TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/TX-90+472-6		

4. Title and Subtitle	5. Report Date
A CONTINUOUSLY REINFORCED CONCRETE PAVEMENT DATABASE	November 1989
	6. Performing Organization Code
7. Author's)	8. Performing Organization Report No.
Terry Dossey and Angela Jannini Weissmann	Research Report 472-6
9. Performing Organization Name and Address	10. Work Unit No.
Center for Transportation Research The University of Texas at Austin Austin, Texas 78712-1075	11. Contract or Grant No. Research Study 3-8-86-472
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address Texas State Department of Highways and Public Transportation; Transportation Planning Division P. O. Box 5051 Austin, Texas 78763-5051	Interim
	14. Sponsoring Agency Code

15. Supplementary Notes

Study conducted in cooperation with the U. S. Department of Transportation, Federal Highway Administration

Research Study Title: "Rigid Pavement Data Base"

16. Abstract

This report documents the contents and structure of a 14-year database containing a state-wide sample of continuously reinforced concrete pavement (CRCP) data in Texas.

Although this report is intended to serve primarily as a user manual for the rigid pavement database maintained by the Center for Transportation Research, and as a progress report for Project 472, it is also offered as a model for any agency considering the development of its own pavement database.

17. Key Words	18. Distribution Statement
database, falling weight deflectometer, deflections, continuously reinforced concrete pavement, non-destructive testing, evaluation, crack width, diagnostic survey	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	60	

Form DOT F 1700.7 (8-69)

A CONTINUOUSLY REINFORCED CONCRETE PAVEMENT DATABASE

by

Terry Dossey
Angela Jannini Weissmann

Research Report Number 472-6

Research Project 3-8-86-472

Rigid Pavement Data Base

conducted for

Texas State Department of Highways and Public Transportation

in cooperation with the

U.S. Department of Transportation Federal Highway Administration

by the

CENTER FOR TRANSPORTATION RESEARCH

Bureau of Engineering Research

THE UNIVERSITY OF TEXAS AT AUSTIN

November 1989

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

PREFACE

The work accomplished and summarized in this report can be divided into two categories:

(1) Summary of pavement data collected and techniques used over a 14-year period at the Center for Transportation Research.
(2) Implementation and utilization of the CRCP database.

The authors would like to extend their appreciation to all those who helped in the design of the database and the preparation of this report, including Bryan Black and David Thames, undergraduate assistants, for their expert programming assistance; Naomi Downman, for her tireless and accurate data entry; Lyn Gabbert Antoniotti for working her usual magic with the Macintosh to prepare this document; and Dr. Chia-pei Chou, for patiently applying her expertise to our many questions.

LIST OF REPORTS

Research Report 472-1, "Evaluation of Proposed Texas SDHPT Design Standards for CRCP," by Mooncheol Won, B. Frank McCullough, and W. R. Hudson, presents the results of an evaluation of the proposed CRCP Design Standard for various coarse aggregates, describes the theoretical models used in the study, and discusses several important design parameters for CRCP. April 1988.

Research Report 472-2, "Development of a Long-Term Monitoring System for the Texas CRC Pavement Network," by Chia-pei J. Chou, B. Frank McCullough, W. R. Hudson, and C. L. Saraf, presents the application of an experimental design method to develop a long-term monitoring system in Texas. Development of a distress index and a decision criteria index for determining the present and terminal conditions of pavements is also discussed. October 1988.

Research Report 472-3, "A Twenty-Four Year Performance Review of Concrete Pavement Sections Using Silicious and Lightweight Coarse Aggregates," by Mooncheol Won, Kenneth Hankins, and B. Frank McCullough, presents the results of statistical analyses over a twenty-four year performance period of continuously reinforced concrete pavements made with lightweight and conventional/standard aggregates. The performance variables include pavement deflections and a visual condition survey. Recommendations for future research, emanating from the study, are presented for consideration by CRCP designers. April 1989.

Research Report 472-4, "Development of Procedures for a CRCP Diagnostic Survey," by Angela Jannini Weissmann and Kenneth Hankins, describes and discusses the studies carried out to establish the procedures for collecting the diagnostic data. November 1989.

Research Report 472-5, "A State-Wide Diagnostic Survey of Continuously Reinforced Concrete Pavements in Texas," by Angela Jannini Weissmann and Kenneth Hankins, describes the preparations for and the conducting of a statewide diagnostic survey on continuously reinforced concrete pavements. It includes a summary of the data and a discussion of the results. August 1989.

Research Report 472-6, "A Continuously Reinforced Concrete Pavement Database," by Terry Dossey and Angela Jannini Weissmann, documents the contents and structure of a 14-year database containing a statewide sample of continuously reinforced concrete pavement data in Texas. A description of data collection methods is included, as is a user's manual for the database. November 1989.

ABSTRACT

This report documents the contents and structure of a 14-year database containing a state-wide sample of continuously reinforced concrete pavement (CRCP) data in Texas.

Although this report is intended to serve primarily as a user manual for the rigid pavement database maintained by the Center for Transportation Research, and as a progress report for Project 472, it is also offered as a model for any agency considering the development of its own pavement database.

KEYWORDS: Database, falling weight deflectometer, deflections, continuously reinforced concrete pavement, non-destructive testing, non-destructive evaluation, crack width, diagnostic survey, field evaluation, pavement temperature.

SUMMARY

During a 14-year period, the Center for Transportation Research has collected a large amount of pavement performance data for continuously reinforced concrete pavement across Texas. Matching data relating to construction specifications, environmental factors, and traffic have also been obtained from various state agencies whenever possible.

In 1988, instead of a visual condition survey (as in all previous years), a structural evaluation survey was conducted using a Falling Weight Deflectometer. Additionally, crack widths, pavement temperature, and rut depths were recorded.

In order to study the evolution of pavement distress with time, a database was designed and implemented using the SAS statistical analysis package, combining all the data into one easily accessed system. The user's guide, which is included, contains examples of common extractions from the database.

IMPLEMENTATION STATEMENT

The contents of this report are intended primarily as in-house documentation for the CTR rigid pavement database, but design concepts developed herein may be applicable to a wide variety of pavement performance related data and are offered as a model to be considered by other database designers.

TABLE OF CONTENTS

CHAPTER 1. NEED FOR A RIGID PAVEMENT DATABASE

BACKGROUND

In the past, the design of pavements has occupied the attention of engineers (Ref 1), although pavement performance depends only in part on appropriate design. It is widely recognized that construction, maintenance, and rehabilitation also play a very important role in the performance of a pavement. Consequently, the attention of designers and researchers has broadened to consider all activities involved in providing pavements (Ref 1). This overall approach has been termed a Pavement Management System (PMS). A flowchart of the major activities involved in a PMS, as well as their links to one another, is shown in Fig 1.1. The main point of Fig 1.1 is that the task of providing pavements encompasses a number of interrelated activities.

It is worth noting that the database shown in Fig 1.1 has indirect links to all the other activities in the PMS, and, therefore, that the quality of a PMS depends largely on the quality of the information available (Ref 1). In a similar manner, the efficiency of a PMS depends on efficient access to the database. In other words, a PMS is only as effective as the database that supports it.

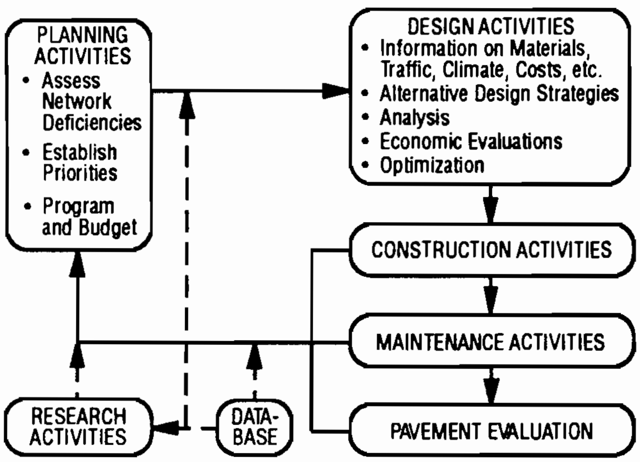


Fig 1.1. Basic components of a pavement management system.

In Texas, the need for an effective PMS is especially vital. The Texas State Department of Highways and Public Transportation (SDHPT) maintains about 7,000 lane-miles of continuously reinforced concrete pavement (CRCP), and the expenditures required to maintain and rehabilitate the Texas network are estimated to exceed four million dollars per year; because of this large investment, it is important to monitor pavement performance by obtaining network level condition survey data. Since 1974, CRCP survey data have been collected periodically by the Center for Transportation Research (CTR), resulting in the accumulation of a wealth of information concerning CRCP pavements. In order to efficiently organize this massive amount of information, a major effort to develop an effective database management system was included in the subject project.

OBJECTIVE

Understanding the specific techniques used for collecting data is often of the utmost importance for their correct usage in analysis. For example, deflection data are useful only when their exact locations on the pavement are also provided; comparisons of punchouts and patches over time can be meaningful only when survey procedures are known for each collection period.

The objectives of this report, therefore, are to (1) provide a comprehensive list of information in the Texas CRCP database, including details of data collection techniques, which, in some cases, have varied from year to year, and (2) present instructions for accessing the data, both in the form of "hands-on" examples for the casual user and as detailed information about the design and structure of the database for the computer professional, who may wish to adapt or redesign the database for his own use. Although some of this material has appeared in previous CTR publications and internal memoranda, the overall objective of this report is the production of a comprehensive, easily accessed document describing what is in the database and how to retrieve it.

CHAPTER 2. CONTENTS OF THE CRCP DATABASE

GENERAL OUTLINE OF THE DATABASE CONTENTS

Generally, a pavement condition survey consists of obtaining information on structural capacity, riding quality, skid resistance, and distress manifestations. Usually additional information on environment, traffic, and materials is also required. Most of these data are available in the Texas CRCP database, although not for all survey years. Table 2.1 summarizes the data available for each survey year; detailed descriptions of the data comprise the bulk of this chapter.

A network level survey covers a representative sample of the entire pavement inventory; accordingly, the CRCP network was divided into 312 sections, called projects, each with approximately the same pavement design and ranging in length from 0.1 to 17 miles. Projects are identified by means of a CFTR (Center for Transportation Research) number, the first two digits of which represent the SDHPT district in which the section is located. Within each project, test sections were selected according to specific criteria, depending on research objectives targeted at the times the surveys were conducted. Consequently, a comprehensive view of the database requires an understanding of how the selection criteria have changed throughout the years. Figure 2.1 shows the evolution from 1974 to 1988 of a typical survey section, CFTR Project 01001, which is Project 001 of District 1.

