14	
June	✓	✓	99.7	62.1	80.9	106	50	30	0	0	
July	✓	✓	100.6	67.2	83.9	109	56	31	0	0.19	
Aug.	✓	✓	99.2	63.0	81.1	104	56	31	0	0	
Sept.	✓	✓	97.5	61.2	79.4	104	53	30	0	0	
Oct.	✓	✓	81.7	48.2	65.0	95	29	4	0	0.12	
Nov.	✓	✓	69.2	35.0	52.1	78	25	0	7	0.01	
Dec.	✓	✓	58.8	28.9	43.7	68	17	0	24	0.63	
									Total	2.79	
1975	79										Average 5.59
Jan	✓	5	67.6	28.3	45.5	76	16	0	24	0.01	
Feb.	✓	✓	63.7	33.3	48.5	78	23	0	14	0.14	
Mar	✓	✓	68.1	38.5	53.3	81	27	0	6	0.18	
Apr.	✓	✓	69.1	39.1	54.1	80	30	0	4	0.32	
May	✓	✓	86.5	51.3	68.9	100	38	14	0	0	
June	✓	✓	95.2	60.4	77.8	104	50	26	0	0	
July	✓	✓	101.5	64.8	83.2	110	52	31	0	0	
Aug.	✓	✓	99.1	61.6	80.4	108	55	29	0	0	
Sept.	✓	✓	94.9	59.7	77.3	103	53	28	0	0.40	
Oct	✓	✓	80.7	45.7	62.7	95	28	6	2	0	
Nov.	✓	✓	*68.4	*37.7	*53.1	*80	*27	*0	*6	*0.34	
Dec.	✓	✓	64.0	29.9	47.0	76	18	0	21	0.16	
									Total	1.56	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BARSTOW

TABLE A-2 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-fall Total (")	Remarks
1976	80										Average 5.59
Jan.	✓	6	64.9	28.6	46.8	75	13	0	20	0	
Feb.	✓	✓	66.7	35.7	51.2	85	27	0	7	1.31	
Mar.	✓	✓	68.8	37.7	53.8	82	26	0	7	0.28	
Apr.	✓	✓	74.3	42.2	58.3	89	33	0	0	0.13	
May	✓	✓	89.5	55.4	72.5	98	41	16	0	0.01	
June	✓	✓	94.7	60.0	77.4	110	50	24	0	0.01	
July	✓	✓	100.7	67.1	83.9	110	57	31	0	0.12	
Aug.	✓	✓	95.1	59.6	77.4	108	53	25	0	0	
Sept.	✓	✓	88.2	60.3	74.3	108	52	12	0	1.67	
Oct.	✓	✓	82.0	47.3	64.7	94	34	4	0	0.55	
Nov.	✓	✓	73.1	36.9	55.0	83	21	0	3	0.18	
Dec.	✓	✓	61.5	23.9	42.7	69	18	0	30	0.05	
									Total	4.11	
1977	81										Average 5.59
Jan	✓	6	58.5	30.8	44.7	71	21	0	18	0.99	
Feb.	✓	✓	69.5	33.0	51.3	82	26	0	13	0.02	
Mar	✓	✓	66.1	32.6	49.4	78	26	0	14	0.50	
Apr.	✓	✓	81.7	44.6	63.2	89	30	0	1	0.01	
May	✓	✓	76.3	48.1	62.2	99	37	3	0	0.64	
June	✓	✓	97.7	60.7	79.2	105	50	27	0	0	
July	✓	✓	101.7	66.0	83.9	108	58	31	0	0.01	
Aug.	✓	✓	98.1	66.1	82.4	108	56	28	0	1.62	
Sept.	✓	✓	92.2	57.6	74.9	106	48	18	0	0	
Oct.	✓	✓	85.0	48.8	66.9	92	40	6	0	0.01	
Nov.	✓	✓	72.0	36.7	54.4	81	26	0	5	0.03	
Dec.	✓	✓	65.8	36.9	51.4	81	28	0	6	1.94	
									Total	5.70	

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BARSTOW

TABLE A-2 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in)	Remarks
1978	82										Average 5.59
Jan.	✓	5	58.0	36.8	47.4	69	27	0	5	1.74	
Feb.	✓	✓	63.5	38.2	50.9	74	30	0	5	1.99	
Mar.	✓	✓	70.5	44.1	57.3	84	36	0	0	2.20	
Apr.	✓	✓	72.6	44.2	58.4	84	35	0	0	0.42	
May	✓	✓	86.7	50.9	68.8	98	42	12	0	0.08	
June	✓	✓	96.5	61.0	78.8	104	52	28	0	0	
July	✓	✓	102.1	64.5	83.3	107	54	31	0	0.01	
Aug.	✓	✓	99.4	64.3	81.9	108	57	31	0	0.18	
Sept.	✓	✓	90.4	55.9	73.2	100	39	15	0	0.31	
Oct.	✓	✓	87.7	50.7	69.2	98	38	14	0	0.02	
Nov.	✓	✓	66.4	34.9	50.7	84	24	0	10	0.28	
Dec.	✓	✓	57.4	26.6	43.0	68	10	0	25	0.63	
									Total	7.86	
1979	83										Average 5.59
Jan	✓	5	55.1	31.5	43.3	68	18	0	17	1.13	
Feb.	✓	✓	62.1	32.9	47.5	73	22	0	14	0.71	
Mar	✓	✓	67.9	39.3	53.6	83	30	0	2	1.37	
Apr.	✓	✓	78.3	44.7	61.5	88	37	0	0	0	
May	✓	✓	87.8	53.7	70.5	99	41	20	0	0.01	
June	✓	✓	98.4	60.8	79.6	108	50	28	0	0	
July	✓	✓	102.5	64.4	83.5	112	52	31	0	0.72	
Aug.	✓	✓	97.2	64.3	80.8	108	56	26	0	1.62	
Sept.	✓	✓	98.1	62.7	80.4	107	56	29	0	0.16	
Oct	✓	✓	82.8	52.3	67.6	96	42	9	0	0.30	
Nov.	✓	✓	65.5	38.9	52.2	73	24	0	4	0.01	
Dec.	✓	✓	62.9	34.5	48.7	73	28	0	10	0.02	
									Total	6.05	

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BARSTOW

TABLE A-2 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-fall Total (in)	Remarks
1980	84										Average 5.59
Jan.	✓	5	62.4	40.4	51.4	72	28	0	4	2.41	
Feb.	✓	✓	66.0	41.9	54.0	76	29	0	2	2.82	
Mar.	✓	✓	65.6	46.9	53.3	74	31	0	1	1.36	
Apr.	✓	✓	*75.2	*43.7	*60.6	*89	*33	*2	*1	*0.19	
May	✓	✓	80.4	50.1	65.3	98	32	6	0	0.24	
June	✓	✓	91.9	57.8	75.7	101	49	20	0	0.01	
July	✓	✓	*100.6	*65.9	*83.3	*109	*56	*30	*0	*0.37	
Aug.	✓	✓	98.2	63.3	81.8	108	54	29	0	0	
Sept.	✓	✓	93.2	57.4	75.3	108	45	22	0	0.31	
Oct.	✓	✓	83.5	48.6	66.1	101	37	11	0	0	
Nov.	✓	✓	71.6	38.9	55.3	85	27	0	10	0	
Dec.	✓	✓	67.2	36.6	51.9	75	25	0	10	0	
									Total	7.71	
1981	85										Average 5.59
Jan	✓	5	62.6	38.8	50.5	72	28	0	6	0.62	
Feb.	✓	✓	66.6	38.4	52.5	80	28	0	8	0.80	
Mar	✓	✓	67.5	41.8	54.7	78	36	0	0	0.62	
Apr.	✓	✓	80.7	50.0	65.4	98	39	3	0	0.04	
May	✓	✓	86.2	55.9	71.1	98	45	13	0	0.11	
June	✓	✓	98.8	66.9	83.4	106	52	29	0	0	
July	✓	✓	102.3	65.4	83.9	106	57	31	0	0	
Aug.	✓	✓	102.4	67.4	84.9	110	59	31	0	0.20	
Sept.	✓	✓	98.2	61.0	77.6	99	31	25	0	0.60	
Oct	✓	✓	76.0	45.9	61.0	85	33	0	0	0.06	
Nov.	✓	✓	70.3	41.9	56.1	79	32	0	1	0.24	
Dec.	✓	✓	63.8	36.7	50.3	75	24	0	7	0	
									Total	2.89	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BARSTOW

