RIGID PAVEMENT PERFORMANCE DATA

Final Report

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Project Number 5285

By

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16. Abstract

Pavement structure, condition ratings, and distress were used to characterize the performance of rigid pavements in Oregon. Data from jointed and continuously reinforced concrete pavements ranging in age from 2 to 32 years were collected. Sixty-two experimental sections were identified along Interstate routes representing the range of environmental conditions in Oregon.

All Oregon rigid pavements are performing very well structurally. Older pavements have carried 2 to 6 times their design traffic, yet maintain serviceability indices above 3.0. Distress types commonly associated with the need for rehabilitation were not generally evident. Efforts to predict pavement distress development with structural, environmental, and loading data were unsuccessful.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9	Celsius temperature	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	1.8 + 32	Fahrenheit	°F

* SI is the symbol for the International System of Measurement

(4-7-94 jbp)

EXECUTIVE SUMMARY

Establishment of a rigid pavement data base was undertaken to assist in effective pavement rehabilitation and the calibration of mechanistic pavement design procedures. Pavement structure, condition ratings, and distress were used to characterize the performance of rigid pavements in Oregon. Data from jointed and continuously reinforced concrete pavements ranging in age from 2 to 32 years were collected. Sixty-two experimental sections representing the range of environmental conditions in Oregon were identified along Interstate routes.

Based on the data gathered and evaluated as part of this project, the following summary statements, conclusions and recommendations are warranted.

- Most rigid pavements in Oregon have reached or exceeded their intended design life and have carried 2 to 6 times the traffic for which they were designed. Almost all sections surveyed have pavement serviceability ratings in excess of 3.

- Many sections of rigid pavement have little or no medium or high severity transverse and longitudinal cracking normally associated with eminent failure. Using distress-based rehabilitation criteria from other states, no CRCP sections require immediate rehabilitation.

- The estimated time to failure for existing Oregon rigid pavements could not be established.

- Recent trends in the construction of CRC pavements appear to favor the use of treated-base courses despite the excellent performance given by untreated aggregate bases.

- The AASHTO Design procedure grossly under-predicts the load carrying capacity of CRC and JRC pavements in Oregon.

- Certain rigid sections identified herein have surface distresses that may indicate the need for rehabilitation in the near future. These sections should be carefully monitored.

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DISCLAIMER

RIGID PAVEMENT PERFORMANCE DATA

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1.0 INTRODUCTION

Concrete pavements constitute a significant portion of the primary and secondary highway system in Oregon. The Oregon Department of Transportation (ODOT) is responsible for many lane-miles of concrete pavement on the Interstate, primary, and secondary highway systems. These pavements have given excellent service, some for more than 30 years. The excellent performance of rigid pavements has prompted ODOT to select rigid pavements for many highly trafficked areas on the Interstate. The experience of Oregon provides an excellent opportunity to gain insight into the possible relationships between rigid pavement performance and pavement structural design.

These relationships are particularly important because of the national effort to incorporate mechanistic procedures into the design of all pavement types. Use of these developing mechanistic design procedures requires the calibration of inputs to reflect local conditions. The calibration requires a substantial database of performance and materials information.

In addition, the design of continuously reinforced concrete (CRC) pavement presents a special challenge because mechanistic design techniques are not well developed for this pavement type. The design of these pavements relies heavily on quasi-empirical information gathered from CRC pavements nationwide. Until mechanistically based design procedures are developed, the data gathered in this study will provide a locally developed database on CRC performance.

This database will also assist in the scheduling of rehabilitation of all concrete pavements. Minimum pavement life cycle costs generally occur only if the full range of maintenance and rehabilitation options are available to the agency. These options can be severely reduced when pavement performance is not predicted. For example, continuously reinforced concrete (CRC) pavements characteristically maintain a high level of performance for many years, then deteriorate rapidly to failure (Zollinger and Barenberg, 1990). Therefore, if rehabilitation rather than reconstruction is to be considered, performance histories of the pavements must be determined. The data collected herein will form the foundation for the selection of a suitable time for rigid pavement rehabilitation.

Mechanistic pavement design procedures are the next step in the evolution of pavement design methodology. Procedures are now being developed at the national level through a cooperative research effort coordinated by the Transportation Research Board (TRB) and American Association of State Highway and Transportation Officials (AASHTO). It is expected that the use of these new procedures will be encouraged through the release of a revised AASHTO Design Guide. Preliminary reports by the development team (Thompson et al., 1989) have indicated a need for calibration of the design models. This calibration is essential to the preparation of reliable designs. Calibration will require that significant materials and performance information be gathered and analyzed.

1.1 OBJECTIVES

The primary objective of this research was to collect information on rigid pavements in Oregon and use that information to judge performance.

The database developed to assess performance also established a baseline information set which could eventually be used to calibrate mechanistic design procedures and schedule effective pavement rehabilitation.

1.2 SCOPE

The nature of this project, and indeed any project of this sort, places certain limits on the ultimate use of information gathered. Specifically for this project, these limitations are:

1) Although all three major rigid pavement types (jointed plain and reinforced, and continuously reinforced) exist in Oregon, only jointed reinforced and continuously reinforced are analyzed in detail due to the limited amount of data available for non-reinforced projects.

2) Only pavements on the interstate system are included due to the availability of data.

3) Maintenance records were not included in the analyses and therefore the impact of maintenance cannot be evaluated.

4) Environmental factors necessarily reflect Oregon conditions.

2.0 DATA COLLECTION PROGRAM

2.1 DATA NEEDS

The Technical Advisory Committee for this project helped define the data which, if collected, would meet the objectives of the project. The selected data fall into five broad categories. These categories and the elements contained in each are a subset of the categories identified by Kilareski et al., 1987. Specific elements in each category are identified in Tables A.1 through A.5 (Appendix A).

- Identification and Geometric
- Material Properties and Construction
- Traffic Volume and Classification
- Performance and Condition Surveys
- Environmental Data

The required data are: 1) historical information, 2) falling weight deflectometer (FWD) measurements, 3) weather bureau records, 4) condition surveys, 5) traffic loadings, and 6) roughness measurements.

Although the collection and analysis of all of the data elements described above is desirable, available data and funds precluded the collection of complete data sets for all projects. Therefore, the dataset was reduced based on available data and the recommendations of the Technical Advisory Committee as discussed in the next section.

2.2 AVAILABLE DATA

Through consultation with ODOT personnel, it was determined that the data items shown in Table 2.1 could be found in Departmental records for most pavement sections. Material properties and layer thicknesses were based on historical records only; no field sampling was conducted to verify the records. Limited FWD measurements were available for two sites.

Yearly traffic volume and classification information was available for many sites from the Planning Section of the Oregon Department of Transportation.

Environmental information was available from the National Oceanic and Atmospheric Administration (NOAA). Several NOAA sites are located near the rigid pavement test sections selected for this study.

Condition surveys were conducted on several sections. The Strategic Highway Research Program (SHRP) developed a condition survey protocol in the Long-Term Pavement Performance (LTPP) study. A subset of the LTPP protocol and the LTPP Distress Identification Manual (SHRP, 1990) served as the basis of the condition surveys conducted in this project.

Table 2.1 Pavement Structure Information Available from ODOT Records

DATA ELEMENT	DESCRIPTION
PROJECT IDENTIFICATION	
Highway Identification	ODOT Highway number.
Direction	Eastbound (EB), Westbound (WB), Northbound (NB), or Southbound (SB).
Beginning Mile Post	Beginning mile post (hundredths).
Ending Mile Post	Ending mile post (hundredths).
Plan Set Number	Initial construction plan identification number from ODOT line drawings.
Contract Number	Initial construction contract number; taken from ODOT plans.
Construction Date	Date of construction as per ODOT records.
Pavement Type	JRC Jointed reinforced concrete pavement, JPC Jointed plain concrete pavement, or CRC Continuously reinforced concrete pavement.
Number of Lanes	Number of travel lanes in one direction.
Outer Travel Lane Width	Outside lane width in feet.
Outside Shoulder Width	Outside shoulder width in feet.
Inside Shoulder Width	Inside shoulder width in feet.
PAVEMENT STRUCTURE	
Surface Thickness	Thickness of surface layer in inches (as per plans).
Base Thickness	Thickness of second layer in inches (as per plans).
Subbase Thickness	Thickness of third layer in inches (as per plans)
Base or Subbase Type	AB gravel or crushed stone, SC cement-treated soil, ATB asphalt-treated base, dense graded, SAND sand, CTB cement-treated base, LCB lean concrete base (econocrete), ATPB asphalt-treated permeable base, HMAC hot-mix asphalt concrete, FDAB free draining aggregate base, LFAS lime-flyash stabilized base, LTSG lime-treated subgrade, or NONE no base; constructed directly on subgrade.
Subgrade Type	Soil classification, if possible.

Table 2.1 Pavement Structure Information Available from ODOT Records (cont'd)

DATA ELEMENT	DESCRIPTION
TRANSVERSE JOINTS	
Joint Spacing	Spacing of joints in feet. If non-uniform, then record spacing scheme (i.e. 12, 13, 15, 17).
Skewness (Y/N)	Note presence of skewed joints.
Sealant Type	HP Hot poured bituminous material, SIL Silicone sealant, RA Rubberized asphalt, NONE No sealant used, or UNK Unknown type.
Dowels (Y/N)	Note use of load transfer devices at joints. If other than dowels (i.e. star lugs), record as yes. Describe type.
Dowel Diameter	Dowel diameter in inches.
Dowel Spacing	Dowel spacing in inches.
Dowel Length	Dowel length in inches.
Dowel Coating	PG paint or grease, LA liquid asphalt, EP epoxy, or NONE no coating.
LONGITUDINAL JOINTS	
Joint Type	Keyed, butt, or weakened plane.
Tie Bar Diameter	Tie bar diameter; use bar size (i.e. 4, 5, or 6).
Tie Bar Spacing	Tie bar spacing in inches.
Tie Bar Length	Tie bar length in inches.
Sealant Type	Use categories described above.
REINFORCEMENT DATA	
Type of Reinforcement	Welded wire fabric (WWF) or rebar (BAR).
Transverse Bar Diameter	Transverse bar size or wire diameter in inches.
Longitudinal Bar Diameter	Longitudinal bar size or wire diameter in inches.
Yield Strength	Steel yield strength in ksi.
Transverse Bar Spacing	Transverse reinforcement spacing, inches.
Longitudinal Bar Spacing	Longitudinal reinforcement spacing, inches.
Steel Placement Method	Tubes or Chairs.
Depth to Reinforcement	Depth to reinforcement, inches.

3.0 RIGID PAVEMENTS IN OREGON

3.1 PAVEMENT STRUCTURE

Oregon DOT pavement inventory records were used to initially identify rigid pavements under agency jurisdiction. Screening of these records for bridges and sections shorter than 0.75 miles resulted in the identification of approximately 585 directional miles of rigid pavement. These sections are summarized by type in Table 3.1. Additional details are in Appendix B.

Table 3.1 Rigid Pavement Inventory for Oregon

Pavement Type	Number of Directional Miles	Number of Sections	Average Section Length, Mile
JPC	29.7	20	1.5
JRC	78.8	18	4.4
CRC	475.9	73	6.5

All the jointed, plain concrete pavements are off the Interstate highway system and based on limited records, generally more than 30 years old. The short section length reported for JPC pavements reflects ODOT reporting and rehabilitation procedures. Oregon DOT classifies pavements as rigid only if the exposed surface is concrete. Thus, many of the older jointed plain concrete pavements have been overlaid with asphalt concrete leaving only short exposed sections. Because of the relatively small portion of the total mileage that is JPC (5%), this rigid pavement type was not considered further.

Reinforced concrete pavements make up about 40 percent of the Oregon Interstate system. Jointed pavements constitute about fifteen percent of the rigid pavement miles. The remaining 85 percent are CRC pavements.

The structure and age of each of these pavement types differ significantly and in addition, the pavement designs have evolved as new materials became available or design criteria changed. These variations are summarized below for the 62 sections that were selected for detailed analysis. Additional information on each rigid pavement section is included in Appendix C.

Table 3.2 Summary of Structural Characteristics of Selected JRC and CRC Pavements in Oregon

Characteristic	JRC	CRC	Combined
Number of sections	12	50	62
Average Age, years	30	16	19
Range	26 to 32	2 to 30	
Average Surface Thicknesses, in.	8.0	8.9	8.7
Range	none	8 to 13	-
Base Types			
No. of Aggregate Bases	**10**	**15**	**25**
Average Thickness, in	10.8	6.4	-
No. of Asphalt Treated Bases	**2**	**11**	**13**
Average Thickness, in	1.0	4.7	-
No. of Cement Treated Bases	**0**	**19**	**19**
Average Thickness, in	-	4.6	-
No. of Lean Concrete Bases	**0**	**5**	**5**
Average Thickness, in	-	7.6	-

Several interesting features emerged from the data in Table 3.2. First, the jointed reinforced concrete pavements are, on average, significantly older than the CRC pavements. However, some CRC pavements are almost as old as the JRC pavements. Second, the JRC pavements average approximately 1 inch thinner than the CRC pavements. This reflects the average ages of the JRC and CRC pavements and the recognition of increasing traffic loads, not specific ODOT design criteria. All CRC pavements constructed prior to 1983 were eight inches thick.

The use of different base types are shown in Table 3.2. Oregon DOT did not use cement treated materials as bases under JRC pavements. Overall, aggregate bases are the most frequently used base material, recently however, cement treated bases have been used more frequently as support for CRC pavements.

3.2 ENVIRONMENT

The environment plays a significant role in the performance of flexible and rigid pavements (Yoder et al., 1975). Commonly-used design procedures (i.e., AASHTO, Asphalt Institute) require information on the pavement (or ambient) temperatures expected during the life of the pavement. Although not explicitly included in the AASHTO rigid pavement design procedure, precipitation is indirectly included, through the coefficient of drainage factor.

NOAA collects environmental data at about 200 sites in Oregon. Weather stations are indexed by division and number. Station name, county, and latitude and longitude were used to locate the station nearest each test section.

Data were collected from nearby weather stations for each site for every year since construction. These data included the total annual precipitation, the maximum yearly temperature, and the minimum yearly temperature.

These data were used to compute the average yearly precipitation, minimum temperature, maximum temperature differential, and average temperature differential from the time of construction to 1990 for each section (Appendix C.) These environmental variables were selected because the performance of concrete pavements has been related to these environmental factors (Zollinger et al., 1990, Cedergren, 1988, Darter et al., 1977).

Average precipitation ranges from 6 inches in Eastern Oregon to 61 inches in the Willamette Valley. Likewise, the minimum temperatures are lower in Eastern Oregon, about -28°F, compared to 9°F in the Willamette Valley. Average temperature differentials are normally higher in Eastern Oregon and lower in the Willamette Valley. Statistical correlations between performance measures and weather data are discussed in the analysis section.

3.3 SUBGRADE SUPPORT

Two sources of information were available to estimate the level of subgrade support at each test site. Subgrade R-values are available for most sites. These values were taken from ODOT records and may or may not represent actual field support conditions. The recorded values are summarized by pavement type in Table 3.3. Based on an F-test comparison of means, there is a difference between the R-values for the JRC and CRC test sections.

Table 3.3 ODOT Design R-Value for Selected JRC and CRC Pavements

Pavement Type	Design R-Value			
	Average	St. Dev	Minimum	Maximum
JRC (12 Sections)	18.5	7.1	11	31
CRC (50 sections)	11.4	4.9	6	24

A second source of information on subgrade support was available from in situ measurements. Falling weight deflectometer measurements were taken in the outer lane of southbound Interstate 205 between the Tualatin River and Interstate 5 and in the outer lane of southbound Interstate 5 between North Jefferson and North Albany interchanges. Both of these sections are continuously reinforced concrete pavements. A computerized backcalculation (ILLIBACK, Ioannides, 1990) was used to calculate the subgrade Young's modulus (E_s) and modulus of subgrade reaction (k) (Table 3.4).

Table 3.4 Backcalculated Subgrade Young's Modulus and Modulus of Subgrade Reaction for Two Sites in Oregon

Site	Subgrade Young's Modulus, psi		Modulus of Subgrade Reaction, psi/in	
	Mean	St. Dev.	Mean	St. Dev.
I-205	21,100	6,200	200	75
I-5	20,100	9,500	195	120

3.4 TRAFFIC AND LOADING HISTORY

Traffic data were obtained from Oregon Department of Transportation records. The best information on traffic volumes and classification are reported in traffic volume summaries published yearly by the Department (i.e., ODOT, 1990). Each annual report provides the previous year's information. Although the format has changed slightly during the last thirty years, the available information remains about the same.

The report is divided into two sections. Section I tabulates State Highway road numbers and two-way Average Daily Traffic (ADT) at various mileposts. Data is collected at three year intervals and prorated between surveys by the Planning Section. Section II summarizes the traffic data collected at approximately 115 permanent stations. Data are reported for the previous ten years and include: 1) yearly ADT, 2) seasonal variation by month, 3) peak day, 4) peak hour, and 5) types of vehicles. Classification information is based on 16 or 24 hour manual counts.

For this study, only the 3, 4, 5, and 6-axle truck categories were considered critical. Light vehicles (i.e., cars, pickups, and light trucks) make up the majority of the ADT, yet do not significantly damage the pavement and are not normally included in pavement thickness design (AASHTO, 1993). The 3, 4, 5, and 6-axle trucks cause significant damage to the pavement and are therefore commonly included in pavement thickness design calculations (AASHTO, 1993).

The first step in the conversion of ADT and percent trucks to equivalent single axle loads (ESAL) was accomplished by computing an average mix of 3, 4, 5, and 6-axle trucks for all sites near test sections (Table 3.5).

Table 3.5 Percent Trucks by Class at Permanent Recorder Sites.

Recorder Site	Percent of Total ADT by Class in 1990			
	3 Axle	4 Axle	5 Axle	6 Axle
01-011	1.4	0.3	26.1	1.4
33-001	1.0	0.4	17.0	1.4
23-016	0.6	0.8	27.3	2.4
26-019	1.6	0.4	4.9	0.2
23-014	1.3	0.6	16.4	0.8
03-016	1.6	0.2	4.1	0.2
30-025	1.1	0.2	21.7	0.6
20-008	1.2	0.2	1.7	0.1
15-018	1.6	0.3	11.5	0.0
15-019	1.7	0.2	9.5	0.1
15-001	1.5	0.4	14.5	0.5
17-001	1.7	0.6	19.8	0.7
10-007	1.9	0.6	20.0	1.2
22-016	1.4	0.7	19.9	1.1
30-004	0.9	0.3	17.1	1.3
AVERAGE	1.4	0.4	15.4	0.8

The average ESAL per truck was computed using the average mix of trucks from Table 3.5 and an estimated, representative ESAL for each truck type. The AASHTO ESAL per truck are shown in Table 3.6 for fully loaded vehicles (AASHTO, 1993).
Not all trucks are fully loaded on all trips. Therefore the fully loaded ESAL per truck is normally reduced. The amount of reduction is based on agency data collected at truck weighing stations. For example, the Asphalt Institute (using FHWA data) reduces the fully loaded ESAL per truck by $^1/_2$ to $^1/_3$ to reflect actual conditions (Asphalt Institute, 1983).

Table 3.6 Fully Loaded Truck ESAL by Type.

Truck type	ESAL per fully loaded truck	% of all Trucks	Contribution to Composite ESAL
3-axle	2.05	8%	0.16
Average ESL per Fully Loaded Truck			3.68

The ODOT Pavements Unit has developed a means of converting ADT and percent trucks to equivalent single axle loads. This method was implemented in 1987 when ODOT adopted the AASHTO Design procedure for rigid pavements (ODOT, 1993). Using this technique, an average ESAL per truck of 2.44 (1/3 of 3.68) results for the mix of vehicles described in Table 3.6. The Asphalt Institute procedure described above puts the average ESAL per truck between 1.8 and 2.5. The conservative value of 1.8 was chosen for this study.

The estimated cumulative ESAL for each section are shown in Table 3.7 along with the design ESAL. The design ESAL was estimated by ODOT using the rigid pavement structure thicknesses and the AASHTO Design Procedure (ODOT, 1992). Note that each section more than 12 years old has carried 1 to 6 times the number of ESAL that the AASHTO design procedure predicted it was capable of carrying.

3.5 CONDITION SURVEYS

3.5.1 HISTORICAL INFORMATION FOR ODOT SURVEYS

The Oregon DOT has conducted detailed condition surveys of the Interstate system every two years since 1987. Before 1987, condition surveys were mainly subjective (i.e., poor, fair, good, very good). It was felt that attempting to correlate subjective ratings to detailed condition surveys, which are based on physical measurements would be fruitless. Therefore, these values have not been reported herein.

Pavement ratings beginning in 1987 were modeled after the present serviceability index (PSI) rating system used by AASHTO (AASHTO, 1993). Under this rating system, a perfect pavement would be given a rating of 5.0. Although theoretically a pavement could deteriorate to a rating of 0.0, rehabilitation is normally undertaken at an agency-defined terminal rating. Terminal ratings for pavements range from 1.5 to 3.0 depending on functional classification with Interstate highways being rehabilitated when ratings are 2.5 to 3.0. The ratings for 1987, 1989, and 1991 are summarized in Table 3.8. Details are in Appendix C, Table C.1.

3.5.2 OREGON STATE UNIVERSITY CONDITION SURVEYS

Five hundred foot test sections were located on sites selected for detailed analysis. The typical method of collecting data consisted of starting at a mile post and working in the direction of traffic for 500 feet. A detailed description is in Appendix D to identify the starting point for each section.

Table 3.7 Estimated Design and Cumulative ESAL for Selected Rigid Pavements in Oregon

Hwy. No.	Section Beginning Milepost	Section Ending Milepost	Location	Age, years	Design ESAL, millions	Estimated ESAL, millions	Ratio Estimated/ Design
1	11.5	18.7	S. Ashland - N. Ashland	29	3.6	18.3	5.1
1	18.7	28.3	N. Ashland - 12th Street	30	3.6	22.6	6.3
1	28.3	35.8	Jackson St. - Seven Oaks	31	3.6	21.7	6.0
1	43.1	49.1	Rock Point - Evans Creek	32	3.7	21.9	5.9
1	49.1	58.2	Evans Cr. - N. Grants Pass	31	3.7	23.9	6.5
1	81.5	87.4	Glendale Jct. - Azalea	27	4.0	22.9	5.8
1	147.7	154.9	Rice Hill - Elkhead Road	8	35.0	9.1	0.3
1	162.1	169.5	Anlauf - Martin Creek	11	16.7	12.7	0.8
1	174.7	187.9	Cottage Grove - Goshen	7	33.9	6.8	0.2
1	192.5	197.4	Willamette Riv. - McKenzie Riv.	6	44.3	5.7	0.1
1	227.7	234.7	Corvallis/Lebanon - N. Albany	8	44.3	14.0	0.3
1	258.3	272.3	Hayesville - Woodburn Int.	17	44.3	25.8	0.6
1	272.3	281.8	Woodburn Int. - Baldock SRA	19	14.5	27.7	1.9
1	287.6	289.2	E. Portland Fwy. Int.	22	14.5	42.7	2.9
2	84.4	88.0	The Dalles - Fifteen Mile Cr.	26	8.4	15.9	1.9
6	188.0	88.0	Stanfield Jct. - Pendleton Sect.	24	2.5	12.3	4.9
6	204.4	213.1	Pendleton Section	23	2.5	12.1	4.8
6	225.7	237.8	Poverty Flats - Meacham	3	2.4	1.9	0.8
6	259.2	265.5	La Grande Section	21	3.4	10.2	3.0
6	265.5	272.1	La Grande - Ladd Canyon	20	3.4	10.1	2.9
6	272.1	276.1	Ladd Canyon Section	20	3.7	10.1	2.7
6	276.1	285.3	Ladd Canyon - N. Powder	18	3.7	9.4	2.5
6	285.3	297.1	N. Powder - Baldock Slough	7	n/a	4.5	-
6	306.5	313.3	S. Baker - Encina	2	n/a	1.7	-
6	342.1	345.6	Lime Section	23	3.0	10.7	3.6
6	345.6	343.3	Lime - Malheur Co. Line	25	1.4	11.0	8.1
6	368.2	374.8	N. Jacobsen's Gulch - N. Ontario	19	3.2	11.6	3.6
64	0.0	4.0	Tualatin River - Pacific Hwy.	22	6.9	22.0	3.2
64	4.0	8.8	West Linn - Tualatin River	23	n/a	22.1	-
64	11.3	15.0	SE Causey Ave. - Gladstone Int.	18	9.1	20.9	2.3
64	15.0	17.7	SE Foster Rd. - SE Causey Ave.	17	10.8	20.5	1.9
64	17.7	19.0	SE Powell Blvd. - SE Foster Rd.	11	19.7	17.7	0.9
70	0.0	10.1	Columbia R. - Old Ore Trail Hwy.	5	8.6	3.4	0.4
227	2.2	4.0	Coburg Rd. - Pacific Hwy.	32	n/a	17.1	-

Note: n/a = not available

Table 3.8 Summary of Pavement Ratings for All Rigid Interstate Pavements - 1987, 1989, and 1991

Pavement Type	1987 Pavement Rating	1989 Pavement Rating	1991 Pavement Rating
Average of 18 JRC Sections	3.1	3.0	3.1
Average of 62 CRC Sections	4.2	4.1	4.0

Two survey sheets were used; one for continuously reinforced concrete pavements and one for jointed concrete pavements. These were modified forms of the standard SHRP distress survey sheets modified to allow for more convenient use and reporting. Examples of the recording forms along with the survey results are shown in Appendix D.

3.6 MATERIALS

Laboratory records were reviewed for ten JRC and CRC projects. Concrete mixture information including compressive strength, percent air, and slump were obtained by project stationing and contract number. Aggregate information including maximum size, Oregon Degradation and Sand Equivalence tests results were compiled for ten sites. These data are also in Appendix D. Records from older jobs were not available, thus eliminating these variables from being included in subsequent analyses.

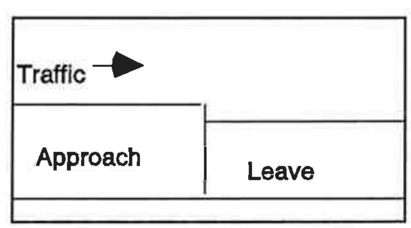
4.0 ANALYSIS AND EVALUATION

Statistical analyses were performed to relate measured distress (performance) variables to structural, environmental, and traffic variables. Simple descriptive statistics are summarized in Section 4.1, followed by the analysis of variance (Li, 1993). The variables are described below.

4.1 VARIABLES

DISTRESS VARIABLES

RATE91	Overall rating of the pavement. These data were collected by ODOT in 1991. Theoretical range: 5.0 to 0.0 where 5.0 is a perfect road and 0.0 is impassable (similar to PSI). The value represents the entire project instead of the 500-foot test section.
CRK	Degree of cracking in pavement. Collected by ODOT. Theoretical range: 100 to 0 where 100 is an uncracked road. The value represents the entire project instead of the 500-foot test section.
T_LOW T_MED T_HIGH	Number of transverse cracks (perpendicular to the direction of traffic) per test section 500 ft.). These are categorized by the severity of the crack. Low, medium, and high severity levels are defined by SHRP (SHRP 1990).
FORK	Number of transverse cracks that branch or fork in the 500-foot section.
L_LOW L_MED T_HIGH	Length (in feet) of longitudinal cracks in each 500-feet section by severity category. Low, medium, and high severity are defined by SHRP.
EDGE	Vertical displacement between the roadway and shoulder, in inches. Average of 5 measurements in each 500-foot section. Negative values indicate that the shoulder is higher than the roadway.
SEP	Horizontal displacement between the roadway and shoulder, in inches. Average of 5 measurements in 500-foot section.
FAULT	Vertical displacement of one slab relative to the adjacent, in inches. Average of 4 measurements in each section. A positive value indicates approach slab is higher than the leave slab. This measurement has meaning only for jointed reinforced concrete (JRC) slabs.
PATCH	Percent of total area in each section that has been patched.



STRUCTURAL VARIABLES

SUR_TYPE	Type of surface: JRC - Jointed Reinforced Concrete Pavement
SUR_THCK	Thickness of surface in inches.
B_TYPE	Type of base material: 1 = AB - Aggregate Base 2 = CTB - Cement Treated Base 3 = ATB - Asphalt Treated Base 4 = LEAN - Lean Concrete Base
B_THCK	Thickness of base in inches.
SB_TYPE	Type of subbase; same as in B_TYPE plus NONE - No subbase used LTSG - Lime Treated Subgrade
SB_THCK	Thickness of subbase, if present.
SG_TYPE	Classification of subgrade: 1 = CL - Clay, Low plasticity 2 = SM - Sandy, silt 3 = MH - Silt, High plasticity 4 = ML - Silt, Low plasticity 5 = GP - Gravel, Poorly graded
SG_RVALUE	Numerical value indicating the strength of the subgrade. Higher values = higher strength.
AGE	Time in years since construction.
CONTROL	ID Number for relating results to field location.

ENVIRONMENTAL VARIABLES

PREC	Average yearly precipitation for each site.
MINTEMP	Minimum temperature the test section has experienced since construction.
AVERDIFF	Average yearly temperature differential at each site.
MAXDIFF	Maximum yearly temperature differential at each site.

TRAFFIC VARIABLES

ESAL	Total ESAL passing over each site since construction.

4.2 SUMMARY STATISTICS

The means, counts, standard deviations and minimum and maximum values of variables are summarized for all pavement types in Table 4.1. The ODOT pavement (RATE91) and cracking (CRK) ratings represent the entire project while the other distresses variables represent the condition within the 500-foot test section only.

The average pavement rating (RATE91) of 3.89 is high, despite the fact that the average age of all pavements is 19 years. The AASHTO Design Guide (AASHTO, 1993) procedure would predict that most of the sections should be at or near the terminal serviceability index of 2.5 or 3.0 after 20 years of service. Also, very few of the test sections have medium or high severity transverse or longitudinal cracking. The presence of this type of cracking has been related to impending failure in CRCP (Zollinger, et al., 1990, La Coursiere, et al. 1978).

Table 4.1 Descriptive Statistics for All Continuous Variables used in Subsequent Analyses

Variable	Count	Mean	Std. Dev.	Minimum	Maximum
AGE	62	19	9	2	32
PREC	62	26	15	6.7	61.5
MIN	62	-8	11	-28	9
AVGDIFF	62	96	12	82	121
MAXDIF	62	113	12	90	128
SURTHC	62	8.7	1.3	8	13
B_THCK	62	6.2	2.9	1.25	12
SB_THCK	62	8.9	5.2	3	18
RVALUE	62	13.5	7.2	6	35
RATE91	62	3.89	0.65	2.1	4.9
CRK	62	73	14	31	84
T_LOW	62	103.5	66	3	229
T_MED	62	11	30	0	177
T_HIGH	62	0.0	0.25	0	2
FORK	62	10.7	11.5	0	43
L_LOW	62	46.7	87.1	0	389
L_MED	62	4.6	30.2	0	237
L_HIGH	62	0	0	0	0
EDGE	62	0.08	0.20	-0.5	1
SEP	62	0.27	0.48	0	2
FAULT	12	0.15	0.11	0.0	0.34
PATCH	62	1.04	3.07	0	16
ESAL	62	1.48E	8.03E	1.69E	4.27E

An average of more than 100 low-severity transverse cracks were found in the 500-foot sections. The presence of transverse cracking in continuously reinforced concrete pavement is expected, since the CRCP design procedure includes a crack spacing criterion that ranges from 3 to 8 feet. Therefore, a 500-foot section should have between 60 and 170 cracks. In contrast, transverse cracks in jointed pavements are not desired. The different design and performance parameters for the two pavement types necessitated separating the variables by pavement type as shown in Table 4.2.

A review of the means of the environmental variables showed that there is no statistical difference in the environments for the two pavement types. With the exception of surface thickness, there are no differences among the structural variables when pavement types alone are considered. Although the average base and subbase thicknesses are different, this can be attributed to the difference in base and subbase type as discussed below. The cumulative equivalent single axle loads (ESAL) were not found to be statistically different based on pavement type alone.

4.3 IMPACT OF CRACKING ON REHABILITATION

The separation of the variables by pavement type demonstrates the difference between JRC and CRC pavements with respect to cracking. As would be expected, transverse cracking is much more prevalent in CRC than in JRC. However, the average total number of transverse cracks (T_LOW + T_MED + T_HIGH) in CRC is 140 per section, which is within the design range. Some sections have more than 170 cracks (less than 3 foot crack spacing) and are therefore more likely to develop longitudinal cracks (Won and McCullough, 1987). The combination of longitudinal and transverse cracks eventually leads to punchouts and failure of the pavement. Although no nationwide criterion exists, Texas rehabilitates by the time 3 punchouts are present per mile (Viljaen and McCullough 1985).