THE CONDITION SURVEY DATA

The following sections provide a brief summary of data collection practices for each data type in each survey year. References are provided for the reader who requires additional information on collection techniques.

1974 Condition Survey

The 1974 condition survey was made from a car traveling on the shoulder at 5 mph, over survey sections 0.2 mile in length. In a previous study (Ref 6), results of experimental surveys of sections 0.1, 0.2, and 0.5 mile long indicated 0.2 mile to be the optimum length. It was also felt that this was the maximum length of road for which similar subgrade properties could be assumed (Ref 6).

All the distress quantities were estimated by the raters during the shoulder ride at 5 mph. The present serviceability index (PSR) was rated from a ride at 50 mph in the right lane. A crew of two, the driver and a passenger, was used on this survey. Figure A.1 depicts the survey form used in 1974. References 6, 7, 8, 9, and 10 describe the survey in detail and the development of procedures for it.

The data consist of

(1) ***Transverse Cracking***. Estimated percent of pavement area with transverse cracks spaced at least 18 inches from the neighboring cracks. Rated by the passenger.

(2) ***Localized Cracks***. Estimated percent of pavement area with Y shaped cracks that link two closely spaced neighboring cracks of the type described in item 1. Rated by the passenger.

(3) ***Spalling***. Estimated percent of cracks with spalling, recorded separately for minor and severe spalling, into four percentile categories: 1 to 5, 6 to 20, 21 to 50, and 51 to 100. Reference 6 has a comprehensive description and pictures of minor and severe spalling. Rated by the passenger.

(4) ***Pumping***. Estimated percent of section subject to pumping, recorded separately for both minor and severe pumping, into four percentile categories: 1 to 5, 6 to 20, 21 to 50, and 51 to 100. Reference 6 has pictures and a detailed description of the severity of this distress. Rated by the driver.

(5) ***Punchouts***. Estimated length of the road that is subject to minor and severe punchouts, recorded into four length categories (in feet): 1 to 3, 4 to 9, 10 to 19, and 20 or greater. Rated by the driver.

According to Ref 6, a punchout is minor when the block does not move under traffic and the surrounding longitudinal and transverse cracks are narrow and in good condition. A punchout is severe when the block moves under traffic and the surrounding longitudinal and transverse cracks are wide and spalled.

(6) ***Patches***. Estimated area of the road that has patches, recorded separately for asphalt concrete (AC) and portland cement concrete (PCC) patches, for the following area categories (in square feet): 1 to 15, 16 to 120, 121 to 240, and 241 and greater. The condition of the patch was not recorded. Rated by the driver.

(7) ***Shoulder Condition***. Subjective description made by driver.

(8) ***Present Serviceability Rating (PSR)***. Subjective rating of riding quality.

1978 Condition Survey

The 1978 condition survey was made from a car traveling on the shoulder at 5 mph. The survey sections were 0.2 mile long. All the lengths and percentages were estimated by the raters. A crew of two, the driver and a passenger, was used on this survey. Figure A.2 depicts the survey form used in 1978. References 7, 8, 9, and 10 present more detailed information about this survey.

The data consist of

(1) ***Transverse Crack Spacing***. Crack spacing of transverse cracks measured in one 300-foot sample of the road per project.

TABLE 2.1. SUMMARY OF THE CONDITION SURVEY DATA

Distress Manifestation	Type	Intensity	Condition Survey Year 74	78	80	82	84	87
Cracking	Transverse	Minor	•	•				•
		Severe	•	•				•
	Longitudinal		•					
	Localized	Minor	•					
		Severe	•					
Spalling		Minor	•	•	•	•		
		Severe	•	•	•	•	•	•
Pumping		Minor	•	•	•	•		
		Severe	•	•	•	•		
Punchouts		Minor	•	•	•	•		•
		Severe	•	•	•	•	•	•
Patch	AC		•	•	•	•	•	•
	PCC		•	•	•	•	•	•
Crack Spacing	Transverse							•
Reflected Cracks								•
Overlay Bond Failure								•

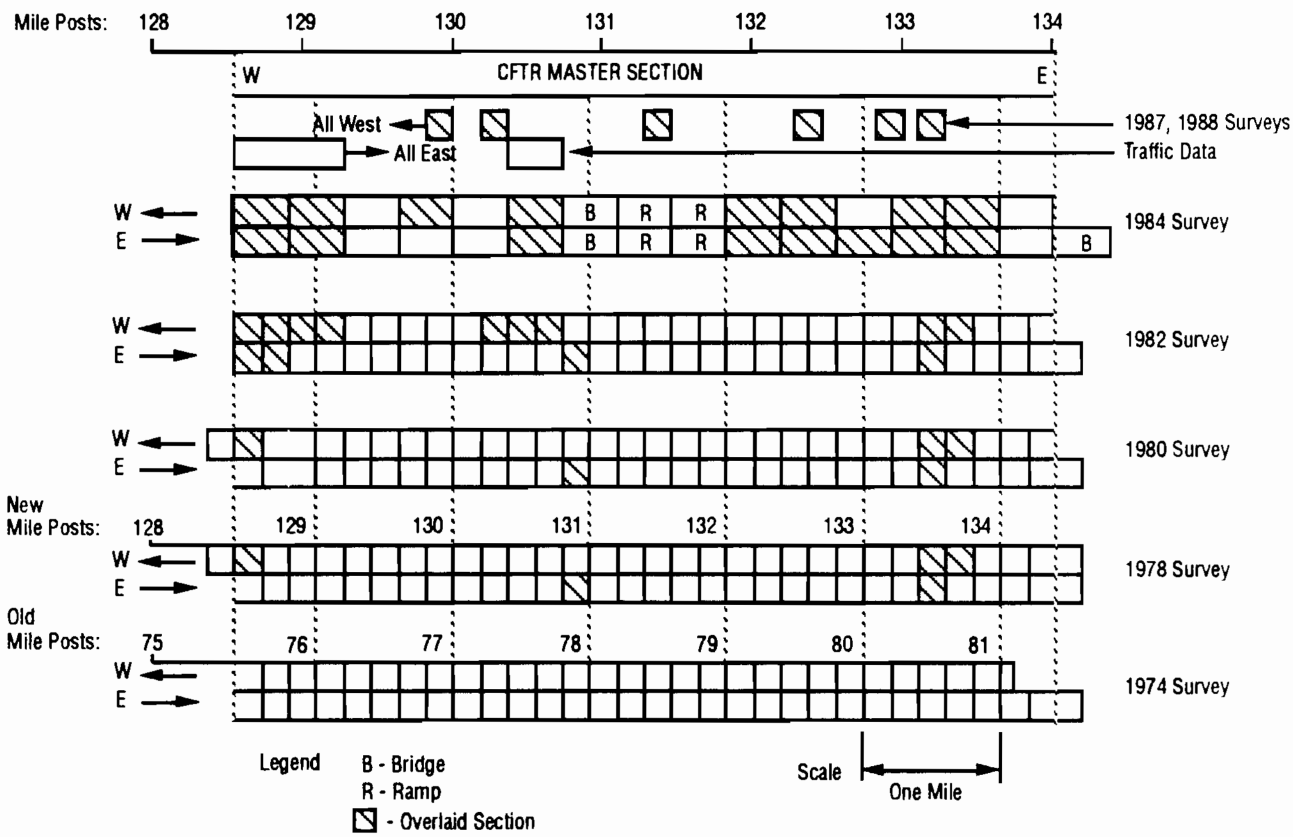


Fig 2.1. Rigid pavement database contents for CFTR 1001.

(2) ***Spalling***. Number of spalled cracks, recorded separately for minor spalling and severe spalling. The number was not estimated but was actually counted, by keying it into a mechanical counter and then transferring to the survey form. Reference 7 has a detailed description of minor and severe spalling with pictures. Rated by the passenger.

(3) ***Pumping***. The criterion is identical to that for 1974 (estimated percent of road area subject to minor and severe pumping).The rater was the driver.

(4) ***Punchouts***. Number of punchouts, recorded separately for punchouts shorter than 20 feet and longer than 20 feet (minor and severe). Rated by the driver.

(5) ***Patches***. Number of patches (AC and PCC separately). Rated by the passenger.

Reference 10 suggests the following formula to convert 1974/1978 spalling data to percentage of spalled cracks:

$$PSPL = (NSPL * CSPC) / 1056$$

where

PSPL = percent spalling in a 0.2-mile section,

NSPL = number of spalled cracks in a 0.2-mile section, and

CSPC = mean crack spacing for the project.

1980 Condition Survey

The 1980 condition survey was made from a car traveling on the shoulder at 5 mph. The survey sections were 0.2 mile long. All the lengths and percentages were estimated by the raters. No crack survey was done this year. A crew of two, the driver and a passenger, was used on this survey. The survey form used in 1980 was the same as that used in 1978 (Fig A.2). The only difference was in the recording of pumping, as described below. References 8, 9, and 10 have more detailed information about this survey.

The data consist of

(1) ***Spalling***. Number of spalled cracks, for minor and severe spalling separately. The number was actually counted, as in 1978, but only in the first mile of a project; spalling in the rest of the project was counted only if the first count showed differences from the previous survey (Refs 8 and 10).

(2) ***Pumping***. Yes/No occurrence, without distinction between minor and severe pumping.

(3) ***Punchouts***. Number of punchouts, recorded separately for punchouts shorter than 20 feet and longer than 20 feet.

(4) ***Patches***. Number of patches.

1982 Condition Survey

The 1982 survey used the 1980 procedure. Some of the sections, especially those in urban areas, were actually surveyed in 1981. More detailed information about this survey can be found in References 8, 9, and 10.

1984 Condition Survey

The 1984 condition survey was made from a car traveling on the shoulder at 15 mph, instead of at 5 mph as in the previous years. The length of the survey sections was increased to 0.4 mile. These changes were suggested by SDHPT personnel, because the 5 mph speed was too slow in comparison to their related PES (Pavement Evaluation System) and as a result of an experiment conducted in early 1984 to determine the effect of speed on the condition survey (Ref 11), which indicated that the survey could be reliably done at 15 mph.

A crew of one driver and two passengers was used on this survey, because it was decided that the driver should not participate in the survey. Instead of using survey forms, the raters entered the data into a Macintosh computer which was available in the car. Reference 11 describes the program and the procedure used for entering the field data into the computer. Figure A.3 depicts some typical screens of the computer used in the field. The Macintosh disks used in this survey are available in the CTR Programmer's Office.