TABLE A-2 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in)	Remarks
1982	86										Average 5.59
Jan.	✓	8	56.5	33.5	45.0	67	22	0	16	1.15	
Feb.	✓	✓	65.2	40.0	52.6	79	29	0	4	0.52	
Mar.	✓	✓	65.5	40.2	52.9	76	31	0	2	0.98	
Apr.	✓	✓	74.2	45.4	59.8	88	31	0	1	0.96	
May	✓	✓	85.8	55.2	70.5	98	42	8	0	0.16	
June	✓	✓	91.6	58.5	75.1	101	50	20	0	0	
July	✓	✓	97.8	66.1	82.0	109	56	29	0	1.03	
Aug.	✓	✓	98.8	67.6	83.2	108	60	30	0	0.13	
Sept.	✓	✓	89.2	59.9	74.6	104	40	13	0	0.16	
Oct.	✓	✓	78.2	48.1	63.2	86	34	0	0	0.19	
Nov.	✓	✓	62.9	38.3	50.6	75	32	0	4	1.54	
Dec.	✓	✓	56.1	33.2	44.7	65	24	0	14	0.69	
									Total	7.51	
1983	87										Average 5.59
Jan	✓	8	*64.2	*31.0	*47.6	*74	*21	*0	*20	*0.44	
Feb.	✓	✓	63.0	39.7	51.4	75	31	0	1	1.03	
Mar	✓	✓	66.2	43.5	54.9	82	35	0	0	2.96	
Apr.	✓	✓	68.6	42.4	55.5	80	32	0	1	0.42	
May	✓	✓	84.9	54.0	69.5	103	38	11	0	0	
June	✓	✓	92.3	57.7	75.0	100	36	25	0	0	
July	✓	✓	97.6	62.9	80.3	106	55	29	0	0	
Aug.	✓	✓	96.1	67.0	81.6	107	55	24	0	0.88	
Sept.	✓	✓	94.7	64.9	79.8	103	53	24	0	0.12	
Oct.	✓	✓	81.1	52.3	66.7	88	47	0	0	1.00	
Nov.	✓	✓	67.8	40.5	54.2	82	25	0	9	0.63	
Dec.	✓	✓	60.5	33.0	46.8	69	20	0	13	0.78	
									Total	8.26	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BARSTOW

TABLE A-2 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature: Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or blow	Precip. Rain-Fall Total (..)	Remarks
1984	88										Average 5.59
Jan.	✓	8	63.8	33.6	48.7	75	23	0	10	0.01	
Feb.	✓	✓	67.2	33.6	50.4	75	26	0	15	0	
Mar.	✓	✓	73.7	40.0	56.9	82	27	0	5	0.01	
Apr.	✓	✓	76.2	42.8	59.9	94	31	3	2	0.01	
May	✓	✓	*84.9	*52.7	*68.8	*99	*39	*11	*0	*0.14	
June	✓	✓	93.5	61.7	77.6	107	53	20	0	0.04	
July	✓	✓	99.8	70.6	85.2	111	62	29	0	1.65	
Aug.	✓	✓	*98.4	*64.6	*81.5	*108	*56	*28	*0	*0.08	
Sept.	✓	✓	95.1	64.3	79.7	106	55	24	0	1.84	
Oct.	✓	✓	76.7	47.2	62.0	89	38	0	0	0	
Nov.	✓	✓	65.2	35.6	50.4	79	27	0	7	0.45	
Dec.	✓	✓	52.2	31.4	41.8	62	19	0	17	2.75	
									Total	6.98	

* Data Missing — Used 1974 - 84 avg.

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BAKER

TABLE A-3

Year Month	Southwest Desert Basin Vol. 78	Page	Av. May Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (")	Remarks
1974											Average = 4.64
Jan.	✓	11	58.1	36.8	47.5	69	18	0	5	1.02	
Feb.	✓	6	70.6	38.8	54.7	81	30	0	2	0	
Mar.	✓	7	78.5	48.9	63.7	89	34	0	0	1.09	
Apr.	✓	✓	84.6	50.6	67.6	95	44	6	0	0	
May	✓	✓	*94.6	*58.9	*76.8	*109	*46	*21	*0	*0.07	
June	✓	✓	109.7	72.2	91.0	116	67	30	0	0	
July	✓	✓	111.8	76.7	93.9	118	64	31	0	0.15	
Aug.	✓	✓	108.5	74.8	91.7	118	68	31	0	0.35	
Sept.	✓	✓	105.3	74.0	89.7	111	68	30	0	0	
Oct.	✓	✓	88.5	60.9	74.7	104	29	18	0	2.28	
Nov.	✓	✓	73.7	45.0	59.4	82	36	0	0	0	
Dec.	✓	✓	65.8	37.4	51.6	69	33	0	0	0.33	
									Total	5.29	
1975	79										Average = 4.64
Jan	✓	6	63.8	35.6	44.7	72	22	0	7	0.09	
Feb.	✓	✓	68.8	40.0	54.4	85	29	0	2	0.43	
Mar	✓	✓	74.3	42.8	58.6	86	34	0	0	0.32	
Apr.	✓	✓	77.1	46.9	62.0	90	40	1	0	0.39	
May	✓	✓	94.7	59.2	77.0	104	47	24	0	0	
June	✓	✓	104.6	68.7	86.7	114	57	30	0	0	
July	✓	✓	111.3	75.4	93.4	118	66	31	0	0.04	
Aug.	✓	✓	108.7	70.2	89.5	117	65	31	0	0	
Sept.	✓	✓	103.2	67.9	85.6	111	58	30	0	0.10	
Oct	✓	✓	87.1	54.5	70.8	103	40	11	0	0.05	
Nov.	✓	✓	*74.0	*39.5	*59.3	*85	*31	*0	*3	*0.32	
Dec.	✓	✓	67.4	35.3	51.4	75	25	0	7	0	
									Total	1.74	

* Data Missing — Used 1974 - 84 avg.

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BAKER

TABLE A-3 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-fall Total (")	Remarks
1976	80										Average=4.64
Jan.	✓	6	66.8	31.7	49.3	77	18	0	16	0	
Feb.	✓	✓	69.4	45.1	57.3	78	37	0	0	2.03	
Mar.	✓	✓	74.9	46.7	60.8	87	39	0	0	0.08	
Apr.	✓	✓	82.7	50.8	66.8	97	38	7	0	0.15	
May	✓	✓	97.5	61.7	79.6	108	52	27	0	0.23	
June	✓	✓	103.9	66.8	85.4	117	48	29	0	0	
July	✓	✓	110.5	79.0	94.8	118	66	31	0	0.12	
Aug.	✓	✓	104.7	78.9	91.8	114	70	31	0	0	
Sept.	✓	✓	96.1	74.6	85.4	112	*56	*29	0	2.44	
Oct.	✓	✓	86.3	66.1	76.2	95	58	11	0	0.21	
Nov.	✓	✓	70.6	55.2	66.9	84	30	0	1	0	
Dec.	✓	✓	63.2	30.8	47.0	70	26	0	28	0.60	
									Total	5.86	
1977	81										Average=4.64
Jan	✓	6	62.1	39.3	50.7	72	26	0	8	0.13	
Feb.	✓	✓	78.0	43.3	60.7	85	37	0	0	0	
Mar	✓	✓	77.8	44.7	61.2	86	38	0	0	0.61	
Apr.	✓	✓	89.4	54.7	72.1	99	48	20	0	0.10	
May	✓	✓	86.5	56.5	71.5	108	46	7	0	0.92	
June	✓	✓	107.8	70.8	89.3	116	60	30	0	0	
July	✓	✓	*113	*74.1	*92.6	*119	*63	*31	*0	*0.07	
Aug.	✓	✓	108.0	74.8	91.4	118	64	31	0	1.78	
Sept.	✓	✓	100.1	67.2	83.7	111	57	29	0	0.09	
Oct.	✓	✓	*87.1	*56.5	*71.3	*99	*43	*12	*0	*0.09	
Nov.	✓	✓	76.2	46.0	61.1	87	38	0	0	0.08	
Dec.	✓	✓	68.4	39.6	54.0	76	34	0	0	0.96	
									Total	4.83	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BAKER