Table 4.2 Descriptive Statistics for 50 CRC and 12 JRC Pavement Sections

		Mean	Std. Dev.	Minimum	Maximum
AGE	JRC	30.17	2.21	26.	32.
	CRC	16.26	7.89	2.	30.
PREC	JRC	25.37	12.79	14.08	50.22
	CRC	26.41	15.55	6.75	61.5
MIN	JRC	-6.33	3.65	-12.	-1.
	CRC	-8.44	12.09	-28.	9.
AVGDIFF	JRC	89.86	4.37	84.7	97.5
	CRC	97.99	12.20	81.86	121.
MAXDIFF	JRC	113.67	4.38	108.	118.
	CRC	112.44	13.39	90.	128.
SURTHCK	JRC	8.	0.	8.	8.
	CRC	8.9	1.39	8.	13.
B_THCK	JRC	9.21	3.97	1.25	12.
	CRC	5.45	1.96	1.5	10.
SB_THCK	JRC	7.5	1.73	6.	9.
	CRC	9.11	5.45	3.	18.
RVALUE	JRC	18.5	7.13	11.	31.
	CRC	12.38	6.73	6.	24.
RATE91	JRC	3.02	0.48	2.1	3.6
	CRC	4.11	0.48	2.9	4.9
CRK	JRC	47.92	11.72	31.	70.
	CRC	78.83	3.83	67.	84.
T_LOW	JRC	8.83	6.42	3.	22.
	CRC	126.28	51.90	23.	229.
T_MED	JRC	0.42	1.44	0.	5.
	CRC	13.68	32.98	0.	177.
T_HIGH	JRC	0.	0.	0.	0.
	CRC	0.04	0.28	0.	2.
FORK	JRC	0.75	0.75	0.	2.
	CRC	13.06	11.63	0.	43.
L_LOW	JRC	73.25	92.85	8.	352.
	CRC	40.3	85.44	0.	389.
L_MED	JRC	0.83	2.89	0.	10.
	CRC	5.56	33.59	0.	237.
L_HIGH	JRC	0.	0.	0.	0.
	CRC	0.	0.	0.	0.
EDGE	JRC	0.23	0.28	0.	1.
	CRC	0.04	0.16	-0.5	0.4
SEP	JRC	0.39	0.41	0.	1.
	CRC	0.24	0.50	0.	2.
FAULT	JRC	0.15	0.11	0.	0.34
	CRC	-	-	-	-
PATCH	JRC	4.37	5.73	0.	16.
	CRC	0.24	0.99	0.	5.4
ESAL	JRC	1.98 E+07	3.00 E+06	1.59 E+07	2.39 E+07
	CRC	1.36 E+07	8.41 E+06	1.69 E+06	4.27 E+07

If it is assumed that the patches identified in the survey of CRC pavements are punchout repairs, then Oregon CRC pavements have an average of 2.3 punchouts per mile. However, this assumption represents the worst case since patched areas may or may not represent a punchout failure. It should be noted that no punchouts were observed during the field survey of the 50 CRC sections.

Just as the presence of longitudinal cracks is important, the location is also of interest. Longitudinal cracks may occur shortly after the concrete is placed if sawing is delayed. This type of crack typically meanders near the center of a two lane placement, adjacent to the sawn longitudinal joint. Because the small blocks formed by these cracks are not normally trafficked, punchouts are less likely to occur. The cracks are nevertheless a problem because of the ingress of moisture and fines. This survey showed that longitudinal cracking in JRC pavements occurred mainly in the center of the lane and therefore cannot be attributed to late sawing.

Three CRC pavement sections which have significant longitudinal cracking were found to have meandering cracks near the lane edge. These are 1) I-205 northbound, SE Foster Rd. to SE Causey Ave. (363 feet), 2) I-84 eastbound, Pendleton section (95 feet), and 3) I-5 northbound, Cottage Grove to Goshen (389 feet). These three sections are shown as darkened circles in Figure 4.1.

The combination of closely-spaced transverse cracks and longitudinal cracks generally indicates significant distress in a CRC pavement. Some of the 50 CRC sections surveyed exhibited this combination. These sections will likely develop punchouts in the near future and require maintenance and/or rehabilitation

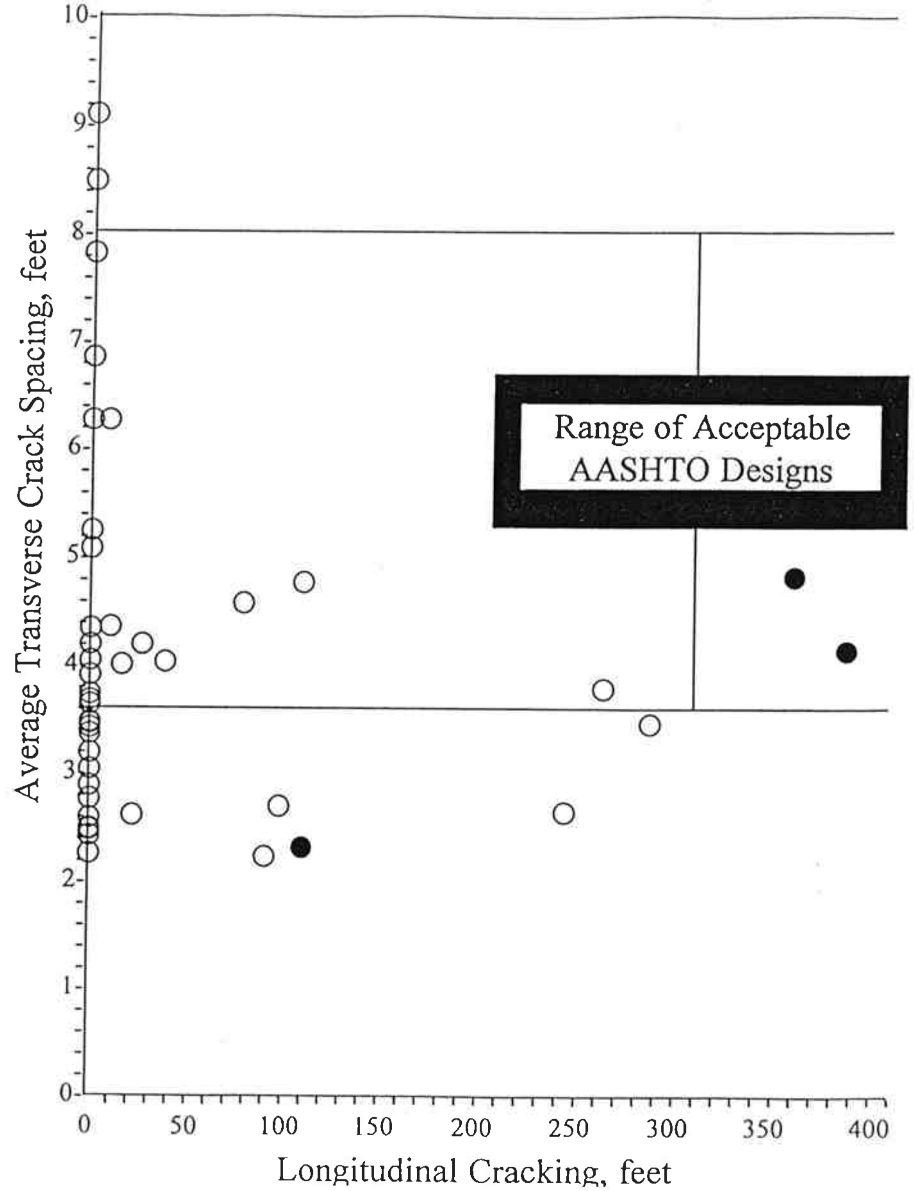


Figure 4.1 Transverse and Longitudinal Cracking in CRCP Sections

The jointed reinforced concrete pavements in the survey have an average joint spacing of approximately 63 feet or 8 panels per 500-foot section. The average number of low and medium severity transverse cracks per section is 9; indicating, on average, a crack in each panel. The presence of these cracks, though not desirable, is not surprising given the long joint spacing of these pavements. Mid-panel cracks are common when the joint spacing exceeds 40 feet (Smith, et al. 1990). The transverse cracks are not a problem provided further deterioration of the crack (through spalling, pumping, etc.) does not initiate repair or rehabilitation. However, when the severity of the crack increases and /or faulting occurs, rehabilitation may be required. Most surveyed JRCP sections did not exhibit excessive faulting or high severity cracking.

Guidelines for timing rehabilitation of JRC pavements vary widely from agency to agency, however general guidelines are available (Smith, et al. 1990). Rehabilitation should be considered when joint faulting is 0.26 in. or greater, medium or high severity transverse cracking count exceeds 70 per mile, more than 500 feet of longitudinal cracking exists per mile, or the pavement rating falls below 3.0.

When converted to the 500-foot sections reported herein, the transverse and longitudinal cracking limits are 6.6 and 47, respectively. Applying the above criteria, some JRC sections would require some form of rehabilitation based on the extent of longitudinal cracking. These are 1) Southbound I-5, South Ashland to North Ashland, 2) Northbound I-5, Evans Creek to North Grants Pass, 3) Westbound I-84, The Dalles to Pendleton Section, and 4) Westbound I-105, Coburg Road to Pacific Highway.

The pavement rating in 1991 (RATE91) for both north and southbound I-5, between Jackson St. and Seven Oaks showed these sections require rehabilitation.

Further separation by base type is informative, as shown in Table 4.3. Specifically, the CRCP sections placed on cement treated or aggregate bases exhibited fewer forked cracks than sections placed on lean concrete or asphalt bases. Forked cracks often indicate the potential for punchout-type failures because of the closely spaced cracks. The sections on lean concrete bases also exhibit more low severity transverse and longitudinal cracks despite the relatively low total ESAL count.

Table 4.3 Average Variable Values Separated by Pavement and Base Type

Variable	JRC		CRC			
	Aggregate Base (10)	Asphalt Treated Base (2)	Aggregate Base (15)	Cement Treated Base (19)	Asphalt Treated Base (11)	Lean Concrete Base (5)
AGE	31	26	20.7	18.6	10.8	6.0
ESAL	27.6	20.7	15.8	21.2	18.3	8.4
Surface Thickness	8.0	8.0	8.7	8.3	9.5	10.6
Base Thickness	10.8	1.0	6.4	4.6	4.7	7.6
Rating 1991	2.8	4.0	3.8	4.1	4.5	5.0
Cracking Rating	50.6	34.5	78.2	78.2	80.0	80.6
Number of Forked Cracks	0.6	1.5	12.7	8.1	17.5	23.0
Number of Low Severity Transverse Cracks	9.1	7.5	149.9	111.1	99.8	171.2
Number of Low Severity Longitudinal Cracks	74.8	65.5	52.3	36.8	11.5	80.8
Number of Medium Severity Longitudinal Cracks	1.0	0.0	2.7	12.5	0.0	0.0

4.4 ANALYSIS OF VARIANCE RESULTS

The primary objective of this analysis was to explore the deterministic relationship between the measurements of distress (i.e., low severity transverse cracking) and the structural, environmental, and traffic variables. These variables are often termed the dependent and independent variables, respectively.

When all data are examined, some apparent relationships between the dependent and independent variables were discovered as discussed below. However, analysis of the full data set could not be completed due to missing data. For example, JRC pavement has not been placed on cement treated bases in Oregon. Analyses of data sets containing a significant number of missing values is rarely of value.

Therefore, analyses were conducted on CRC pavements only. This data set is termed unbalanced because even within the fifty CRC pavement sections, there are sections with different surface thicknesses. Of the fifty CRC sections, thirty-four (34) have 8-inch thick surface layers. Thus, a second data set was established using only the 8-inch thick CRC pavement sections. The inferences drawn from the small data set should be interpreted with caution and are valid only within the range of the reduced data (CRC).

It should be noted that some variables were related or non-separable (confounded), further complicating analyses. For example, age and ESAL both represent some measure of the service life of the pavement. Likewise, the average differential temperature (AVGDIFF) and the maximum differential temperature (MAXDIFF) are related since both are calculated from yearly temperature extremes. Thus, for certain independent variables, only simple statistical analyses were performed (Section 4.2).

The analyses were of two types. First, exploratory analyses were conducted using a matrix of scatter plots to identify the relationships between the variables of interest (Appendix E). These plots were used with means tables (Tables 4.1 and 4.2) to judge the likelihood that relationships exist between variables. Second, model-dependent data analysis was used to select the best model of the mean of a dependent variable (i.e., cracking) as a linear function of some independent variable (i.e., environment, age, etc.). Model-dependent analyses were performed on the 8-inch thick CRC pavement sections to determine the effect of base type (B_TYPE) and on all the CRC data to determine the effects of the base and subbase material type. The summary of the statistical findings are given in Table E.2 and Table E.3 in Appendix E.

An example is presented to assist in understanding the analysis methodology. In the following, the distress variable RATE91 is taken as an example. Only data for 8-inch thick CRC are used.

First, a matrix of scatter plots for variable RATE91 versus all structural, age, traffic, and environmental variables were constructed (Appendix E). These plots show that the variable is linearly related to variable AGE (with correlation r = - 0.6170). Further, base type appears to have some effect on RATE91. There are no other relations apparent between the dependent variables and the explanatory variables.

In this example, since RATE91 was linearly related to age, the effect of base type is assessed after adjusting for the age effect. The fitted model is

$$RATE91 = 4.7 - 0.043(AGE) + 0.049(B_{TYPE})$$

The significance of base type on RATE91 is judged using p-values. The p-values represent the significance level for testing if the coefficients are, in fact, zero. In this case, the p-value for AGE and B_TYPE are 0.0216 and 0.6506, respectively. Small p-values indicate the associated coefficient is not likely to be zero, in other words, it is likely that the associated variable has an effect on the dependent variable. Values approaching 1.0 show that little correlation exists between the variables. In the above case, since the p-value for base type is very large, there is no evidence that base type has an effect on RATE91 within 8-inch CRC pavements when the age effect is taken into account.

After performing similar analyses on other combinations, the following statements are statistically warranted. CRC pavements with a surface thickness of 8 inches showed some evidence that base type has an effect on low severity transverse cracking (T_LOW), low severity longitudinal cracking (L_LOW), and cracking (CRK) when age is taken into account. For corresponding scatter plots, see Appendix E. No other statistical relationships were found.

Within all CRC pavements, only the performance indicator RATE91 is linearly related to age, base and subbase types. Only subbase type has a significant effect on RATE91 after the age is taken into account.

5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Based on the data gathered and evaluated as part of this project, the following summary statements, conclusions and recommendations are warranted.

5.1 SUMMARY AND CONCLUSIONS

1. Most rigid pavements in Oregon have reached or exceeded their intended design life and have carried 2 to 6 times the traffic for which they were designed. Remarkably, almost all sections surveyed have pavement ratings above 3.0.

2. Many sections of JRC and CRC pavement have little or no medium or high severity transverse and longitudinal cracking normally associated with eminent failure. Using distress-based rehabilitation criteria from other states, no CRCP sections require immediate rehabilitation.

3. The time to failure for existing Oregon CRC pavements, in this study, has not been established, chiefly because no sections have failed. The collected data provide a data base upon which predictions could eventually be based.

4. Sixty-two pavement condition survey sites have been established along the interstate system which will assist in establishing Oregon-based failure criteria. The SHRP-LTPP Distress Survey Protocol was easily implemented on Oregon rigid pavements.

5. Certain data could not be collected because they were unavailable or unreliable. In the main areas of interest, these data included traffic loadings, material properties, and construction history. The difficulty was chiefly related to the cost of field sampling and testing.

6. Recent trends in the construction of CRC pavements appear to favor the use of treated-base courses despite the excellent performance given by untreated aggregate bases.

7. Environmental values did not correlate with either distress or performance indicators. This may be due to the relative coarseness of the available NOAA data. Weather information from a single station was often used for several test sections.

8. With the exception of rainfall, the temperature-related environmental variables included in this project showed little significant variation along the two interstate corridors studied. Due to the spatial distribution of JRC and CRC pavements throughout the state, the two pavement types are exposed to the same range of environmental conditions.

9. Subgrade support was difficult to adequately characterize using as-built data, except in the most general sense. Only limited FWD data was available. The average backcalculated subgrade modulus is about 20,000 psi for Willamette Valley soils.

10. Pavement Ratings are approximately one full point higher for CRC than JRC, undoubtedly reflecting age.

11. Pavement age is related to some performance parameters. When the structural parameters of 8-inch CRC are evaluated taking age into account, low severity transverse and longitudinal cracking are affected by base type.

5.2 RECOMMENDATIONS

1. Oregon DOT should examine the AASHTO Design procedure to determine the cause of the gross under-prediction of load carrying capacity in their CRC and JRC pavements. Additional laboratory data gathering may help quantify appropriate design inputs.

2. The JRC and CRC pavement sections identified herein as having lower remaining lives should be carefully monitored.

3. Pavement management distress surveys should continue and where possible, the sixty-two sites identified in this study should be included. The use of these data to establish Oregon-based failure criteria will allow timely rehabilitation of CRC and JRC pavements. Furthermore, the continued collection of data will allow the Oregon DOT to more efficiently implement mechanistic design procedures, when they become available.

4. Better estimates of traffic loadings throughout the life of the pavement would benefit the accuracy of pavement-life predictions. Therefore, some of the newer CRC pavements should be instrumented with weigh-in-motion devices to provide this information.

5. Routine FWD testing should be conducted to assist in the characterization of subgrade soils throughout the State. These data would also help the State's pavement management efforts.

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Appendix A

Preferred Data Collection Items

Table A.1 Identification and Geometric Data Requirements

IDENTIFICATION AND GEOMETRIC DATA
• State Highway Code
• Project ID
• Section Location (beginning and ending mile markers and stations)
• Type of Pavement (JPCP, JRCP, CRCP)
• Number of Through Lanes (one direction)
• Structural Layer Thicknesses
• Lane Width
• Outside Shoulder Width
• Inside Shoulder Width
• Shoulder Surface Type
• Shoulder Base Type
• Shoulder Surface Thickness
• Shoulder Base Thickness
• Subsurface Drainage Type
• Date Constructed

Table A.2 Material Properties and Construction Information

SUBGRADE DATA

- AASHTO Soil Classification (from boring)
- CBR (if available) or R-Value (if available)
- Resilient Modulus or k-value (backcalculated from 9-kip FWD data)
- Percent Passing No. 200 Sieve (from borings)
- Liquid Limit and Plasticity Index (from borings)

UNBOUND OR STABILIZED BASE OR SUBBASE MATERIAL DESCRIPTION

- Layer Number
- AASHTO Soil Classification
- Percent Binder (passing No. 40 Sieve)
- Percent Passing No. 200 Sieve
- Type of Stabilizing Agent
- Modulus of Elasticity or k-value (backcalculated from 9-kip FWD data)

CONCRETE DATA

- Strength (28-Day Third-Point Modulus of Rupture)
- Slump and Air Content
- Type of Coarse Aggregate
- Method Used to Cure Concrete
- Indirect Tensile Strength of In-Place Concrete From Cores

REINFORCING STEEL DATA

- Type and Yield Strength of Reinforcement
- Transverse Bar Diameter and Spacing
- Longitudinal Bar Diameter and Spacing
- Depth to Reinforcement from Slab Surface

JOINT DATA

- Average Contraction Joint Spacing
- Skewness of Transverse Joints
- Transverse Contraction Joint Load Transfer System
  - Dowel Diameter
  - Dowel Coating
  - Dowel Spacing in Inches
  - Dowel Length
  - Method Used to Install Dowels
- Methods Used to Form Transverse Joints
- Transverse Joint Sealant Type
- Type of Longitudinal Joint
  - Tie Bar Diameter
  - Tie Bar Spacing
  - Tie Bar Length
  - Tie Bar Coating

Table A.3 Traffic Volume and Classification

HISTORICAL DATA: TRAFFIC VOLUME AND DISTRIBUTION

- Year (obtain as many past years of data as possible)
- One-Way ADT
- One-Way Percent Trucks
- One-Way Lane Distribution of Trucks (outer lane)

HISTORICAL DATA: VEHICLE CLASSIFICATION, PERCENT OF TRUCK VOLUME BY TRUCK TYPE

- Two-Axle, Six-Tire Single-Unit Trucks
- Three-Axle Single-Unit Trucks
- Four-or-More Axle Single-Unit Trucks
- Four-or-Less Axle Single-Trailer Trucks
- Five-Axle Single-Trailer Trucks
- Six-or-More Axle Single-Trailer Trucks
- Five-or-Less Axle Multi-Trailer Trucks
- Six-Axle Multi-Trailer Trucks
- Seven-or-More Axle Multi-Trailer Trucks

Table A.4 Performance and Condition Surveys

SURVEYS

- SHRP LTPP-based Condition Surveys
- Rideability or PSI Measurement
- Rutting

MAINTENANCE

- Location
- Type of Maintenance
- Time of Maintenance

Table A.5 Environmental Data

TEMPERATURE

- Average Monthly Temperature
- Average Maximum Daily Temperature By Month
- Average Minimum Daily Temperature By Month
- Freezing Index
- Average Number of Annual Air Freeze-Thaw Cycles
- Elevation Above Sea Level

PRECIPITATION

- Average Monthly Precipitation
- Average Annual Number of Days of Precipitation
- Thornthwaite Moisture Index

Appendix B

Identification and Location of Rigid Pavements under Oregon Department of Transportation Jurisdiction

Table B.1 Jointed, Plain Concrete Pavement under ODOT Jurisdiction

HWY No.	Beginning Milepost	Ending Milepost	Direction	Section Length, miles
04	256.42	257.69	NB	1.27
09	0.00	3.72	NB	3.72
09	4.51	5.31	NB	0.80
09	155.25	155.80	NB	0.55
09	233.48	234.81	NB	1.33
26	0.00	1.06	NB	1.06
39	37.58	40.37	NB	2.79
42	3.11	4.00	NB	0.89
60	1.39	3.44	NB	2.05
63	20.89	22.40	NB	1.51
66	1.28	2.02	NB	0.74
91	-5.52	-3.07	NB	2.45
91	-3.01	-1.78	NB	1.23
91	-1.16	-0.64	NB	0.52
91	5.52	7.16	NB	1.64
91	106.98	108.68	NB	1.70
91	16.72	17.44	SB	0.72
92	0.95	1.96	NB	1.01
92	17.90	21.05	NB	3.15
92	1.36	1.96	SB	0.60
			Total Mileage	**29.73**
			Average Section Length	**1.49**

Table B.2 Jointed, Reinforced Concrete Pavement under ODOT Jurisdiction

HWY No.	Beginning Milepost	Ending Milepost	Direction	Section Length, miles
1	11.45	18.70	NB	7.25
1	28.33	35.75	NB	7.42
1	43.10	49.05	NB	5.95
1	49.05	58.15	NB	9.10
1	303.71	305.97	NB	2.26
1	11.45	18.70	SB	7.25
1	28.33	35.75	SB	7.42
1	43.10	49.05	SB	5.95
1	49.05	58.15	SB	9.10
1	303.71	305.97	SB	2.26
2	84.40	88.01	EB	3.61
2	84.40	88.01	WB	3.61
227	0.00	0.75	EB	0.75
227	0.89	2.16	EB	1.27
227	2.16	3.95	EB	1.79
227	0.00	0.75	WB	0.75
227	0.89	2.16	WB	1.27
227	2.16	3.95	WB	1.79
			Total Mileage	**78.80**
			Average Section Length	**4.38**

Table B.3 Continuously Reinforced Concrete Pavement under ODOT Jurisdiction

HWY No.	Beginning Milepost	Ending Milepost	Direction	Section Length, miles
01	0.00	11.45	NB	11.45
01	18.70	28.33	NB	9.63
01	162.12	169.50	NB	7.38
01	174.73	187.85	NB	13.12
01	192.52	197.44	NB	4.92
01	227.68	234.74	NB	7.06
01	258.32	272.29	NB	13.97
01	272.29	281.75	NB	9.46
01	283.00	287.63	NB	4.63
01	287.63	289.17	NB	1.54
01	289.17	292.77	NB	3.60
01	292.77	293.92	NB	1.15
01	300.92	303.71	NB	2.79
01	305.97	307.51	NB	1.54
01	0.00	11.45	SB	11.45
01	18.70	28.33	SB	9.63
01	81.45	87.36	SB	5.91
01	147.70	154.88	SB	7.18
01	162.12	169.50	SB	7.38
01	174.73	187.85	SB	13.12
01	192.52	197.44	SB	4.92
01	227.68	234.74	SB	7.06
01	258.32	272.29	SB	13.97
01	272.29	281.75	SB	9.46
01	283.00	287.63	SB	4.63
01	287.63	289.17	SB	1.54
01	289.17	292.77	SB	3.60
01	292.77	293.92	SB	1.15
01	300.92	303.71	SB	2.79
01	305.97	307.51	SB	1.54
02	0.46	5.50	EB	5.04
02	0.39	5.50	WB	5.11
06	188.04	204.43	EB	16.39
06	204.43	213.05	EB	8.62
06	225.70	237.79	EB	12.09
06	259.19	265.51	EB	6.32
06	306.53	313.25	EB	6.72
06	265.51	272.09	EB	6.58
06	272.09	276.07	EB	3.98
06	276.07	285.33	EB	9.26
06	285.33	297.11	EB	11.78
06	342.12	345.56	EB	3.44
06	345.56	353.28	EB	7.72
06	188.04	204.43	WB	16.39
06	204.43	213.05	WB	8.62
06	225.70	237.79	WB	12.09
06	259.19	265.51	WB	6.32
06	265.51	272.09	WB	6.58
06	272.09	276.07	WB	3.98
06	276.07	285.33	WB	9.26
06	285.33	297.11	WB	11.78
06	306.53	313.25	WB	6.72
06	342.12	345.56	WB	3.44
06	345.56	353.28	WB	7.72
06	368.16	374.78	WB	6.62
61	0.00	2.59	NB	2.59
61	0.00	2.59	SB	2.59
64	0.00	3.98	NB	3.98
64	3.98	8.80	NB	4.82
64	9.31	11.34	NB	2.03
64	11.34	15.02	NB	3.68
64	15.02	17.69	NB	2.67
64	17.69	19.01	NB	1.32
64	19.01	25.70	NB	6.69
64	0.00	3.98	SB	3.98
64	3.98	8.80	SB	4.82
64	9.31	11.34	SB	2.03
64	11.34	15.02	SB	3.68
64	15.02	17.69	SB	2.67
64	17.69	19.01	SB	1.32
64	19.01	25.70	SB	6.69
70	0.00	10.10	EB	10.10
70	0.00	10.10	WB	10.10
		Total Mileage		475.90
		Average Section Length		6.52