The data consist of

(1) ***Spalling***. Number of severely spalled cracks or joints.

(2) ***Punchouts***. Number of severe punchouts.

(3) ***Patches***. Number of patches in the rightmost lane, counted separately for AC and PCC patches. The size was not recorded. If the patch exhibited characteristics similar to those for a punchout, it was recorded as a punchout (Ref 11).

1987 Condition Survey

Unlike previous surveys, the 1987 condition survey was not made from a car; instead, the raters walked on the shoulder. It was recommended that six 1,000-foot-long survey sections be selected out of every project, according to grading characteristics: two on cut, two on fill, two at grade, and one at a transition. It was decided that the survey sections would be 1,000 feet long, each divided into five 200-foot subsections. Since it was not always possible to find, for example, a cut 1,000 feet long, some sections are smaller, but these are relatively few. Figures A.4, A.5, and A.6 depict the survey forms used in 1987. A crew of two people was used on this survey.

Since a considerable number of CRCP sections had already been overlaid by 1987, a procedure for surveying the overlaid sections was developed and applied in the field. Reference 9 describes in detail the development of procedures for this survey, as well as the survey itself.

For the non-overlaid sections, the data consist of

(1) ***Number of Cracks.*** Number of cracks, counted on every 200-foot survey subsection.
(2) ***Crack Spacing.*** Cumulative crack spacing measured with the Rolatape at the edge of the rightmost lane, for only the first 200-foot subsection.
(3) ***Punchouts.*** Number of punchouts, recorded separately for minor and severe punchouts. Reference 9 describes the severity of punchouts.
(4) ***Patches.*** Number and size of patches of each material (AC or PCC), as shown in the survey forms (Figs A.4, A.5, and A.6).

For the overlaid sections, the data consist of

(1) ***Number of Cracks.*** Number of reflected cracks, counted on every 200-foot survey subsection.
(2) ***Crack Spacing.*** If reflective cracks were present, the cumulative crack spacing was measured with the Rolatape at the edge of the rightmost lane, for the first 200-foot subsection only.
(3) ***Bond Failures.*** Recorded for each 200-foot subsection, as a yes/no occurrence.
(4) ***Patches.*** Identical to the data for the non-overlaid case.

For both overlaid and non-overlaid sections, the condition of the shoulder was also described by the raters.

THE DIAGNOSTIC DATA

In the summer of 1988, a survey was conducted to collect data for structural evaluation, instead of distress data, as in the previous years. This survey was termed a "diagnostic survey," and the "diagnostic data" consisted of

- deflections, research with the falling weight deflectometer (FWD);
- crack width, measured with a microscope;
- pavement temperature; and
- rut depth, in some districts.

The procedures for collecting 1988 data were developed during fall 1987 and spring 1988 and are documented in Ref 13. The field work is documented in Ref 14.

Once collected, the diagnostic data were transferred to an IBM 3081 mainframe computer, verified to eliminate transcription errors, and edited to be readable by a computer program in the database language (SAS). In order to further ensure accuracy of the diagnostic data, a careful check for errors was done; it was termed the "data review process." Its objective was to apply judgement to ascertain which of the data were reasonable from an engineering standpoint (Ref 4). This review process strived to achieve an optimal point between two conflicting objectives: maximizing the closeness to the original data while minimizing the amount of problematic data in the database.

Figure 2.2 traces the steps followed to collect, store, review, and correct the diagnostic data. The nature of the diagnostic data, as well as the findings of the review process, is described later in this chapter by data type. This material is based entirely on Ref 4, which is the main source for a detailed explanation of the 1988 survey.

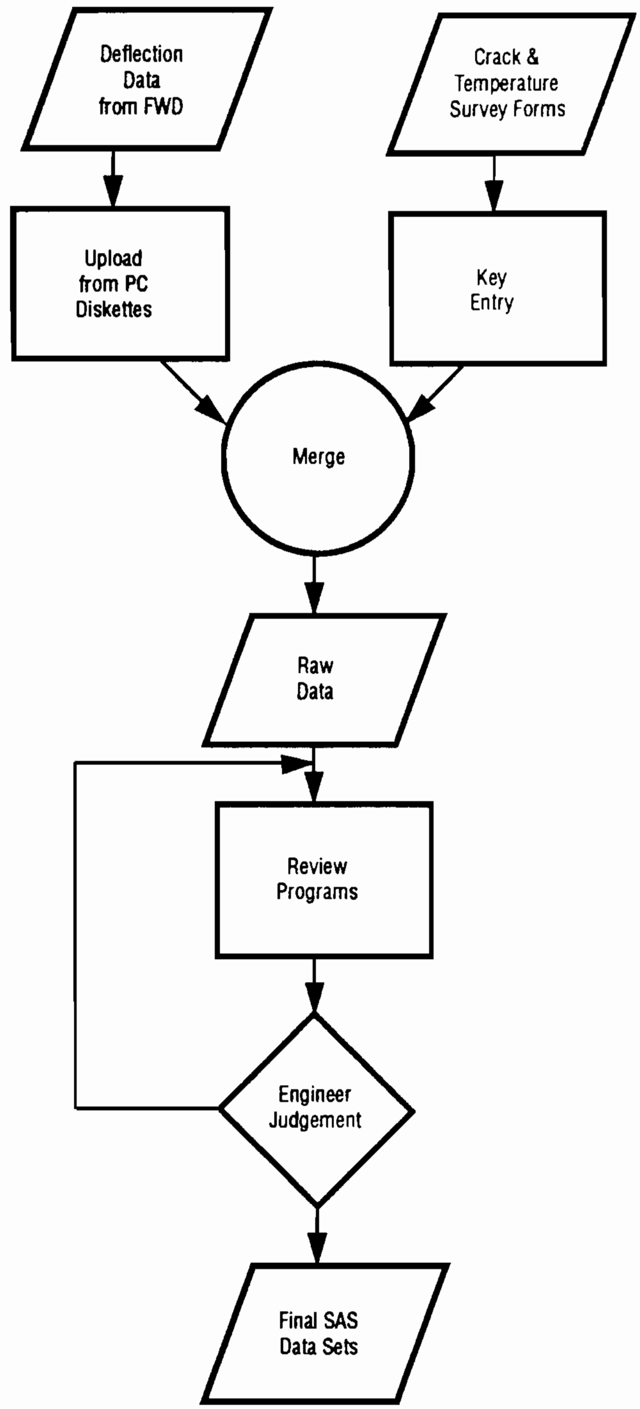


Fig 2.2. Collection and storage process for diagnostic data.

DEFLECTION DATA

The procedures used to collect 1988 data are thoroughly described in References 13 and 14, but a brief description is given here, in order to make this document as comprehensive as possible.

The deflections were collected with the falling weight deflectometer (FWD), which is described in Ref 13. All four drop heights were used. The CRCP test sections were divided into ten replicates if overlaid and five replicates if non-overlaid. Each replicate taken from a test section is called a "subsection." Five different stations were tested in each non-overlaid subsection and two in each overlaid subsection. The subsection/station identification system used in the CRCP database is depicted in Figs 2.3 and 2.4, for overlaid and non-overlaid sections, respectively. Crack spacings corresponding to every station in the non-overlaid subsections were recorded manually in field forms and included in the CRCP database.

The field crews were required to use the available FWD in each district, with the result that two different geophone configurations were used. Figure 2.5 depicts configuration C – sensor one at the load and the other six in front. Figure 2.6 depicts configuration A – sensor one at the load, sensor 2 at the rear, and the other five in front. These configurations are referred to as A and C, because this designation is already used in other projects.

Figure 2.7 depicts a typical plot of actual deflections in a non-overlaid subsection. The deflection basins are expected to follow this shape, if no discontinuities, such as voids, exist under the sensors.

A SAS computer program was written to check the deflection basins for each deflection station and to flag those departing from the expected pattern, with an allowance of 5 percent for error (Ref 4). The advantages of this method are that, first, it consists of a practical, fast, and error-proof way to examine the deflection basins, and, second, it can also be used as a part of any other SAS program that retrieves and/or analyzes the data, whenever the user wants to make sure that only the appropriate basins are considered. Consequently, deletions in the data set could be avoided and were made only when it was evident that the reliability of that piece of data was questionable.

The results of the data review process for each district are summarized below.

District 1. No deflection basins were flagged.

District 2. Forty-three basins were flagged, most of them measured at drop height 1. All the other abnormal basins were recorded on overlaid sections. The occurrence of abnormal deflection basins for the small loads does not seem to indicate a void or crack at the spot, because no voids or cracks would show up only at small loads. In addition, it seems evident from previous experience with the FWD that low loads on stiff pavements give unreliable deflection measurements. No action was taken, but it is suggested that these sections not be considered when using or analyzing data from District 2 if influences from possible paving flaws are not desired. Conversely, if it is desired to look at evidence of discontinuity, this seems to be a very characteristic case, because it is very likely that there are cracks or punchouts under the overlay, on the stations where all four heights were consistently flagged. The above mentioned SAS program that flags the stations with abnormal deflection basins (Ref 4) can be used for both purposes, with minor modification.

District 3. Only two stations were flagged. No actions were taken or suggested.

District 4. Nineteen stations were flagged, 10 of them in drop height 1, the others on overlaid pavements. No action was taken; comments and suggestions made for District 2 are also applicable in this case.

District 5. Twenty-seven stations were flagged. However, most of the awkward deflection basins were those for drop height 1 (the smallest load). No action was taken; comments and suggestions made for District 2 are also applicable in this case.

District 12. One hundred fifty-six stations were flagged, of which 127 were at drop heights 1 or 2. No action was taken; comments and suggestions made for District 2 are also applicable in this case.

District 13. Only one station was flagged. No action was taken or suggested.

District 15. The output of the checking program indicated an evident malfunction of geophone 4, whose readings were close to zero in almost all cases. All geophone 4 readings in this district were set to missing. Reference 4 has a printout of the output referred to above.

District 17. Eight stations were consistently flagged for all drop heights, always for stations 2 and 3 in the same subsection. This suggests that some discontinuity was influencing these measurements. Therefore, it is suggested that they not be included in any analysis where no influences from discontinuities are desired. Conversely, if it is desired to look at some evidence of discontinuity, this seems to be an ideal case.