TABLE A-3 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in)	Remarks
1978	82										Average = 4.64
Jan.	✓	5	60.9	39.4	50.2	69	16	0	3	1.58	
Feb.	✓	✓	68.5	40.0	54.3	77	30	0	3	1.25	
Mar.	✓	✓	75.3	46.7	61.0	91	39	1	0	1.04	
Apr.	✓	✓	78.7	49.0	63.9	91	38	2	0	0.33	
May	✓	✓	94.6	54.3	74.5	107	43	22	0	0.30	
June	✓	✓	106.3	66.1	86.2	115	43	30	0	0	
July	✓	✓	111.6	66.9	89.3	117	58	31	0	0	
Aug.	✓	✓	108.9	64.1	86.5	118	54	31	0	0	
Sept.	✓	✓	*101.2	*68.6	*84.9	*111	*56	*29	*0	*0.41	
Oct.	✓	✓	93.1	62.3	77.7	105	55	20	0	0	
Nov.	✓	✓	73.3	52.8	63.1	85	36	0	0	0.61	
Dec.	✓	✓	59.6	*36.0	*50.0	65	33	0	0	0.11	
									Total	5.53	
1979	83										Average = 4.64
Jan	✓	5	*63.8	*35.6	*44.7	*72	*22	*0	*7	*0.52	
Feb.	✓	✓	68.1	41.4	54.8	76	31	0	2	0.14	
Mar	✓	✓	70.1	47.4	58.8	78	40	0	0	2.24	
Apr.	✓	✓	81.7	51.4	66.6	95	39	5	0	0	
May	✓	✓	*94.6	*58.9	*76.8	*109	*46	*21	*0	*0.25	
June	✓	✓	*106.1	*68.5	*87.2	*116	*56	*30	*0	*0	
July	✓	✓	*111.3	*74.1	*92.6	*119	*63	*31	*0	*0.07	
Aug.	✓	✓	*108.5	*72.5	*90.2	*118	*65	*30	*0	*0.55	
Sept.	✓	✓	*101.2	*68.6	*84.9	*111	*56	*29	*0	*0.41	
Oct	✓	✓	*87.1	*56.5	*71.3	*99	*43	*12	*0	*0.09	
Nov.	✓	✓	*74.0	*39.5	*57.3	*85	*31	*0	*3	*0.32	
Dec.	✓	✓	65.7	32.1	48.9	78	22	0	15	0.41	
									Total	5.25	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BAKER

TABLE A-3 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (")	Remarks
1980	84										Average = 4.64
Jan.	✓	5	65.6	40.4	53.0	76	28	0	5	1.23	
Feb.	✓	✓	71.1	42.2	56.7	83	29	0	2	1.80	
Mar.	✓	✓	72.7	44.2	58.5	82	39	0	0	0.64	
Apr.	✓	✓	85.8	50.8	68.3	105	40	11	0	0.41	
May	✓	✓	90.6	56.9	73.8	108	45	16	0	0	
June	✓	✓	104.1	64.4	84.3	119	58	30	0	0.21	
July	✓	✓	115.0	69.7	92.4	124	53	31	0	0	
Aug.	✓	✓	110.3	73.7	92.0	124	65	31	0	0	
Sept.	✓	✓	102.8	64.0	83.4	110	50	30	0	0.36	
Oct.	✓	✓	90.8	52.3	71.6	110	38	14	0	0	
Nov.	✓	✓	75.8	39.5	57.7	92	27	4	10	0	
Dec.	✓	✓	69.9	32.5	51.2	79	21	0	8	0	
									Total	4.65	
1981	85										Average = 4.64
Jan	✓	5	66.8	36.0	51.4	*72	29	0	*7	0.36	
Feb.	✓	✓	69.3	35.8	52.6	86	22	0	9	0.04	
Mar	✓	✓	75.1	45.6	60.4	92	38	1	0	0.47	
Apr.	✓	✓	92.1	56.6	74.4	105	41	20	0	0	
May	✓	✓	95.4	61.6	78.5	107	*46	*21	0	0.78	
June	✓	✓	110.4	73.2	91.8	119	62	30	0	0	
July	✓	✓	112.7	76.0	94.4	118	70	23	0	0	
Aug.	✓	✓	110.6	74.9	92.8	121	68	31	0	0.24	
Sept.	✓	✓	102.0	66.8	84.4	*111	58	30	0	0.31	
Oct.	✓	✓	84.8	50.8	67.8	96	43	9	0	0	
Nov.	✓	✓	78.0	42.1	60.1	88	29	0	2	0	
Dec.	✓	✓	66.5	34.2	50.4	82	22	0	8	0	
									Total	2.20	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BAKER

TABLE A-3 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min. Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or blow	Precip. Rain-fall Total (in)	Remarks
1982	86										Average = 4.64
Jan.	✓	8	65.4	31.0	47.2	71	21	0	18	0	
Feb.	✓	✓	69.5	40.2	54.9	87	28	0	5	0	
Mar.	✓	✓	73.7	43.7	58.7	83	34	0	0	1.01	
Apr.	✓	✓	85.9	50.6	68.3	100	37	11	0	.01	
May	✓	✓	96.1	57.6	77.9	109	47	27	0	0.05	
June	✓	✓	*106.1	65.1	83.9	112	53	30	0	0	
July	✓	✓	*111.3	71.6	90.4	119	61	31	0	0	
Aug.	✓	✓	*108.5	72.1	89.7	116	66	30	0	0.69	
Sept.	✓	✓	97.9	60.8	79.4	115	42	24	0	0	
Oct.	✓	✓	85.5	45.2	65.4	94	35	9	0	0	
Nov.	✓	✓	68.2	34.5	51.4	79	27	0	7	0.87	
Dec.	✓	✓	58.4	30.8	44.6	65	20	0	21	0.42	
									Total	3.05	
1983	87										Average = 4.64
Jan	✓	8	*64.2	*31.0	*47.6	*74	*21	*0	*0	*0.44	
Feb.	✓	✓	68.3	38.1	53.7	80	30	0	2	0.87	
Mar	✓	✓	73.5	44.0	58.8	84	36	0	0	2.59	
Apr.	✓	✓	78.7	45.0	62.1	91	36	2	0	0.20	
May	✓	✓	98.4	56.3	75.4	116	38	18	0	0	
June	✓	✓	*106.1	*68.5	*87.2	*116	*56	*30	*0	*0.01	
July	✓	✓	*111.3	*74.1	*92.6	*119	*63	*31	*0	*0.01	
Aug.	✓	✓	100.7	72.9	86.8	116	65	24	0	1.95	
Sept.	✓	✓	101.3	71.9	86.6	110	58	27	0	0.17	
Oct	✓	✓	87.1	57.2	72.2	93	51	9	0	0.57	
Nov.	✓	✓	73.0	44.2	58.6	87	30	0	4	0.07	
Dec.	✓	✓	64.8	38.1	51.5	74	27	0	5	0.32	
									Total	7.69	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

BAKER

TABLE A-3 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Temperature: Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or blow	Precip. Rain-Fall Total (in)	Remarks
1984	88										Average = 4.64
Jan.	✓	8	66.3	35.1	50.7	75	23	0	6	0	
Feb.	✓	✓	70.1	36.1	53.1	77	28	0	9	0	
Mar.	✓	✓	78.0	45.5	61.8	86	33	0	0	0	
Apr.	✓	✓	84.3	50.7	67.5	102	39	8	0	0.01	
May	✓	✓	101.3	63.8	82.6	113	46	28	0	0	
June	✓	✓	102.1	69.4	85.8	116	58	30	0	0.01	
July	✓	✓	106.8	72.7	92.3	121	69	31	0	2.08	
Aug.	✓	✓	*108.5	*72.9	*90.2	*118	*65	*30	*0	*0.53	
Sept.	✓	✓	102.3	70.4	86.4	111	61	29	0	0.23	
Oct.	✓	✓	80.9	49.6	65.3	97	39	8	0	0	
Nov.	✓	✓	69.4	41.1	55.3	84	31	0	2	0.54	
Dec.	✓	✓	55.6	36.8	46.2	70	22	0	9	1.54	
									Total	4.94	

* Data Missing — Used 1974 - 84 avg.

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

MOUNTAIN PASS

TABLE A-4

Year Month	Southeast Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (in)	Remarks
1974	78										Average = 10.30
Jan.	✓	12	41.3	21.2	31.3	62	3	0	30	1.67	
Feb.	✓	6	49.5	25.0	37.3	60	18	0	27	.03	
Mar.	✓	7	58.4	33.8	46.1	72	12	0	9	.28	
Apr.	✓	7	62.3	35.6	49.0	79	26	0	7	.20	
May	✓	7	*74.5	*47.9	*61.2	*90	*33	*2	*2	*.30	
June	✓	7	91.0	60.3	75.7	101	43	17	0	0	
July	✓	7	90.3	62.8	76.6	100	46	20	0	.66	
Aug.	✓	7	90.4	60.6	75.5	99	52	24	0	.98	
Sept.	✓	7	87.2	57.7	73.5	94	49	19	0	.72	
Oct.	✓	7	72.2	45.4	58.8	87	27	0	2	3.48	
Nov.	✓	7	56.1	32.9	44.5	69	23	0	13	.44	
Dec.	✓	6	46.2	22.8	34.5	60	9	0	29	.95	
									Total	9.71	
1975	79	6									Average = 10.30
Jan.	✓	✓	47.5	23.5	35.5	65	7	0	25	0.38	
Feb.	✓	✓	48.5	24.5	36.5	66	12	0	26	0.18	
Mar.	✓	✓	51.7	27.5	39.6	77	13	0	23	0.95	
Apr.	✓	✓	51.7	28.9	40.3	70	20	0	21	2.70	
May	✓	✓	69.0	42.0	55.5	85	20	0	4	0.	
June	✓	✓	82.4	54.2	68.3	*98	38	12	0	0	
July	✓	✓	89.3	63.5	76.4	98	56	17	0	0.05	
Aug.	✓	✓	94.3	64.7	79.5	104	55	24	0	0	
Sept.	✓	✓	87.6	59.6	72.8	98	47	13	0	1.05	
Oct.	✓	✓	*72.7	*45.3	*59.0	87	20	0	2	0.37	
Nov.	✓	✓	*59.6	*35.3	*47.4	*83	*23	*0	*11	*0.87	
Dec.	✓	✓	56.2	32.4	44.3	67	16	0	6	0.1	
									Total	6.45	

* Data Missing — Used 1974 - 84 avg.