Appendix C

Oregon Interstate Rigid Pavement Data Summary

Table C.1 Interstate Database as Provided by ODOT

Highway Number	Section BMP	Section EMP	Length, miles	Dir	Location	County	Cmpltn Date	Surface Type	Surface Thick. In.	Base Type	Base Thick., In.	Subbase Type	Subbase Thick., In.	Subgrade Type	Subgrade R-Value	Design Period, yrs.	Design ESAL	ADT 1989	Percent Trucks	Ride 85	Ride 86	Ride 87	Ride 89	Cond 87	Cond 89	Pvt. Rate 85	Pvt. Rate 86	Pvt. Rate 87	Pvt. Rate 89	Pvt. Rate lr91
0001	0.00	11.45	11.45	NB	Calif. St. Line - S. Ashland	Jackson	1988	CRC	12.0	P.M.B.B.	3	AGG	10 to 14	CLAYEY SAND	26			12100	31				0.0							4.8
0001	0.00	11.45	11.45	SB	Calif. St. Line - S. Ashland	Jackson	1988	CRC	12.0	P.M.B.B.	3	AGG	10 to 14	CLAYEY SAND	26			12100	31				0.0							4.8
0001	11.45	18.70	7.25	NB	S. Ashland - N. Ashland	Jackson	1964	JRC	8.0	AGG	12			SILTY SAND	21	20	3.60	12100	31	3.9	3.9	3.9	3.9	FR	FR	3.3	3.3	3.1	3.1	3.0
0001	11.45	18.70	7.25	SB	S. Ashland - N. Ashland	Jackson	1964	JRC	8.0	AGG	12			SILTY SAND	21	20	3.60	12100	31	3.9	3.9	3.9	3.9	FR	FR	3.4	3.3	3.1	3.1	3.0
0001	18.70	28.33	9.63	NB	N. Ashland - 12th Street	Jackson	1963	CRC	8.0	AGG	6	AGG	18	SANDY SILT	13	20	3.60	28300	17	3.9	3.9	3.9	3.9	FR	FR	3.4	3.4	3.4	3.2	3.2
0001	18.70	28.33	9.63	SB	N. Ashland - 12th Street	Jackson	1963	CRC	8.0	AGG	6	AGG	18	SANDY SILT	13	20	3.60	28300	17	3.8	3.8	3.8	3.9	FR	FR	3.5	3.4	3.4	3.2	3.2
0001	28.33	35.75	7.42	NB	Jackson St.- Seven Oaks	Jackson	1962	JRC	8.0	AGG	12			CLAY LOAM	31	20	3.60	26900	16	3.3	3.3	3.3	3.3	PR	PR	2.2	2.2	2.2	2.1	2.1
0001	28.33	35.75	7.42	SB	Jackson St.- Seven Oaks	Jackson	1962	JRC	8.0	AGG	12			CLAY LOAM	31	20	3.60	26900	16	3.0	3.0	3.0	3.0	PR	PR	2.2	2.2	2.2	2.1	2.1
0001	43.10	49.05	5.95	NB	Rock Point - Evans Creek	Josephine	1961	JRC	8.0	AGG	12			SILTY CLAY LOAM	12	20	3.70	24500	20	3.7	3.7	0.0	3.4	FR	FR	3.3	3.3	3.3	3.2	3.2
0001	43.10	49.05	5.95	SB	Rock Point - Evans Creek	Josephine	1961	JRC	8.0	AGG	12			SILTY CLAY LOAM	12	20	3.70	24500	20	3.6	3.6	0.0	3.4	FR	FR	3.5	3.3	3.3	3.2	3.2
0001	49.05	58.15	9.10	NB	Evans Cr. - N. Grants Pass	Josephine	1962	JRC	8.0	AGG	6 to 12	AGG	0 to 18	CLAY LOAM	21	20	3.70	20700	20	3.1	3.1	0.0	3.0	FR	FR	2.7	2.7	2.7	2.6	3.2
0001	49.05	58.15	9.10	SB	Evans Cr. - N. Grants Pass	Josephine	1962	JRC	8.0	AGG	6 to 12	AGG	0 to 18	CLAY LOAM	21	20	3.70	20700	20	3.2	3.2	0.0	3.0	FR	FR	2.9	2.7	2.7	2.6	3.2
0001	81.45	87.36	5.91	SB	Glendale Jct. - Azalea	Douglas	1966	CRC	8.0	AGG	10	AGG	7	SANDY SILT	18	20	3.98	15400	32	3.9	3.4	3.4	3.4	GD	FR	3.0	4.0	3.9	3.3	2.9
0001	147.70	154.88	7.18	SB	Rice Hill - Elkhead Road	Douglas	1985	CRC	11.0	C.T.B	6				12	30	35.00	18500	31	0.0	5.0	5.0	4.5	VG	VG	3.0	4.8	4.8	4.8	4.8
0001	162.12	169.50	7.38	NB	Anlauf - Martin Creek	Douglas	1982	CRC	8.0	P.M.B.B.	7	AGG	17		24	20	16.68	17400	23	4.1	4.1	4.1	4.0	VG	VG	4.5	4.5	4.5	4.5	4.5
0001	162.12	169.50	7.38	SB	Anlauf - Martin Creek	Douglas	1982	CRC	8.0	P.M.B.B.	7	AGG	17		24	20	16.68	17400	23	4.0	4.0	4.0	4.0	VG	VG	4.2	4.5	4.5	4.5	4.5
0001	174.73	187.85	13.12	NB	Cottage Grove - Goshen	Lane	1986	CRC	10.0	C.T.B.	8			SILTY CLAY	10	30	33.90	27300	26	5.0	5.0	5.0	4.6	VG	VG	5.0	4.7	4.7	4.7	4.5
0001	174.73	187.85	13.12	SB	Cottage Grove - Goshen	Lane	1984	CRC	13.0	AGG	10			SILTY CLAY	10	30	35.00	27300	26	4.3	4.3	4.3	4.3	VG	VG	4.7	4.3	4.7	4.7	4.3
0001	192.52	197.44	4.92	NB	Willamette Riv.-McKenzie Riv.	Lane	1987	CRC	11.0	LEAN	8			SILTY CLAY	15	30	44.27	43300	26				4.6	VG	VG			4.9	4.9	4.7
0001	192.52	197.44	4.92	SB	Willamette Riv.-McKenzie Riv.	Lane	1987	CRC	11.0	LEAN	8			SILTY CLAY	15	30	44.27	43300	26				4.6	VG	VG			4.9	4.9	4.7
0001	227.68	234.74	7.06	NB	Corvallis/Lebanon- N. Albany	Linn	1985	CRC	11.0	LEAN	6			SILTY CLAY LOAM	8	30	44.30	28900	22	4.0	4.0	4.0	4.0	VG	VG	5.0	4.7	4.9	4.9	4.7
0001	227.68	234.74	7.06	SB	Corvallis/Lebanon- N. Albany	Linn	1985	CRC	11.0	LEAN	6			SILTY CLAY LOAM	8	30	44.30	28900	22	4.0	4.0	4.0	4.0	VG	VG	5.0	4.7	4.9	4.9	4.7
0001	258.32	272.29	13.97	NB	Hayesville - Woodburn Int.	Marion	1976	CRC	8.0	AC	4	AGG	12	LIME T.S. 6 in.	7	20	14.45	56900	17	4.2	4.2	4.2	4.2	GD	GD	4.3	4.3	4.3	4.3	4.2
0001	258.32	272.29	13.97	SB	Hayesville - Woodburn Int.	Marion	1976	CRC	8.0	AC	4	AGG	12	LIME T.S. 6 in.	7	20	14.45	56900	17	4.2	4.2	4.2	4.2	GD	GD	4.3	4.3	4.3	4.3	4.2
0001	272.29	281.75	9.46	NB	Woodburn Int.- Baldock SRA	Marion	1974	CRC	8.0	AC	4	AGG	12	SANDY SILT	9	20	14.45	54500	17	4.4	4.4	4.2	4.2	GD	GD	4.1	4.1	4.1	4.1	4.1
0001	272.29	281.75	9.46	SB	Woodburn Int.- Baldock SRA	Marion	1974	CRC	8.0	AC	4	AGG	12	SANDY SILT	9	20	14.45	54500	17	4.1	4.3	4.2	4.2	GD	GD	3.9	4.1	4.1	4.1	4.1
0001	283.00	287.63	4.63	NB	Willamette Rv.-E. Portland Fwy	Wash&Clack	1970	CRC	8.0	C.T.B.	6	LTS	6	CLAYEY SILT	13	20	14.50	76000	12	3.9	3.9	3.9	3.9	GD	GD	3.6	3.7	3.7	3.7	3.6
0001	283.00	287.63	4.63	SB	Willamette Rv.-E. Portland Fwy	Wash&Clack	1970	CRC	8.0	C.T.B.	6	LTS	6	CLAYEY SILT	13	20	14.50	76000	12	3.9	3.9	3.9	3.9	GD	GD	3.8	3.7	3.7	3.7	3.6
0001	287.63	289.17	1.54	NB	E. Portland Fwy. Int.	Washington	1971	CRC	8.0	C.T.B.	4	AGG	4	LIME T. SGRD.	10	20	14.50	85700	9	4.0	4.0	4.0	4.0	GD	GD	4.1	4.1	4.1	4.1	4.0
0001	287.63	289.17	1.54	SB	E. Portland Fwy. Int.	Washington	1971	CRC	8.0	C.T.B.	4	AGG	4	LIME T. SGRD.	10	20	14.50	85700	9	4.0	4.0	4.0	4.0	GD	GD	4.1	4.1	4.1	4.1	4.0
0001	289.17	292.77	3.60	NB	E. Portland Fwy.-S. Tigard Int	Washington	1976	CRC	8.0	AC	9	LTS	6	SANDY SILT	12	20	14.70	99100	8	4.0	4.0	4.0	4.0	GD	GD	4.1	4.1	4.1	4.1	4.0
0001	289.17	292.77	3.60	SB	E. Portland Fwy.-S. Tigard Int	Washington	1976	CRC	8.0	C.T.B.	6	LTS	6	SANDY SILT	12	20	14.70	99100	8	4.0	4.0	4.0	4.0	GD	GD	4.1	4.1	4.1	4.1	4.0
0001	292.77	293.92	1.15	NB	S. Tigard Int. - N. Tigard Int	Multnomah	1986	CRC	11.5	C.T.B.	8			SANDY SILT	12	30		90600	9	4.0	4.0	4.0	4.0	VG	VG	5.0	4.7	4.7	4.6	4.6
0001	292.77	293.92	1.15	SB	S. Tigard Int. - N. Tigard Int	Multnomah	1986	CRC	11.5	C.T.B.	8			SANDY SILT	12	30		90600	9	4.0	4.0	4.0	4.0	VG	VG.	5.0	4.7	4.7	4.6	4.6
0001	300.92	303.71	2.79	NB	Marquam Bridge - Stadium Frwy	Multnomah	1964	CRC	8.0	AGG	12			CLAYEY SILT	12	20	4.30	93400	9	3.4	3.3	3.3	3.0	FR	FR	3.2	3.0	3.0	3.0	3.2
0001	300.92	303.71	2.79	SB	Marquam Bridge - Stadium Frwy	Multnomah	1964	CRC	8.0	AGG	12			CLAYEY SILT	12	20	4.30	93400	9	3.3	3.4	3.4	3.0	FR	FR	3.0	3.2	3.2	3.0	3.2
0001	303.71	305.97	2.26	NB	Stadium Frwy - Columbia Blvd.	Multnomah	1965	JRC	8.0	AGG	9			SILTY SAND	51	20	4.30	104800	9	3.6	3.6	3.6	3.2	FR	FR	3.4	3.4	3.4	3.2	3.2
0001	303.71	305.97	2.26	SB	Stadium Frwy - Columbia Blvd.	Multnomah	1965	JRC	8.0	AGG	9			SILTY SAND	51	20	4.30	104800	9	3.6	3.6	3.6	3.2	FR	FR	3.4	3.4	3.4	3.2	3.2
0001	305.97	307.51	1.54	NB	Columbia Blvd. - Oregon Slough	Multnomah	1991	CRC	12.0	P.M.B.B.	3	AGG	11	SILTY SAND	51	30		85000	9											4.8
0001	305.97	307.51	1.54	SB	Columbia Blvd. - Oregon Slough	Multnomah	1991	CRC	12.0	P.M.B.B.	3	AGG	11	SILTY SAND	51	30		85000	9											4.8
0002	0.39	5.50	5.04	WB	N.E. Union Ave.-N.E. 87th Ave.	Multnomah	1985	CRC	11.0	P.M.B.B.	8			SANDYCLAYEYSILT	8	20	28.40	126900	4	4.0	4.0	0.0	4.0	VG	VG	5.0	5.0	5.0	4.7	4.7
0002	0.46	5.50	5.04	EB	N.E. Union Ave.-N.E. 87th Ave.	Multnomah	1985	CRC	11.0	P.M.B.B.	6			SANDYCLAYEYSILT	8	20	28.40	126900	4	4.0	4.0	0.0	4.0	VG	VG	5.0	5.0	5.0	4.7	4.7
0002	5.50	10.08	2.29	EB	87th Ave. - 122nd Ave.	Multnomah	1990	CRC	11.0	AGG	2	SEL. SUB	18		10	30		38500	6				0.0							4.9
0002	5.50	10.08	2.29	WB	87th Ave. - 122nd Ave.	Multnomah	1990	CRC	11.0	AGG	2	SEL. SUB	18		10	30		38500	6				0.0							4.9
0002	10.08	13.03	2.95	EB	122nd Ave. - 181st Ave.	Multnomah	1990	CRC	11.0	AGG	2	SEL. SUB	6 to 18	GRAVL.SAND.SILT	10	30		54600	7											4.9
0002	10.08	13.03	2.95	WB	122nd Ave. - 181st Ave.	Multnomah	1990	CRC	11.0	AGG	2	SEL. SUB	6 to 18		10	30		54600	7											4.9
0002	84.40	88.01	3.61	EB	The Dalles - Fifteen Mile Cr.	Wasco	1967	JRC	8.0	OIL MAT	1.25	AGG	6		11	20	8.40	13200	17	3.6	3.6	3.6	3.6	FR	GD	3.3	3.5	3.4	3.6	3.6
0002	84.40	88.01	3.61	WB	The Dalles - Fifteen Mile Cr.	Wasco	1967	JRC	8.0	OIL MAT	1.25	AGG	6		11	20	8.40	13200	17	3.3	3.3	3.3	3.3	FR	FR	3.0	3.2	3.0	3.2	3.6
0006	188.04	204.43	16.39	EB	Stanfield Jct.-Pendleton Sect.	Umatilla	1969	CRC	8.0	AGG	7			SANDY SILT	9	20	2.53	10300	24	4.6	4.6	4.6	4.6	GD	GD	3.9	4.2	4.2	4.2	4.2
0006	188.04	204.43	16.39	WB	Stanfield Jct.-Pendleton Sect.	Umatilla	1969	CRC	8.0	AGG	7			SANDY SILT	9	20	2.53	10300	24	4.5	4.5	4.5	4.6	GD	GD	3.8	4.2	4.2	4.2	4.2
0006	204.43	213.05	8.62	EB	Pendleton Section	Umatilla	1970	CRC	8.0	AGG	7			SANDY SILT	6	20	2.53	8200	24	4.3	4.3	4.3	4.1	GD	GD	3.9	4.0	4.0	4.0	4.0
0006	204.43	213.05	8.62	WB	Pendleton Section	Umatilla	1970	CRC	8.0	AGG	7			SANDY SILT	6	20	2.53	8200	24	4.1	4.1	4.1	4.1	GD	GD	3.8	4.0	4.0	4.0	4.0

Table C.1 (cont'd) Interstate Database as Provided by ODOT

Highway Number	Section BMP	Section EMP	Length, miles	Dir	Location	County	Cmpltn Date	Surface Type	Surface Thick. In.	Base Type	Base Thick., In.	Subbase Type	Subbase Thick., In.	Subgrade Type	Subgrade R-Value	Design Period, yrs.	Design ESAL	ADT 1989	Percent Trucks	Ride 85	Ride 86	Ride 87	Ride 89	Cond 87	Cond 89	Pvt. Rate 85	Pvt. Rate 86	Pvt. Rate 87	Pvt. Rate 89	Pvt. Rate Ir91
0006	225.70	237.79	12.09	EB	Poverty Flats - Meacham	Umatilla	1990	CRC	11.0	AGG	11 to 14	SEL. SUB	0 to 12	CLAY LOAM	24	30		6000	36											4.9
0006	225.70	237.79	12.09	WB	Poverty Flats - Meacham	Umatilla	1990	CRC	11.0	AGG	11 to 14	SEL. SUB	0 to 12	CLAY LOAM	24	30		6000	36											4.9
0006	259.19	265.51	6.32	EB	La Grande Section	Union	1972	CRC	8.0	C.T.B.	4	AGG	6	SANDY SILT	7	20	3.37	5900	39	3.9	3.9	3.9	3.9	GD	GD	3.5	4.0	4.0	4.0	3.9
0006	259.19	265.51	6.32	WB	La Grande Section	Union	1972	CRC	8.0	C.T.B.	4	AGG	6	SANDY SILT	7	20	3.37	5900	39	3.9	3.9	3.9	3.9	GD	GD	3.5	4.0	4.0	4.0	3.7
0006	265.51	272.09	6.58	EB	La Grande - Ladd Canyon	Union	1973	CRC	8.0	C.T.B.	4	AGG	6	SANDY SILT	12	20	3.44	6700	39	4.0	4.0	4.0	4.0	GD	GD	4.1	4.1	4.1	4.0	4.0
0006	265.51	272.09	6.58	WB	La Grande - Ladd Canyon	Union	1973	CRC	8.0	C.T.B.	4	AGG	6	SANDY SILT	12	20	3.44	6700	39	4.0	4.0	4.0	4.0	GD	GD	4.0	4.1	4.1	4.0	4.0
0006	272.09	276.07	3.98	EB	Ladd Canyon Section	Union	1973	CRC	8.0	AGG	1.5			SILTY CLAY	8	20	3.71	6600	39	4.0	4.0	4.0	4.0	GD	GD	4.0	4.0	4.0	4.0	4.0
0006	272.09	276.07	3.98	WB	Ladd Canyon Section	Union	1973	CRC	8.0	C.T.B.	4	AGG	6	SILTY CLAY	8	20	3.71	6600	39	4.0	4.0	4.0	4.0	GD	GD	4.0	4.0	4.0	4.0	4.0
0006	276.07	285.33	9.26	EB	Ladd Canyon - N. Powder	Union	1975	CRC	8.0	C.T.B.	4.	AGG	6	SILTY CLAY	8	20	3.71	6600	39	5.0	5.0	5.0	4.0	GD	GD	3.0	3.7	3.7	3.7	3.7
0006	276.07	285.33	9.26	WB	Ladd Canyon - N. Powder	Union	1975	CRC	8.0	C.T.B.	4	AGG	6	SILTY CLAY	8	20	3.71	6600	39	5.0	5.0	5.0	4.0	GD	GD	3.4	3.7	3.7	3.7	3.5
0006	285.33	297.11	11.78	EB	North Powder - Baldock Slough	Baker	1986	CRC	10.0	AC	6	AGG	14	SILTY CLAY	8	20	3.11	6300	40		5.0	5.0	5.0	VG	VG		4.9	4.7	4.7	4.7
0006	285.33	297.11	11.78	WB	North Powder - Baldock Slough	Baker	1986	CRC	10.0	AC	6	AGG	14	SILTY CLAY	8	20	3.11	6300	40		5.0	5.0	5.0	VG	VG		4.9	4.7	4.7	4.7
0006	306.53	313.25	6.72	EB	S. Baker - Encina	Baker	1991	CRC	11.0	AGG	14	SEL. SUB	12 to 18	SANDY SILT	10	30		5400	45											4.8
0006	306.53	313.25	6.72	WB	S. Baker - Encina	Baker	1991	CRC	11.0	P.M.B.B.	3	AGG	12	SANDY SILT	10	30		5400	45											4.8
0006	342.12	345.56	3.44	EB	Lime Section	Baker	1970	CRC	8.0	AGG	7	SEL. SUB	18	CLAYEY SILT	18	20	3.00	5400	45	3.3	3.3	3.3	3.3	FR	FR	3.1	3.1	3.1	3.3	3.8
0006	342.12	345.56	3.44	WB	Lime Section	Baker	1970	CRC	8.0	AGG	7	SEL. SUB	18	CLAYEY SILT	18	20	3.00	5400	45	3.3	3.3	3.3	3.3	FR	FR	3.1	3.1	3.1	3.3	3.5
0006	345.56	353.28	7.72	EB	Lime - Malheur Co. Line	Baker	1968	CRC	8.0	AGG	7			CLAY	16	20	1.35	5300	43	3.5	3.5	3.5	3.5	GD	GD	3.9	3.9	3.9	3.9	3.9
0006	345.56	353.28	7.72	WB	Lime - Malheur Co. Line	Baker	1968	CRC	8.0	AGG	7			CLAY	16	20	1.35	5300	43	3.5	3.5	3.5	3.5	GD	GD	3.9	3.9	3.9	3.9	3.7
0006	368.16	374.78	6.62	WB	N.Jacobsen's Gulch-N. Ontario	Malheur	1974	CRC	8.0	C.T.B.	4	AGG	4	SANDY SILT	8	20	3.20	5500	46	3.8	3.8	3.8	3.8	GD	GD	3.8	4.0	4.0	3.9	3.7
0061	0.00	2.59	2.59	NB	I-5 Frwy - Fremont Bridge	Multnomah	1966	CRC	8.0	AGG	12			SANDY SILT	18	20	5.33	73300	8	4.1	4.1	4.1	4.1	GD	GD	4.1	4.0	4.0	4.0	3.5
0061	0.00	2.59	2.59	SB	I-5 Frwy - Fremont Bridge	Multnomah	1966	CRC	8.0	AGG	12			SANDY SILT	18	20	5.33	73300	8	4.1	4.1	4.1	4.1	GD	GD	3.9	4.0	4.0	4.0	3.5
0064	0.00	3.98	3.98	NB	Tualatin River - Pacific Hwy.	Clackamas	1971	CRC	8.0	C.T.B.	4	AGG	3	LIME T.S. 6.0	10	20	6.85	57100	10	4.2	4.2	4.2	4.2	GD	GD	4.2	4.2	4.2	4.0	4.0
0064	0.00	3.98	3.98	SB	Tualatin River - Pacific Hwy.	Clackamas	1971	CRC	8.0	C.T.B.	4	AGG	3	LIME T.S. 6.0	10	20	6.85	57100	10	4.2	4.2	4.2	4.2	GD	GD	4.2	4.2	4.2	4.0	4.0
0064	3.98	8.80	4.82	NB	West Linn - Tualatin River	Clackamas	1970	CRC	8.0	C.T.B.	4	AGG	4	LIME T.S. 6.0	10	20		59900	10	4.1	4.1	4.1	4.1	GD	GD	4.2	4.2	4.2	4.2	4.0
0064	3.98	8.80	4.82	SB	West Linn - Tualatin River	Clackamas	1970	CRC	8.0	C.T.B.	4	AGG	4	LIME T.S. 6.0	10	20		59900	10	4.1	4.1	4.1	4.1	GD	GD	4.1	4.2	4.2	4.2	4.0
0064	9.31	11.34	2.03	NB	Gladstone Int. - West Linn	Clackamas	1973	CRC	8.0	C.T.B.	4	AGG	5	CLAYEY SILT	10	20	11.67	82100	8	4.1	4.1	4.1	4.1	GD	GD	4.2	4.2	4.2	4.2	4.2
0064	9.31	11.34	2.02	SB	Gladstone Int. - West Linn	Clackamas	1973	CRC	8.0	C.T.B.	4	AGG	5	CLAYEY SILT	10	20	11.67	82100	8	4.2	4.2	4.2	4.1	GD	GD	4.2	4.2	4.2	4.2	4.2
0064	11.34	15.02	3.68	NB	SE Causey Ave.-Gladstone Int	Clackamas	1975	CRC	8.0	C.T.B.	4	AGG	5	CLAYEY SILT	10	20	9.10	89000	8	4.3	4.3	4.3	4.0	GD	GD	4.2	4.2	4.2	4.2	3.8
0064	11.34	15.02	3.68	SB	SE Causey Ave.-Gladstone Int	Clackamas	1975	CRC	8.0	C.T.B.	4	AGG	5	CLAYEY SILT	10	20	9.10	89000	8	4.2	4.2	4.2	4.0	GD	GD	4.2	4.2	4.2	4.2	3.8
0064	15.02	17.69	2.67	NB	SE Foster Rd.-SE Causey Ave.	Clackamas	1976	CRC	8.0	C.T.B.	6	AGG	4	LIME T.S.0-6.0	10	20	10.78	101300	8	4.0	4.0	4.0	4.0	GD	GD	4.1	4.2	4.2	4.2	3.8
0064	15.02	17.69	2.67	SB	SE Foster Rd.-SE Causey Ave.	Clackamas	1976	CRC	8.0	C.T.B.	6	AGG	4	LIME T.S.0-6.0	10	20	10.78	101300	8	4.0	4.0	4.0	4.0	GD	GD	4.2	4.2	4.2	4.2	3.8
0064	17.69	19.01	1.32	NB	SE Powell Blvd. - SE Foster Rd	Multnomah	1982	CRC	11.0	C.T.B.	4	LTS	3	CLAYEY SILT	6	20	19.69	107900	8	4.0	4.0	4.0	4.0	GD	GD	4.3	4.3	4.3	4.3	4.3
0064	17.69	19.01	1.32	SB	SE Powell Blvd. - SE Foster Rd	Multnomah	1982	CRC	11.0	C.T.B.	4	LTS	3	CLAYEY SILT	6	20	19.69	107900	8	4.0	4.0	4.0	4.0	GD	GD	4.3	4.3	4.3	4.3	4.3
0064	19.01	25.70	6.69	NB	Columbia Riv. Br. - SE Powell	Multnomah	1983	CRC	10.0	C.T.B.	6			CLAYEY SILT	6	20	16.69	94300	7	3.9	3.9	3.9	3.9	GD	GD	4.4	4.4	4.4	4.4	4.4
0064	19.01	25.70	6.69	SB	Columbia Riv. Br. - SE Powell	Multnomah	1983	CRC	10.0	C.T.B.	6			CLAYEY SILT	6	20	16.69	94300	7	3.9	3.9	3.9	3.9	GD	GD	4.4	4.4	4.4	4.4	4.4
0070	0.00	10.10	10.10	EB	Columbia R.- Old Ore Trail Hwy	Umatilla	1988	CRC	10.0	LEAN	8			Gravel		20	8.60	5700	31				4.6		VG				4.9	4.9
0070	0.00	10.10	10.10	WB	Columbia R.- Old Ore Trail Hwy	Umatilla	1988	CRC	10.0	LEAN	8			Gravel		20	8.60	5700	31				4.6		VG				4.9	4.9
0227	0.00	0.75	0.75	EB	7th Ave. - Willamette River	Lane	1973	JRC	8.0	AGG	11			GRAVL.SILT.CLAY	14	20	4.20	37500	6	0.0	0.0	3.5	3.5	FR	FR	3.2	3.3	3.3	3.3	3.2
0227	0.00	0.75	0.75	WB	7th Ave. - Willamette River	Lane	1973	JRC	8.0	AGG	11			GRAVL.SILT.CLAY	14	20	4.20	37500	6	0.0	0.0	3.2	3.2	FR	FR	3.3	3.3	3.3	3.3	3.2
0227	0.89	2.16	1.27	EB	Willamette River - Coburg Rd.	Lane	1964	JRC	8.0	AGG	9			LOAM	15	20		42200	6	0.0	0.0	3.5	3.5	FR	FR	3.2	3.3	3.3	3.1	3.0
0227	0.89	2.16	1.27	WB	Willamette River - Coburg Rd.	Lane	1964	JRC	8.0	AGG	9			LOAM	15	20		42200	6	0.0	0.0	3.2	3.2	FR	FR	3.3	3.3	3.3	3.1	3.0
0227	2.16	3.95	1.79	EB	Coburg Rd. - Pacific Hwy	Lane	1961	JRC	8.0	AGG	9			LOAM	15	20		46500	6	0.0	0.0	3.5	3.5	FR	FR	3.2	3.3	3.3	3.1	3.0
0227	2.16	3.95	1.79	WB	Coburg Rd. - Pacific Hwy	Lane	1961	JRC	8.0	AGG	9			LOAM	15	20		46500	6	0.0	0.0	3.2	3.2	FR	FR	3.3	3.3	3.3	3.1	3.0

Table C.2 Contract and Plan Numbers for Test Section Sites on the Interstate System in Oregon

HWY	BMP	EMP	LEN	DIR	SEC	AGE	PLANS NO.	CONTRACT NO.
1	11.45	18.7	7.25	NB	S. Ashland - N. Ashland	29	7V-270 (7V-141)	C6170(C5991)
1	11.45	18.7	7.25	SB	S. Ashland - N. Ashland	29	7V-270	C6170(C5991)
1	18.7	28.33	9.63	NB	N. Ashland - 12th Street	30	7V-215 (7V-71)	C6089(C5902)
1	18.7	28.33	9.63	SB	N. Ashland - 12th Street	30		
1	28.33	35.75	7.42	NB	Jackson St.- Seven Oaks	31	7V-13	C5831
1	28.33	35.75	7.42	SB	Jackson St.- Seven Oaks	31	7V-13	C5831
1	43.1	49.05	5.95	NB	Rock Point - Evans Creek	32	7V-28	C5834
1	43.1	49.05	5.95	SB	Rock Point - Evans Creek	32	7V-28	C5834
1	49.05	58.15	9.1	NB	Evans Cr. - N. Grants Pass	31	6V-433	C5714
1	49.05	58.15	9.1	SB	Evans Cr. - N. Grants Pass	31	6V-433	C5714
1	81.45	87.36	5.91	SB	Glendale Jct. - Azalea	27	8V-203	
1	147.7	154.88	7.18	SB	Rice Hill - Elkhead Road	8		
1	162.12	169.5	7.38	NB	Anlauf - Martin Creek	11	4V-266	C3640
1	162.12	169.5	7.38	SB	Anlauf - Martin Creek	11	4V-266	C3640
1	174.73	187.85	13.12	NB	Cottage Grove - Goshen	7	17V-63	C9638
1	174.73	187.85	13.12	SB	Cottage Grove - Goshen	9		
1	192.52	197.44	4.92	NB	Willamette Riv.-McKenzie Riv.	6	6V-355	
1	192.52	197.44	4.92	SB	Willamette Riv.-McKenzie Riv.	6	6V-355	
1	227.68	234.74	7.06	NB	Corvallis/Lebanon- N. Albany	8	18V-35	C9860
1	258.32	272.29	13.97	NB	Hayesville - Woodburn Int.	17	5V-77	
1	272.29	281.75	9.46	NB	Woodburn Int.- Baldock SRA	19	5V-77	
1	272.29	281.75	9.46	SB	Woodburn Int.- Baldock SRA	19	5V-77	
1	287.63	289.17	1.54	NB	E. Portland Fwy. Int.	22	4V-362	C3853
2	84.4	88.01	3.61	EB	The Dalles - Fifteen Mile Cr.	26	8V-429	C6829
2	84.4	88.01	3.61	WB	The Dalles - Fifteen Mile Cr.	26	8V-429	C6829
6	188.04	204.43	16.39	EB	Stanfield Jct.-Pendleton Sect.	24	9V-180	
6	188.04	204.43	16.39	WB	Stanfield Jct.-Pendleton Sect.	24	9V-180	
6	204.43	213.05	8.62	EB	Pendleton Section	23	9V-250	
6	204.43	213.05	8.62	WB	Pendleton Section	23	9V-250	
6	225.7	237.79	12.09	EB	Poverty Flats - Meacham	3		
6	225.7	237.79	12.09	WB	Poverty Flats - Meacham	3		
6	259.19	265.51	6.32	EB	La Grande Section	21	9V-429	C7337
6	259.19	265.51	6.32	WB	La Grande Section	21	9V-429	C7337
6	265.51	272.09	6.58	EB	La Grande - Ladd Canyon	20	4V-261	
6	265.51	272.09	6.58	WB	La Grande - Ladd Canyon	20	4V-261	
6	272.09	276.07	3.98	EB	Ladd Canyon Section	20		
6	272.09	276.07	3.98	WB	Ladd Canyon Section	20		
6	276.07	285.33	9.26	EB	Ladd Canyon - N. Powder	18		
6	276.07	285.33	9.26	WB	Ladd Canyon - N. Powder	18		
6	285.33	297.11	11.78	EB	North Powder - Baldock Slough	7		
6	285.33	297.11	11.78	WB	North Powder - Baldock Slough	7		
6	306.53	313.25	6.72	EB	S. Baker - Encina	2		
6	306.53	313.25	6.72	WB	S. Baker - Encina	2		
6	342.12	345.56	3.44	EB	Lime Section	23	9V-321	C7165
6	342.12	345.56	3.44	WB	Lime Section	23	9V-321	C7165
6	345.56	353.28	7.72	EB	Lime - Malheur Co. Line	25	8V-374	C9125
6	345.56	353.28	7.72	WB	Lime - Malheur Co. Line	25	8V-374	C9125
6	368.16	374.78	6.62	WB	N.Jacobsen's Gulch-N. Ontario	19		
64	0	3.98	3.98	NB	Tualatin River - Pacific Hwy.	22	9V-308	C7151
64	0	3.98	3.98	SB	Tualatin River - Pacific Hwy.	22	9V-308	C7151
64	3.98	8.8	4.82	NB	West Linn - Tualatin River	23	9V-306	C7150
64	3.98	8.8	4.82	SB	West Linn - Tualatin River	23	9V-306	C7150
64	11.34	15.02	3.68	NB	SE Causey Ave.-Gladstone Int	18	10V-229	C7660
64	11.34	15.02	3.68	SB	SE Causey Ave.-Gladstone Int	18	10V-229	C7660
64	15.02	17.69	2.67	NB	SE Foster Rd.-SE Causey Ave.	17	11V-362	
64	15.02	17.69	2.67	SB	SE Foster Rd.-SE Causey Ave.	17	11V-362	
64	17.69	19.01	1.32	NB	SE Powell Blvd. - SE Foster Rd	11		
64	17.69	19.01	1.32	SB	SE Powell Blvd. - SE Foster Rd	11		
70	0	10.1	10.1	EB	Columbia R.- Old Ore Trail Hwy	5		
70	0	10.1	10.1	WB	Columbia R.- Old Ore Trail Hwy	5		
227	2.16	3.95	1.79	EB	Coburg Rd. - Pacific Hwy	32	6V-355	
227	2.16	3.95	1.79	WB	Coburg Rd. - Pacific Hwy	32	6V-355	

Table C.3 Selected Pavement Structural Information from ODOT Records

Hwy No.	Dir	BMP	EMP	PCC Lanes	Outer Lane, ft.	Outer Shldr, ft.	Inner Shldr, ft.	Type	Sur Thk	Base Thk	SBBase Thk	Base Type	SBBase Type	Subg. Type	Tie Bar Dia.	Tie Bar Spcing	Tie Bar Len	Seal. Type	Type Rein	Trans. Bar Dia	Long. Bar Dal	Trans. Bar Spcing	Long. Bar Spcing	Depth to Rein.
1	NB/SB	0	11.45					CRC	c															
1	NB/SB	11.45	18.7	4	12'	10'	4'	JRC	8"	2"	10"	AGGREGATE	AGG.											
1	NB	18.7	28.33	2	12'	10'	4'	CRC	8"	6"	18"	AGG.	AGG.											
1	NB/SB	28.33	35.75	4	12'	10'	4'	JRC	8"	8"	4.75"	AGG.	AGG.											
1	NB/SB	43.1	49.05	4	12'	10'	4'	JRC	8"	12"	0"	AGG.												
1	NB/SB	49.05	58.15	4	12'	10'	8'	JRC	8"	6"	0"	AGG.												
1	SB	81.45	87.36	2	12'	10'	4'	CRC	8"	3"	7"	AGG.	AGG.		#5	4'	2.5'		bars	#4	#5	5'	6.5"	3"
1	NB	142.58	144.76	2	12'	10'	4'		8"	8"	4"	AGG.	AGG.											
1	SB	144.32	146.98	2	12'	10'	4'	JRC	8"	8"	4"	AGG.	AGG.											
1	NB/SB	162.12	169.5	4	12'	9.5'	5.5'	CRC	1.5"	4"	15"	BASE COURSE + ROCK LEVELING COURSE	AGG.											
1	NB	174.74	187.85	1	13'	9'	4'	CRC	13"						#5	3'	2.5'		bars	#4	#6	5'	4.75"	6.5"
1	NB/SB	192.52	197.44	4	12'	10'	6'	CRC	8"	9"	0"	AGG.												
1	NB/SB	227.68	234.74	4	12'	8'	6'	CRC	11"	6"	0"	AGG.												
1	SB	234.74	244.46	2	12'	10'	10'		8"	3"	0"	AGG.												
1	NB/SB	258.32	281.75	4	12'	4'	4'	CRC	4"	1.5"	18"	AGG.	AGG.											
1	NB/SB	283.11	290.25	4	12'	10'	4'	CRC	3.5"	4"	14"	AGG.	AGG.											
1	NB/SB	290.25	293.3					CRC																
1	NB/SB	299.23	300.64	4	12'	10'	4.5'		4"	2"	18"	AGG.	AGG.											
1	NB/SB	301.06	303.62	4.6	12'	10'	8'	CRC	8"	2"	10"	AGG.	AGG.											
1	NB/SB	303.62	305.85	4.8	12'	10'	8'		8"	2"	7"	AGG.	AGG.											
2	NB/SB	84.4	88.01	4	12'	10'	4.2'	JRC	8"	7"	0"	1.25" OIL MAT+2" R.L.C.+3.75" ROCK		12"										
6	EB/WB	188.58	204.43	4	12'	10'	6'	CRC	8"	2"	5"	R.L.C.	AGG.											
6	EB/WB	204.43	213.04	4	12'	10'	4'	CRC	8"	1.5"	5.5"	R.L.C.	AGG.											
6	EB/WB	258.89	264.9	4	12'	10'	4'	CRC	8"	4"	6"	R.L.C.	AGG.											
6	EB/WB	265	285.58	2.4	12'	8-10'	NONE	CRC	3.5"	6"	12"	CINDER TOPPING	AGG.											
6	EB/WB	341.86	345.56	4	12'	10'	8'	CRC	8"	1.5"	5.5"	R.L.C.	AGG.	18"										
6	EB/WB	343	353.29	4	12'	10'	4'	CRC	8"	2"	5"	R.L.C.	AGG.											
61	NB/SB	0.2	1.03	6.8	12'	6-10'	8-10'	CRC	8"	8"	4"	AGG.	SAND											
61	NB/SB	1.03	1.52	6	12'	10'	8'	CRC	8"	1.5"	10.5"	AGG.	AGG.		#5	4'	2.5'		bars	#4	#5	5'	6.5"	3"(.5"tol)
61	NB/SB	1.52	2.59	6	12'	10'	8'	CRC	8"	1.5"	10.5"	AGG.	PLANT MIX											
64	NB/SB	0	4.1	4	12'	10'	4'	CRC	8"	6"	0"	CEM. TREATED BASE		6" LIME TREATED SUBGRADE										
64	NB/SN	4.1	8.69	4	12'	10'	8'	CRC	8"	4"	5"	CEM. TREATED BASE	PLANT MIX											
64	NB/SB	9.31	11.34	6	12'	12'	12'	CRC	7"-9"	4"	5"	CEM. TREATED BASE	PLANT MIX											
64	NB/SB	11.34	15.02	6	12'	10'	10'	CRC	7"-9"	4"	5"	CEM. TREATED BASE	PLANT MIX											
64	NB/SB	15.02	17.85	6	12'	12'	10'	CRC	8"	6"	0"	CEM. TREATED BASE												
64	NB/SB	19.12	25.02	8	12'	10'	10'	CRC	10"	6"	0"	PLANT MIX BIT. BASE												
227	EB/WB	0	2	6	12'	6'	5'	JRC	8"	2"	9"	AGG. L.C.	AGG.	AGG.										
227	EB/WB	2	3.95	4	12'	10'	6'	JRC	8"	9"	0"	AGG.												