District 19. Fifty-five stations were flagged, most of them consistently for all four heights. Since those sections are all overlaid, it is possible that these abnormal deflections were due to some crack or punchout underneath the overlay. However, since all the deviations from the expected pattern occurred at the same sensor, a geophone malfunction could also explain the data behavior. No action was taken, in order to avoid deletion of data, but it is suggested that these sections not be included in any analysis. These sections do not seem to be a very good case of evidence of discontinuity, for the reasons discussed above.

District 20. Twelve stations were flagged, 8 of them in drop height 1. Comments made for District 2 are applicable.

District 24. Thirty-five stations were flagged, 31 of them in drop heights 1 and 2, and the rest of them in overlaid sections. No action was taken; comments made for District 2 are also applicable in this case.

In summary, the data review process indicated that the inconsistent FWD results have a tendency to appear at low drop heights (small loads). For CRCP, which is usually very stiff, it is likely that small loads do not provide enough pulse to activate the sensors correctly. Another possibility might be the influence of traffic. The FWD measurements were always taken in the rightmost lane, while the rest remained open to traffic. In the case of small loads, it is possible that the influence of a nearby vehicle on the sensors was greater than that of the FWD load itself. However, since the duration of the FWD pulse is only 0.025 second, the likelihood of a vehicle passing near the test station at the moment of the test is significant only for sections carrying very heavy traffic. In cases where the departure from the expected pattern was consistent for all four drop heights, it seems safe to conclude that some discontinuity is being detected. The latter case could be useful for eventually studying discontinuity (e.g., void) detection with the FWD data.

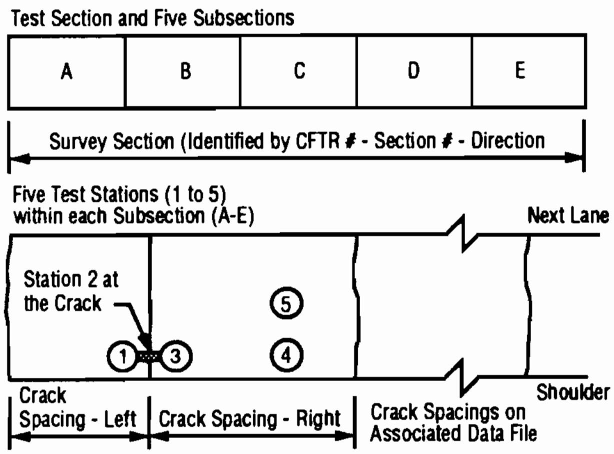


Fig 2.3. Non-overlaid test section: subsections and stations.

CRACK WIDTH DATA

Crack width data were manually recorded in the field on the forms illustrated in Fig A.7. The resulting data ledgers were manually input into the IBM 3081, using a double-entry comparison process to eliminate error. The resulting computer file was then read by a SAS program and converted into the initial crack width data set. Then, after the data were reviewed according to the procedure discussed below, the results were put into the final crack width data set, which is now part of the CRCP database. The original data set, however, has also been kept available and is entirely compatible with the CRCP database.

A preliminary review of the crack width data was undertaken, checking the data for outliers and for unexpected behavior. Earlier in the project, an experiment was performed to determine the expected behavior of crack width data, as well as the sample sizes required for a desired accuracy (Ref 13). According to this reference, the expected behavior would include

(1) good reproducibility of results between operators,
(2) coefficient of variation of about 20 percent, and
(3) less accuracy in faulted or spalled cracks.

Operator reproducibility had been checked previously in an experiment conducted at the Balcones Research Center shortly after operators were hired for the 1988 survey. This experiment is described in Ref 14. The data review process, therefore, concentrated on checking items 2 and 3.

Figure 2.8 shows a plot of the original cumulative crack width frequencies for close, medium, and widely spaced cracks. According to theory and to previous studies (Ref 13), the greater the crack spacing, the wider the crack width. Thus, some stochastic dominance would be expected, in the following order: close, medium, and wide (spacing). Figure 2.8, however, shows that dominance holds only for the wide spacing, whereas the close and medium spacings are not clearly separated.

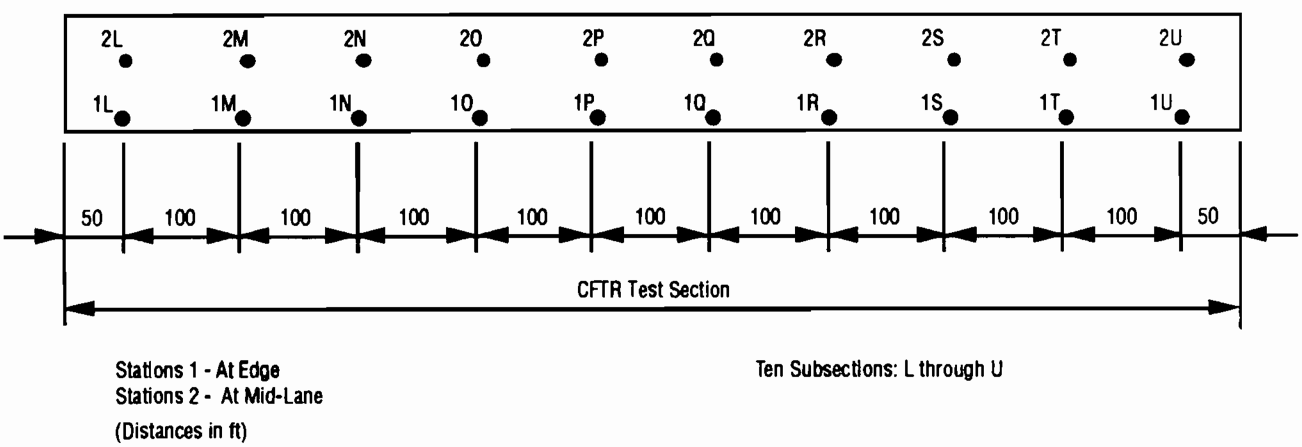


Fig 2.4. Overlaid test section: subsections and stations.

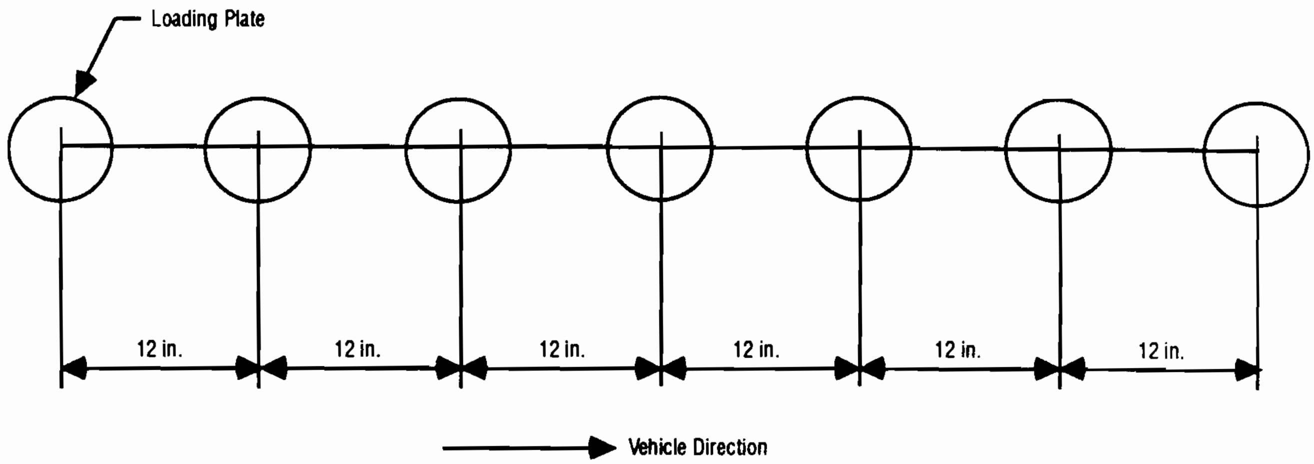


Fig 2.5. Geophone configuration C.

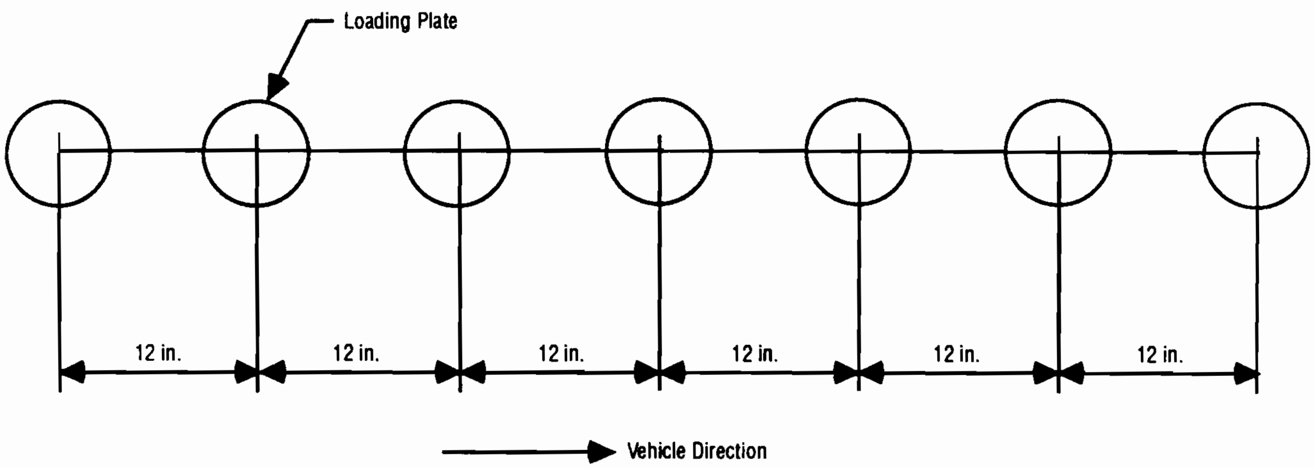


Fig 2.6. Geophone configuration A.

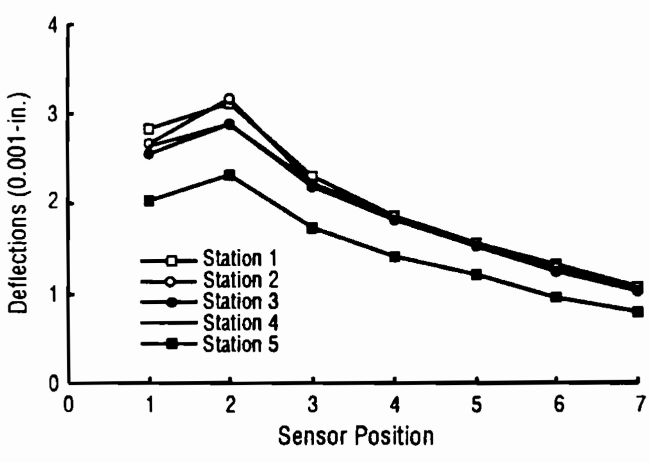


Fig 2.7. Deflection basin in a typical non-overlaid subsection.