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

MOUNTAIN PASS

TABLE A-4 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (")	Remarks
1976	80	6									Average = 10.30
Jan.	✓	✓	56.3	30.6	43.5	68	14	0	18	0	
Feb.	✓	✓	56.2	35.4	45.8	70	27	0	10	1.84	
Mar.	✓	✓	57.4	33.2	45.3	72	22	0	17	0.28	
Apr.	✓	✓	64.6	37.9	51.3	79	26	0	7	0.19	
May	✓	✓	79.8	53.5	66.7	89	41	0	0	0.45	
June	✓	✓	*86.4	*59.6	*72.4	98	42	*12	0	0	
July	✓	✓	90.9	64.5	77.7	99	56	22	0	0.32	
Aug.	✓	✓	86.4	56.0	70.7	98	44	15	0	0	
Sept.	✓	✓	80.5	51.2	65.9	99	44	4	0	3.43	
Oct.	✓	✓	70.3	40.6	55.5	87	31	0	1	0.28	
Nov.	✓	✓	64.7	34.2	49.5	77	12	0	7	0	
Dec.	✓	✓	56.2	25.4	40.3	65	18	0	30	0.06	
									Total	6.75	
1977	81	6									Average = 10.30
Jan	✓	✓	48.7	29.7	39.2	63	19	0	22	0.64	
Feb.	✓	✓	60.3	35.1	47.7	73	26	0	9	0	
Mar	✓	✓	53.8	29.3	41.6	*75	23	0	*7	6.72	
Apr.	✓	✓	70.1	43.7	56.9	82	27	0	3	0	
May	✓	✓	65.7	42.5	54.1	89	31	0	2	1.16	
June	✓	✓	88.4	62.0	75.2	99	53	14	0	0.27	
July	✓	✓	91.9	68.3	80.1	99	60	25	0	0.10	
Aug.	✓	✓	89.9	65.7	77.8	103	57	19	0	3.64	
Sept.	✓	✓	81.5	57.0	69.3	94	45	9	0	0.54	
Oct	✓	✓	76.5	50.0	63.3	89	38	0	0	0.38	
Nov.	✓	✓	64.2	38.0	51.1	75	21	0	3	0.52	
Dec.	✓	✓	57.7	35.9	46.3	70	26	0	6	1.40	
									Total	9.37	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

MOUNTAIN PASS

TABLE A-4 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Temperature Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (")	Remarks
1978	82	6									Average 10.30
Jan.	✓	✓	48.6	31.5	40.1	59	21	0	21	2.00	
Feb.	✓	✓	53.2	34.9	44.4	66	25	0	13	1.79	
Mar.	✓	✓	60.2	43.5	51.9	73	35	0	0	2.27	
Apr.	✓	✓	61.7	42.9	52.3	76	32	0	1	1.01	
May	✓	✓	74.4	45.4	59.9	89	33	0	0	0.56	
June	✓	✓	*86.4	*57.6	*72.4	*98	*44	*12	*0	*0.06	
July	✓	✓	92.4	67.0	79.7	100	54	25	0	0.27	
Aug.	✓	✓	*89.3	*62.1	*75.7	*100	*53	*15	*0	*1.34	
Sept.	✓	✓	81.8	54.1	68.0	93	35	6	0	0.01	
Oct.	✓	✓	79.0	51.7	65.4	95	40	3	0	0.16	
Nov.	✓	✓	56.0	34.5	45.3	77	22	0	14	2.18	
Dec.	✓	✓	*52.8	*30.2	*41.5	63	8	0	19	2.25	
									Total	13.90	
1979	83	6									Average = 10.30
Jan	✓	✓	44.2	25.3	34.8	55	9	0	30	1.99	
Feb.	✓	✓	50.7	29.2	46.0	66	15	0	20	0.61	
Mar	✓	✓	57.7	35.2	46.5	75	26	0	9	2.20	
Apr.	✓	✓	67.5	46.9	54.2	80	30	0	5	0	
May	✓	✓	77.0	49.6	63.3	89	35	0	0	0.02	
June	✓	✓	86.8	58.8	72.8	96	42	14	0	0	
July	✓	✓	92.1	65.2	78.7	103	54	22	0	1.97	
Aug.	✓	✓	86.2	61.1	73.7	100	52	12	0	2.45	
Sept.	✓	✓	89.8	60.4	75.1	98	55	15	0	0	
Oct.	✓	✓	76.1	49.2	62.7	90	34	2	0	0.30	
Nov.	✓	✓	57.2	34.1	45.7	76	22	0	0	0.13	
Dec.	*✓	*✓	*57.8	*30.2	*41.1	*64	*17	*0	*19	*0.63	
									Total	10.30	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

MOUNTAIN PASS

TABLE A-4 (Continued)

Year Month	Southeast Desert Region Vol.	Page	Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or blow	Precip. Rain-Fall Total (")	Remarks
1980	84	6									Average = 10.30
Jan.	✓	✓	50.7	34.3	42.5	60	25	0	13	2.13	
Feb.	✓	✓	56.0	35.9	46.0	70	26	0	8	2.66	
Mar.	✓	✓	55.2	32.9	44.1	62	22	0	13	1.71	
Apr.	✓	✓	66.2	40.3	53.3	83	30	0	5	0.72	
May	✓	✓	68.6	43.5	56.1	86	29	0	2	0.37	
June	✓	✓	84.3	58.1	71.2	95	45	8	0	0.20	
July	✓	✓	93.3	67.0	80.2	*100	57	27	0	3.33	
Aug.	✓	✓	89.8	64.5	77.2	101	54	15	0	0.01	
Sept.	✓	✓	85.8	55.1	70.5	94	48	10	0	0.64	
Oct.	✓	✓	75.5	45.2	60.4	96	31	10	4	0.29	
Nov.	✓	✓	64.1	37.3	50.7	79	23	0	11	0	
Dec.	✓	✓	58.4	35.9	47.2	70	22	0	8	0.01	
									Total	12.07	
1981	85	6									Average = 10.30
Jan	✓	✓	55.7	33.3	44.5	66	24	0	10	0.71	
Feb.	✓	✓	56.7	33.6	45.2	72	26	0	12	0.76	
Mar	✓	✓	56.0	35.3	45.7	72	28	0	5	1.24	
Apr.	✓	✓	71.0	46.6	58.8	87	33	0	0	0.03	
May	✓	✓	76.2	51.6	63.9	89	36	0	0	1.34	
June	✓	✓	*86.4	*59.6	*72.4	*98	*44	*12	*0	*0.06	
July	✓	✓	*89.9	*65.4	*77.7	*104	*55	*16	*0	*1.49	
Aug.	✓	✓	*89.3	*62.1	*75.7	*100	*53	*15	*0	*1.34	
Sept.	✓	✓	87.0	58.6	72.8	98	49	13	0	1.05	
Oct.	✓	✓	68.7	43.2	56.0	79	31	0	2	0.64	
Nov.	✓	✓	63.6	39.1	51.4	76	23	0	6	0.82	
Dec.	✓	✓	57.4	31.5	44.5	69	24	0	5	0.08	
									Total	9.54	

*** Data Missing — Used 1974 - 84 avg.**

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MOUNTAIN PASS
TABLE A-4 (Continued)