Table C.4 Concrete Aggregate Source Information

													Averages
Contract No.	7389												
Max. Size	1.5												
Source	Williamett R. Era Bar												
Oregon Air	17.3	15.1	20.1	16.8	16.6	14.9							16.8
	1.3	1.2	1.2	1.6	1.3	1.5							1.4
SE													
Contract No.	9125												
Max. Size	0.75												
Source	Morse Bros. Harrisburg												
Oregon Air													
SE	75												
Contract No.	7337												
Max. Size	1.5												
Source	Oro Dell Quarry, Old Oregon Trail HWY												
Oregon Air	15												
	1.2												
SE	66	48	70	47	51	62	79	55	50	71	44	46	57.4
Contract No.	7637												
Max. Size	1.5												
Source	McKenzie River, 1mi. W of Armitage Park												
Oregon Air	17	18.6	18.41										18.0
	1.1	0.8	0.9										0.9
SE	79	80	85	82									81.5
Contract No.	9443												
Max. Size	0.75												
Source													
Oregon Air													
SE	76	77	75	60	79	76	80	66					73.6
Contract No.	9638												
Max. Size	1.5												
Source	Wildish #2												
Oregon Air	12.9	9.1	11.3	10.8									11.0
	1.1	0.7	0.6	0.7									0.8
SE	77	87											82.0
Contract No.	7660												
Max. Size	1.5												
Source	New Era Bar												
Oregon Air	9.8	10.7	14.32										11.6
	0.6	0.4	0.4										0.5
SE													
Contract No.	7185												
Max. Size													
Source													
Oregon Air	23.6												23.6
	0.8												0.8
SE	89	83	82	76									82.5
Contract No.	7151												
Max. Size													
Source	Gibbons & Reed Crusher												
Oregon Air	18.9	20.3	19.3	15.8	18.1								18.5
	0.7	0.8	0.7	0.9	0.8								0.8
SE	50	35	14	5	22								25.2
Contract No.	7150												
Max. Size	1.5												
Source													
Oregon Air	22	22.4	17.13										20.5
	1.6	1	0.7										1.1
SE	86	88	90	87									87.8

Table C.5 Laboratory Data for Selected Concrete Projects

Contract No.	Dir	Station	Date	Compressive Strength, psi	Air Content, %	Slump. Inches
7337	EB	367	8/12/71	4460	5.8	2.00
	EB	360	8/12/71	4645	5.3	1.25
	EB	353	8/12/71	4580	5.6	2.25
	EB	346	8/12/71	4540	5.1	1.50
	EB	333	8/13/71	4670	4.9	1.25
	EB	326	8/13/71	4895	5.2	2.00
	EB	316	8/13/71	4525	5.2	2.00
	EB	310	8/13/71	4815	4.2	1.25
	EB	304	8/13/71	4415	6.4	2.00
	EB	295	8/13/71	4295	6.5	2.25
	EB	291	8/13/71	5195	5.1	1.25
	EB	287	8/17/71	5360	5.3	2.25
	EB	277	8/17/71	5525	5.3	2.00
	EB	270	8/17/71	5400	5.2	2.00
	EB	263	8/17/71	5455	4.6	1.75
	EB	255	8/17/71	5030	4.8	1.75
	EB	248	8/17/71	5260	6.0	2.50
	EB	241	8/17/71	4800	4.8	2.00
	EB	234	8/17/71	6150	4.3	0.75
	EB	227	8/18/71	5345	2.8	2.00
	EB	220	8/18/71	4710	4.2	2.00
	EB	212	8/18/71	5335	4.4	1.50
	EB	204	8/18/71	5225	4.0	1.50
	EB	197	8/18/71	5010	4.4	1.50
	EB	192	8/19/71	4735	5.4	2.50
	EB	185	8/19/71	3970	5.0	2.00
	EB	170	8/19/71	4665	5.0	2.00
	EB	161	8/19/71	4620	4.8	1.75
	EB	154	8/23/71	5025	5.4	2.50
	EB	134	8/23/71	4990	4.5	25.00
	EB	123	8/23/71	4480	5.4	2.00
	EB	114	8/23/71	5100	5.4	2.25
	EB	108	8/24/71	5085	5.3	1.75
	EB	102	8/24/71	4650	5.8	2.25
	EB	73	8/25/71	5130	5.0	2.00
	EB	63	8/25/71	4715	5.2	1.75
	EB	56	8/25/71	4955	5.5	2.50
	EB	49	8/25/71	4320	4.6	1.25
			EB Average	4897	5.0	2.47
	WB	296	8/16/71	4950	5.0	1.25
	WB	303	8/16/71	5650	2.2	1.50
	WB	310	8/16/71	4500	6.2	2.00
	WB	318	8/16/71	4530	6.4	2.25
	WB	325	8/16/71	5255	5.4	1.75

Table C.5 Laboratory Data for Selected Concrete Projects (cont'd)

Contract No.	Dir	Station	Date	Compressive Strength, psi	Air Content, %	Slump. Inches
	WB	331	8/16/71	5480	5.0	2.00
	WB	37	8/26/71	4525	4.8	1.75
	WB	45	8/26/71	4565	4.8	2.50
	WB	52	8/26/71	4695	4.8	1.75
	WB	60	8/26/71	5760	4.5	2.25
	WB	65	8/27/71	4725	4.4	2.25
	WB	72	8/27/71	4585	4.5	2.00
	WB	79	8/27/71	4480	4.5	1.50
	WB	91	8/27/71	4400	5.3	2.25
	WB	127	9/13/71	4480	4.7	5.50
	WB	173	9/13/71	4685	4.6	5.00
			WB Average	4829	4.8	2.34
			Job Average	4877	5.0	2.44
9443	NB	129	7/12/82	4830	4.9	1.50
	NB	174	7/14/82	4950	4.5	1.00
	NB	193	7/15/82	5420	4.6	1.25
	NB	210	7/15/82	4670	5.2	1.25
	NB	229	7/16/82	5300	5.1	0.75
	NB	311	7/19/82	4770	5.6	1.00
	NB	324	7/19/82	5115	4.5	1.50
	NB	348	7/20/82	4750	5.3	1.50
	NB	334	7/20/82	4850	4.9	1.25
	NB	362	7/21/82	4360	5.3	1.75
	NB	389	7/22/82	4830	5.2	1.25
	NB	412	7/23/82	4770	5.2	1.00
	NB	91	7/30/82	4310	5.4	1.50
			NB Average	4840	5.1	1.27
	SB	433+75	6/16/82	4030	6.5	2.50
	SB	419	6/18/82	4790	4.9	1.13
	SB	408	6/18/82	4645	3.7	1.13
	SB	389	6/23/82	6520	5.0	1.50
	SB	373	6/24/82	4700	4.7	1.25
	SB	354	6/25/82	4840	5.0	1.25
	SB	331	6/28/82	4655	5.0	1.50
	SB	318	6/28/82	4340	5.0	1.25
	SB	300	6/29/82	4980	5.0	1.25
	SB	285	6/30/82	4650	5.0	1.75
	SB	219	7/1/82	4340	5.0	2.25
	SB	207	7/2/82	4900	5.0	1.38
	SB	192	7/6/82	4475	5.1	2.00
	SB	170	7/7/82	4760	5.0	1.50
	SB	146	7/7/82	4830	4.7	1.25
	SB	130	7/8/82	5195	4.9	1.25

Table C.5 Laboratory Data for Selected Concrete Projects (cont'd)

Contract No.	Dir	Station	Date	Compressive Strength, psi	Air Content, %	Slump. Inches
	SB	86	7/12/82	4970	4.2	1.25
	SB	431	7/26/82	5110	5.3	1.00
	SB	89	7/29/82	3990	5.5	1.25
	SB AVER		SB Average	4775	5.0	1.45
	JOB AVER		JOB Average	4801	5.0	1.38
9638		439+50	6/19/84	4980	5.1	2.00
		452+50	6/23/84	5155	4.8	2.25
		467+25	6/23/84	5445	4.5	1.75
		490+25	6/25/84	4920	4.9	2.25
		500+11	6/27/84	4400	5.0	2.75
		500+61	7/2/84	4825	4.9	1.75
		500	6/26/84	5855	4.9	2.00
		500+36	6/29/84	5235	4.7	1.75
		500+49	7/3/84	5020	4.6	2.00
		283	8/7/84	6205	4.7	2.50
		164	8/13/84	5095	4.9	1.50
		181	8/13/84	5155	5.0	2.00
		289+00	6/11/84	5020	4.7	1.75
		24+00	8/10/83	5495	5.1	1.25
		48	8/12/83	5095	5.4	2.00
		190	8/14/84	4980	4.8	2.00
		208	8/14/84	5125	4.9	1.75
		251	8/17/84	5100	4.9	1.75
		69	8/15/83	4425	6.0	2.00
		82	8/15/83	4970	4.7	1.75
		288+50	8/4/84	4890	4.8	2.00
		100	8/17/83	4235	5.8	1.75
		109	8/17/83	4225	4.8	1.75
		123	8/18/83	5130	4.8	0.75
		138	8/18/83	5975	4.8	1.00
		154	8/19/83	5370	4.9	1.50
		331	9/21/83	4775	5.5	1.75
		346	9/21/83	4755	5.1	2.25
		418	9/19/83	5450	4.8	2.75
		310	9/20/83	5145	5.0	2.25
		368	9/23/83	5385	6.0	2.00
		397	9/23/83	5055	4.9	1.75
		412	9/26/83	5130	5.0	2.00
	JOB AVER		JOB Average	5092	5.0	1.89
7660	NB	555+25	8/15/72	4520	5.1	1.50
	NB	532+75	8/15/72	4875	3.5	1.75
	NB	525+25	8/15/72	5025	4.3	2.00

Table C.5 Laboratory Data for Selected Concrete Projects (cont'd)

Contract No.	Dir	Station	Date	Compressive Strength, psi	Air Content, %	Slump. Inches
	NB	517+75	8/16/72	5025	3.5	1.25
	NB	600+25	8/10/72	5515	4.6	1.25
	NB	592+75	8/10/72	4685	3.6	1.00
	NB	585+25	8/10/72	4480	4.3	1.25
	NB	575+00	8/10/72	4700	4.3	1.25
	NB	570+25	8/10/72	4360	4.5	1.00
	NB	562+75	8/10/72	4715	4.3	1.25
	NB AVER		NB Average	4790	4.2	1.35
	SB	510+35	8/16/72	4025	4.8	2.00
	SB	517+85	8/16/72	4875	3.8	1.75
	SB	525+35	8/16/72	5300	3.3	1.50
	SB	532+85	8/16/72	5415	3.7	1.50
	SB	540+85	8/17/72	5065	3.3	1.50
	SB	555+35	8/17/72	5180	3.3	1.75
	SB	562+85	8/17/72	4915	3.3	1.25
	SB	570+35	8/17/72	4700	3.4	1.25
	SB	577+85	8/17/72	5865	3.4	1.50
	SB	585+35	8/17/72	5005	3.3	1.50
	SB	592+85	8/18/72	4840	3.7	1.25
	SB	600+35	8/18/72	4915	3.6	1.00
	SB AVER		SB Average	5008	3.6	1.48
	JOB AVER		JOB Average	4909	3.9	1.42
7185	EB	813	9/18/69	5935	3.5	1.75
	EB	806	9/18/69	4650	4.0	2.00
	EB	799	9/18/69	5900	4.4	2.00
	EB	792	9/18/69	6650	3.9	1.25
	EB	764	9/22/69	5880	3.7	1.50
	EB	771	9/22/69	5870	3.5	1.50
	EB	778	9/22/69	5950	3.7	1.00
	EB	785	9/22/69	5120	3.6	1.50
	EB	750	9/22/69	5820	3.8	1.75
	EB	757	9/22/69	6190	3.5	2.00
	EB	736	9/24/69	5690	3.5	2.00
	EB	729	9/24/69	6160	3.6	1.75
	EB	722	9/24/69	5900	3.5	1.50
	EB	715	9/24/69	6335	3.2	1.25
	EB	708	9/24/69	6305	3.4	1.25
	EB	701	9/24/69	6180	3.5	1.50
	EB	694	9/24/69	6350	3.5	1.50
	EB	687	9/25/69	5900	3.5	1.50
	EB	680	9/25/69	6010	3.4	1.25
	EB	673	9/25/69	5975	3.7	1.00
	EB	666	9/25/69	5900	3.9	1.50

Table C.5 Laboratory Data for Selected Concrete Projects (cont'd)

Contract No.	Dir	Station	Date	Compressive Strength, psi	Air Content, %	Slump. Inches
	EB	743	9/23/69	6660	3.7	1.25
	EB	658	9/30/69	8030	3.4	1.00
	EB	651	9/30/69	6615	3.7	2.00
	EB	644	10/1/69	6495	4.8	3.00
	EB	637	10/1/69	7705	4.3	1.75
	EB	630	10/1/69	6890	4.4	1.50
	EB	623	10/1/69	7540	4.3	1.75
	EB AVER		EB Average	6236	3.7	1.59
	WB	670	9/25/69	6150	3.8	1.25
	WB	677	9/25/69	5290	3.5	1.50
	WB	684	9/26/69	6365	3.3	2.25
	WB	691	9/26/69	5900	3.5	1.00
	WB	698	9/26/69	5950	3.9	1.25
	WB	705	9/26/69	6470	3.8	1.50
	WB	712	9/26/69	6130	3.5	1.75
	WB	719	9/26/69	6830	4.1	1.25
	WB	726	9/27/69	6305	3.8	1.25
	WB	782	9/29/69	6905	3.9	1.00
	WB	733	9/27/69	6640	4.1	1.25
	WB	740	9/27/69	6580	4.0	1.00
	WB	747	9/27/69	6520	3.7	1.25
	WB	754	9/27/69	5900	3.9	1.50
	WB	761	9/27/69	7180	4.2	1.00
	WB	768	9/29/69	6300	4.1	1.25
	WB	775	9/29/69	7050	3.3	1.00
	WB	789	9/29/69	7150	4.1	1.50
	WB	796	9/29/69	7100	3.9	1.50
	WB	803	9/29/69	7225	3.6	1.25
	WB	810	9/29/69	7380	3.6	1.00
	WB		10/1/69	8135	3.9	0.75
	WB	632	10/1/69	7870	4.2	1.50
	WB	639	10/1/69	7455	3.9	1.00
	WB	646	10/2/69	6850	4.0	1.50
	WB	653	10/2/69	7710	3.9	1.25
			WB Average	6744	3.8	1.29
			JOB Average	6480	3.8	1.44
7151	NB	338+75	5/19/70	5990	3.3	0.50
	NB	323	5/20/70	5595	4.1	1.75
	NB	309+50	5/20/70	5700	3.7	1.50
	NB	289+50	5/21/70	4960	4.0	3.25
	NB	275	5/21/70	5800	3.2	2.00
	NB	258+50	5/21/70	5455	3.7	1.25
	NB	290+65	5/29/70	5145	3.4	0.50

Table C.5 Laboratory Data for Selected Concrete Projects (cont'd)

Contract No.	Dir	Station	Date	Compressive Strength, psi	Air Content, %	Slump. Inches
	NB	325+50	8/10/70	5290	3.0	1.75
	NB	320+50	8/10/70	5130	2.7	2.25
	NB	307+50	8/10/70	4910	3.0	1.50
	NB	291	8/11/70	5125	3.2	2.25
	NB	284+25	8/11/70	5300	3.5	1.25
	NB	277	8/11/70	5315	3.3	1.50
	NB	267	8/11/70	4750	3.3	2.25
			NB Average	5319	3.4	1.68
	SB	257+75	5/6/70	5765	3.1	1.00
	SB	272	5/7/70	5940	5.0	2.00
	SB	296	5/12/70	6020	3.1	2.00
	SB	310	5/12/70	6690	3.0	1.50
	SB	325	5/13/79	6780	3.2	1.25
	SB	336	5/13/79	6500	3.4	1.63
	SB	259+25	5/22/70	6110	3.3	1.00
	SB	293+75	5/25/70	4795	3.3	3.00
	SB	328+50	7/8/70	4160	3.8	3.50
			SB Average	5862	3.5	1.88
			JOB Average	5532	3.4	1.76
9860	NB	1389+55+85	4/18/86	4650	4.7	5.00
	NB	1379+50	7/24/85	5210	5.5	1.50
	NB	1355+00	7/24/85	5600	5.2	1.75
	NB	1310+00	7/22/85	4755	6.6	2.25
	NB	1330+00	7/23/85	5325		
	NB	1284+50	7/31/85	6680	5.5	1.50
	NB	1269+00	7/31/85	4490	6.5	3.00
	NB	1258+00	7/16/85	5670	6.2	2.00
	NB	1243+00	7/16/85	5240	5.9	2.00
	NB	1219+10	7/15/85	4580	5.4	2.00
			NB Average	5220	5.7	2.33
	SB	1219+00	9/10/85	4600	7.0	3.00
	SB	1254+50	9/9/85	4700	6.4	5.00
	SB	1246+50	9/9/85	6990	5.7	1.75
	SB	1260+00	9/7/85	5650	5.5	2.25
	SB	1292+50	9/6/85	6410	3.8	0.75
	SB	1316+00	9/4/85	6395	4.4	1.75
	SB	1304+50	9/5/85	6745	5.0	1.75
	SB	1318+00	9/4/85	6285	4.2	2.50
	SB	1323+00	9/4/85	5615	4.2	1.50
	SB	1327+50	9/4/85	5665	4.2	1.00
			SB Average	5906	5.0	2.13
			JOB Average	5563	5.4	2.22

Table C.6 Environmental Effects Summary Data for Selected Rigid Pavements in Oregon

Hwy ID	Section Beginning Milepost	Section Ending Milepost	Direction	Average Prec., in.	Min. Temp.	Average Differential Temp.	Max. Differential Temp.
1	11.45	18.7	NB	19.3	-4	87	108
1	11.45	18.7	SB	19.3	-4	87	108
1	18.7	28.33	NB	18.7	-6	91	115
1	18.7	28.33	SB	18.7	-6	91	115
1	28.33	35.75	NB	18.8	-6	91	115
1	28.33	35.75	SB	18.8	-6	91	115
1	43.1	49.05	NB	18.8	-6	91	115
1	43.1	49.05	SB	18.8	-6	91	115
1	49.05	58.15	NB	31.0	-1	87	108
1	49.05	58.15	SB	31.0	-1	87	108
1	81.45	87.36	SB	30.6	3	83	102
1	147.7	154.88	SB	25.6	5	86	97
1	162.12	169.5	NB	45.8	4	85	96
1	162.12	169.5	SB	45.8	4	85	96
1	174.73	187.85	NB	40.9	0	93	124
1	174.73	187.85	SB	44.4	0	90	124
1	192.52	197.44	NB	61.5	0	93	124
1	192.52	197.44	SB	61.5	0	93	124
1	227.68	234.74	NB	37.6	7	82	94
1	258.32	272.29	NB	36.8	-1	88	97
1	272.29	281.75	NB	37.5	-1	88	97
1	272.29	281.75	SB	37.5	-1	88	97
1	287.63	289.17	NB	36.0	8	83	96
2	84.4	88.01	EB	14.1	-9	98	118
2	84.4	88.01	WB	14.1	-9	98	118
6	188.04	204.43	EB	12.9	-19	105	124
6	188.04	204.43	WB	12.9	-19	105	124
6	204.43	213.05	EB	13.0	-19	105	124
6	204.43	213.05	WB	13.0	-19	105	124
6	225.7	237.79	EB	9.4	-16	121	121
6	225.7	237.79	WB	9.4	-16	121	121
6	259.19	265.51	EB	17.0	-18	107	120
6	259.19	265.51	WB	17.0	-18	107	120
6	265.51	272.09	EB	17.0	-18	107	120
6	265.51	272.09	WB	17.0	-18	107	120
6	272.09	276.07	EB	17.0	-18	107	120
6	272.09	276.07	WB	17.0	-18	107	120
6	276.07	285.33	EB	17.1	-18	106	120
6	276.07	285.33	WB	17.1	-18	106	120
6	285.33	297.11	EB	9.4	-28	115	127
6	285.33	297.11	WB	9.4	-28	115	127
6	306.53	313.25	EB	9.4	-28	115	127

Table C.6 Environmental Effects Summary Data for Selected Rigid Pavement in Oregon (cont'd)

Hwy ID	Section Beginning Milepost	Section Ending Milepost	Direction	Average Prec., in.	Min. Temp.	Average Differential Temp.	Max. Differential Temp.
6	306.53	313.25	WB	9.4	-28	115	127
6	342.12	345.56	EB	13.9	-19	108	125
6	342.12	345.56	WB	13.9	-19	108	125
6	345.56	353.28	EB	13.9	-19	108	125
6	345.56	353.28	WB	13.9	-19	108	125
6	368.16	374.78	WB	9.6	-24	115	128
64	0	3.98	NB	45.0	6	84	96
64	0	3.98	SB	45.0	6	84	96
64	3.98	8.8	NB	45.4	6	84	96
64	3.98	8.8	SB	45.4	6	84	96
64	11.34	15.02	NB	42.2	6	84	94
64	11.34	15.02	SB	42.2	6	84	94
64	15.02	17.69	NB	34.5	9	84	90
64	15.02	17.69	SB	34.5	9	84	90
64	17.69	19.01	NB	42.4	0	88	100
64	17.69	19.01	SB	42.4	0	88	100
70	0	10.1	EB	6.8	-14	106	119
70	0	10.1	WB	6.8	-14	106	119
227	2.16	3.95	EB	50.2	-12	85	118
227	2.16	3.95	WB	50.2	-12	85	118
Minimum Values				6.8	-28	82	90
Maximum Values				61.5	9	121	128
Average Values				26.2	-8	96	113

Appendix D

Rigid Pavement Data Collection Forms and Detailed Descriptions of Each Section

Table D.1 Distress Survey Form for Jointed Concrete Pavements, Page 1

DISTRESS SURVEY FOR PAVEMENTS With Jointed Portland Cement Concrete Surfaces						
Surveyor Name:			Survey Date:			
Survey Location:						
REF NO	DISTRESS TYPE	UNIT	SEVERITY LEVEL LOW	MEDIUM	HIGH	NOTES
CRACKING:						
1	Corner Breaks	EA				
2	Durability "D" Cracking.	EA				
		SF				
3	Longitudinal Cracking	LF				
4	Transverse Cracking	EA				
		LF				
JOINT DEFICIENCIES:						
5	Transverse Joint Seal Damage	EA				
		LF				
5a	Longitudinal Joint Seal Damage	EA				
		LF				
6	Spalling of Longitudinal Joints	LF				
7	Spalling of Transverse Joints	EA				
		LF				
SURFACE DEFECTS:						
8	Map Cracking	SF				
8a	Scaling	SF				
9	Polished Aggregates	SF				
10	Popouts	EA				

Table D.2 Distress Survey Form for Jointed Concrete Pavements, Page 2

DISTRESS SURVEY FOR PAVEMENTS
With Jointed Portland Cement Concrete Surfaces

Surveyor Name:	Survey Date:
Survey Location:	

REF NO	DISTRESS TYPE	UNIT	SEVERITY LEVEL LOW	MEDIUM	HIGH	NOTES
MISCELLANEOUS DISTRESS:						
11	Blowups	EA				
12	Faulting of Transverse Joints & Cracks	Point No.	Point Distance	Joint Fault (in)	Crack Fault (in)	
	* In inches to the nearest 1/10.	1				
	* 1' from the outside slab edge.	2				
	* If approach slab is higher than	3				
	departure slab, faulting is positive	4				
	(+); if approach slab is lower, then	5				
	faulting is negative (−).	6				
		7				
		8				
		9				
		10				
13 14	Lane−to−Shoulder Dropoff and Separation	Point No.	Point Distance (ft)	Lane − to − Shoulder Separation (in)	Dropoff (in)	
	* If heave of the shoulder occurs	1	0			
	record as a negative (−)	2	100			
	* In inches to the nearest 1/10	3	200			
		4	300			
		5	400			
		6	500			
15	Patch/Patch Deterioration	EA				
	(Flexable)	SF				
15a	Patch/Patch Deterioration	EA				
	(Rigid)	SF				
16	Water Bleeding and Pumping	EA				
		LF				

Table D.3 Distress Survey Form for Continuously Reinforced Concrete Pavements

DISTRESS SURVEY FOR PAVEMENTS
With Continuously Reinforced Portland Cement Concrete Surfaces

Surveyor Name:	Survey Date:
Survey Location:	

REF NO	DISTRESS TYPE	UNIT	SEVERITY LEVEL LOW	MEDIUM	HIGH	NOTES
CRACKING:						
1	Durability "D" Cracking	EA				
		SF				
2	Longitudinal Cracking	LF				
3	Transverse Cracking	EA				
		LF				
SURFACE DEFECTS:						
4	Map Cracking	SF				
4a	Scaling	SF				
5	Polished Aggregates	SF				
6	Popouts	EA				
MISCELLANEOUS DISTRESS:						
7	Blowups	EA				
8	Construction Joint Deterioraiton	EA				
9	Lane – to – Shoulder	Point	Point Distance	Lane – to – Shoulder		
10	Separation and Dropoff	No.	(ft)	Separation (in)	Dropoff (in)	
	* If heave of the shoulder occurs	1	0			
	record as a negative (–).	2	100			
	* In inches to the nearest 1/10	3	200			
		4	300			
		5	400			
		6	500			
11	Patch/Patch Deterioration	EA				
	(Flexable)	SF				
11a	Patch/Patch Deterioration	EA				
	(Rigid)	SF				
12	Punchouts	EA				
13	Spalling of Longitudinal Joint	LF				
14	Water Bleeding and Pumping	EA				
		LF				

Figure D.1 Blank Crack and Distress Mapping Form for Rigid Pavements

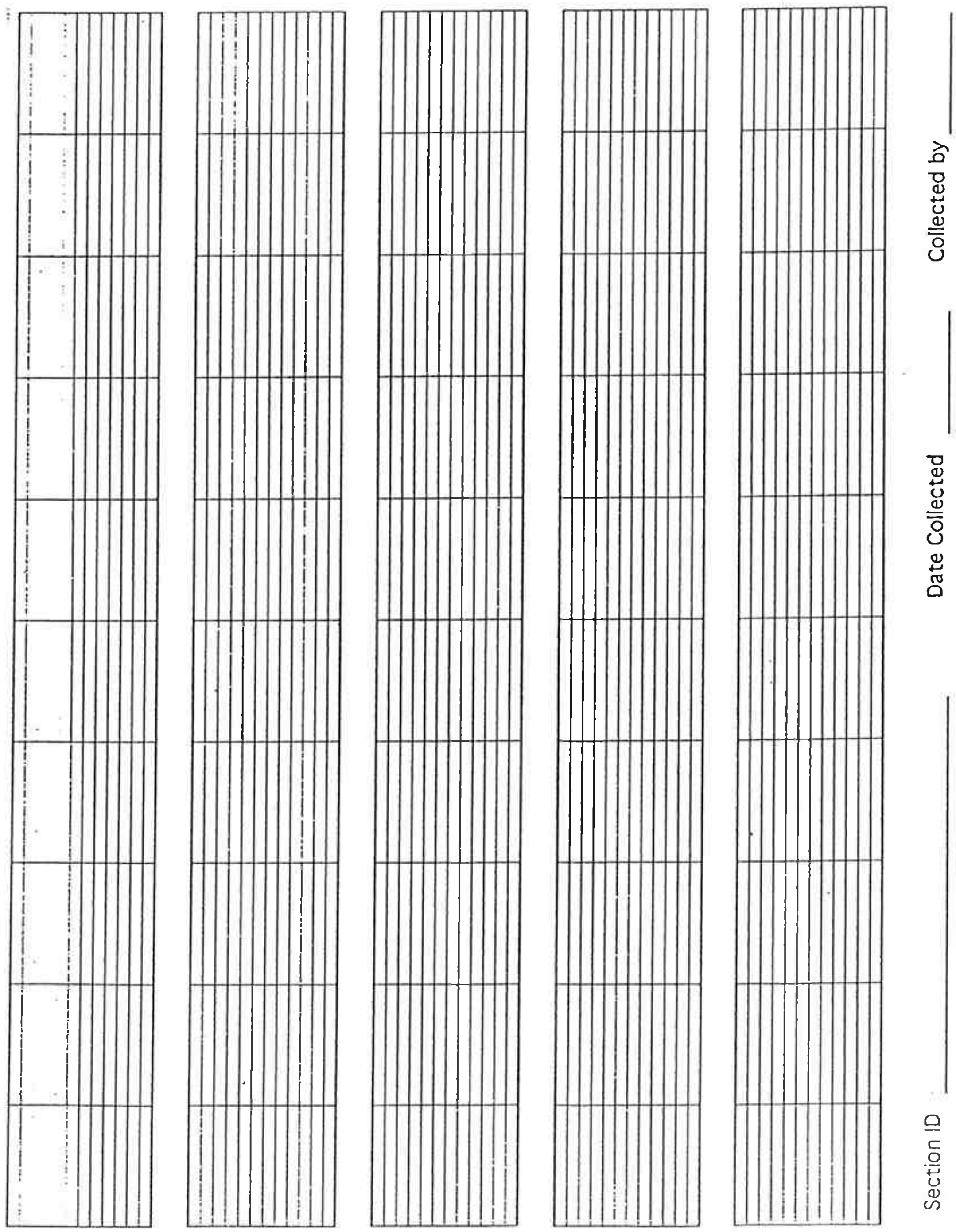

Table D.4 ODOT Historical Pavement Rating Indices for Selected Interstate Pavements