An investigation of the data disclosed that the classification of crack spacing in close, medium, and wide was imprecise for some sections. For example, for several sections crack spacings classified as "close" were equal to or greater than those classified as "medium." In other sections, widths were read from cracks with non-uniform spacing, suggesting that the classification scheme should be reviewed, and perhaps a category for "UNEVEN" spacing should be added. Table 2.2 shows a partial printout comparing parts of both the original and final SAS data sets containing the misclassifications described above and the corresponding changes that were made. Figure 2.9 shows the cumulative frequency plot for the final data set. Perfect stochastic dominance still does not hold, nor would it be reasonable to expect that it would, for the following reasons:

(1) The spacing classified as, say, "medium" in one case may be of the same magnitude as the one classified as "wide" in another section. A plot using actual spacings instead of subjective classification can also be obtained, but it was not used in this case

because the main objective of this part of the review process was to check the classification of the spacings in close, medium, and wide categories.

(2) Sections are not uniform in terms of thickness, subbase support, concrete type, etc, which are all factors influencing crack width.

Variations in crack width readings across the same crack were also inspected. After several criteria were tested, it was found that it would be more realistic to consider as "high variation" only the cases where the maximum reading for a given crack was greater than four times the minimum. Details on these findings are documented in Ref 4. Although a significant number of cracks presenting large variation were found, no deletions were made because

- crack width data, by its own nature, can be expected to have a considerable variation in some cases (Ref 13) and
- whenever too much variation is undesirable in a given study, an appropriate SAS program code can easily be used to skip the cracks with high variance for any variance criterion desired.

PAVEMENT TEMPERATURE DATA

The temperature data taken at the pavement surface and at three different depths of a portable slab taken to the field have been included in the CRCP database. References 4, 5, and 14 present detailed information on the nature of these data. Reference 13 documents the development of procedures for estimating pavement temperatures as a function of portable slab temperatures.

Because of difficulties encountered using the portable slabs in the field (Ref 14), only a small amount of temperature data was collected in the 1988 diagnostic survey. Consequently, the temperature data has not been included in the database at this time, but has been kept in a sequential file (Table C.7) which includes relational keys; it can easily be linked to the database at a later time, should more temperature data become available.

RUT DEPTH DATA

The rut depth data were intended to evaluate the condition of the overlays; however, since the rut depth was always zero, it was not included in the current CRCP database. In the future, if more rut depth data are collected, a simple modification can include a zero rut depth for 1988 in the database.

DATA FROM SOURCES OTHER THAN FIELD SURVEY

One of the uses of the CRCP database is in research on modelling CRCP behavior. For this, data on other parameters that influence CRCP performance are required, in addition to data on pavement evaluation.

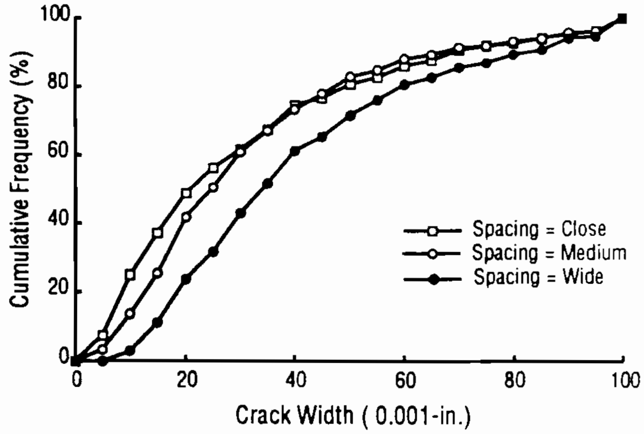


Fig 2.8. Cumulative distribution of crack width by crack spacing, original data.

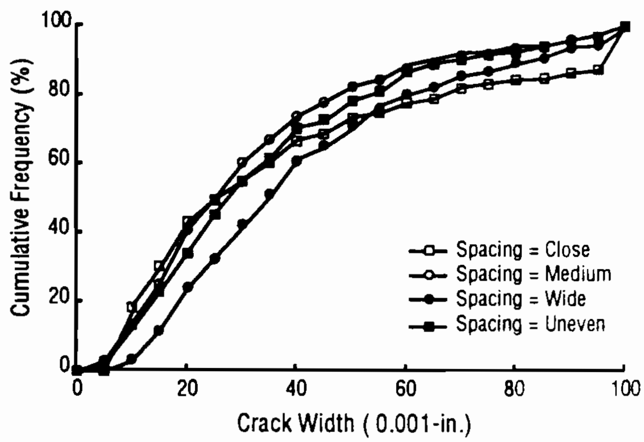


Fig 2.9. Cumulative distributions of the crack width by crack spacing, final data.

Some self-explanatory examples of this type of data are traffic, rainfall, and pavement thickness. The following non-diagnostic variables have also been included in the database.

DRAINAGE COEFFICIENTS

Drainage coefficients for each CTR section have been estimated from rainfall amounts and subbase type and included in the database, according to the following regression model suggested by V. Shyam for CTR Project 1169:

$$Cd = 2.171 - 0.0149\,(RAIN) + SBT \qquad \text{(Ref 17)}$$

where

Cd = coefficient of drainage;
RAIN = average annual rainfall, in inches;
SBT = -0.3649 (for asphalt-treated subbases);
- 0.2784 (for cement-treated subbases); and
- 0.4641 (for crushed stone subbases).

TABLE 2.2. MATCHING PRINTOUTS OF THE ORIGINAL AND REVIEWED CLASSIFICATION OF CRACK SPACING

CFTR	Section	Direction	Spacing Left	Spacing Right	Width	Spacing Category Original	Spacing Category Revised
1015	2	E	21	36	12	Close	Medium
1015	2	E	36	36	12	Close	Medium
1015	2	E	54	36	12	Close	Medium
1015	2	E	60	36	12	Close	Medium
1015	2	E	58	36	12	Close	Medium
1015	2	E	39	36	12	Close	Medium
1015	2	E	45	25	30	Medium	Medium
1015	2	E	40	25	30	Medium	Medium
1015	2	E	22	25	30	Medium	Medium
1015	2	E	36	25	30	Medium	Medium
1015	2	E	57	25	30	Medium	Medium
1015	2	E	47	25	30	Medium	Medium
1015	2	E	76	100	111	Wide	Wide
1015	2	E	69	100	111	Wide	Wide
1015	2	E	42	100	111	Wide	Wide
1015	2	E	38	100	111	Wide	Wide
1015	2	E	51	100	111	Wide	Wide
1015	2	E	54	100	111	Wide	Wide
2002	4	E	17	12	55	Close	Uneven
2002	4	E	29	12	55	Close	Uneven
2002	4	E	30	12	55	Close	Uneven
2002	4	E	9	12	55	Close	Uneven
2002	4	E	10	12	55	Close	Uneven
2002	4	E	70	12	55	Close	Uneven
2002	4	E	27	35	34	Medium	Medium
2002	4	E	30	35	34	Medium	Medium
2002	4	E	27	35	34	Medium	Medium
2002	4	E	35	35	34	Medium	Medium
2002	4	E	35	35	34	Medium	Medium
2002	4	E	24	35	34	Medium	Medium
2002	4	E	11	63	69	Wide	Wide
2002	4	E	19	63	69	Wide	Wide
2002	4	E	40	63	69	Wide	Wide
2002	4	E	25	63	69	Wide	Wide
2002	4	E	15	63	69	Wide	Wide
2002	4	E	20	63	69	Wide	Wide

Cd is present in the AASHTO model for designing rigid pavements, which has the following format (Ref 16):

$$\text{Log(Weq)} = 7.35*\log(D + 1) - 0.06 + \frac{\left[\log \frac{\Delta PSI}{3}\right]}{[1 + (1.624*10^{7}*(D + 1)^{-8.46})]}$$
$$+ (4.22 - 0.32*\Delta PSI)*\log\,[MR*Cd*(D^{0.75} - 1.132)*(215.63*J)^{-1}*(D^{-0.75})*A^{-1}]$$

where

A = 3,971.88 * J * (Ec / K) – 0.25

ΔPSI = initial - final PSI.

D = thickness;

Ec = elasticity modulus of the PC concrete;

MR = modulus of rupture of the PC concrete;

K = modulus of reaction on top of subbase;

J = load transfer coefficient;

Cd = drainage coefficient;

Weq = equivalent single axle loads; and

All logs are base 10.

In the equation above, Cd has been introduced in the numerator of the portion of the performance equation that considers the slab strength and support conditions. The coefficients show that Cd was given the same relative importance as the modulus of rupture and the load transfer coefficient. Cd is thus a very important parameter for CRCP design and evaluation. Reference 17 describes in detail the procedure used to arrive at the drainage coefficients for the test sections in the CRCP database.

TRAFFIC DATA

The considerable practical problems in obtaining accurate traffic data are universally recognized by engineers (Refs 1, 16, 18, and 19), especially in the case of a statewide database. Compromises were necessary to include traffic variables in the CRCP database; the nature of the traffic data it contains is described in this section.

As mentioned previously, the 1987 condition survey test sections were selected to fill an experimental factorial (Ref 9), in order to determine which variables other than traffic affect CRCP performance. Simultaneously, a major effort was being conducted within Project 1169 to obtain traffic data from SDHPT records (Ref 18). Because of the specific needs of Project 1169, traffic data were obtained only for overlaid sections, which do not exactly correspond to the Project 472 survey sections. A graphic comparison between the test sections selected for traffic data collection and those selected for the condition survey can be seen in Fig 2.1.

Obviously, it would be completely infeasible to assign facilities such as traffic counting and weighing stations to every test section, or even to every project in the CRCP database; consequently, the best that can be done at this time is to develop some rationale to assign existing traffic data to the experimental sections. A two-part procedure was developed:

(1) Direct assignment of traffic information from Project 1169 sections where possible.

(2) Estimation of traffic data for those sections where little information is available (Ref 19), especially for urban areas where there are no loadometers or weighing stations.