Year Month	Southeast Desert Basin Vol.	Page	Av. Max Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (")	Remarks
1982	86	9									Average = 10.30
Jan.	✓	✓	47.7	25.1	36.4	64	12	0	27	1.69	
Feb.	✓	✓	53.2	32.9	43.1	72	13	0	13	0.74	
Mar.	✓	✓	54.7	33.5	44.1	68	21	0	16	1.46	
Apr.	✓	✓	63.0	38.4	50.7	76	23	0	5	0.16	
May	✓	✓	*74.5	*47.9	*61.2	*90	*33	*2	*2	*0.30	
June	✓	✓	*86.4	*57.6	*72.4	*98	*44	*12	*0	*0.06	
July	✓	✓	*91.2	*65.2	*78.2	*100	*54	*21	*0	*1.47	
Aug.	✓	✓	88.5	62.8	75.7	100	58	15	0	2.92	
Sept.	✓	✓	*87.0	*58.6	*72.8	*98	*49	*13	*0	*1.05	
Oct.	✓	✓	68.7	41.8	55.3	77	36	0	0	0.32	
Nov.	✓	✓	54.4	33.4	43.9	69	28	0	13	2.13	
Dec.	✓	✓	47.8	28.0	37.9	60	19	0	25	1.11	
									Total	12.81	
1983	87	9									Average = 10.30
Jan	✓	✓	*53.3	*32.0	*42.7	*65	*23	*0	*0	*0.78	
Feb.	✓	✓	52.3	35.4	43.9	66	25	0	10	1.79	
Mar	✓	✓	57.2	36.3	46.8	69	29	0	9	2.73	
Apr.	✓	✓	59.3	36.3	47.8	70	28	0	9	0.13	
May	✓	✓	76.7	46.2	61.5	98	35	8	0	0.01	
June	✓	✓	*86.4	*57.6	*72.4	*98	*44	*12	*0	*0.06	
July	✓	✓	*89.9	*65.4	*77.7	*104	*55	*16	*0	*1.47	
Aug.	✓	✓	*89.3	*62.1	*75.7	*100	*53	*15	*0	*1.34	
Sept.	✓	✓	*87.0	*58.6	*72.8	*98	*49	*13	*0	*1.05	
Oct.	✓	✓	*72.7	*45.3	*59.0	*87	*35	*2	*2	*0.65	
Nov.	✓	✓	*59.6	*35.3	*47.4	80	8	0	11	1.05	
Dec.	✓	✓	52.5	32.2	42.4	62	20	0	14	0.40	
									Total	11.46	

*** Data Missing — Used 1974 - 84 avg.**

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MONTHLY SUMMARY OF CLIMATOLOGICAL DATA

MOUNTAIN PASS

TABLE A-4 (Continued)

Year Month	Southwest Desert Basin Vol.	Page	Av. May Temp. (°F)	Av. Min Temp (°F)	Av. Temp. (°F)	Highest Temp (°F)	Lowest Temp.	Days Max 90°F or above	Days Min. 32°F or below	Precip. Rain-Fall Total (")	Remarks
1984	88	9									Average = 10.30
Jan.	✓	✓	53.5	30.9	42.2	64	16	0	16	0.01	
Feb.	✓	✓	56.3	31.3	43.8	67	24	0	17	0.01	
Mar.	✓	✓	63.6	37.1	50.4	72	26	0	4	0.01	
Apr.	✓	✓	66.2	39.8	53.0	85	26	0	4	0.22	
May	✓	✓	83.5	56.5	70.0	98	40	10	0	0.01	
June	✓	✓	85.5	57.1	71.3	100	45	7	0	0.01	
July	✓	✓	89.9	65.4	77.7	104	55	16	0	5.90	
Aug.	✓	✓	* 89.3	* 62.1	* 75.7	* 100	* 53	* 15	* 0	* 1.34	
Sept.	✓	✓	86.8	57.9	72.4	95	48	13	0	0.01	
Oct.	✓	✓	66.8	41.0	53.9	84	30	0	6	0	
Nov.	✓	✓	56.6	34.3	45.5	71	23	0	13	1.44	
Dec.	✓	✓	45.1	27.5	36.3	55	14	0	26	2.08	
									Total	11.04	

* Data Missing — Used 1974 - 84 avg.

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APPENDIX B

CORE LOCATIONS & CONDITION SURVEY

Post Mile		Lane			Comments
Project	Core Location	Rating	No.	Direction	
Oak Hill Rd to Palmdale Rd PM 27.0 to PM 40.0	30.62	C C	2,4 2,4	NB SB	4-lanes - intermittent cracking, crack sealing. #1 lane appears best but has some cracking - mostly longitudinal wheel track cracking.
	36.50	B B	2,4 2,4	NB SB	3-lanes - Intermittent cracking, both 1 & 2 lanes - occasional cracking #1 lane - (cracking is longitudinal in wheel tracks
	39.66	B B	2,4 2,4	NB SB	3-lanes - Intermittent cracking in wheel track - less prolific than previous locations indicated above.
Palmdale Rd to "D" Street Overlay Placed 1979 PM 40.0 to 42.5	41.35	B	1,2,3	NB	All three lanes look good - no cracking. However, slight flushing started in wheel track of #2 & #3 lane ± 1 mile of this location
		A	1,2,3	SB	All three lanes look good - no cracking or flushing
	42.55	A	1,2,3	NB	All three lanes look good - no cracking or flushing.
		A	1,2,3	SB	All three lanes look good - no cracking or flushing

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APPENDIX B (Continued)

Post Mile		Lane			Comments
Project	Core Location	Rating	No.	Direction	
"D" Street to Boulder Rd PM 42.5 to PM 53.8	45.10	D	1,2	NB	Two lanes - continuous cracking in wheel tracks - both lanes.
		D	1,2	SB	Two lanes - continuous wheel track cracking - both lanes. Most severe in #2 lane.
	49.70	C	1,2	NB	Two lanes - minimal cracking (intermittent) in #2 lane - no cracking in #1 lane.
		D	1,2	SB	Two lanes - wheel track cracking - no cracking in #1 lane.
	52.60	A	1,2	NB	Two lanes - no cracking in either lane.
		C	1,2	SB	Two lanes - wheel track cracking in #2 lane - no cracking in #1 lane.
Boulder Rd. to Barstow PM 53.8 to PM 71.7	60.00	A	1,2	NB	Two lanes - no cracks in either lane.
		A	1,2	SB	Two Lanes - no cracks i n either lane.
	58.30 58.50	B B	1,2 1,2	NB SB	Two lanes - cracking in wheel track - #1 lane "OK".
	67.10	C	1,2	NB	Longitudinal & transverse cracking #1 lane - no cracks in #2 lane.
		A	1,2	SB	No cracks either lane.

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APPENDIX B (Continued)

Post Mile		Lane			Comments
Project	Core Location	Rating	No.	Direction	
Boulder Rd. to Barstow (Cont.)	69.90 69.96 70.00	C	1,2	NB	Cracking in wheel tracks #2 lane - no cracking in #1 lane.
	71.20	D	1,2	SB	Alligator cracking in outer wheel track in #2 lane - no cracks in #1 lane. (This section has recycled mix on surface.)
	71.00	B	1,2	SB	OGAC over recycled AC - occasional cracks in wheel track #2 lane.
Through Barstow to Yermo PM 71.7 to PM 81.3	72.00	B	1,2	NB	Intermittent longitudinal cracking in wheel track #2 lane; some cracking in #1 lane.
	72.50	A	1,2	SB	No cracks either lane.
	ThickOverlay 76.25 Start Thin Overlay 76.90	C	1,2	NB	Transverse cracking both lanes.
	76.25	A	1,2	SB	No cracks - either lane.
	80.00	B	1,2 1,2	NB SB	Transverse cracks in both lanes.
Yermo to Field PM 81.3 to PM 101.3	83.00	Note: SB lanes are worse than NB. B (NB) C (SB)	1,2	NB	Two lanes - no OGAC - surface looks good - however, cracking is in wheel track of #2 lane - no cracks in #1 lane.
		C	1,2	SB	Two lanes - no OGAC - cracking in wheel track of #2 lane - no cracks in #1 lane.
	90.00	A	1,2	NB	Two lanes - no OGAC -no cracks in either lane.
		C	1,2	SB	Two lanes - no OGAC - cracking in both wheel tracks #2 lane - no cracking #1 lane.