Highway ID	Dir	Location	Pvt. Type	Pvt. Rate 87	Pvt. Rate 89	Pvt. Rate 91
0001	NB	S. Ashland - N. Ashland	JRC	3.1	3.1	3.0
0001	SB	S. Ashland - N. Ashland	JRC	3.1	3.1	3.0
0001	NB	N. Ashland - 12th Street	CRC	3.4	3.2	3.2
0001	SB	N. Ashland - 12th Street	CRC	3.4	3.2	3.2
0001	NB	Jackson St.- Seven Oaks	JRC	2.2	2.1	2.1
0001	SB	Jackson St.- Seven Oaks	JRC	2.2	2.1	2.1
0001	NB	Rock Point - Evans Creek	JRC	3.3	3.2	3.2
0001	SB	Rock Point - Evans Creek	JRC	3.3	3.2	3.2
0001	NB	Evans Cr. - N. Grants Pass	JRC	2.7	2.6	3.2
0001	SB	Evans Cr. - N. Grants Pass	JRC	2.7	2.6	3.2
0001	SB	Glendale Jct. - Azalea	CRC	3.9	3.3	2.9
0001	SB	Rice Hill - Elkhead Road	CRC	4.8	4.8	4.8
0001	NB	Anlauf - Martin Creek	CRC	4.5	4.5	4.5
0001	SB	Anlauf - Martin Creek	CRC	4.5	4.5	4.5
0001	NB	Cottage Grove - Goshen	CRC	4.7	4.7	4.5
0001	SB	Cottage Grove - Goshen	CRC	4.7	4.7	4.3
0001	NB	Willamette Riv.-McKenzie Riv.	CRC	4.9	4.9	4.7
0001	SB	Willamette Riv.-McKenzie Riv.	CRC	4.9	4.9	4.7
0001	NB	Corvallis/Lebanon- N. Albany	CRC	4.9	4.9	4.7
0001	SB	Corvallis/Lebanon- N. Albany	CRC	4.9	4.9	4.7
0001	NB	Hayesville - Woodburn Int.	CRC	4.3	4.3	4.2
0001	SB	Hayesville - Woodburn Int.	CRC	4.3	4.3	4.2
0001	NB	Woodburn Int.- Baldock SRA	CRC	4.1	4.1	4.1
0001	SB	Woodburn Int.- Baldock SRA	CRC	4.1	4.1	4.1
0001	NB	Willamette Rv.-E. Portland Fwy	CRC	3.7	3.7	3.6
0001	SB	Willamette Rv.-E. Portland Fwy	CRC	3.7	3.7	3.6
0001	NB	E. Portland Fwy. Int.	CRC	4.1	4.1	4.0
0001	SB	E. Portland Fwy. Int.	CRC	4.1	4.1	4.0
0001	NB	E. Portland Fwy.-S. Tigard Int	CRC	4.1	4.1	4.0
0001	SB	E. Portland Fwy.-S. Tigard Int	CRC	4.1	4.1	4.0
0001	NB	S. Tigard Int. - N. Tigard Int	CRC	4.7	4.6	4.6
0001	SB	S. Tigard Int. - N. Tigard Int	CRC	4.7	4.6	4.6
0001	NB	Marquam Bridge - Stadium Frwy	CRC	3.0	3.0	3.2
0001	SB	Marquam Bridge - Stadium Frwy	CRC	3.2	3.0	3.2
0001	NB	Stadium Frwy - Columbia Blvd.	JRC	3.4	3.2	3.2
0001	SB	Stadium Frwy - Columbia Blvd.	JRC	3.4	3.2	3.2
0002	WB	N.E. Union Ave.-N.E. 87th Ave.	CRC	5.0	4.7	4.7
0002	EB	N.E. Union Ave.-N.E. 87th Ave.	CRC	5.0	4.7	4.7
0002	EB	The Dalles - Fifteen Mile Cr.	JRC	3.4	3.6	3.6
0002	WB	The Dalles - Fifteen Mile Cr.	JRC	3.0	3.2	3.6
0006	EB	Stanfield Jct.-Pendleton Sect.	CRC	4.2	4.2	4.2
0006	WB	Stanfield Jct.-Pendleton Sect.	CRC	4.2	4.2	4.2
0006	EB	Pendleton Section	CRC	4.0	4.0	4.0

Table D.4 ODOT Historical Pavement Rating Indices for Selected Interstate Pavements (cont'd)

High-way ID	Dir	Location	Pvt. Type	Pvt. Rate 87	Pvt. Rate 89	Pvt. Rate 91
0006	WB	Pendleton Section	CRC	4.0	4.0	4.0
0006	EB	La Grande Section	CRC	4.0	4.0	3.9
0006	WB	La Grande Section	CRC	4.0	4.0	3.7
0006	EB	La Grande - Ladd Canyon	CRC	4.1	4.0	4.0
0006	WB	La Grande - Ladd Canyon	CRC	4.1	4.0	4.0
0006	EB	Ladd Canyon Section	CRC	4.0	4.0	4.0
0006	WB	Ladd Canyon Section	CRC	4.0	4.0	4.0
0006	EB	Ladd Canyon - N. Powder	CRC	3.7	3.7	3.7
0006	WB	Ladd Canyon - N. Powder	CRC	3.7	3.7	3.5
0006	EB	North Powder - Baldock Slough	CRC	4.7	4.7	4.7
0006	WB	North Powder - Baldock Slough	CRC	4.7	4.7	4.7
0006	EB	Lime Section	CRC	3.1	3.3	3.8
0006	WB	Lime Section	CRC	3.1	3.3	3.5
0006	EB	Lime - Malheur Co. Line	CRC	3.9	3.9	3.9
0006	WB	Lime - Malheur Co. Line	CRC	3.9	3.9	3.7
0006	WB	N. Jacobsen's Gulch-N. Ontario	CRC	4.0	3.9	3.7
0061	NB	I-5 Frwy - Fremont Bridge	CRC	4.0	4.0	3.5
0061	SB	I-5 Frwy - Fremont Bridge	CRC	4.0	4.0	3.5
0064	NB	Tualatin River - Pacific Hwy.	CRC	4.2	4.0	4.0
0064	SB	Tualatin River - Pacific Hwy.	CRC	4.2	4.0	4.0
0064	NB	West Linn - Tualatin River	CRC	4.2	4.2	4.0
0064	SB	West Linn - Tualatin River	CRC	4.2	4.2	4.0
0064	NB	Gladstone Int..- West Linn	CRC	4.2	4.2	4.2
0064	SB	Gladstone Int. - West Linn	CRC	4.2	4.2	4.2
0064	NB	SE Causey Ave.-Gladstone Int	CRC	4.2	4.2	3.8
0064	SB	SE Causey Ave.-Gladstone Int	CRC	4.2	4.2	3.8
0064	NB	SE Foster Rd.-SE Causey Ave.	CRC	4.2	4.2	3.8
0064	SB	SE Foster Rd.-SE Causey Ave.	CRC	4.2	4.2	3.8
0064	NB	SE Powell Blvd. - SE Foster Rd	CRC	4.3	4.3	4.3
0064	SB	SE Powell Blvd. - SE Foster Rd	CRC	4.3	4.3	4.3
0064	NB	Columbia Riv. Br. - SE Powell	CRC	4.4	4.4	4.4
0064	SB	Columbia Riv. Br. - SE Powell	CRC	4.4	4.4	4.4
0227	EB	7th Ave. - Willamette River	JRC	3.3	3.3	3.2
0227	WB	7th Ave. - Willamette River	JRC	3.3	3.3	3.2
0227	EB	Willamette River - Coburg Rd.	JRC	3.3	3.1	3.0
0227	WB	Willamette River - Coburg Rd.	JRC	3.3	3.1	3.0
0227	EB	Coburg Rd. - Pacific Hwy	JRC	3.3	3.1	3.0
0227	WB	Coburg Rd. - Pacific Hwy	JRC	3.3	3.1	3.0

Table D.5 Location of Condition Survey Sites

I-5 Sections	
Section 0 to 11.45	This section was not surveyed due to inclement weather. Snow on the pass.
Section 11.45 to 18.7, south bound.	This section was collected starting at the south edge of the East Main Street overcrossing and proceeding 500 feet in the direction of traffic. Approximately mile post 14.77.
Section 49.05 to 58.15, north bound.	This section was collected starting 1209 feet south of mile post 53 and proceeding 500 feet in the direction of traffic. This was done because the section at mile post 53 did not seem to be a representative sample of the entire section, due to a large amount of patching.
Section 147.7 to 154.88, south bound.	This sections was collected between mile posts 153 and 154. The sections was started at section station 768+00, which was close to the south end of a guard rail and within sight of the Elkhead-Rice Hill exit warning sign. Collection was conducted in the direction of traffic.
Section 192.52 to 197.44, north bound.	This section was collected starting 500 prior to mile post 197 and proceeding 500 feet in the direction of traffic.
Sections from 283 to 307.51, north and south bound.	There were 12 sections in this range of mile markers that were not collected due to safety concerns. The level of traffic, the small size of the shoulders, and difficulty in finding a 500 foot clear section that did not run into an on or off ramp was the reason.
I-84 Sections	
Sections 0.39 to 13.03, east and west bound.	These sections were not collected due to safety reasons. The level of traffic, the small size of the shoulders, and difficulty in finding a 500 foot clear section that did not run into an on or off ramp was the reason for not collecting data in these sections.
Sections 259.19 to 265.51, east and west bound.	Both of these survey sections were collected within the SHRP test sections. West bound section was SHRP test section 415008 and the east bound test section was SHRP test section 415006.
Section 342.12 to 345.56 west bound.	This sections was collected starting 500 feet prior to mile post 343 and moving in the direction of traffic

Table D.5 Location of Condition Survey Sites (cont'd)

I-205 Sections	
Section 15.02 to 17.69, north bound.	Collection for this section began 200 feet past mile post 15. The section starts at section 15.02, so the measurement was begun approximately 200 feet into the new section.
Section 15.02 to 17.69, south bound.	Data collection for this section began at a large roadside exit indicator sign that indicated "Sunnyside Rd. 1/2 mile, etc." Collection proceeded 500 feet in the direction of traffic from this sign post.
Section 17.69 to 19.01, north bound.	This section was started 500 feet south of the Holgate road overpass, measured from the south edge of the overpass. The data was collected in the direction of traffic. This is approximately mile post 18.6.
Section 17.69 to 19.01, south bound.	This section was collected starting 500 feet prior to the pedestrian overcrossing located at approximately mile post 18.2.
Sections 9.31 to 11.34 and 19.01 to 25.7, north and south bound.	These sections were not collected due to safety reasons. The level of traffic, the small size of the shoulders, and difficulty in finding a 500 foot clear section that did not run into an on or off ramp was the reason for not collecting data in these sections.
I-105 Sections	
Section 2.16 to 3.95, east bound.	This section was collected starting 500 feet prior to mile post 3, and continuing on in the direction of traffic.
Section 0.89 to 2.16, west bound.	Data collection for this section started 750 feet prior to the roadside sign "Exit 3, Santa Clara, Junction City." 750 feet prior to the sign was measured back from the post holding the sign, and the data was collected 500 feet in the direction of traffic.
Sections 0.00 to 0.75, east and west bound, and 0.89 to 2.16 east bound.	These sections were not collected due to safety reasons. The level of traffic, the small size of the shoulders, and difficulty in finding a 500 foot clear section that did not run into an on or off ramp was the reason.

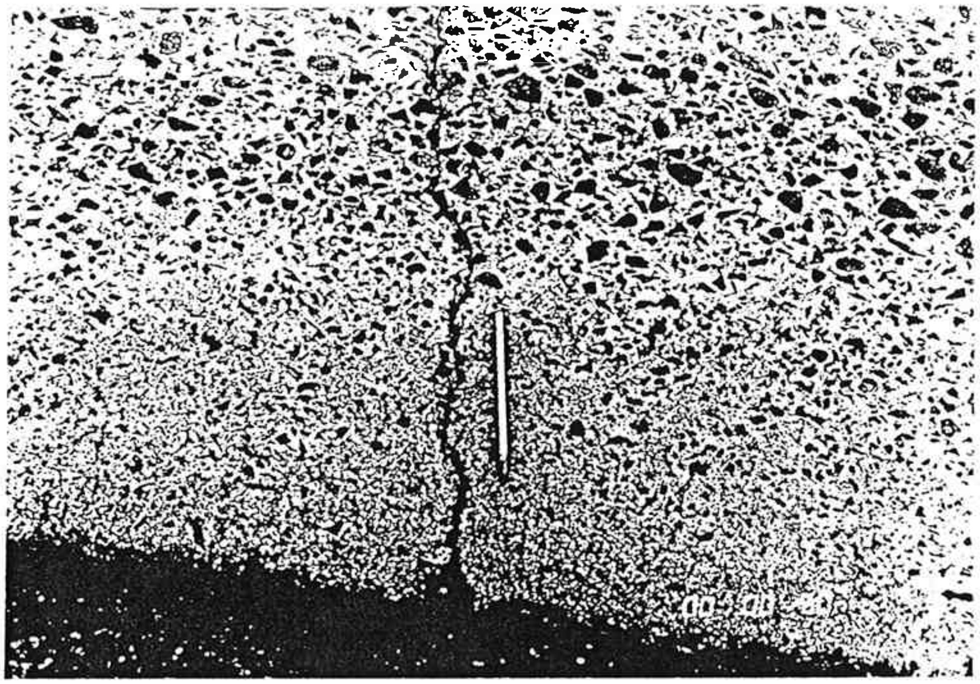

Figure D.2 Transverse Crack in CRC Pavement - Note Concrete Wear in Wheel Path

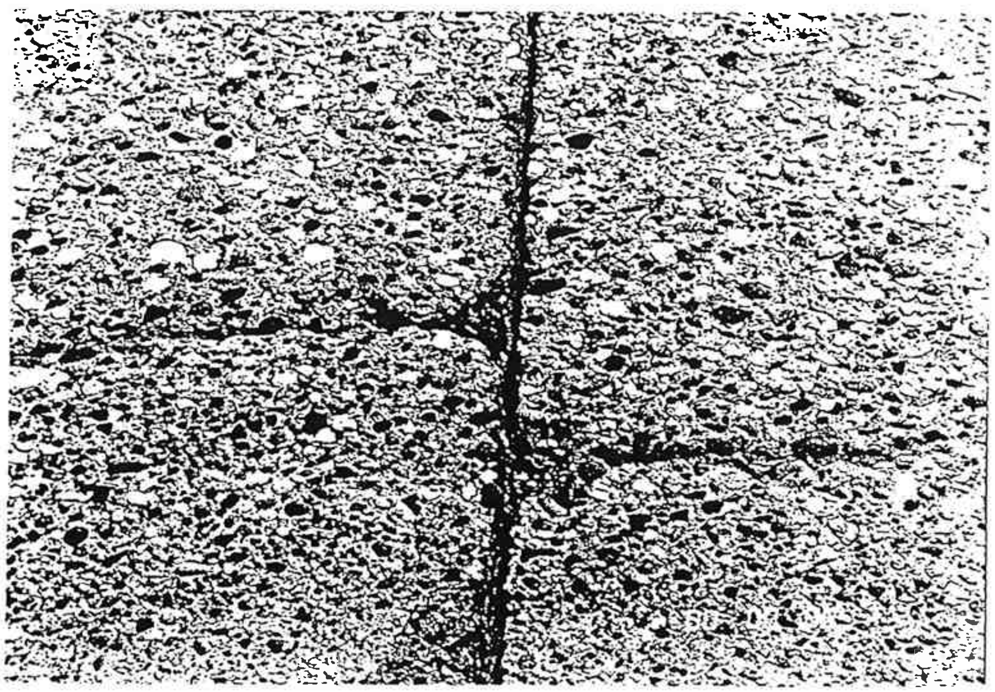

Figure D.3 Transverse Joint in JRC Pavement - Note Longitudinal Cracking Initiating from Joint

Appendix E

Data Set for Statistical Analyses

and

Variable Interaction Plots

Table E.1 Full Data Analysis Set for Rigid Pavements in Oregon

CONTROL	AGE	AVERPREC	MINTEMP	AVERDIFF	MAXDIFF	SUR_TYPE	SUR_THCK	B_TYPE	B_THCK	SB_TYPE	SB_THCK	SG_TYPE	SG_RVALUE	RATE91	CRK	T_LOW	T_MED	T_HIGH	FORK	L_LOW	L_MED	L_HIGH	EDGE	SEP	FAULT	PATCH	ESAL
1100	29	19.3	-4	87	108	JRC	8	AB	12	NONE		CL	21	3	56	3	0	0	0	33	0	0	0.3	1	0.27	0	2.38E+07
1110	29	19.3	-4	87	108	JRC	8	AB	12	NONE		CL	21	3	55	8	0	0	0	95	0	0	0.12	1	0.3	0.6	2.38E+07
1410	30	18.7	-6	91	115	CRC	8	AB	6	AB	18	SM	13	3.2	78	99	11	0	3	79	0	0	0.1	1	0	0	2.94E+07
1420	30	18.7	-6	91	115	CRC	8	AB	6	AB	18	SM	13	3.2	79	105	0	0	0	106	0	0	-0.5	1.1	0	0	2.94E+07
1430	31	18.8	-6	91	115	JRC	8	AB	12	NONE		CL	31	2.1	42	22	0	0	2	26	0	0	0.2	0.3	0.1	0	2.82E+07
1440	31	18.8	-6	91	115	JRC	8	AB	12	NONE		CL	31	2.1	38	18	0	0	0	34	10	0	1	1	0.13	0	2.82E+07
1450	32	18.8	-6	91	115	JRC	8	AB	12	NONE		MH	12	3.2	46	15	0	0	1	25	0	0	0.23	0.23	0.34	14.8	2.84E+07
1460	32	18.8	-6	91	115	JRC	8	AB	12	NONE		MH	12	3.2	62	9	0	0	0	39	0	0	0	0	0.17	4.6	2.84E+07
1230	31	31.0	-1	87	108	JRC	8	AB	9	AB	9	CL	21	3.2	38	5	0	0	1	352	0	0	0	0.14	0	16	3.11E+07
1240	31	31.0	-1	87	108	JRC	8	AB	9	AB	9	CL	21	3.2	43	4	0	0	0	8	0	0	0	0	0.2	4	3.11E+07
1630	27	30.6	3	83	102	CRC	8	AB	10	AB	7	SM	18	2.9	67	92	71	0	21	0	0	0	0	0	0	2	2.97E+07
1640	8	25.6	5	86	97	CRC	11	CTB	6	NONE		MH	12	4.8	76	69	54	0	29	0	0	0	0	0	0	4.2	1.18E+07
1190	11	45.8	4	85	96	CRC	8	ATB	7	AB	17	CL	24	4.5	71	59	0	0	0	0	0	0	0	0	0	0	1.65E+07
1200	11	45.8	4	85	96	CRC	8	ATB	7	AB	17	CL	24	4.5	78	78	77	0	38	0	0	0	0	0	0	0	1.65E+07
1170	7	40.9	0	93	124	CRC	10	CTB	9	NONE		MH	10	4.5	78	120	2	0	1	389	0	0	0.1	0	0	0	8.84E+06
1180	9	44.4	0	90	124	CRC	13	AB	10	NONE		MH	10	4.5	77	124	0	0	14	0	0	0	0	0	0	0	1.15E+07
1390	6	61.5	0	93	124	CRC	11	LEAN	8	NONE		MH	15	4.7	77	147	0	0	34	293	0	0	0	0	0	0	7.43E+06
1400	6	61.5	0	93	124	CRC	11	LEAN	8	NONE		MH	15	4.7	79	143	0	0	9	0	0	0	0	0	0	0	7.43E+06
1160	8	37.6	7	82	94	CRC	11	LEAN	6	NONE		MH	8	4.7	81	146	0	0	37	0	0	0	0.1	0	0	0	1.82E+07
1650	17	36.8	-1	88	97	CRC	8	ATB	4	AB	12	ML	7	4.2	83	138	56	0	22	0	0	0	0.33	0	0	0	3.35E+07
1660	19	37.5	-1	88	97	CRC	8	ATB	4	AB	12	SM	9	4.1	84	23	177	0	19	0	0	0	0	0	0	0	3.60E+07
1670	19	37.5	-1	88	97	CRC	8	ATB	4	AB	12	SM	9	4.1	83	107	70	0	12	0	0	0	0	0	0	0	3.60E+07
1600	22	36.0	8	83	96	CRC	8	CTB	4	AB	4	ML	10	4	83	63	85	0	9	0	0	0	0	0	0	0	5.54E+07
1680	26	14.1	-9	98	118	JRC	8	ATB	1.25	AB	6	MH	11	3.6	31	4	5	0	1	39	0	0	0.23	0.5	0.1	5.833333333	2.07E+07
1690	26	14.1	-9	98	118	JRC	8	ATB	1.25	AB	6	MH	11	3.6	38	11	0	0	2	92	0	0	0.01	0.5	0.2	6.6	2.07E+07
1540	24	12.9	-19	105	124	CRC	8	AB	7	NONE		SM	9	4.2	81	213	0	0	12	0	0	0	0.1	0.1	0	0	1.60E+07
1550	24	12.9	-19	105	124	CRC	8	AB	7	NONE		SM	9	4.2	83	170	0	0	20	0	0	0	-0.1	1	0	0	1.60E+07
1560	23	13.0	-19	105	124	CRC	8	AB	7	NONE		SM	6	4	83	186	0	0	16	75	20	0	-0.33	1.5	0	0	1.57E+07
1570	23	13.0	-19	105	124	CRC	8	AB	7	NONE		SM	6	4	81	197	0	0	24	246	0	0	0.4	0.5	0	0	1.57E+07
1580	3	9.4	-16	121	121	CRC	11	ATB	3	AB	12	CL	24	4.9	78	34	0	0	0	127	0	0	0.05	0	0	0	2.42E+06
1590	3	9.4	-16	121	121	CRC	11	ATB	3	AB	12	CL	24	4.9	81	135	0	0	11	0	0	0	0	0	0	0	2.42E+06
1310	21	17.0	-18	107	120	CRC	8	CTB	4	AB	6	SM	7	3.9	79	98	0	0	2	0	0	0	0	0	0	0	1.33E+07
1320	21	17.0	-18	107	120	CRC	8	CTB	4	AB	6	SM	7	3.7	80	121	4	0	12	43	0	0	0	0.6	0	0	1.33E+07
1370	20	17.0	-18	107	120	CRC	8	CTB	4	AB	6	SM	12	4	81	54	19	0	4	0	0	0	0	0	0	0	1.31E+07
1380	20	17.0	-18	107	120	CRC	8	CTB	4	AB	6	SM	12	4	73	140	2	0	6	0	0	0	0	0	0	0	1.31E+07
1330	20	17.0	-18	107	120	CRC	8	AB	1.5	NONE		MH	8	4	79	78	2	0	0	7	0	0	0.1	0	0	0	1.31E+07
1340	20	17.0	-18	107	120	CRC	8	CTB	4	AB	6	MH	8	4	81	84	40	0	8	0	0	0	0	0.25	0	0	1.31E+07
1350	18	17.1	-18	106	120	CRC	8	CTB	4	AB	6	MH	8	3.7	72	118	2	0	1	32	0	0	0.1	0	0	0	1.22E+07
1360	18	17.1	-18	106	120	CRC	8	CTB	4	AB	6	MH	8	3.5	76	122	2	2	5	11	0	0	0.1	0.5	0	0	1.22E+07
1120	7	9.4	-28	115	127	CRC	10	ATB	6	AB	14.5	MH	8	4.7	82	193	0	0	43	0	0	0	0	0	0	0	5.87E+06
1130	7	9.4	-28	115	127	CRC	10	ATB	6	AB	14.5	MH	8	4.7	81	188	0	0	35	0	0	0	-0.13	0	0	0	5.87E+06
1140	2	9.4	-28	115	127	CRC	11	AB	3	AB	14.5	SM	10	-	-	96	0	0	5	0	0	0	0	0	0	0	2.20E+06
1150	2	9.4	-28	115	127	CRC	11	AB	3	AB	14.5	SM	10	-	-	133	0	0	4	0	0	0	0.1	0	0	0	2.20E+06
1270	23	13.9	-19	108	125	CRC	8	AB	7	AB	18	CL	18	3.8	75	203	0	0	5	17	6	0	0	0.5	0	5.4	1.38E+07
1280	23	13.9	-19	108	125	CRC	8	AB	7	AB	18	CL	18	3.5	69	134	0	0	8	249	15	0	0.35	0.1	0	0	1.38E+07
1290	25	13.9	-19	108	125	CRC	8	AB	7	NONE		CL	16	3.9	83	206	4	0	40	0	0	0	0.4	2	0	0	1.43E+07
1300	25	13.9	-19	108	125	CRC	8	AB	7	NONE		CL	16	3.7	81	211	0	0	19	4	0	0	0.2	2	0	0	1.43E+07
1470	19	9.6	-24	115	128	CRC	8	CTB	4	AB	4	SM	8	3.7	77	229	0	0	5	89	0	0	0.15	0.5	0	0	1.51E+07
1480	22	45.0	6	84	96	CRC	8	CTB	4	AB	3	ML	10	4	77	115	0	0	8	9	0	0	0	0.1	0	0.6	2.85E+07
1490	22	45.0	6	84	96	CRC	8	CTB	4	AB	3	ML	10	4	79	137	0	0	16	0	0	0	0	0	0	0	2.85E+07
1500	23	45.4	6	84	96	CRC	8	CTB	4	AB	4	ML	10	4	82	55	0	0	0	0	0	0	0.17	0	0	0	2.87E+07
1510	23	45.4	6	84	96	CRC	8	CTB	4	AB	4	ML	10	4	82	115	0	0	4	0	0	0	-0.02	0	0	0	2.87E+07
1520	18	42.2	6	84	94	CRC	8	CTB	4	AB	5	CL	10	3.8	79	127	0	0	9	0	0	0	0.04	0	0	0	2.72E+07
1530	18	42.2	6	84	94	CRC	8	CTB	4	AB	5	CL	10	3.8	77	124	0	0	8	0	0	0	-0.07	0.1	0	0	2.72E+07
1610	17	34.5	9	84	90	CRC	8	CTB	6	AB	4	ML	10	3.8	74	100	5	0	15	126	237	0	-0.1	0	0	0	2.66E+07
1620	17	34.5	9	84	90	CRC	8	CTB	6	AB	4	ML	10	3.8	79	120	0	0	12	0	0	0	0.4	0	0	0	2.66E+07
1700	11	42.4	0	88	100	CRC	11	ATB	4	LTSG	3	CL	6	4.3	80	79	1	0	6	0	0	0	-0.03	0	0	0	2.30E+07
1710	11	42.4	0	88	100	CRC	11	ATB	4	LTSG	3	CL	6	4.3	79	64	0	0	7	0	0	0	0	0	0	0	2.30E+07
1250	5	6.8	-14	106	119	CRC	10	LEAN	8	NONE		GP	35	4.9	83	200	0	0	21	0	0	0	0	0	0	0	4.39E+06
1260	5	6.8	-14	106	119	CRC	10	LEAN	8	NONE		GP	35	4.9	83	220	-0	0	14	111	0	0	0.07	0	0	0	4.39E+06
1210	32	50.2	-12	85	118	JRC	8	AB	9	NONE		ML	15	3	70	3	0	0	1	37	0	0	0.25	0	0.03	0	2.22E+07
1220	32	50.2	-12	85	118	JRC	8	AB	9	NONE		ML	15	3	56	4	0	0	1	99	0	0	0.42	0	0	0	2.22E+07

Table E.2 Summary of Fitted Models for Base Type Effects on 8-Inch CRC Pavements

Independent Variable	Fitted Model and Base Type Effect	Means Table by Base Type			
		Level	Count	Mean	s.e.
RATE91	RATE91 = 4.686 - 0.043 AGE + 0.049 B_TYPE p-value = 0.65 B_TYPE not significant	AB CTB ATB	12 17 5	3.716 3.864 4.280	0.123 0.037 0.092
CRK	CRK = 61.94 + 0.526 AGE + 3.08 B_TYPE p-value = 0.07 B_TYPE significant at 10%	AB CTB ATB	12 17 5	78.25 78.29 79.80	1.542 0.780 2.437
T_LOW	T_LOW = 303 - 3.65AGE - 57.1 B_TYPE p-value = 0.003 B_TYPE very significant	AB CTB ATB	12 17 5	158.0 113.1 81.0	15.16 9.76 19.73
FORK	No apparent relationship with all explanatory variables				
L_LOW	LOG(L_LOW) = 3.87 - 1.30 B–TYPE p-value = 0.01 B_TYPE very significant	AB CTB ATB	12 17 5	65.4 18.23 0.0	26.8 8.83 0.0
EDGE	No apparent relationship with all explanatory variables				
SEP	No apparent relationship with all explanatory variables				

Table E.3 Summary of Fitted Models for Base and Subbase Type Effects on All CRC Pavements

Independent Variable	Fitted Model and Base Type Effect	Means Table by Base Type Level	Count	Mean	s.e.
RATE91	RATE91 = 5.07 - 0.046 AGE - 0.208 SB_TYPE + 0.080B_TYPE p-value = 0.001 SB_TYPE very significant p-value = 0.14 B_TYPE not significant	<u>BASES</u>			
		AB	13	4.11	0.09
		CTB	19	3.49	0.08
		ATB	11	4.04	0.08
		LEAN	5	4.20	0.13
		<u>SUBBASE</u>			
		NONE	15	4.68	0.07
		AB	31	3.93	0.06
		LTSG	2	3.72	0.18
CRK	No apparent relationship with all explanatory variable				
T_LOW	No apparent relationship with all explanatory variables				
FORK	No apparent relationship with all explanatory variables				
L_LOW	No apparent relationship with all explanatory variables				
EDGE	No apparent relationship with all explanatory variables				
SEP	No apparent relationship with all explanatory variables				