Data from SDHPT Records

Since the CRCP database (as it existed in 1986) was used to select both the Project 1169 (Ref 18) and Project 472 sections (Ref 9), the traffic sections and condition survey sections are always located within the same overall project (CFTR number), as shown in Fig 2.1. Consequently, the first part of the procedure 1 is relatively straightforward to apply and is reasonably accurate. Whenever traffic data are present in a CFTR project, data were assigned to the condition survey sections either from the closest Project 1169 section or from the average of all Project 1169 sections within the encompassing CFTR project. Both procedures yield very similar results, because few CFTRs contain more than one Project 1169 section, and, for those that do, the differences between traffic data within the same project were negligible. This may be due to the fact that, since the average project length is less than 4 miles, the presence of an exit or a junction between two Project 1169 sections in the same project is unlikely. The similarity may also be due, to some extent, to the procedure used to assign traffic data for Project 1169 sections, which is described in more detail in Ref 18 and critically discussed in Ref 20.

Clearly, the most important drawback of this procedure is the non-correspondence of CFTR test sections to traffic counters and weigh stations. The SDHPT sections are considerably longer than the CRCP database sections; they may well encompass junctions, exits, and other facilities that certainly interfere with ADT. These limitations are even more critical for truck data. However, unless special counting and weighing stations are created statewide, this procedure is the best way to assign traffic data to any experimental pavement section.

Estimation by Regression Model

Because the above procedure is not cost effective (Ref 20), yielding results for a minority of sections while requiring a considerable investment of time by someone qualified to make subjective engineering decisions, several attempts were made to estimate equivalent single axle load (ESAL) data from other available data (Refs 19 and 21). Four regression models were developed, and may be summarized as follows.

Description of Variables for All Models

Variable	Description	Source
ADT	Average Daily Traffic	1169 Data
PTRUCK	Percent Trucks	1169 Data
YR	Year Data Collected (Last Two Digits)	1169 Data
HT	Highway Type (IH,US)	Database
PTAND	Percent Tandem Axles	1169 Data
DIST	SDHPT District	Database
ATHWL	Average 10 Heaviest Wheel Loads	1169 Data
ESAL2	Equivalent Single Axle Loads, Both Directions	1169 Data
ADT85	1985 AADT	(Ref 9)
G	AADT Growth Rate	(Ref 9)

Model 1

$$ESAL2 = H_1 + 225.02(ATHWL) + H_2(ADT) + 4.153(ADT*PTRUCK) + H_3(YR) + H_4 \ln(ADT) + 2{,}202.66(PTAND) + 957{,}460$$

where

H_1 = –4,986,000 for IH,
0 for US highway,

H_2 = 7.0396 for IH,
69.78 for US highway,

H_3 = 24,245.1 for IH,
11,072.2 for US highway, and

H_4 = –62,238 for IH,
–579,338 for US highway.

Model 1 gives the best fit of all the models presented but uses detailed truck information that is unavailable for most of the test sections at the present time. R^2 for model 1 was 0.95, fitting 1,541 observations. Figure 2.10 shows the scattergram for model 1.

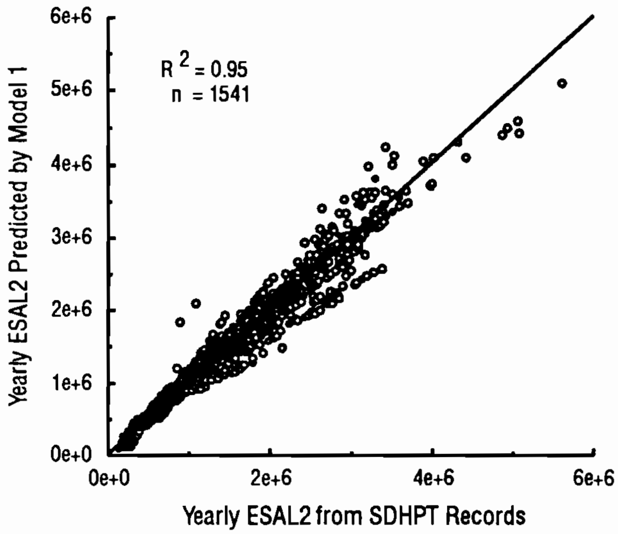


Fig 2.10. Results from model 1.

Model 2

$$ESAL2 = H_1 + H_2 + 12{,}037(YR) + H_3(ADT) + H_4 + H_5(YR) + H_6(YR) - 433{,}658$$

where

H_1 = –3,499,293 for IH,
0 for US Highway,

H_2 = 176,955 for District 1,
–1,978,928 for District 3,
–2,580,881 for District 4,
–4,041,762 for District 9,
–2,034,159 for District 13,
1,102,543 for District 19,
343,147 for District 20,
0 for District 24,

H_3 = 114.23 for District 1,
80.46 for District 3,
33.02 for District 4,
53.37 for District 9,
70.91 for District 13,
63.36 for District 19,
150.09 for District 20,
183.04 for District 24,

H_4 = 786,459 for IH sections in District 1,
567,627 for IH sections in District 13,
0 for all other sections,

H_5 = 44,119 for IH,
0 for US Highway, and

H_6 = –12,172 for District 1,
26,769 for District 3,
41,802 for District 4,
62,560 for District 9,
22,873 for District 13,
–7,951 for District 19,
–16,829 for District 20,
0 for District 24.

Model 2 gives a good fit (R^2 = 0.91, n = 1541), using SDHPT district number as a surrogate predictor in place of the detailed truck variables used in model 1. Since data for only eight districts were available to calibrate the model, predictions for ESAL in other districts would require substituting values from known districts with similar trucking profiles. Figure 2.11 shows the scattergram for model 2.

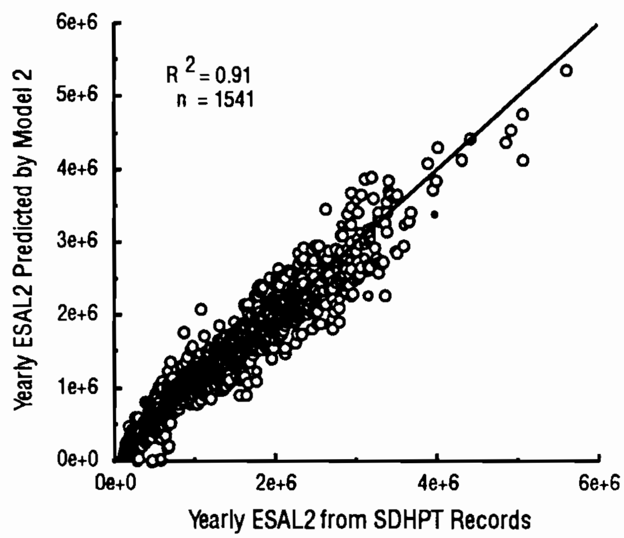


Fig 2.11. Results from model 2.

Model 3

$$ESAL2 = 46{,}056(YR) + H_1 + 1{,}198{,}183(G) + 477(ADT85) + H_2(YR) - 9{,}084(YR*G) - 1.3895(YR*ADT85) + H_3(G) + H_4(ADT85) - 136(G*ADT85) + YR*G*ADT85 + H_5(G*ADT85) - 5{,}966{,}144$$

where

H_1 = –1,083,536 for IH,
0 for US highway,

H_2 = 59,554 for IH,
0 for US highway,

H_3 = –471,910 for IH,
0 for US highway,

H_4 = -350 for IH,
-0 for US highway, and
H_5 = 61.16 for IH,
0 for US highway.

Model 3 uses the 1985 AADT and G, a linear growth rate determined by Chou in Ref 9, resulting in an R^2 of 0.9, using 571 data points. This combination of predictors is present for approximately 42 percent of the pavement sections in the database. Figure 2.12 shows the scattergram for model 3.

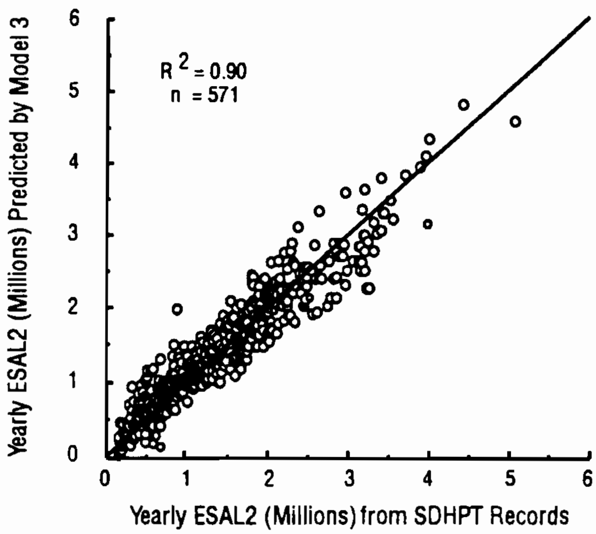


Fig 2.12. Results from model 3.

Model 4

$$ESAL2 = 15{,}640(YR) - H_1 - 205.19(ADT85) + H_2(YR) + 3.108(YR*ADT85) - 650{,}498$$

where

H_1 = 2,907,059 for IH,
0 for US highway, and
H_2 = 44,723 for IH, and
0 for US highway.

Model 4 gives only a modest fit (R^2 = 0.83, n = 846) but is applicable to 72 percent of the sections in the database, since G is not required. With a small additional effort, 1985 AADT data for the remaining sections could be collected from SDHPT files. It would then be possible either to use only the precise ESAL data obtained for Project 1169 (present for 26 percent of the sections), when the greatest accuracy is needed, or to calculate ESAL for the entire database using the estimates from model 4. Figure 2.13 shows the scattergram for model 4.

Any of the above models can be applied repeatedly to produce cumulative ESAL2 for a desired time interval, such as calculating total ESAL2 between construction and

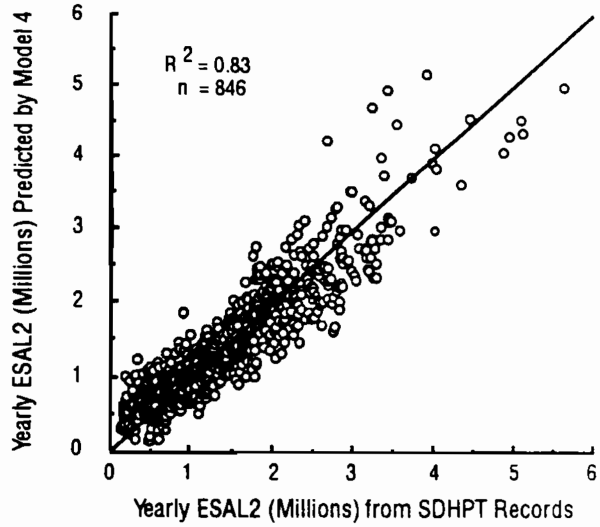


Fig 2.13. Results from model 4.

failure. This can be accomplished by simply summing the results of the chosen model for each consecutive year within the time period:

$$ESAL2_{1970\text{-}1980} = \sum_{i=1970}^{n=1980} (\text{Models } 1, 2, 3, \text{ or } 4)$$

The above equation would estimate the cumulative ESAL2 for a selected section between 1970 and 1980.