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APPENDIX B (Continued)

Post Mile		Lane			Comments
Project	Core Location	Rating	No.	Direction	
Yermo to Field (Cont.)	99.80	A	1,2	NB	(Drainage Area) Two lanes - no OGAC - no cracks.
		D	1,2	SB	No OGAC. Also transverse cracking. Two lanes - badly cracked in wheel tracks of #2 lane - no cracking #1 lane.
Field to Baker P.M. - 101.3 to PM 138.4	103.00	A	1,2	NB	Two lanes - OGAC - no cracks either lane - (recycle).
		A	1,2	SB	Two lanes - OGAC - no cracks either lane -
	121.00	B	1,2	NB	Transverse cracks in #2 lane every 20'± - no cracks in #1 lane.
		B	1,2	SB	Two lanes - OGAC - no cracking.
	133.50	A	1,2	NB	No cracks - either lane.
		A	1,2	SB	No cracks - two lanes - no fog seal.
Baker to Cima Rd (Recycle) PM 138.4 to PM 162	141.00 #3 lane is virgin mix	A	1,2	NB	Three lanes - no OGAC- no cracks either lane.
	147.00	A	1,2	SB	Two lanes - no OGAC - no cracks either lane
		A	1,2	NB	Three lanes - no OGAC- no cracks any lane
		A	1,2	SB	Two lanes - no OGAC- no cracks - no seal either lane.
	154.80 (Halloran)	B	1,2	NB	Three lanes - no cracks any lane. #1 lane has been fog sealed. Slight rutting in owt of #1 lane.
		A	1,2	SB	Two lanes - no cracks either lane - no fog seals.

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APPENDIX B (Continued)

Post Mile		Lane			Comments
Project	Core Location	Rating	No.	Direction	
Baker to Cima Rd (Recycle) (Cont.)	160.00	A	1,2	NB	Two lanes - no cracks either lane - #1 lane has been fog sealed.
		A	1,2	SB	Two lanes - no cracks, #1 lane has been fog sealed.
Cima Rd to State Line PM 162 to PM 186.2	162.00	D	1,2	NB	Three lanes - Nos. 1&2 lanes are cracking - longitudinal - no seal - #3 lane has red chip seal. Overall performance considered bad.
	166.00	D	1,2,3	NB	Three lanes - Nos. 1,2,3 lane have longitudinal cracking - no chip sealing in this area - Overall performance considered bad.
	175.00	D	1,2	NB	Two lanes - both lanes cracked. Overall performance considered slightly better than PM 162 or 166.
	184.00	D	1,2	NB	Two lanes - both lanes cracked - performance about the same as PM 175.
State Line to Cima Rd.	184.00	C	1,2	SB	No. 1 lane - good condition - No. 2 lane cracked.
	179.00	C	1,2,3	SB	No 1 lane - good condition - No. 2 & 3 lane cracked.
	166.00	C	1,2	SB	No. 1 lane looks OK - No. 2 lane has a red chip seal - some reflection cracking.
	157.00	B	1,2	SB	No. 1&2 lane looks good - no chip seals in this area - only occasional transverse cracking.

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APPENDIX C

PAVEMENT CORE TEST DATA

"D" Street to Boulder Road

LOCATION		CORE DATA		RECOMPACTED DATA				TEST ON RECOVERED ASPHALT					EXTRACTION DATA											
TEST NUMBER	POST MILE	MRx10^6	Sp.Gr.	MRX10^5	Stab.	Sp.Gr.	Coh.	Visc. @140F	Visc. @275F	Pen.	Soft Pt.	Duct.	% Asph.	1/2 In.	3/8 In.	4	8	16	30	50	100	200	Surf. Area	Bit. Index
872-257	46.17NB#1	4.00	2.29	3.60	47	2.35	431	32600	922	15	144	12	4.8	96	87	64	45	33	23	16	12	8.1	33.90	0.00142
872-258	46.60SB#2	5.09	2.31	3.32	44	2.33	455	24800	874	18	142	16	4.9	98	80	60	42	30	21	15	11	8.2	32.44	0.00151
872-259	47.50NB#2	5.23	2.32										4.9	100	88	68	48	34	24	18	13	9.2	37.28	0.00131
872-260	48.52NB#1	4.20	2.33	3.27	45	2.39	399	14400	752	21	137	100	4.6	96	84	62	45	32	23	17	12	8.5	34.72	0.00132
872-261	48.52NB#2	4.37	2.36										4.9	98	84	65	50	37	27	19	13	8.5	37.14	0.00132
872-262	48.52SB#1	4.87	2.35										4.8	93	76	50	36	26	19	14	10	7.2	28.90	0.00166
872-263	48.52SB#2	4.74	2.36										5.0	96	76	53	38	28	20	15	10	7.2	29.64	0.00169
872-264	52.20NB#1	5.07	2.37	3.70	18	2.42	397	9100	630	23	142	100	5.7	95	78	56	44	33	24	17	13	8.7	35.70	0.00160
872-265	52.20NB#2	4.90	2.41										5.9	95	80	57	43	32	23	16	12	8.0	33.44	0.00176

Boulder Road to Barstow

LOCATION		CORE DATA		RECOMPACTED DATA				TEST ON RECOVERED ASPHALT					EXTRACTION DATA											
TEST NUMBER	POST MILE	MRx10^6	Sp.Gv.	MRX10^5	Stab	Sp.Gr.	Coh.	Visc. @140F	Visc. @275F	Pen.	Soft Pt.	Duct.	% Asph.	1/2 In.	3/8 In.	4	8	16	30	50	100	200	Surf. Area	Bit. Area
872-86	55.0 NB#1	4.54	2.29										4.8	96	85	59	42	32	23	17	12	8.4	34.38	0.00139
872-87	55.0 NB#2	4.44	2.35										5.1	96	84	58	41	31	22	16	13	8.3	34.24	0.00139
872-88	58.13NB#1	3.95	2.22					4600	360	41	132	100	4.5	97	84	63	47	31	19	13	9	6.1	27.34	0.00139
872-89	58.13SB#1	3.63	2.22										5.0	99	88	64	47	32	20	13	8	5.2	25.54	0.00139
872-90	58.13SB#2	6.75	2.26	8.10	43	2.34	285	7650	455	29	136	100	4.6	96	86	63	44	31	22	16	11	8.0	32.78	0.00139
872-91	60.0 NB#1	4.14	2.26										4.8	97	86	57	41	29	20	13	9	5.9	26.64	0.00139
872-92	60.0 NB#2	7.55	2.28	9.45	45	2.34	407						4.5	97	85	61	42	31	22	15	11	8.0	32.36	0.00139
872-93	60.0 SB#2	3.33	2.26										4.3	93	77	51	36	26	18	12	8	6.3	25.54	0.00139
872-95	69.9 NB#2	3.48	2.26	4.30	54	2.32	631	11200	535	33	139	81	4.3	92	80	60	40	28	19	13	10	7.2	29.12	0.00139
872-96	69.9 SB#1	4.42	2.27										5.5	97	86	62	45	32	21	14	9	5.9	27.58	0.00139
872-97	69.9 SB#2	4.42	2.24										4.5	96	85	59	42	28	19	13	9	6.7	27.78	0.00139
872-98	71.0 SB#1	3.98	2.24										4.3	97	85	60	43	30	21	14	10	7.0	29.66	0.00139
872-99	71.13SB#2	3.69	2.23	3.93	44	2.30	370	29700	811	18	148	22	4.2	91	79	60	41	29	20	14	10	7.5	30.16	0.00139

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APPENDIX C (Continued)
PAVEMENT CORE TEST DATA

Barstow to Yermo

LOCATION		CORE DATA		RECOMPACTED DATA				TEST ON RECOVERED ASPHALT					EXTRACTION DATA											
TEST NUMBER	POST MILE	MRx10^5	Sp.Gr.	MRx10^5	Stab.	Sp.Gr.	Coh.	Visc. @140F	Visc. @275F	Pen.	Soft Pt.	Duct.	% Asph.	1/2 In.	3/8 In.	4	8	16	30	50	100	200	Surf. Area	Bit. Index
872-176	72.0 NB#1	4.96	2.26										5.2	99	88	68	49	35	24	16	11	7.6	33.04	0.00157
872-177	72.0 NB#2	5.70	2.26	3.78	39	2.29	392	7900	600	38	137	100	5.2	98	91	75	55	40	27	18	12	7.9	35.92	0.00144
872-178	72.5 SB#1	5.51	2.29										5.5	99	88	64	46	33	23	16	11	7.4	32.22	0.00170
872-179	72.5 SB#2	6.02	2.30	4.10	35	2.31	374	4900	540	50	130	100	5.7	99	90	66	49	35	24	16	11	8.0	33.64	0.00169
872-180	76.25NB#1	6.31	2.24										5.7	96	86	64	48	34	23	15	10	6.7	30.36	0.00187
872-181	76.25NB#2												6.0	97	86	65	48	35	24	16	10	7.3	31.86	0.00188
872-183	76.25SB#2	3.09	2.24	3.96	37	2.29	306	6600	562	41	136	100	4.9	98	88	65	48	34	23	15	10	7.0	30.86	0.00158
872-184	80.0 NB#1	4.58	2.25										6.2	95	87	66	49	36	24	16	11	7.7	33.24	0.00186
872-185	80.0 NB#2	4.73	2.21										5.9	98	90	68	52	37	26	17	11	7.8	34.22	0.00172
872-186	80.0 SB#1	4.39	2.20										4.9	99	92	66	46	33	23	16	11	7.7	32.74	0.00149
872-187	80.0 SB#2	4.30	2.25	3.76	36	2.31	425	17000	920	20	143	100	4.9	98	86	65	49	36	24	16	11	7.7	33.22	0.00147