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only

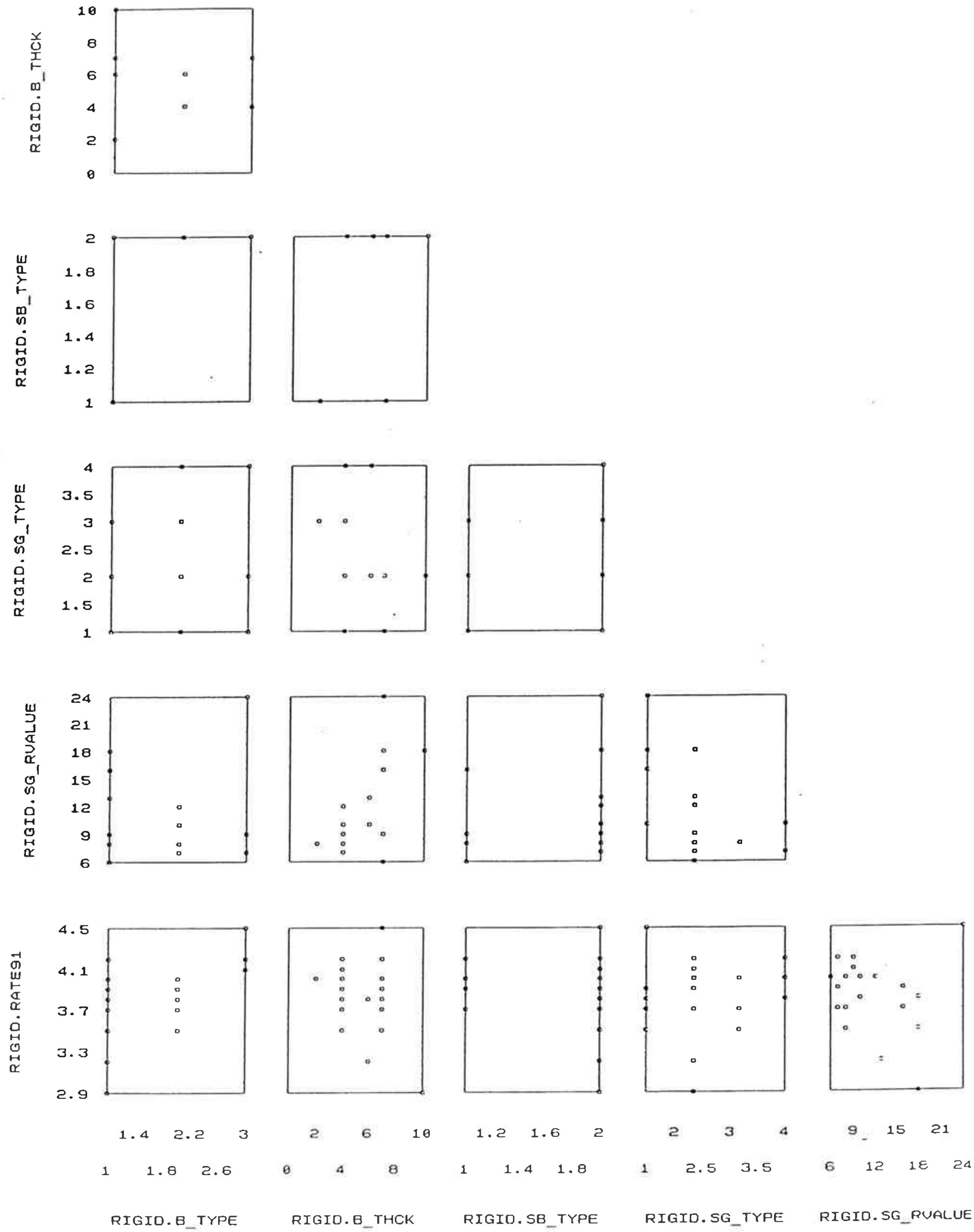

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

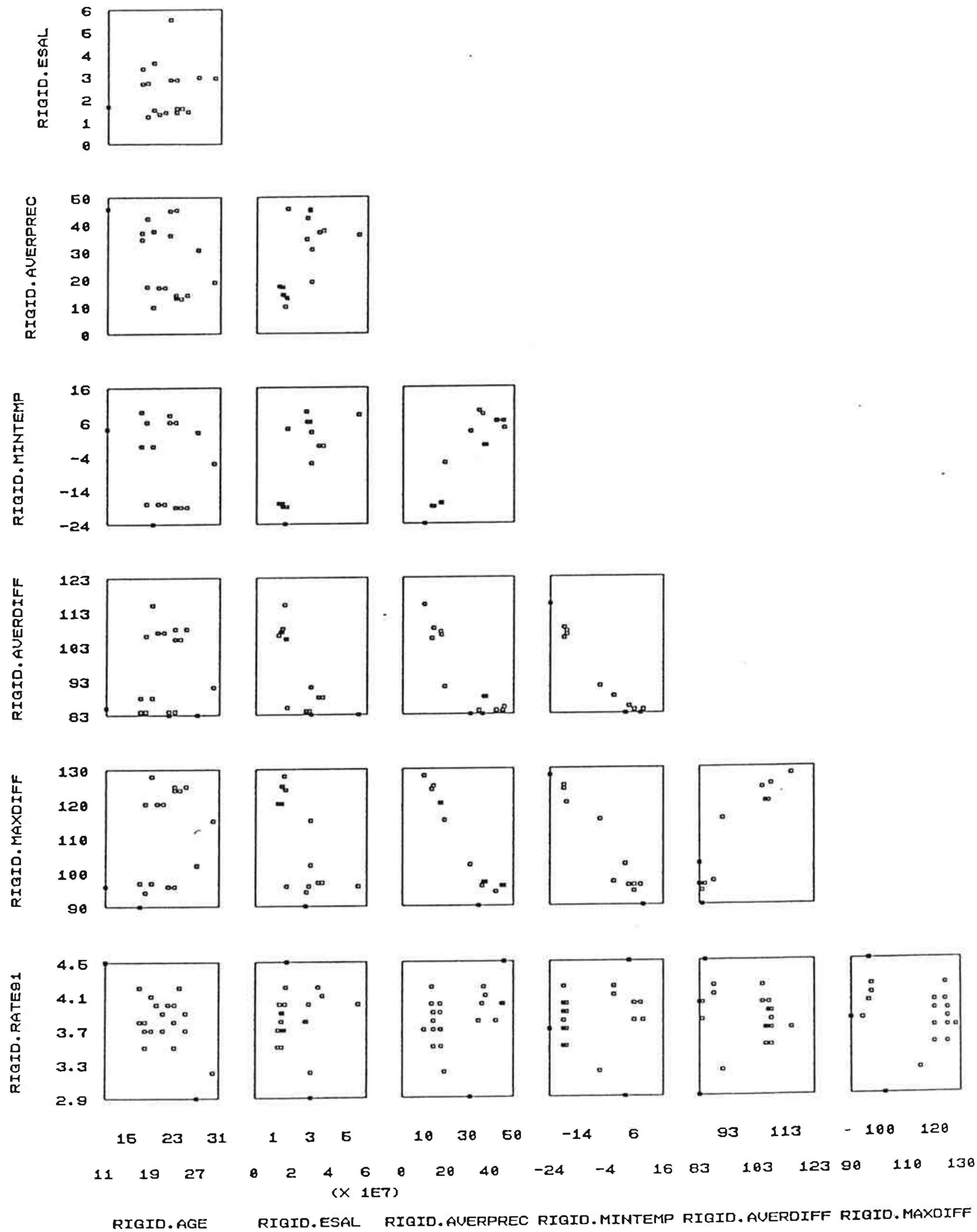

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

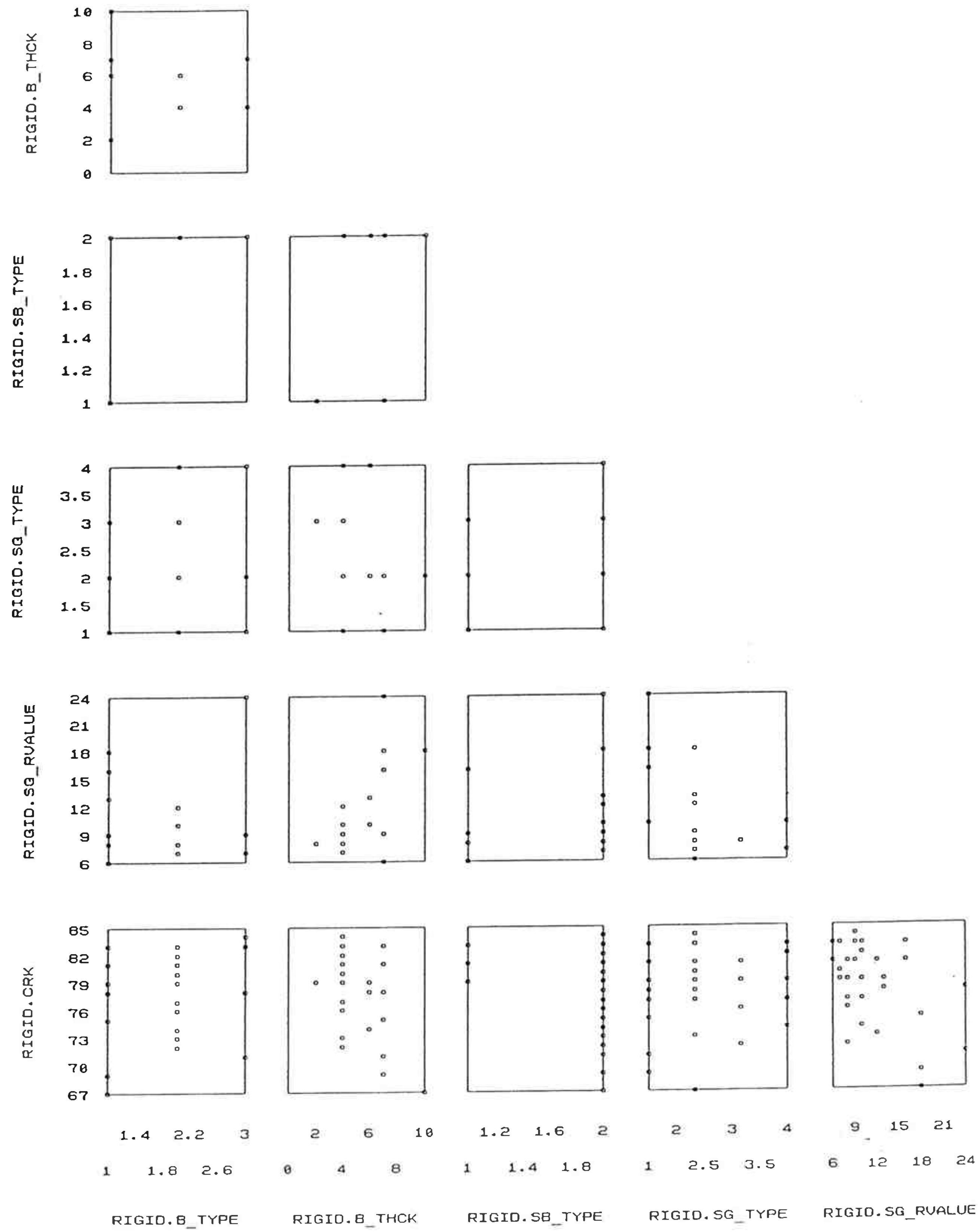

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

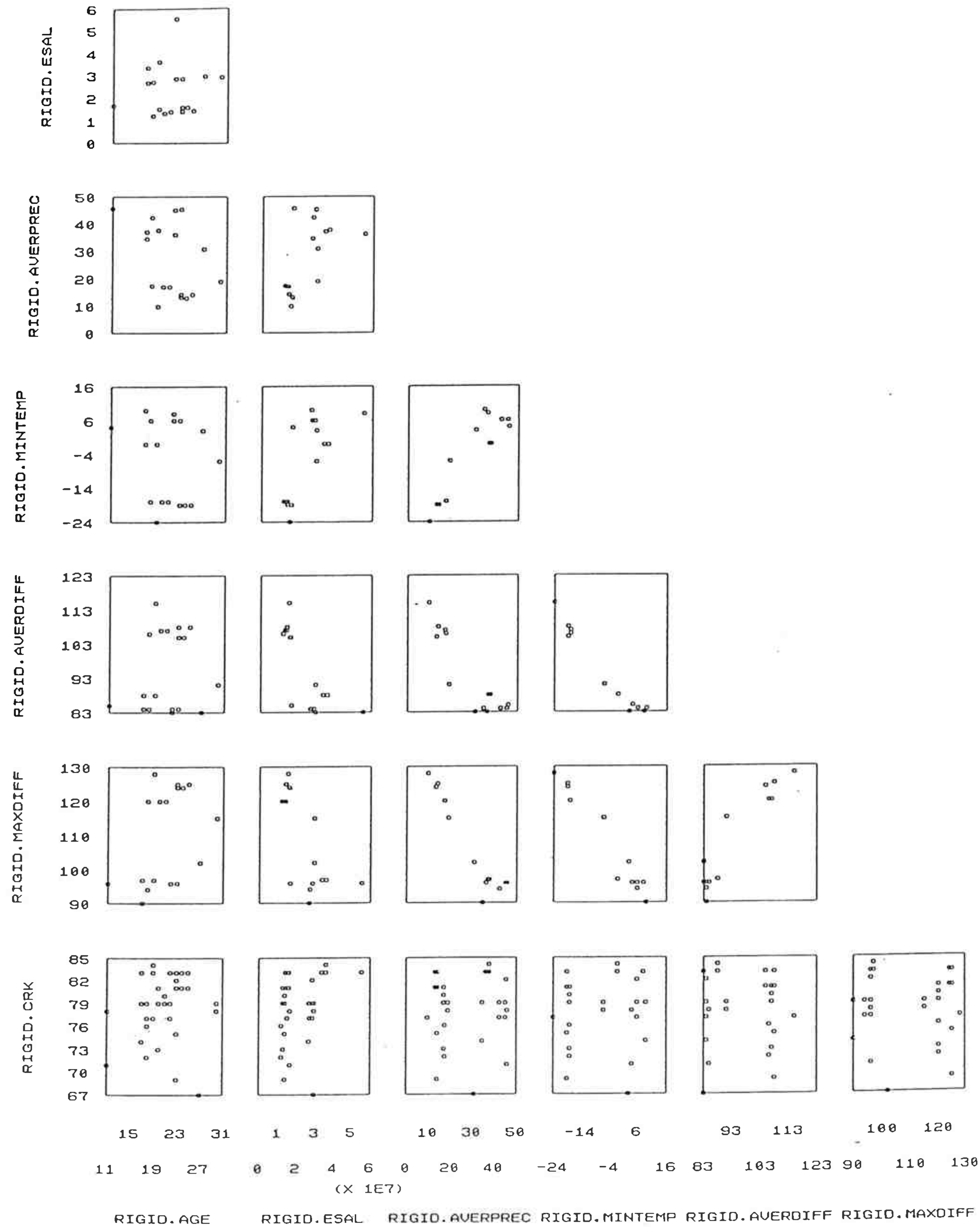

Table E.4 **Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)**

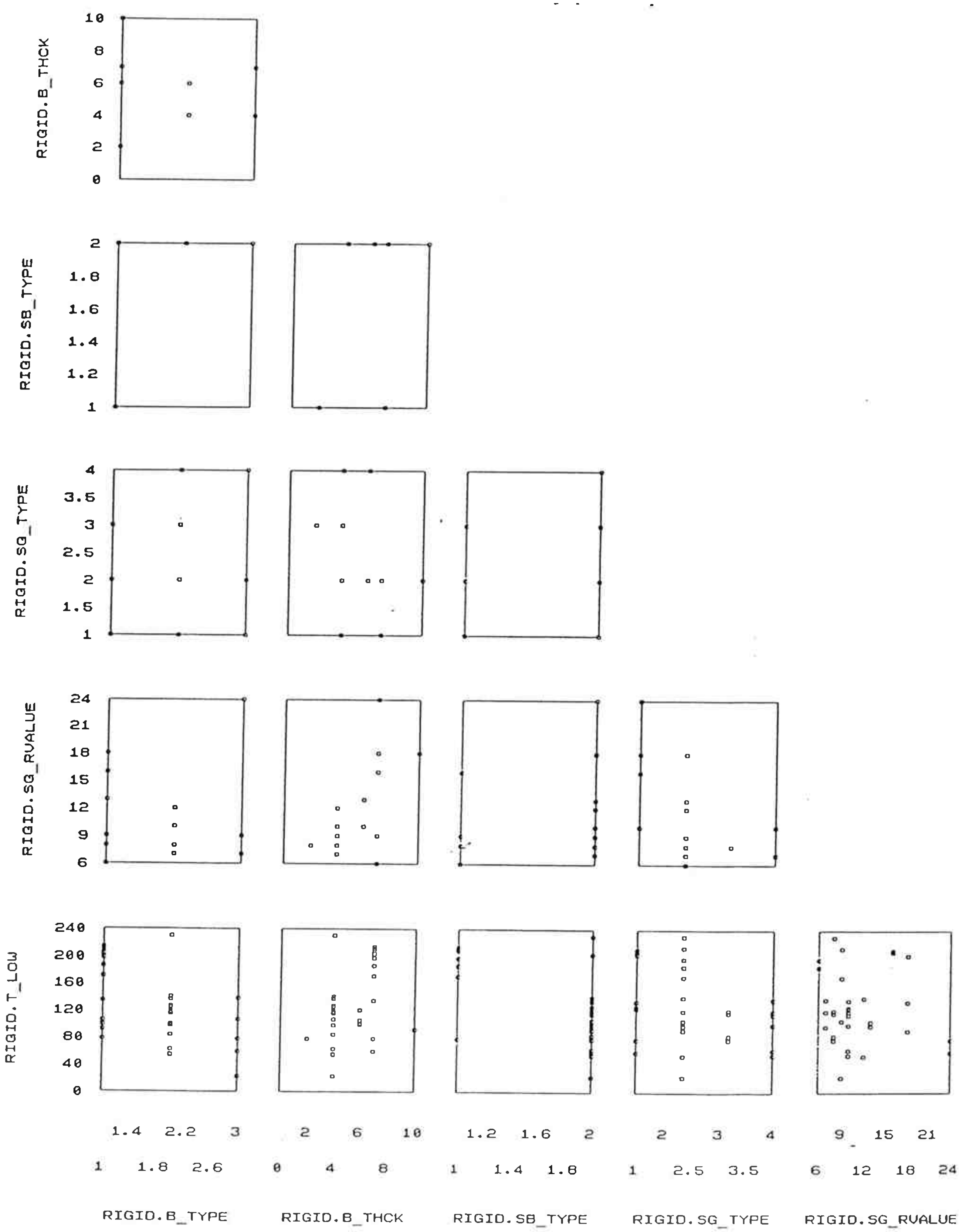

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

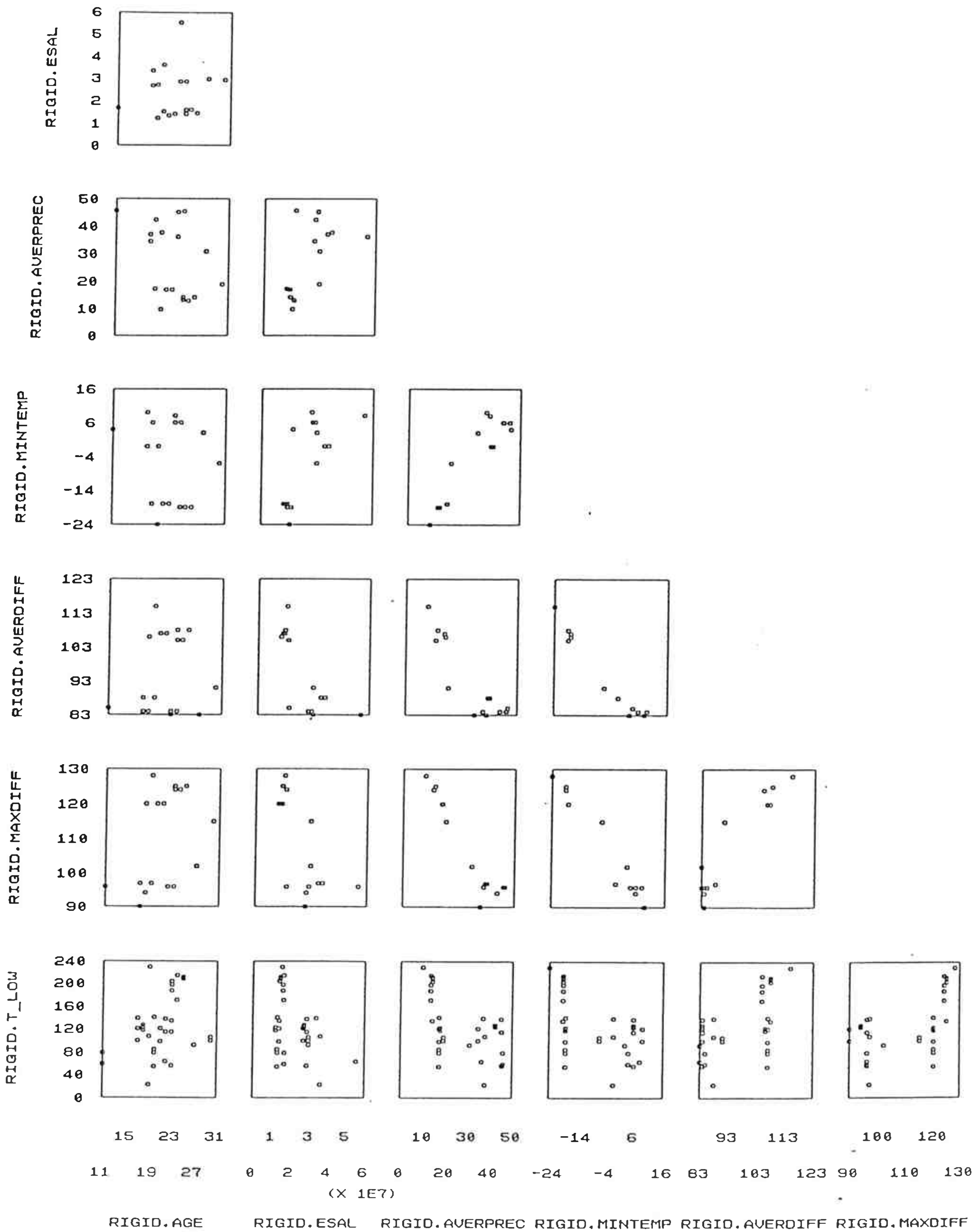

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

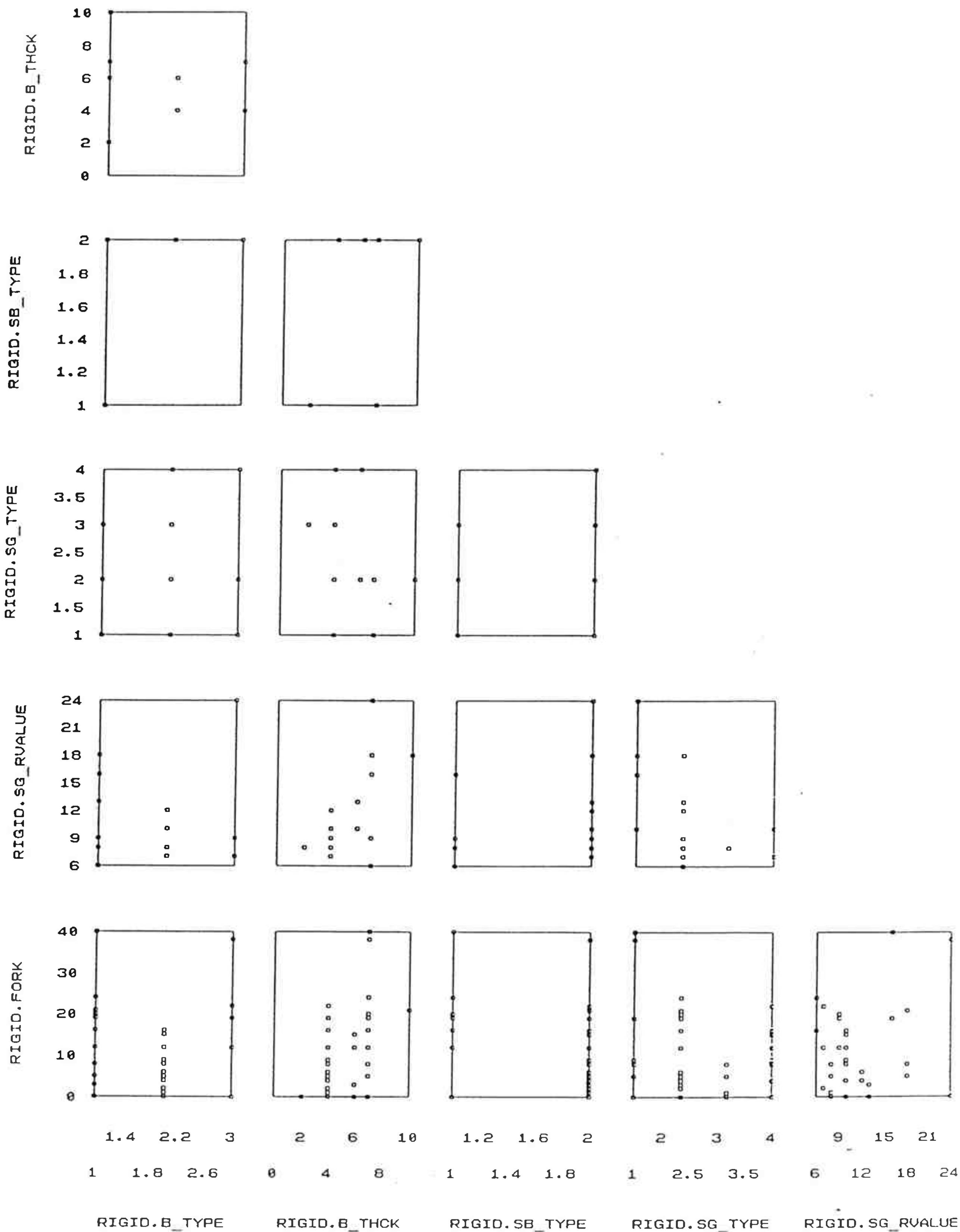

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

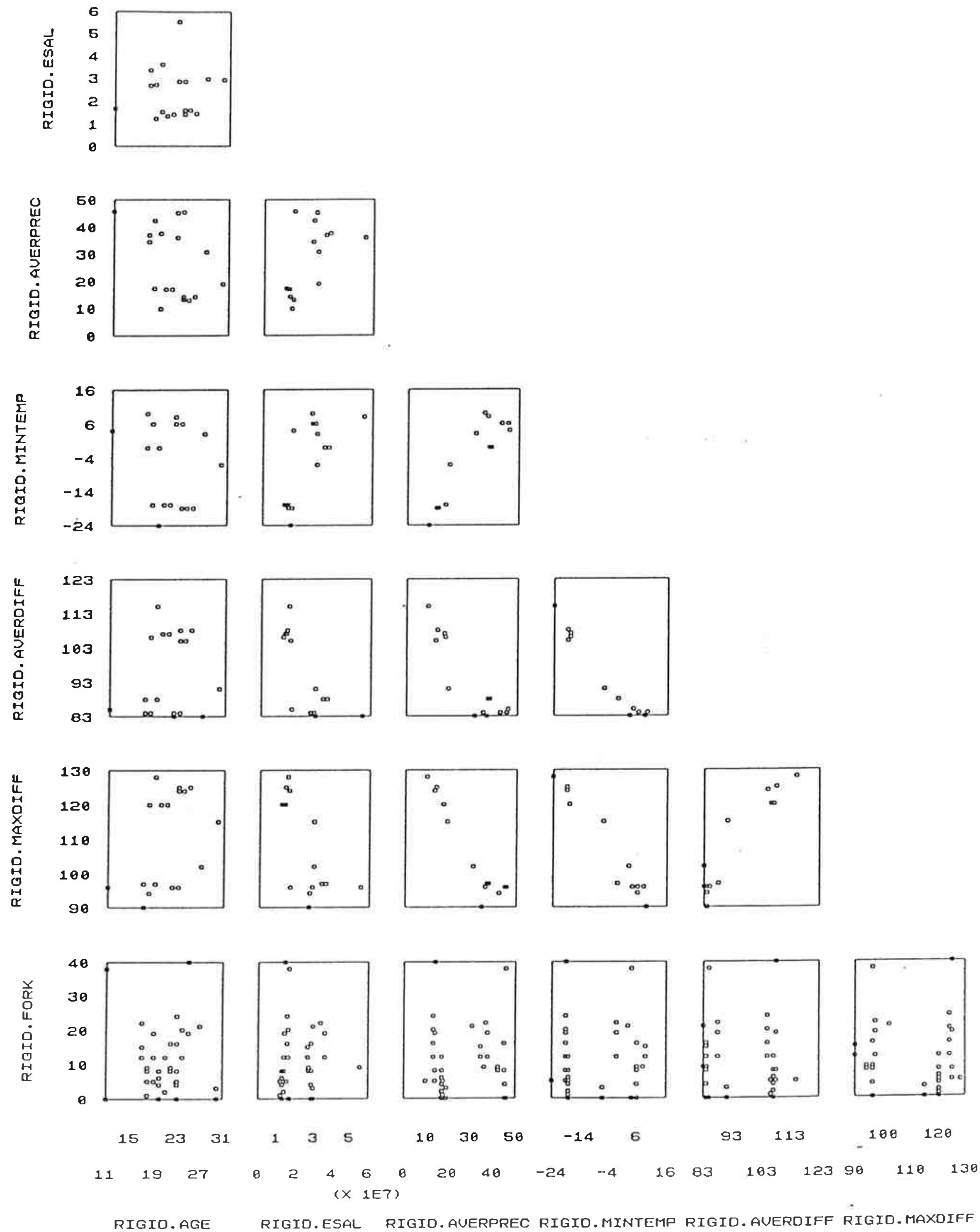

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only(cont'd)