OTHER DATA – NATURE AND SOURCES

Earlier in this project (Ref 9) an experiment was conducted to determine which variables influence CRCP performance. Before collecting data for this experiment, a careful evaluation of all possible variables that might relate to CRCP performance was undertaken (Ref 9). It was decided that four types of variables should be collected: design criteria, environmental factors, traffic, and pavement age (Ref 9). Figure 2.14 depicts the variables and their classification. The sources of data for each of those variables are briefly listed below, except for traffic data, which was described previously.

(1) ***Design Criteria***

(a) *Slab Thickness*. From project construction plans stored in the Information and Records Section, Record Management Branch, Texas SDHPT.

(b) *Subbase Type*. From the same source mentioned in (a).

(c) *Coarse Aggregate Type*. From the Materials Testing Reports, in Folder 5 of Project 472 Correspondence of the Texas SDHPT.

(d) *Subgrade Grading Type.* Visually assigned during the 1987 condition survey.

(2) ***Environmental Data***

(a) *Average Annual Rainfall.* From contour maps obtained from the Weather and Climate Section, Texas Department of Water Resources.

(b) *Average Lowest Annual Temperature.* From reports from the source for (a).

(c) *Roadbed Soil Type.* This type of data is recorded as a binary variable (yes/no), which stands for the presence (Y) or absence (N) of swelling characteristics. This information was extracted from Texas Land Resources Maps, provided by the Bureau of Economic Geology of The University of Texas at Austin.

(3) ***Pavement Age.*** Available in the "Project Summary Sheets," generated by the program CONSRV. More detail about this item can be found in Ref 9.

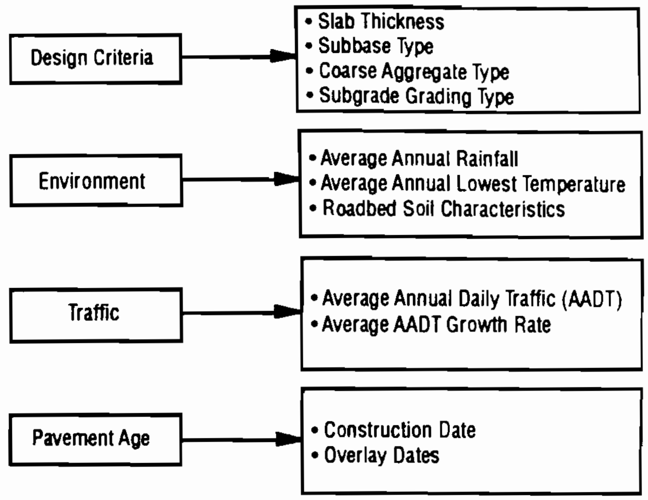


Fig 2.14. Non-survey variables in the CRCP database.

CHAPTER 3. DESIGN AND STRUCTURE OF THE DATA BASE

INTRODUCTION AND OBJECTIVES

As reported in Chapter 2, a large amount of data relating to CRCP pavements has been collected across Texas during the course of several CTR research projects. Since 1974, the data have been stored on magnetic media, according, of course, to the software capabilities of the time. Until recently, the data had existed as a collection of sparsely documented sequential files accessed primarily through large single-purpose Fortran programs. This created such difficulty of access that many users resorted to extracting the data needed for their projects manually, creating still more undocumented files of questionable integrity and format. The problem was further compounded as each user created "customized" versions of the data and then was forced to update each of them as new data were acquired.

Clearly, a central database from which all users could extract current and accurate data was needed. The purpose of this chapter is to describe the database designed to accomplish that goal.

DESIGN PHILOSOPHY

The primary function of any database is to simplify access to data, facilitating the production of reports and analyses. In order to provide this function, the database designer must first identify the typical user and the type of analysis the database will be called on to support.

At CTR, the typical user was determined to be a graduate student in Civil Engineering with a modest amount of programming experience seeking to obtain data to model pavement performance. It was deemed essential, therefore, to provide uncomplicated data access, while retaining sufficient flexibility to accomplish the expected variety of database requests. Once the needed data have been extracted, the user will typically need to run packaged statistical and reporting software with a minimum of modification.

Because of these considerations, the following decisions were made:

(1) As far as possible, without sacrificing flexibility, all database design and construction would be implemented by the CTR programming staff, leaving a minimum of data manipulation to the user. In Fig 3.2, only the tasks marked "user access" would be required for accessing the database.

(2) A comprehensive database user's manual would be produced.

(3) Careful selection of the database language would be made, with priority given to ease of access by the unfamiliar user and to the availability of powerful packaged analysis routines.

SELECTION OF THE DATABASE LANGUAGE

The following characteristics were identified as desirable in a proposed condition survey database language (Ref 2):

(1) ***Permanence***. The database created should last a minimum of five years without having to be redesigned or moved to a different computer or language.

(2) ***Ease of Use***. Users not previously familiar with the language should, after a minimum of training, be able to access desired data and produce simple reports, plots, and statistical analyses.

(3) ***Power***. The language chosen should be able to easily manage the thousands of data records and produce the required reports and analyses in a reasonable period of time.

(4) ***Portability***. The language chosen should be available on at least one popular mainframe computer and on one popular microcomputer.

(5) ***Documentation***. The database should contain inseparable internal documentation, to assure continued use despite turnover of personnel.

Three database languages on The University of Texas' IBM 3081 mainframe were considered: NOMAD, SYSTEM 2000, and SAS. Languages found exclusively on the University's Cyber were discounted due to considerations (1) and (4) above, since the Cyber is an obsolescent machine which is no longer widely supported. Dbase and Microsoft File on the IBM PC and Macintosh microcomputers failed to pass criteria (1) and (3), given the size of the database and current hardware available. NOMAD and SYSTEM 2000 on the 3081 were certainly powerful enough for the task but scored poorly on item (2) and failed item (4) outright, since neither is available on any microcomputer at this time.

Of all the languages considered, only SAS was able to satisfy all five specifications. SAS has been in existence for more than twenty years, and will certainly be supported for years to come. Although SAS is a complex language, a working subset can be learned in just a few hours. The capabilities are considerable; not only does SAS support the standard database functions (retrieval, updating, sorting, report generation, and graphing), but it also contains canned procedures for an overwhelming array of statistical procedures, such as analysis of variance, regression, time series forecasting, and discriminant analysis. It is supported on a variety of computers worldwide, including The University of Texas' IBM 3081 mainframe, CTR's IBM PCs, and the SDHPT's IBM mainframe and PCs. Finally, SAS has an internal documentation feature that maintains a description of all variables stored along with a copy of the program that created the database. Put simply, a user with no documentation at all can simply ask the database itself for a description of its contents and accessing information. Details on how this is done are presented in a later chapter.

DATABASE ORGANIZATION

An examination of Fig 2.1 reveals the strong hierarchical nature of the data. As stated previously, each project (CFTR) is subdivided into survey sections, the length and number of which vary with each survey year. In contrast, the environmental and construction data described in Chapter 2 are constant along the entire project length and do not change from year to year. It is therefore unnecessary to repeat these constants in each section and year of the survey data; instead, the data record marked "CFTR MASTER SECTION" in Fig 2.1 can be linked by CFTR number to each of the sections within the project. Data from the condition surveys and diagnostic survey, as well as the traffic data, are all linked in this manner.

Crack spacing data form a third hierarchical level on the tree (Fig 3.1). Each crack length is stored as a separate observation, linked to its corresponding condition survey section by CFTR (project number), SECT (survey section), and DIR (lane direction). When crack spacing data are collected in a future survey, the additional variable YR (year surveyed) will also be needed. Because crack data are present for a minority of sections, and because the number of cracks per section varies greatly, storing each crack spacing separately results in only a small storage penalty while greatly facilitating analysis.

Although the SAS language does not specifically support database structures, it is a simple matter to simulate a hierarchical database using relational key fields. Each block of information depicted in Fig 3.1 is stored in a separate SAS dataset, with matching key fields. Using separate files keeps the total database size small by eliminating redundant information and has the added advantage of making a PC diskette version of the database possible. Also, each file may be accessed separately when information contained in the other files is not needed, as is usually the case. A simple merge statement combines two or more files when necessary.

The Master File

As detailed in Chapter 2, the master file contains information which is constant throughout the entire CFTR project. This includes construction details, environmental data, and project identification information. Raw data for the master file were supplied by Chou (Ref 9), and have been stored on the mainframe as file MASTER.DATA. Drainage coefficients were estimated from rainfall amount and sub-base treatment (Ref 17). The additional variable MAIN was created to distinguish main lanes from frontage roads or shoulders, since both had been assigned the same CFTR number.

Figure 3.2 shows the creation sequence for the master file, traffic, and condition survey database. The master dataset was created by typing in the raw data (MASTER.DATA) and processing it through a SAS program (CREATEM.SAS, Table B.1) resulting in the SAS dataset SDS.MASTER (Table C.1). Additions, deletions, or changes can be easily made by editing the raw data and rerunning the program. Alternately, the SAS EDITOR procedure could be used to modify the SAS data set directly.

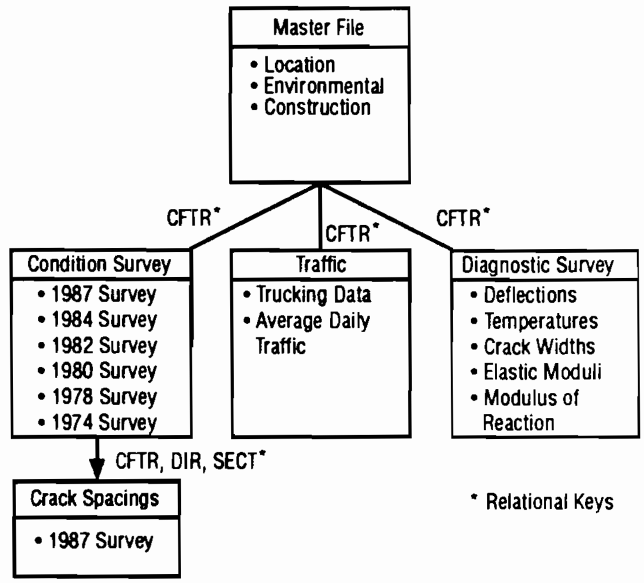


Fig 3.1. Hierarchical database structure.