Yermo to Field

LOCATION		CORE DATA		RECOMPACTED DATA				TEST ON RECOVERED ASPHALT					EXTRACTION DATA											
TEST NUMBER	POST MILE	MRx10^5	Sp.Gv.	MRx10^5	Stab.	Sp.Gr.	Coh.	Visc. @140F	Visc. @275F	Pen.	Soft Pt.	Duct.	% Asph.	1/2 In.	3/8 In.	4	8	16	30	50	100	200	Surf. Area	Bit. Index
872-39	85.0 NB#1	3.59	2.27										5.1	98	87	64	47	34	23	15	10	7.1	30.96	0.00164
872-40	85.0 NB#2	3.09	2.28	3.65	45	2.32	410	29200	902	14	149	12	6.9	97	85	63	47	34	23	15	10	6.9	30.62	0.00164
872-41	85.0 SB#1	3.18	2.29										5.5	97	88	66	49	35	23	16	10	7.3	31.78	0.00164
872-42	85.0 SB#2	3.91	2.27	3.49	49	2.34	415						5.1	99	86	63	47	34	23	16	11	7.8	32.96	0.00164
872-43	90.0 NB#1	3.84	2.27	3.55	50	2.35	407						4.7	97	88	62	45	32	21	14	9	6.5	28.54	0.00164
872-44	90.0 NB#2	3.91	2.32					35000	950	16	151	11	5.3	97	85	65	49	36	24	16	11	7.6	33.06	0.00164
872-45	90.0 SB#2	3.27	2.28					25200	906	18	148	13	5.0	97	89	68	51	36	24	16	11	7.8	33.52	0.00164
872-46	99.8 NB#1		2.26										5.1	96	84	63	48	35	23	16	11	8.3	33.88	0.00164
872-47	99.8 NB#2	4.46	2.26										5.0	99	91	65	47	34	22	15	10	7.1	30.84	0.00164
872-48	99.8 SB#1	2.88	2.27										5.4	97	88	62	46	33	23	16	11	8.3	33.62	0.00164
872-49	99.8 SB#2	3.70	2.29	3.60	48	2.33	395	48000	1080	13	153	8	4.7	95	87	62	46	33	23	16	11	7.7	32.66	0.00164

APPENDIX C (Continued)

PAVEMENT CORE TEST DATA

Field to Baker

LOCATION		CORE DATA		RECOMPACTED DATA				TEST ON RECOVERED ASPHALT					EXTRACTION DATA											
TEST NUMBER	POST MILE	MRx10^5	Sp.Gv.	MRX10^5	Stab.	Sp.Gr.	Coh.	Visc. @140F	Visc. @275F	Pen.	Soft Pt.	Duct.	% Asph	1/2 In.	3/8 In.	4	8	16	30	50	100	200	Surf. Area	Bit. Index
872-29	103 NB#1	3.80	2.23					52500	1040	10	155	7	5.5	99	86	60	45	33	22	15	10	6.8	30.10	0.00185
872-30	103 NB#2	3.90	2.31	4.44	39	2.30	371						5.4	100	88	62	46	34	25	16	11	7.3	32.38	0.00167
872-31	103 SB#2	3.95	2.34					9570	576	23	140	100	5.6	98	85	57	40	30	21	17	8	6.0	27.58	0.00205
872-32	102 NB#2	3.62	2.21					32800	871	12	150	8	6.1	99	86	58	44	32	22	14	9	6.5	28.56	0.00214
872-33	121 SB#1	3.43	2.24	3.50	43	2.24	280						5.3	97	86	62	46	35	24	15	10	6.8	30.62	0.00173
872-34	121 SB#2	3.55	2.24										5.4	98	85	70	44	34	23	15	10	6.1	29.36	0.00184
872-35	133.5NB#1	3.32	2.22	3.96	44	2.28	373						5.4	99	87	63	47	36	25	16	10	7.1	31.68	0.00170
872-36	133.5NB#2	3.95	2.29										5.3	100	84	60	44	33	23	14	9	5.8	27.70	0.00191
872-37	133.5SB#1	3.36	2.27	3.30	43	2.34	285	8800	570	34	135	100	5.6	98	84	58	44	33	23	15	10	6.1	29.04	0.00193

Baker to Cima Road

LOCATION		CORE DATA		RECOMPACTED DATA				TEST ON RECOVERED ASPHALT					EXTRACTION DATA											
TEST NUMBER	POST MILE	MRx10^5	Sp.Gv.	MRX10^5	Stab.	Sp.Gr.	Coh.	Visc. @140F	Visc. @275F	Pen.	Soft Pt.	Duct.	% Asph	1/2 In.	3/8 In.	4	8	16	30	50	100	200	Surf. Area	Bit. Index
872-10	141 SB#1	3.44	2.25										4.6	87	77	55	40	29	20	14	10	7.3	29.70	0.00155
872-11	141 SB#2	3.22	2.26										4.9	93	84	61	45	33	24	17	12	8.1	34.28	0.00143
872-12	141 NB#1	3.35	2.21	3.53	47	2.31	401						4.9	92	85	59	43	33	24	16	11	7.9	32.94	0.00149
872-13	141 NB#2	3.77	2.25					46800	973	13	154	0	4.7	89	77	55	40	30	21	14	10	7.6	30.40	0.00155
872-14	145 NB#3	3.55	2.28	3.68	49	2.35	372						4.6	87	77	56	41	30	22	15	11	7.5	31.34	0.00147
872-15	147 SB#1	3.93	2.25	3.61	46	2.29	328	23500	765	16	146	10	5.1	93	84	61	44	32	23	16	11	7.7	32.48	0.00157
872-16	147 NB#1	3.10	2.25	3.44	45	2.31	407						4.9	93	79	55	41	31	23	15	11	7.2	31.06	0.00158
872-17	149 NB#3	3.57	2.30	3.70	47	2.32	255	18000	690	19	145	12	4.8	90	79	57	42	31	22	15	11	8.0	32.28	0.00149
872-18	153 NB#3	3.46	2.30	4.00	44	2.32	438						4.7	89	81	60	45	34	24	17	12	8.2	34.50	0.00136
872-19	154 NB#1	2.79	2.27	3.58	43	2.30	344						4.9	93	80	58	42	31	23	16	10	6.8	30.22	0.00162
872-20	154 SB#1	3.16	2.22	4.00	46	2.30	441						4.7	90	81	61	44	33	24	17	12	8.0	34.08	0.00138
872-21	157 NB#2	3.21	2.25	4.00	48	2.30	432						4.8	91	80	59	44	32	23	16	11	7.6	32.28	0.00149
872-22	157 SB#2	3.62	2.26	3.86	45	2.32	447	20400	695	16	145	10	4.7	91	82	62	45	34	24	17	12	8.5	35.02	0.00134
872-23	160 NB#1	3.09	2.23	3.72	44	2.31	457						5.0	91	84	63	45	33	24	17	12	8.5	34.96	0.00143
872-24	160 NB#2	3.22	2.27										4.4	88	76	55	40	30	21	15	11	7.2	30.66	0.00144
872-25	162 NB#2	4.12	2.32	3.63	43	2.36	478						4.7	94	85	60	46	34	24	17	12	8.4	34.86	0.00135