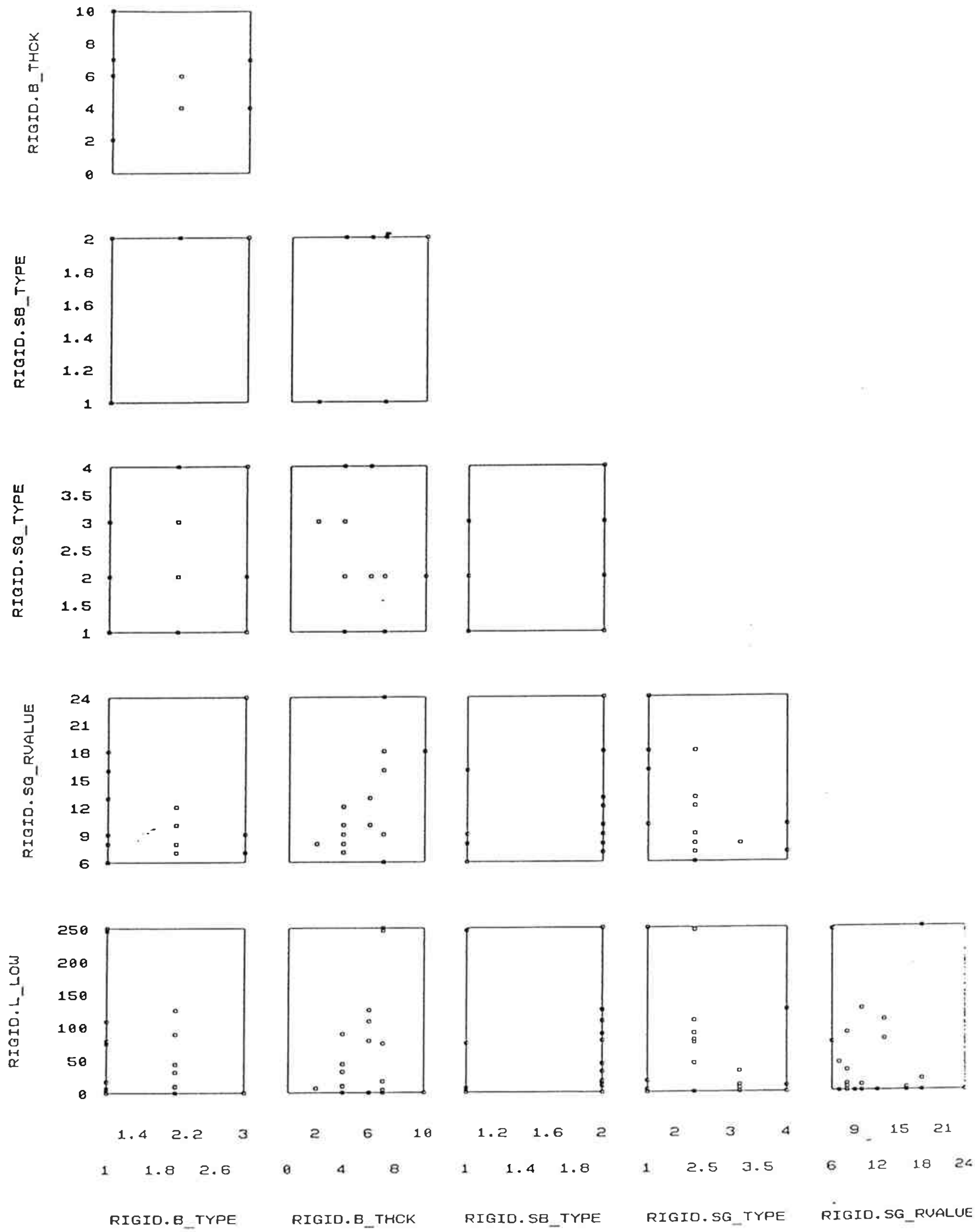

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

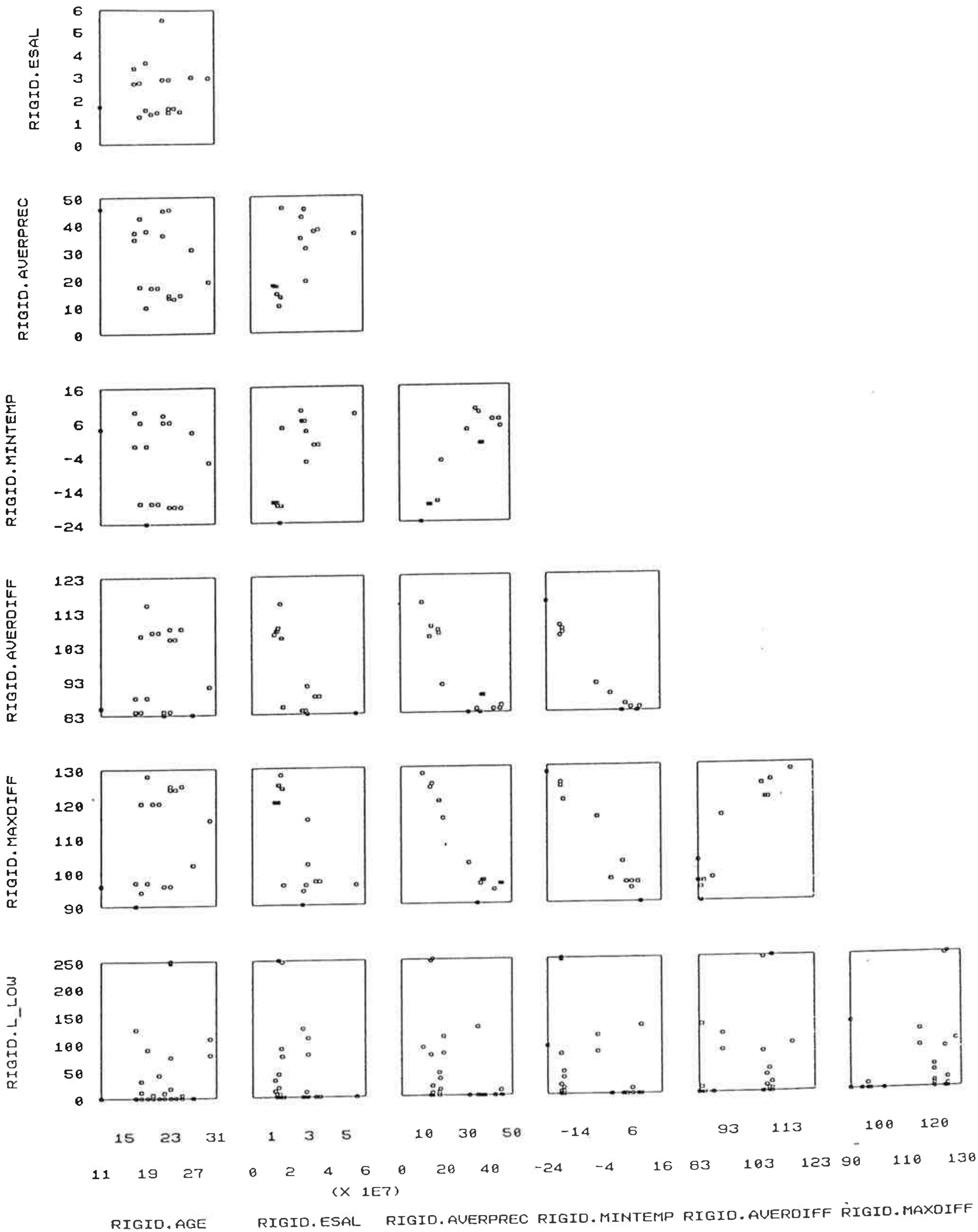

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

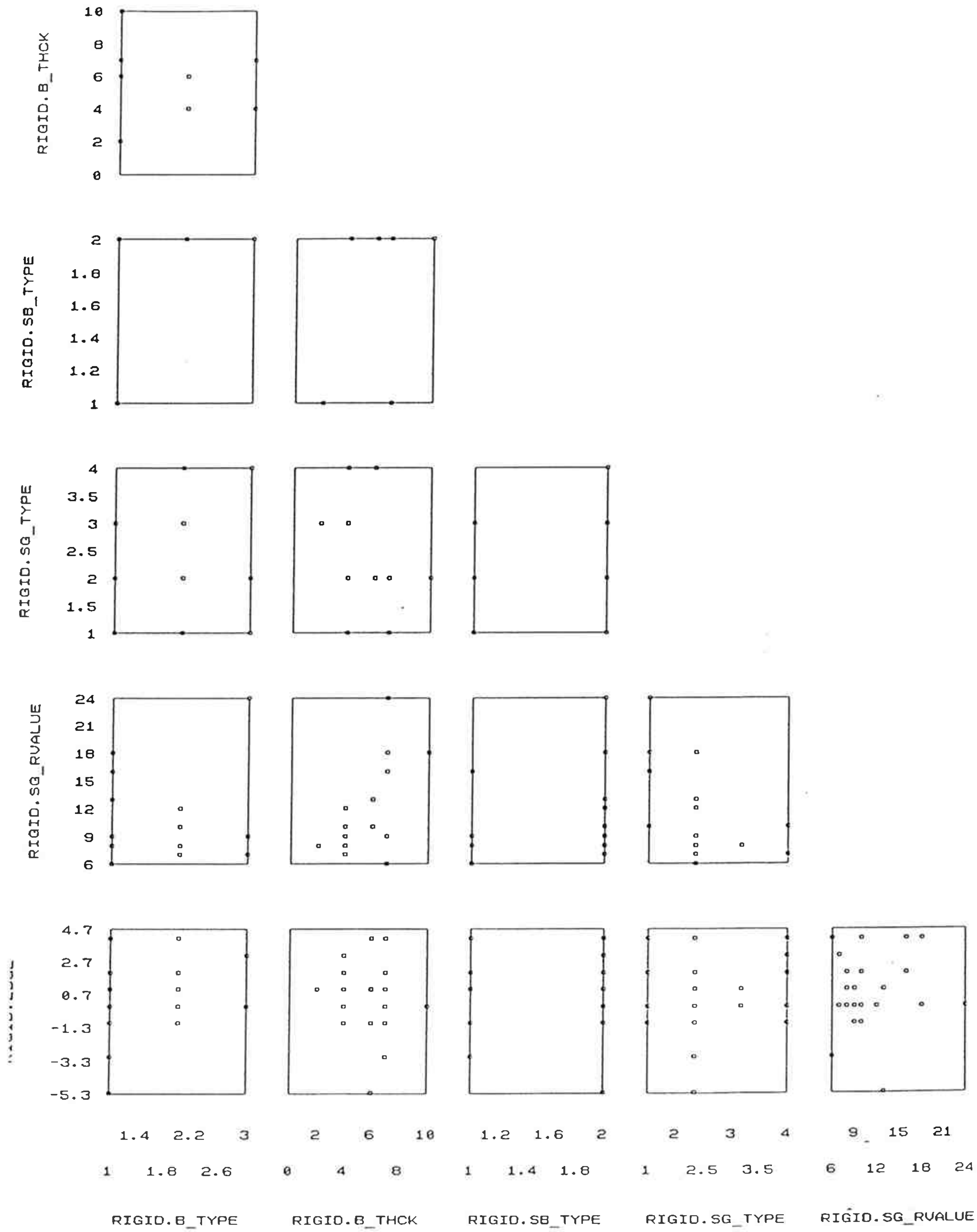

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

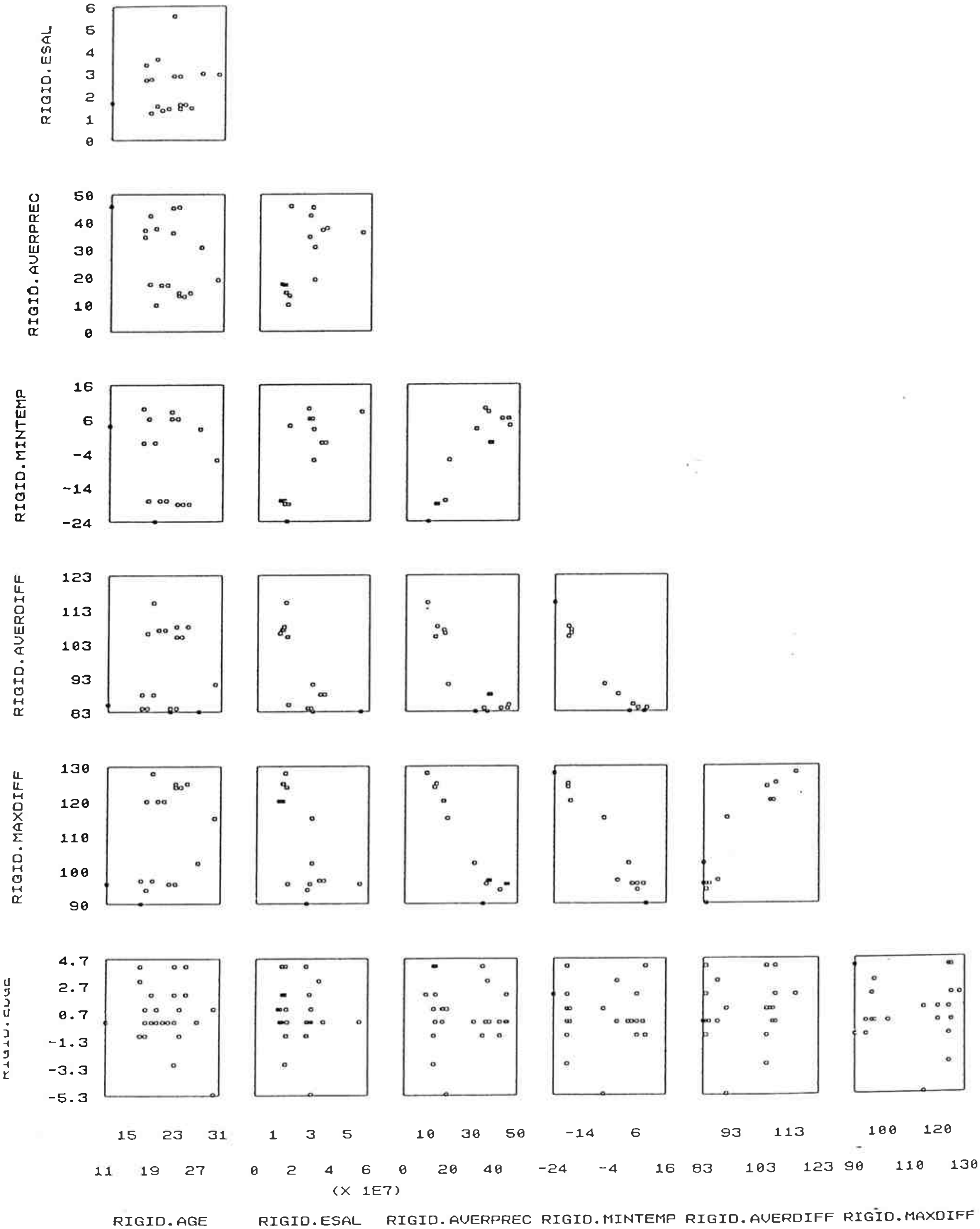

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

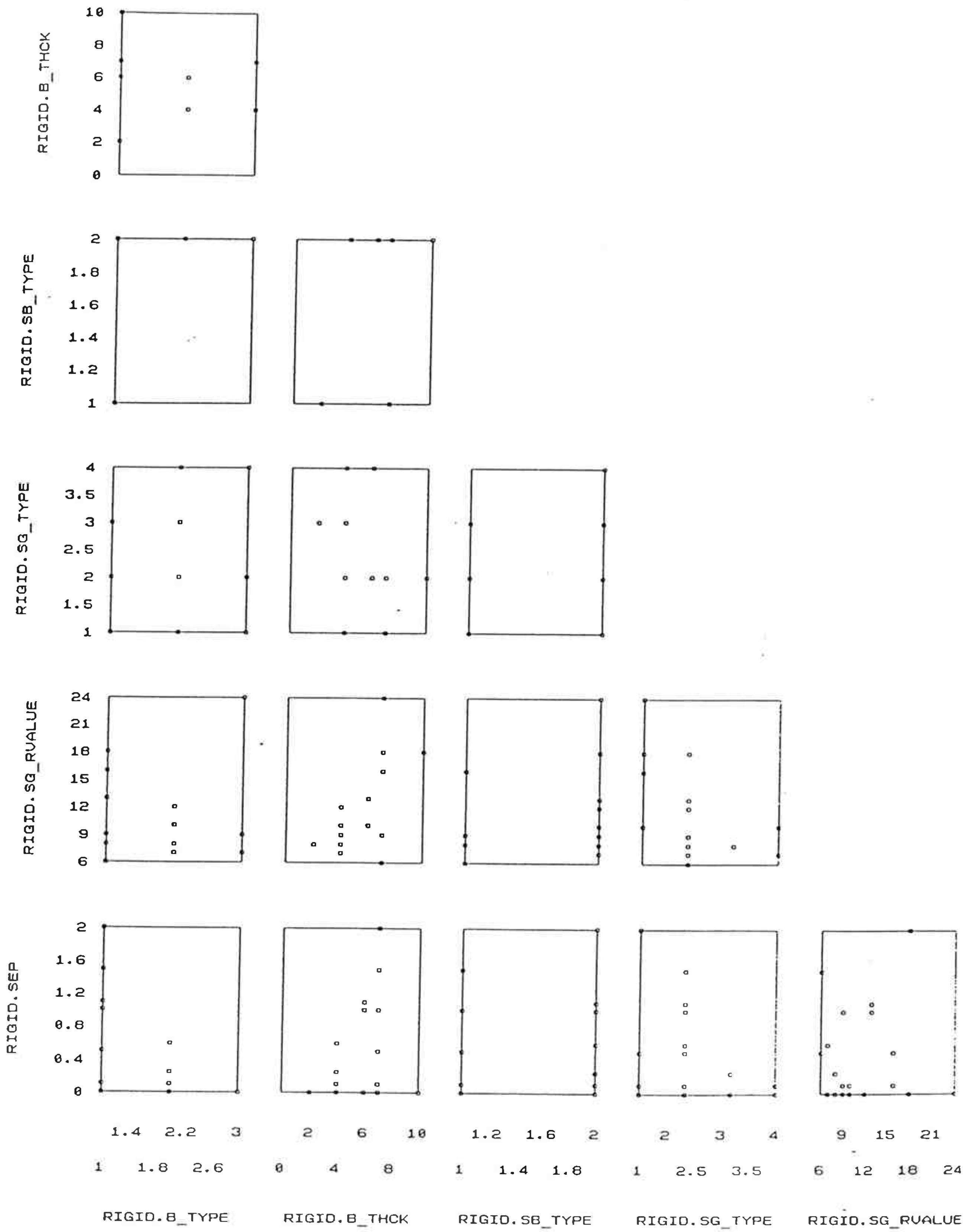

Table E.4 Scatter plots for Distress and Performance Indicators Variables 8-Inch CRC Pavements Only (cont'd)