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APPENDIX C

PAVEMENT CORE TEST DATA

Cima Road to State Line

LOCATION			CORE DATA		RECOMPACTED DATA				TEST ON RECOVERED ASPHALT						EXTRACTION DATA									
TEST NUMBER	POST MILE		MR x10^5	Sp.Gr.	MR x10^5	Stab.	Sp.Gr.	Coh.	Visc. @140F	Visc. @275F	Pen.	Soft Pt.	Duct.	% asph.	1/2 In.	3/8 In.	4	8	16	30	50	100	200	Surf. Area	Bit. Index
862-214	166	NB#3	3.57	2.27	2.70	40	2.31	241	23000	859	16	146	29	5.50	96	87	71	57	37	22	13	8	5.3	26.92	0.00204
862-214	166	NB#1	4.06	2.21	2.61	42	2.27	369	19600	820	19	148	17	5.30	98	87	69	55	38	23	14	9	6.2	29.36	0.00181
862-295	175	NB#2					2.36		21400	624	17	141	13	5.30	96	75	59	44	31	21	15	10	6.3	28.94	0.00183
862-217	175	NB#1	4.00	2.21	3.16	38	2.30	333	24000	960	17	147	20	5.70	98	91	74	58	39	24	14	9	6.3	29.96	0.00190
862-296	184	NB#2							152000	1340	8	162	4	5.00	96	82	66	48	33	22	15	10	6.9	30.50	0.00164
862-218	184	NB#1	3.39	2.23	3.16	46	2.28	339	38900	886	13	152	9	5.20	97	85	68	52	35	22	14	10	6.5	29.92	0.00174
863-222	179	SB#1	3.77	2.22	3.05	44	2.26	324	12800	627	34	138	100	5.30	97	90	76	59	39	23	14	9	5.7	28.94	0.00183
862-223	179	SB#1	3.21	2.21	2.74	39	2.25	231	8400	546	33	137	100	5.20	98	91	75	58	39	23	14	8	4.9	26.92	0.00195
862-245	166	SB#1	3.32	2.23	3.52	44	2.28	307	45000	988	11	150	9	4.90	96	86	66	51	34	21	12	8	5.5	26.22	0.00187
862-246	166	SB#2	2.93	2.24	3.07	36	2.31	354	15400	654	19	141	61	6.10	98	80	70	53	35	20	12	8	5.6	26.32	0.00232

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APPENDIX D
PAVEMENT DEFELECTION DATA

OAKHILL ROAD TO PALMDALE ROAD
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
A--1	PM30.0,NB3	0	75	82	20	22
2	32.2,NB3	0	77	84	39	47
3	33.5,NB3	0	78	87	50	57
4	34.5,NB2	0	90	104	23	25
5	34.5,NB3	0	92	104	39	41
14	37.0,NB3	0	91	98	40	45
15	39.6,NB3	0	90	107	48	51
18	39.6,NB2	0	73	82	26	29
6	31.3,SB4	0	80	74	56	67
7	30.9,SB3	0	78	76	42	50
8	30.4,SB4	0	78	76	26	29
9	30.4,SB3	0	78	77	25	28
10	29.6,SB4	0	78	84	37	45
11	29.6,SB3	0			26	33
12	29.2,SB3	0	81	86	32	37
13	29.2,SB4	0			34	40
16	33.5,SB2	0	58	72	27	31
17	33.5,SB3	0	60	77	47	58

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APPENDIX D (Continued)
PAVEMENT DEFELECTION DATA

PALMDALE ROAD TO "D" STREET
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
B--19	PM41.3,NB3	O	68	93	38	44
20	41.3,NB2	O	68		66	73
21	41.3,NB1	I	69	97	53	59
22	42.5,NB2	I	68	91	58	69
23	42.5,NB1	O	71	88	58	65
27	37.0,NB2	O	54	75	19	23
30	42.5,NB3	O	65	63	29	34
31	43.6,NB2	O	60	75	65	78
25	30.4,SB2	O	55	57	25	31
26	29.2,SB2	O	53		18	29
24	31.3,SB2	O	52	49	38	43
28	37.0,SB2	O	64		35	42
29	37.0,SB3	O	65		44	50
32	43.9,SB1	I	76	84	53	62
33	42.5,SB2	O	72	97	57	65
34	42.5,SB1	O	77	99	61	73
35	42.5,SB3	O	75	96	43	53
36	41.3,SB3		70	96	31	34

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APPENDIX D (Continued)
PAVEMENT DEFELECTION DATA

"D" STREET TO BOULDER ROAD
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
C-105	PM46.2,NB2	O	58	70	35	45
106	46.2,NB1	I	50	58	22	25
107	47.5,NB2	O	51	56	25	30
108	48.5,NB2		53	55	30	36
109	48.5,NB1	I	53	69	16	18
110	52.2,NB2	O	55	71	32	40
111	52.6,NB2	O	55	74	19	24
112	52.2,NB1	I	57	83	27	31
113	52.6,NB1	I	58	86	32	37
100	52.6,SB2	O	60	77	29	31
101	52.2,SB2	O	60	72	29	35
102	48.5,SB2	O	63	79	38	46
103	48.5,SB1	I	64	77	26	30
104	46.8,SB2	O	66	80	39	54

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APPENDIX D (Continued)
PAVEMENT DEFELECTION DATA

BOULDER ROAD TO BARSTOW
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
D-114	PM58.1,NB2	O	63	87	44	54
115	58.1,NB1	I	65	96	38	44
116	60.0,NB2	O	68	96	56	66
117	69.9,NB2	O	70	100	71	84
53	70.0,SB2	O	88	93	95	112
96	70.0,SB1	I	62	79	53	64
97	60.0,SB2	O	60	81	60	72
98	58.1,SB2	O	60	82	43	55
99	58.1,SB1	I	59	79	42	48

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APPENDIX D
PAVEMENT DEFELECTION DATA

BARSTOW TO YERMO

Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
E-118	PM72.0,NB2	O	75	100	47	67
119	76.2,NB2	O	79	103	33	46
120	80.0,NB2	O	77	102	49	66
122	80.0,NB1	I	78	97	35	40
37	76.2,SB2	O	74	100	28	35
38	76.2,SB	O	75	92	38	45
51	80.0,SB2	O	90	112	40	57
52	72.5,SB2	O	85	102	42	56

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APPENDIX D (Continued)
PAVEMENT DEFELECTION DATA

YERMO TO FIELD
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
F--39	PM90.0,NB2		60	58	27	32
40	90.0,NB1		63	58	20	23
41	99.8,NB2	O	79	69	52	62
42	99.8,NB1	O	79	76	46	52
121	83.0,NB2	O	75	98	27	33
46	99.8,SB2	O	86	102	49	54
47	99.8,SB1		84	106	46	52
48	90.0,SB2	O	76	105	42	48
49	83.0,SB2	O	81	104	33	38
50	83.0,SB1	I	89	114	28	32

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APPENDIX D (Continued)
PAVEMENT DEFELECTION DATA

FIELD TO BAKER
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
L--45	PM103.0,SB2	O	80	98	33	39
46	99.8,SB2	O	86	102	49	54
47	99.8,SB1		84	106	46	52
68	147.0,SB2	O	66	54	26	33
69	147.0,SB1	I	66	61	25	29
70	141.0,SB1	I	68	71	35	38
71	141.0,SB2	O	70	77	35	38
72	133.5,SB2	O	82	88	51	60
73	133.5,SB1	I	78	89	36	43
74	121.0,SB1	I	85	91	40	48
75	121.0,SB3	O	82	95	32	40

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APPENDIX D (Continued)
PAVEMENT DEFELECTION DATA

BAKER TO CIMA ROAD
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
H--58	PM141.0,NB2	I	80	86	25	30
59	141.0,NB1	I	85	87	31	37
60	145.0,NB3	O	83	85	37	46
61	147.0,NB3	O	82	98	45	54
62	147.0,NB1	I	89	99	34	40
63	149.0,NB3	O	87	92	46	58
64	153.5,NB3	O	82	86	25	31
65	154.0,NB3	O	78	91	33	40
66	154.0,NB1	I	78	85	36	41
67	157.0,NB2	O	77	79	46	56
76	160.0,NB2		69	82	31	36
77	160.0,NB1	I	77	89	21	25
78	162.0,NB2	O	70	89	23	28
68	147.0,SB2	O	66	54	26	33
69	147.0,SB1	I	66	61	25	29
70	141.0,SB1	I	68	71	35	38
71	141.0,SB2	O	70	77	35	38
91	160.0,SB2	O	72	90	27	32
92	160.0,SB1	I	72	100	23	26
93	157.0,SB2	O	72	97	33	42
94	154.0,SB2	O	73	99	26	31
95	154.0,SB1	I	73	104	22	25

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APPENDIX D (Continued)
PAVEMENT DEFELECTION DATA

CIMA ROAD TO STATE LINE
Dynaflect Measurements (10^{-5} Inches)

TEST NO.	LOCATION	WT	TEMP AIR('F)	TEMP AC('F)	X,S1	BOTH %TILE,S1
I--79	PM166.0,NB3	O	66	92	15	16
80	166.0,NB1	I	77	99	20	23
81	175.0,NB2	O	72	92	36	44
82	175.0,NB1	I	69	85	38	43
83	184.0,NB2	O	73	81	61	69
84	184.0,NB1		73	79	35	40
85	184.0,SB2	O	58	61	51	54
86	184.0,SB1	I	57	64	50	53
87	179.0,SB3	O	70	72	25	28
88	179.0,SB1	I	79	77	27	31
89	166.0,SB2	O	76	90	23	29
90	166.0,SB1	I	71	90	22	27

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