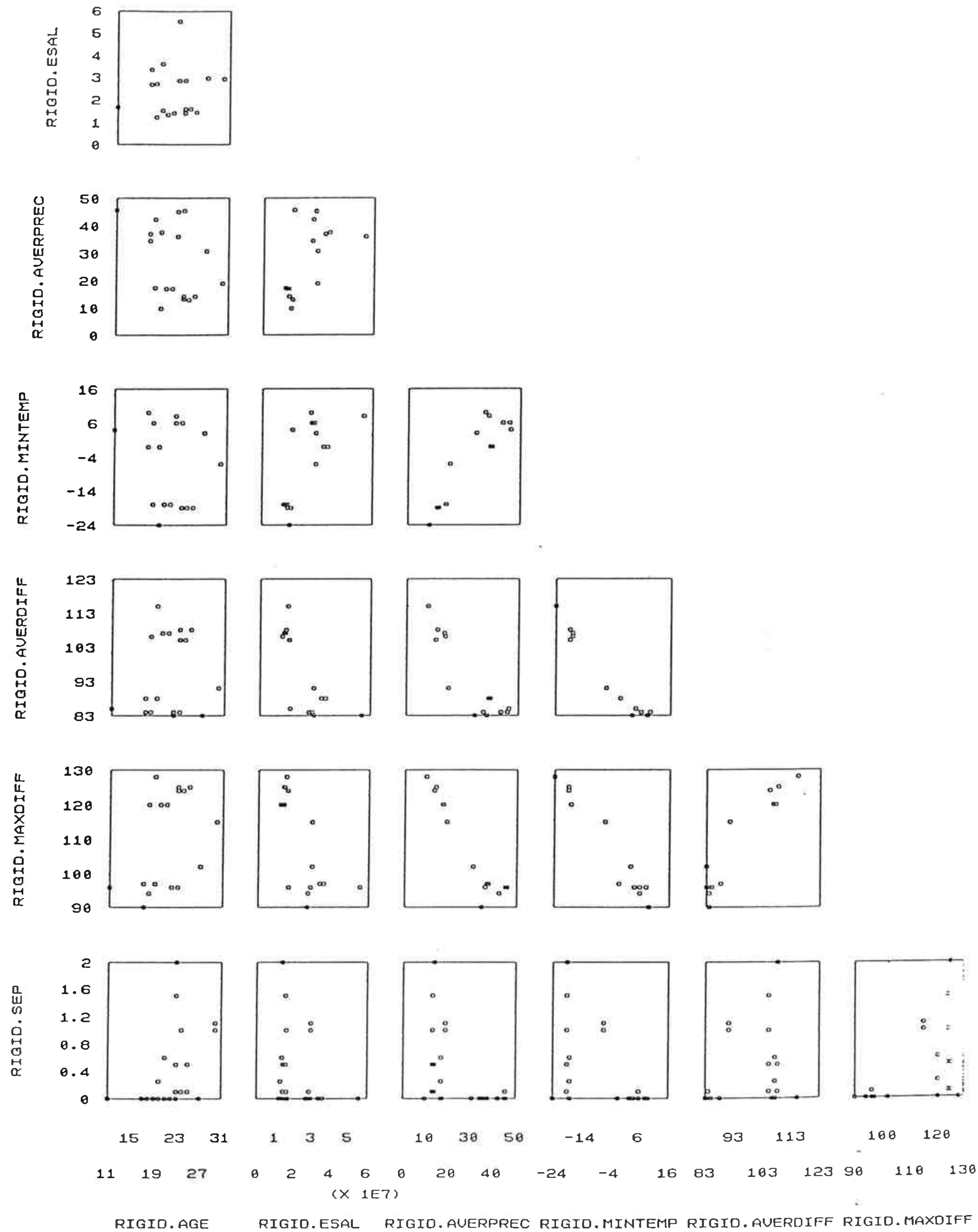

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements

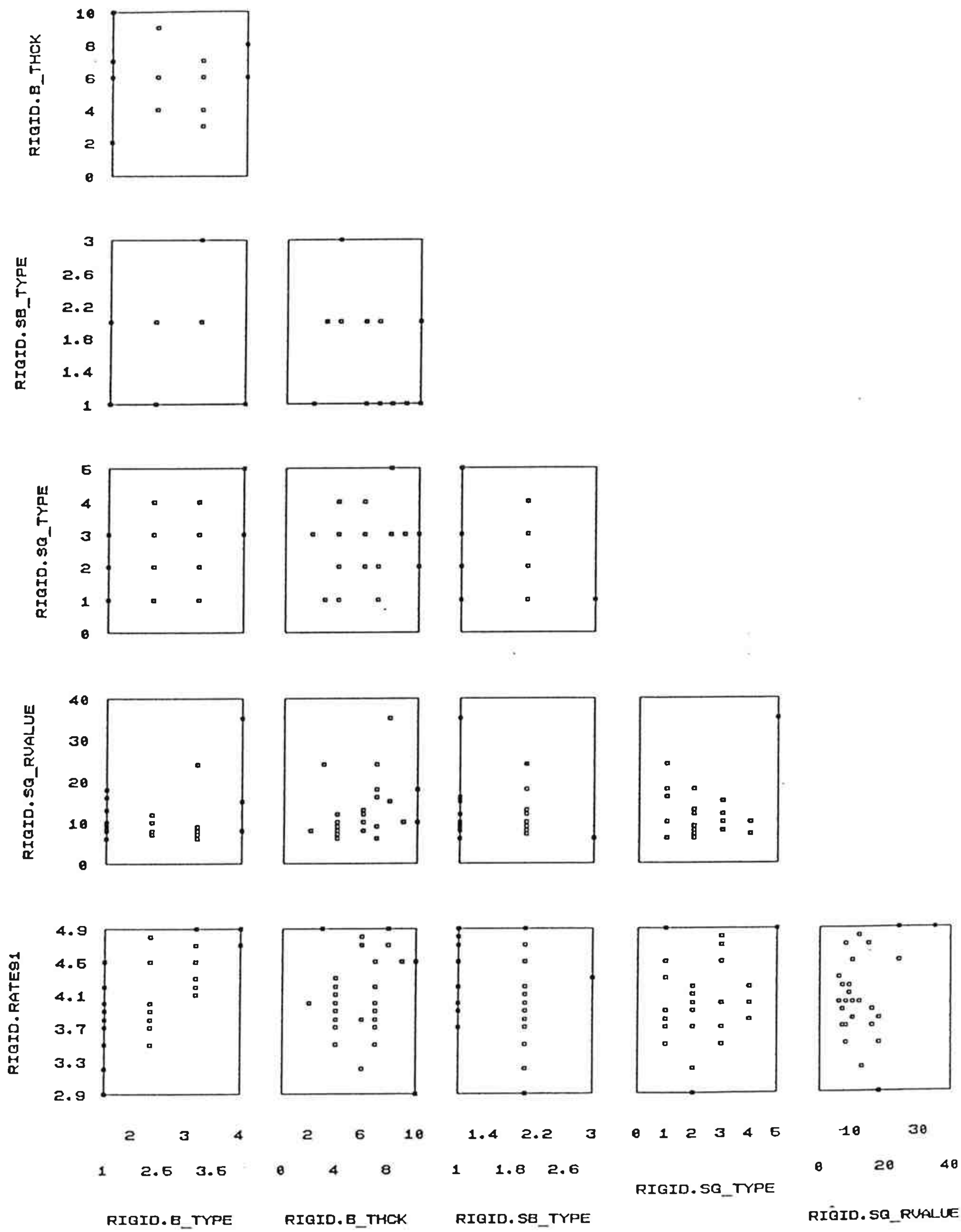

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

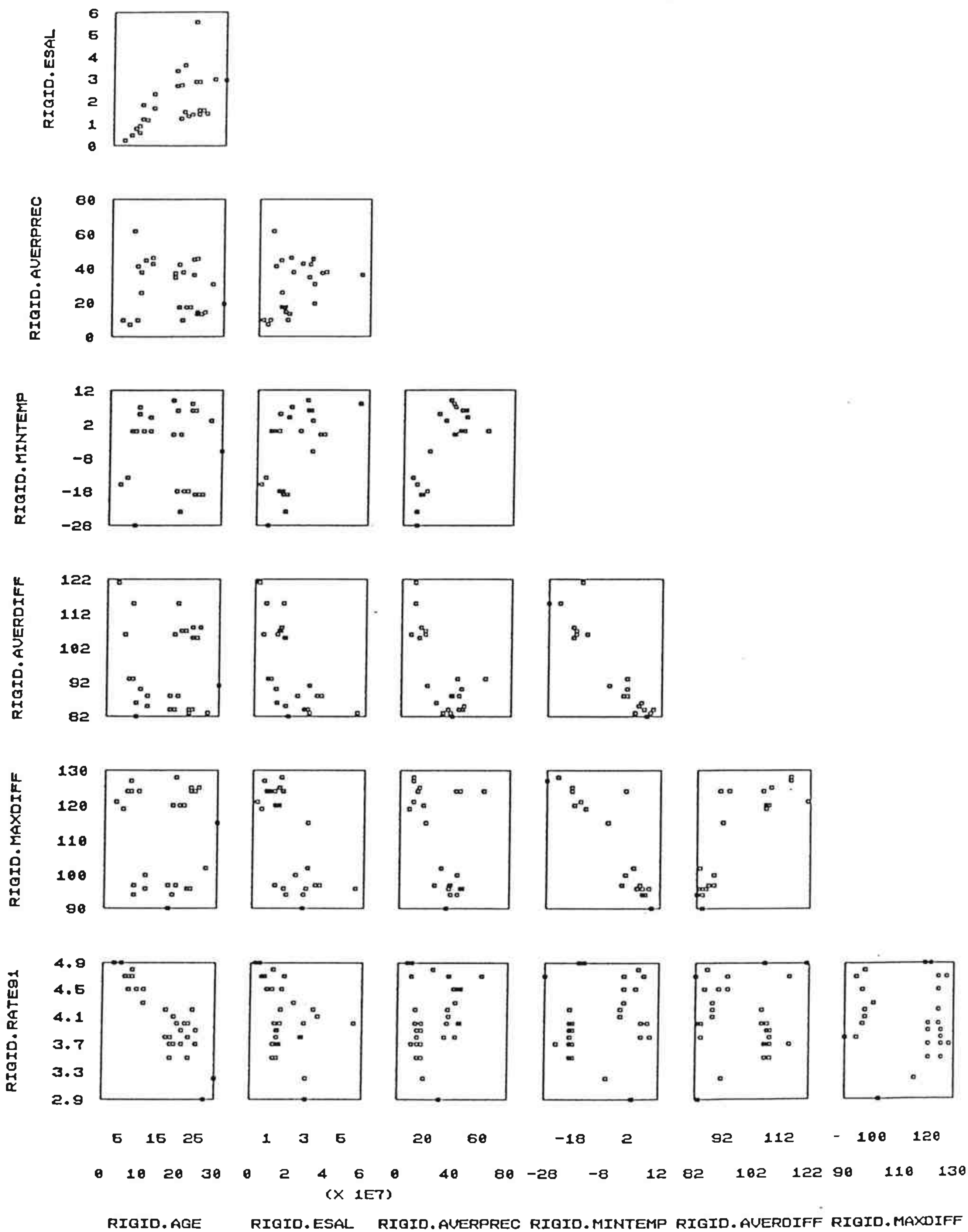

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

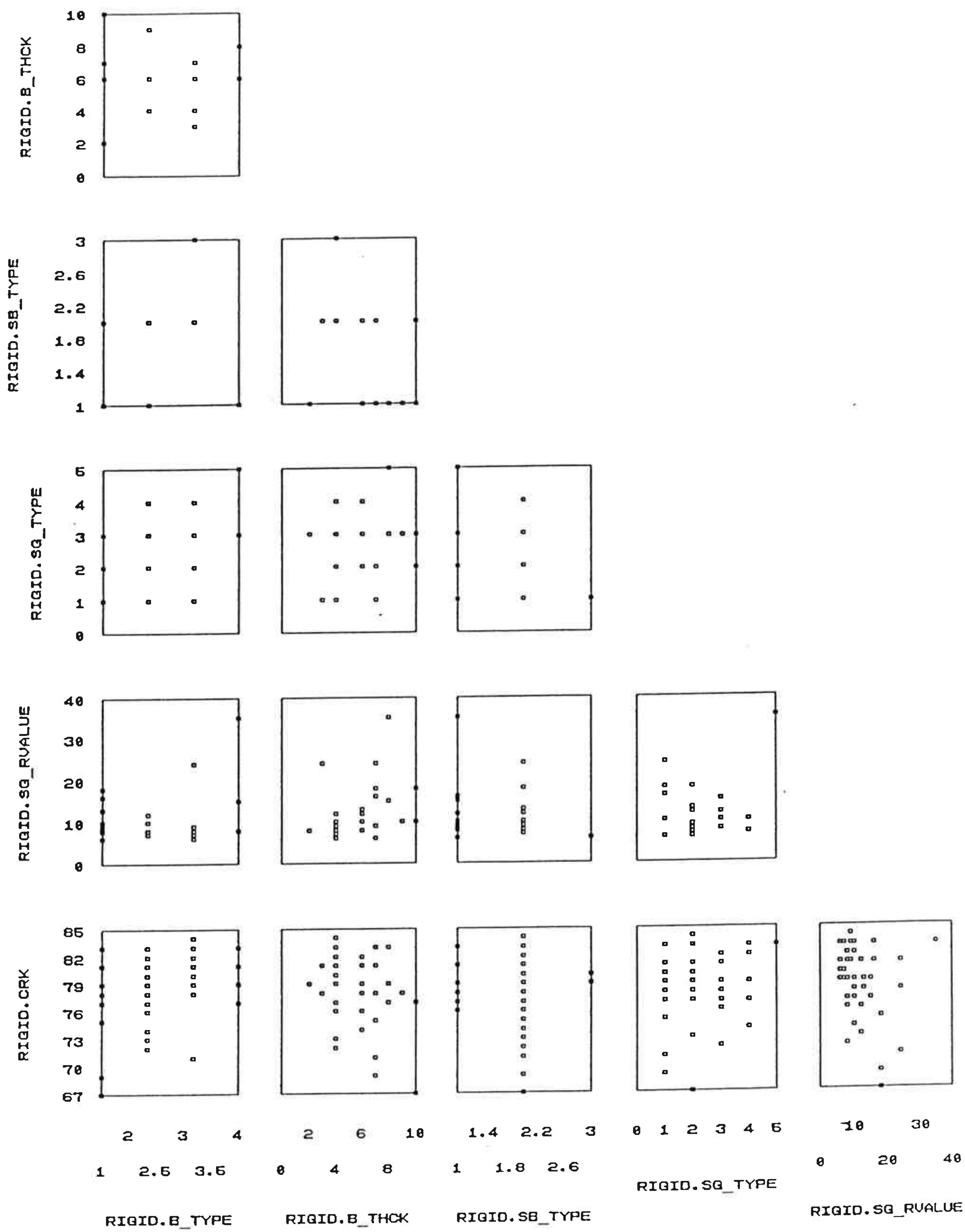

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

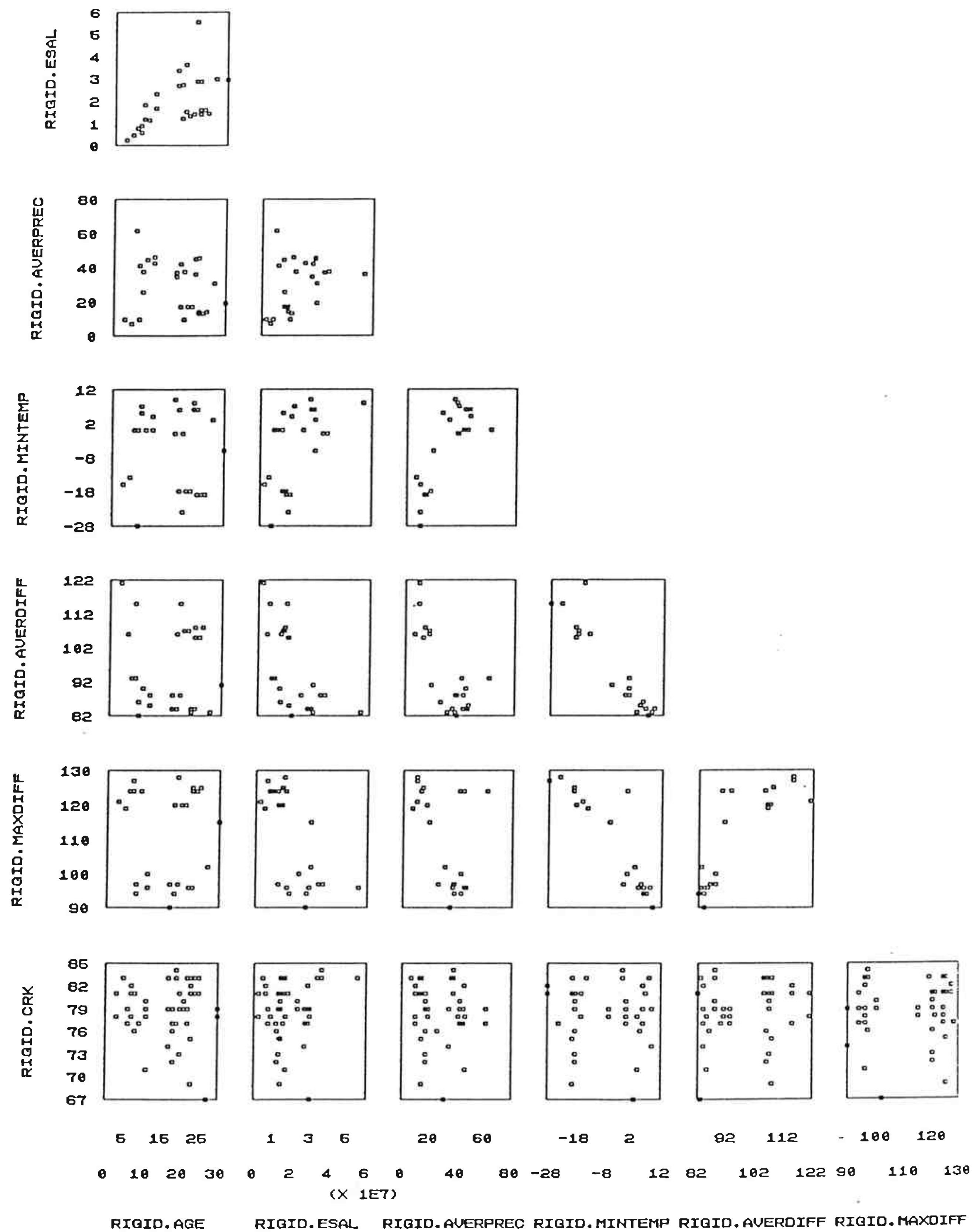

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

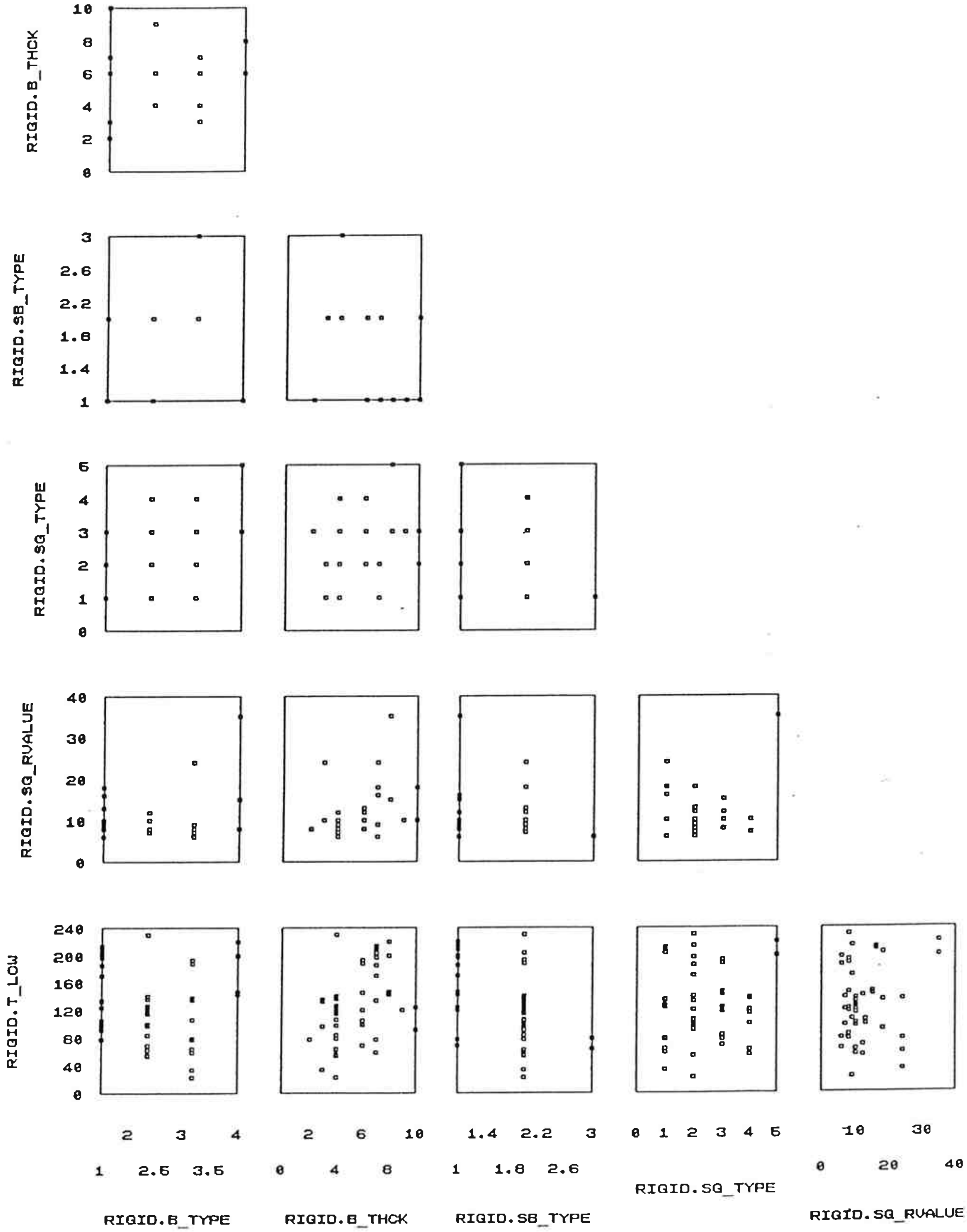

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

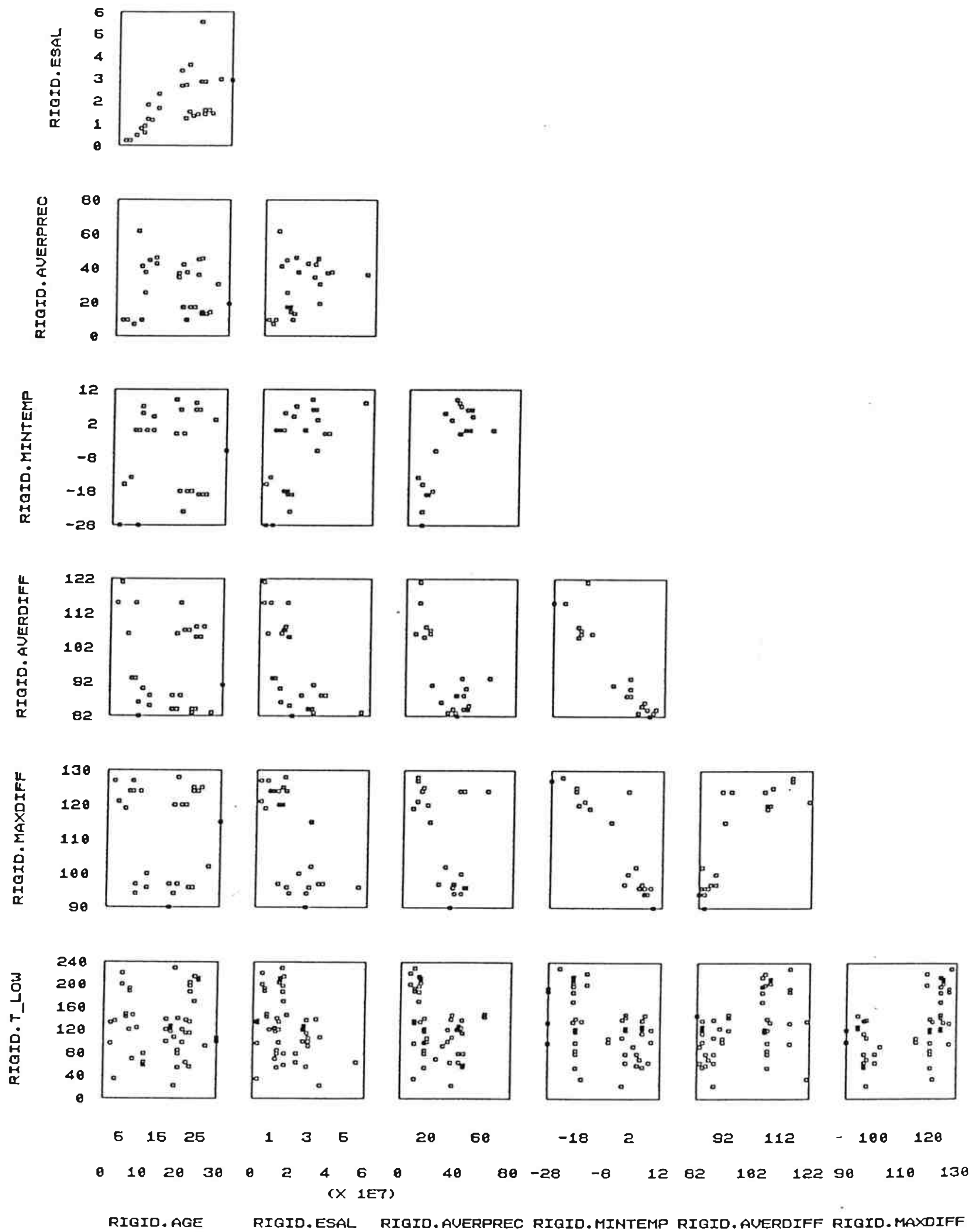

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

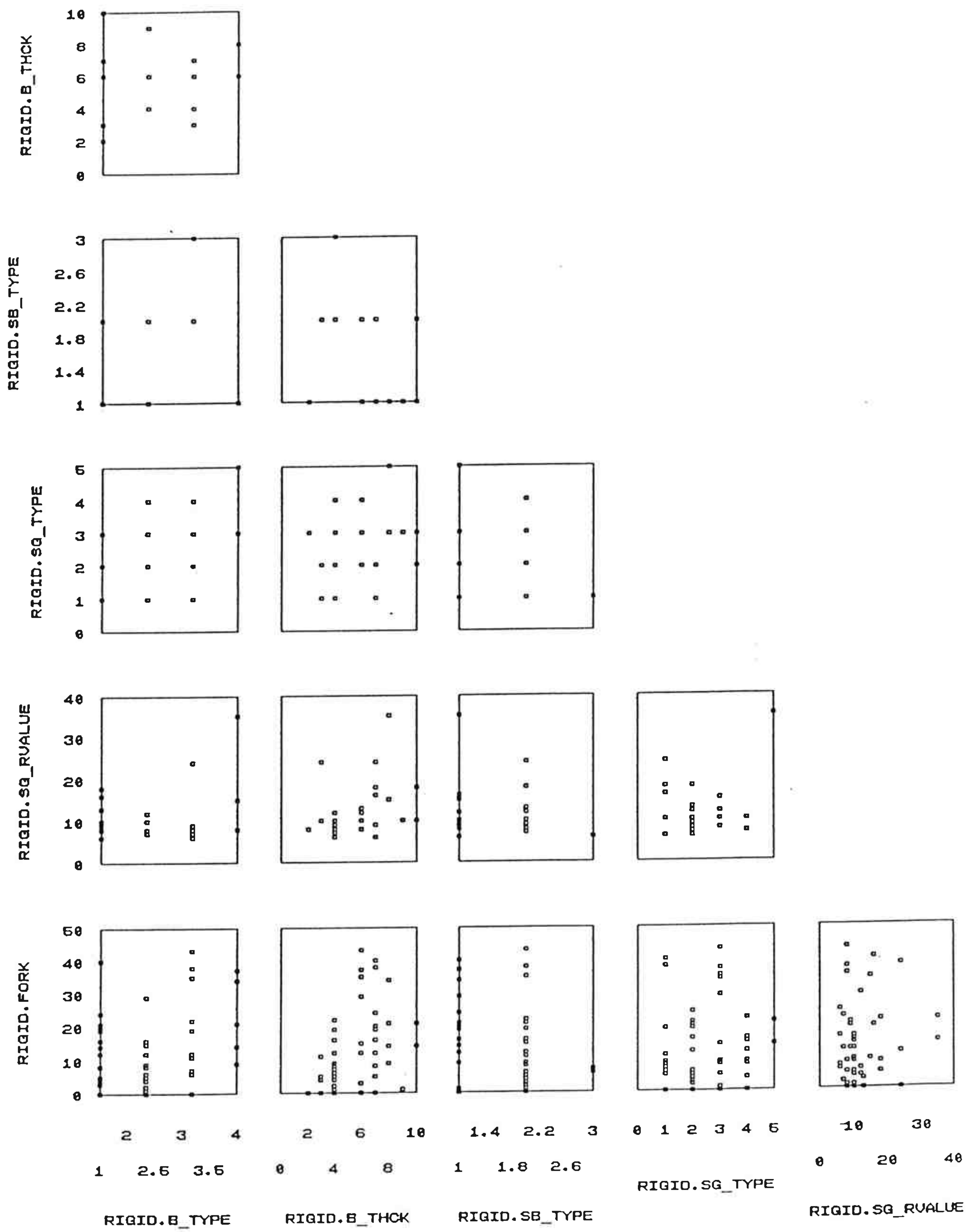

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

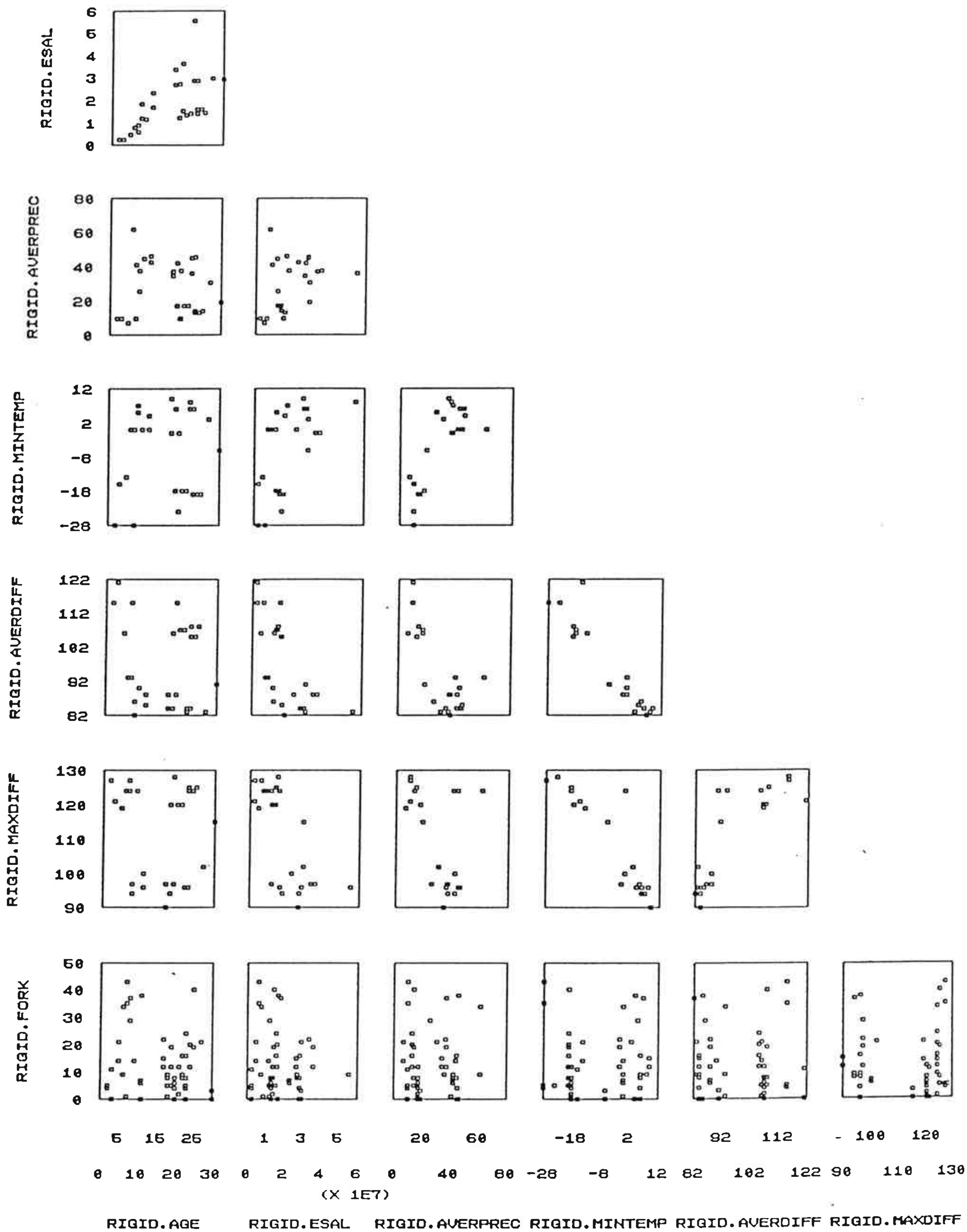

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

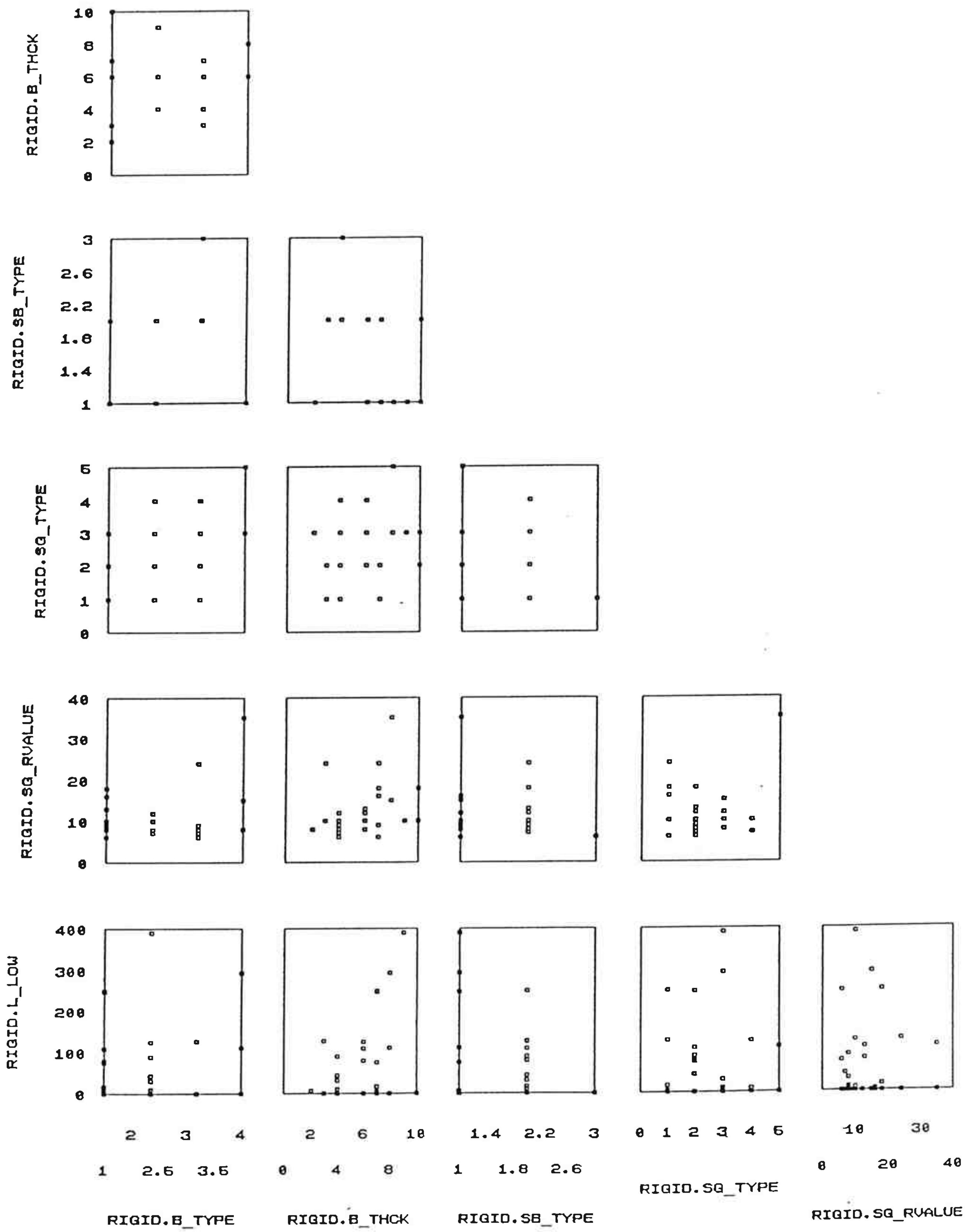

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

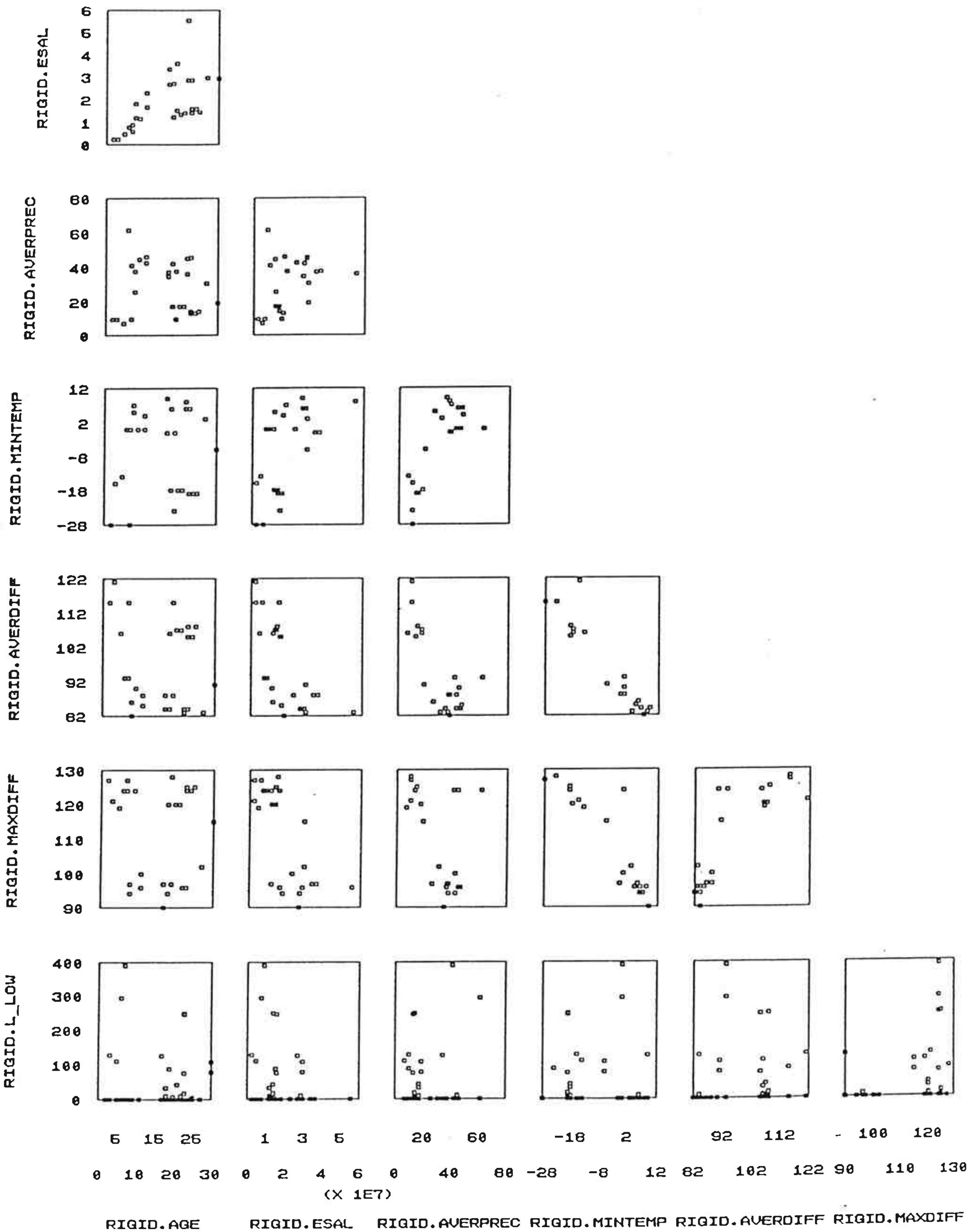

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

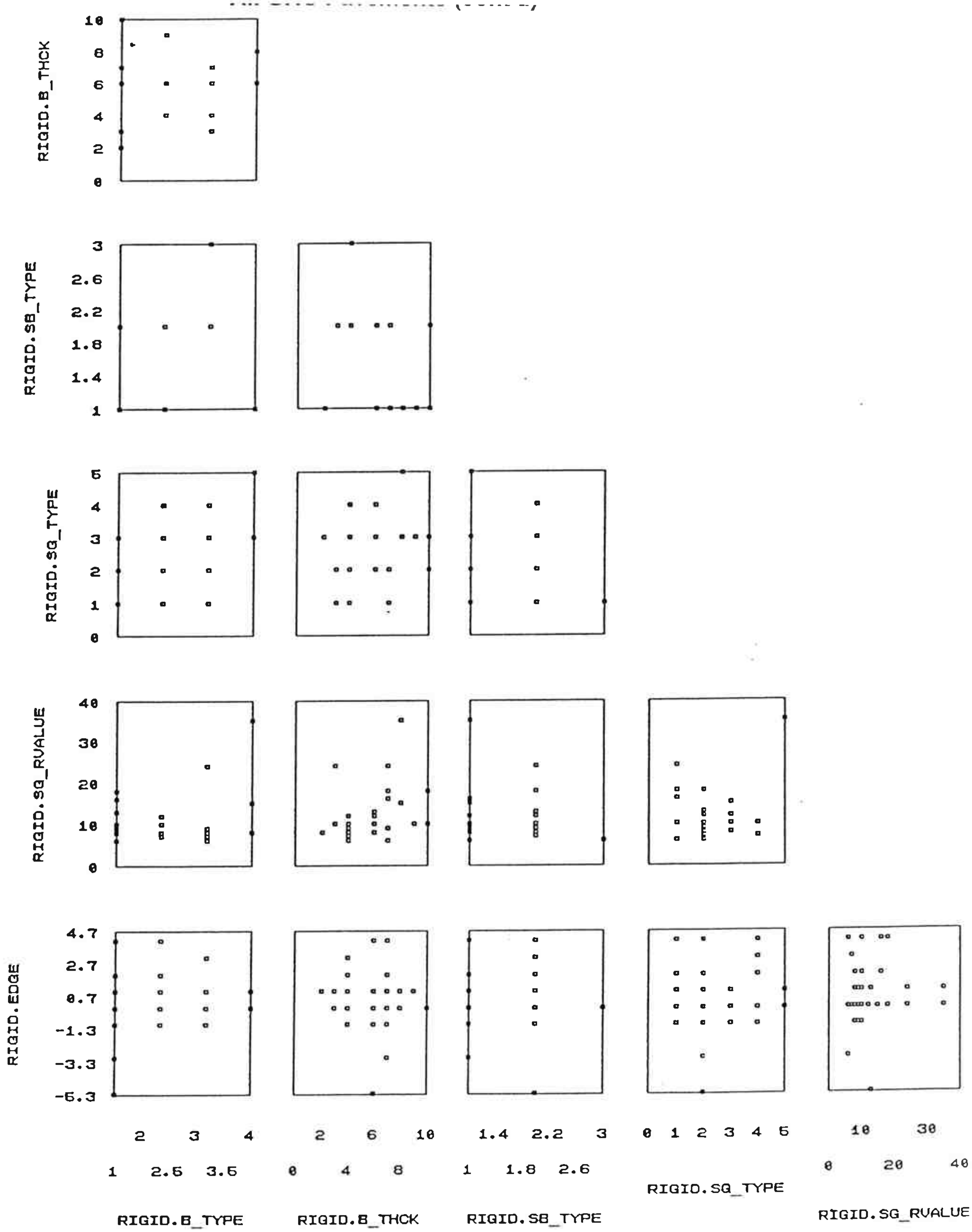

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

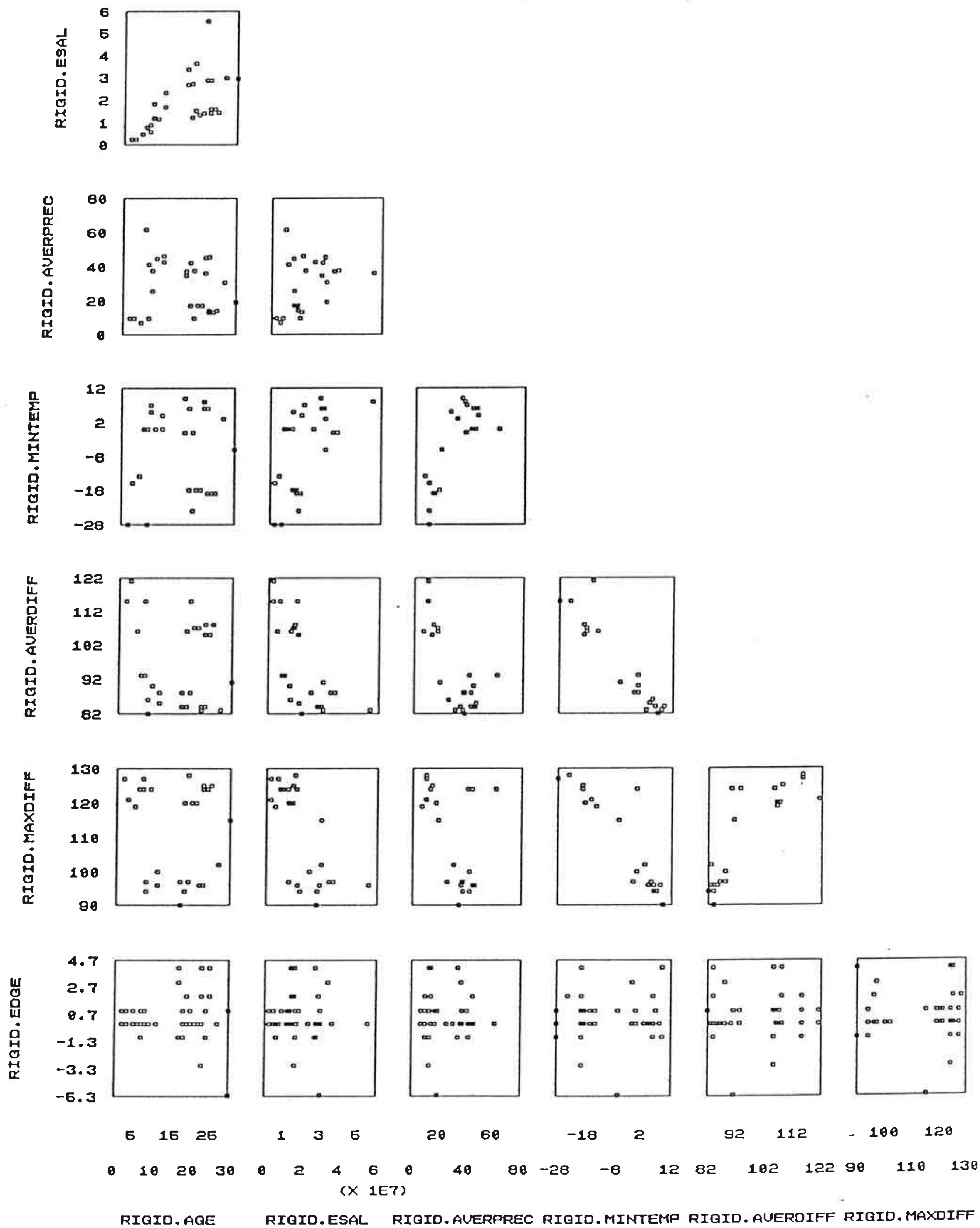

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)

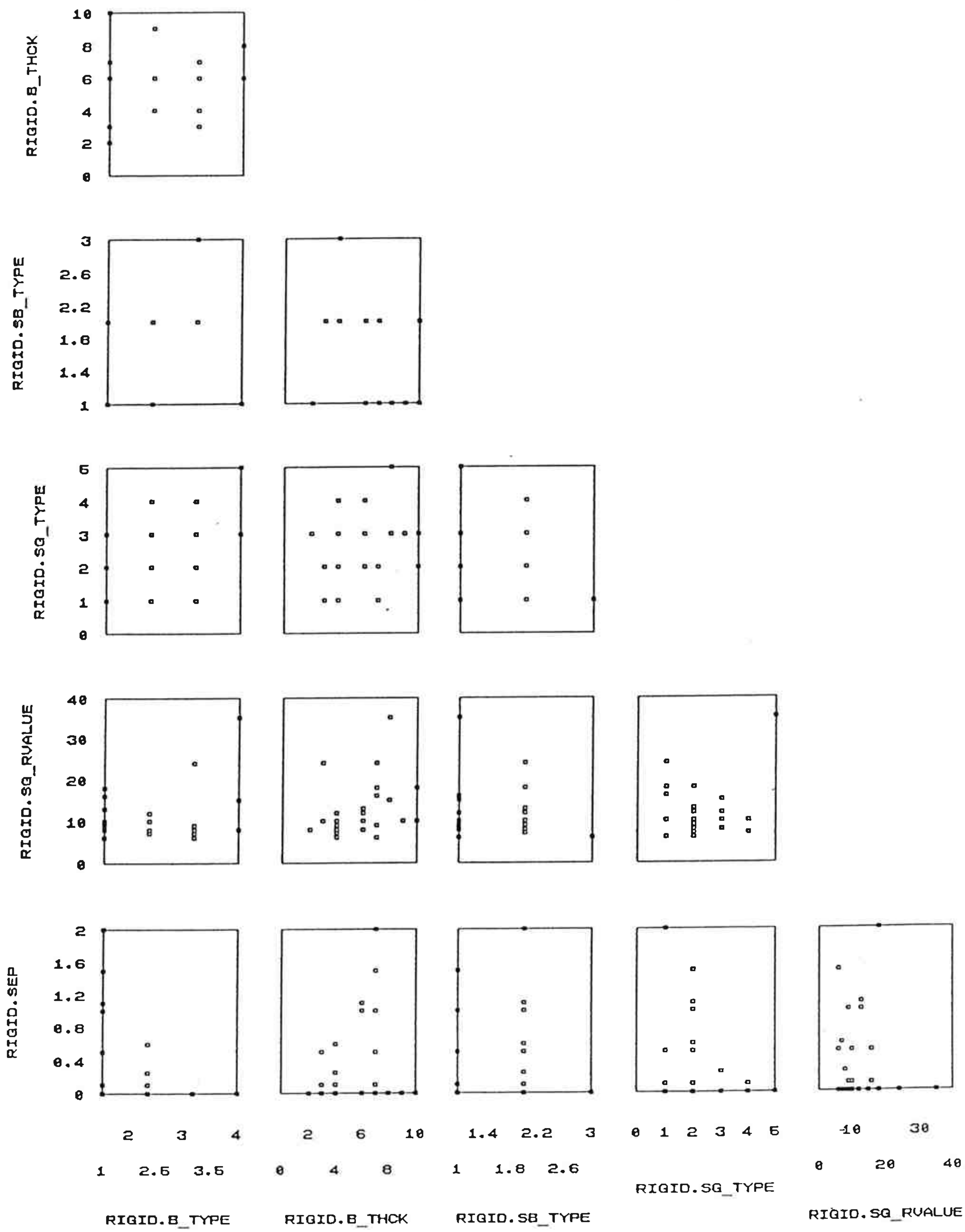

Table E.5 Scatter plots for Distress and Performance Indicators Variables All CRC Pavements (cont'd)