Historical Condition Survey

The 1987 condition survey data were double key entered from field survey forms (see Figs A.1, A.2, and A.3) into file COND87.DATA and then processed by CREATEC.SAS (Table B.2) to produce the SAS dataset SDS.COND87. Distress indicators collected in the 1987 survey were then manually extracted from matching locations in the condition survey files from previous years and merged with the 1987 data to form the final SAS dataset, SDS.CONDSURV (Table C.2). Classification information for the 1987 data, such as cut/fill position or curvature, was assumed to be constant and copied from the 1987 data.

1987 crack spacing data were typed and verified from the survey forms (Fig A.2) into the sequential file CRACK87.DATA. Based on the type of analysis planned for the crack data, a decision was made to store the information as spacings between cracks rather than locations, as originally entered on the survey forms. Patch locations were indicated by negative numbers, which

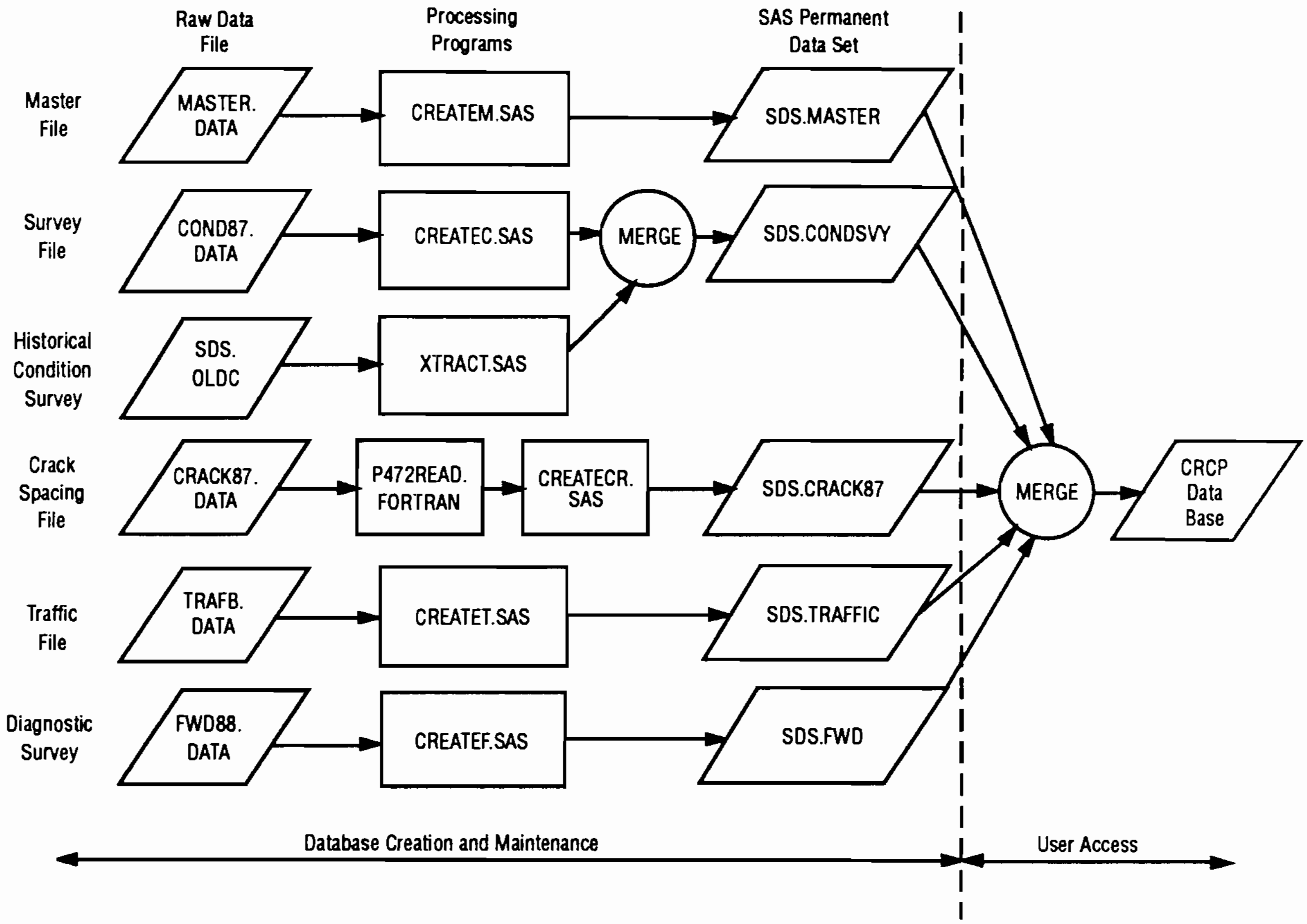


Fig 3.2. Database creation sequence.

were later used to identify and discard cracks on either side of the patch, since it would have been misleading to include the distance across the patch as a crack spacing. Because of this complication, two programs were then used to process the data: first, a Fortran program (P472READ.FORTRAN, Table B.3) and then a SAS program (CREATECR.SAS, Table B.3), resulting in the final data set SDS.CRACK87 (Table C.5). Modifying these files may be accomplished in a manner similar to that described for the master file above.

Diagnostic Data

A detailed explanation of the processing of the diagnostic data has been given in Chapter 2. The FWD stores data on IBM PC diskettes, and it is in this format that the data arrived for processing at CTR. However, configuration of the FWD geophones, file format, and collection techniques varied slightly among SDHPT districts. It was therefore necessary to process the data on a district by district basis, using a number of conversion programs with considerable manual intervention. As explained in Chapter 2, a number of discrepancies in the data prompted the writing of multiple programs to check the deflection data for reasonableness. Since many programs were used, and since it is unlikely that the identical situations would occur in a future diagnostic survey, the programs are not presented here. The data itself are currently stored in three SAS datasets:

SDS.FWD (Table C.4): Deflection measurements

SDS.TEMP88 (Table C.7): Temperature measurements

SDS.CRKWD88 (Table C.6): Crack width measurements

Traffic Data

Traffic data for the database were adapted from data collected for CTR project 1169 (Ref 18). As explained in Chapter 2, exact correspondence between traffic section and condition survey locations is infrequent; it was therefore decided to store traffic data by CFTR (project) key. The data were key entered and verified from the data collection sheets (Ref 18), read by the SAS program CREATET.SAS (Table B.4), and stored in the permanent SAS dataset SDS.TRAFFIC. Figure 3.2 shows the procedure. A partial printout of the traffic file is given as Table C.3.

At the time of this writing, a simplification of the traffic data is in progress. Since most usage of the traffic data to date involves cumulative yearly ESAL, it has been decided to include a few simple traffic variables in the master file. ESAL86 will be the 1986 ESAL, GE will be the yearly growth rate, and EFLAG will indicate whether the data were obtained from SDHPT records or estimated by one of the regression models given in Chapter 2. This proposed modification will simplify access and allow extrapolation of ESAL for several years with reasonable accuracy.

CHAPTER 4. USING THE DATA BASE

INTRODUCTION

In this chapter, detailed instructions for using the data base are provided. Also, a series of example applications is given to demonstrate the capabilites of the SAS language for the novice user. Readers already familiar with SAS need only refer to the variable names given in Table 4.1 and to the accessing information which follows in order to write their applications.

ACCESSING THE DATABASE

IBM mainframe users running under CMS at The University of Texas at Austin must first link to the database by entering the following statements:

```
CP LINK FTAO152 196 195 RR P472
ACCESS 195 Q
```

The entire database is now accessed as the user's Q minidisk and will be released automatically at logoff. For frequent users, it is recommended that these statements be included in the user's PROFILE EXEC file so that the link will be established automatically each time the user logs on.

Every SAS application consists of two basic elements: data steps and procedure steps. Essentially, a data step is used to input, manipulate, combine, and otherwise process data into an internal worksheet called a SAS data set (Ref 21). Once a suitable data set has been prepared, a series of packaged procedure steps can then be called to perform a multitude of analytical and statistical tasks. For most applications, a simple stepwise method may be used to access the database:

(1) Examine Table 4.1 and determine which variables are required.
(2) If all the selected variables are in the same file, proceed to step 4; otherwise go to step 3.
(3) Merge the necessary files in a SAS data step.
(4) Run the appropriate SAS procedure to produce the report or analysis desired.

The following examples are designed to illustrate typical data base requests for the reader who is unfamiliar with the SAS language.

Example 1. Sort and Print

A report is needed listing the location information for all of the sections, sorted alphabetically by county. Following the procedure given above, an examination of Table 4.1 shows that the desired variables COUNTY, CFTR, HWY, CTRL, SEC, and JOB are all present in the master file, so no merge step is needed. The following SAS program is run, and the first page of the output is shown in Table 4.2:

```
PROC SORT DATA=SDS.MASTER OUT=TEMP;
BY COUNTY; RUN; PROC PRINT;
VAR COUNTY CFTR HWY CTRL SEC JOB;
RUN;
```

Example 2. Merge and Form Percentiles

Percentile tables are to be printed detailing how many sections were surveyed in each district during 1987. Sections will also be broken down by cut/fill position. Since this job requires information from both the survey file and the master file, a merge step is necessary. Also, since the district number is not kept in any file, it must be calculated from the CFTR number. Here is the SAS program to produce the tables:

```
DATA A;
MERGE SDS.MASTER  SDS.CONDSURV(IN=OK);
BY CFTR; IF OK;
IF YR=87; DIST=INT(CFTR/1000); RUN;
PROC FREQ; TABLES DIST; TABLES CFP; RUN;
```

The variable OK is set to true whenever input is read from the survey file. Since there are sections in the master file that were not surveyed and thus have no matching records in the survey file, "IF OK" is used to request only the sections with condition survey data present, keeping only those sections for further processing. The second IF statement selects only the 1987 survey data. The complete output from this program appears in Table 4.3.

Example 3. Merge and Tabulate

This example will produce a table of mean crack spacing by coarse aggregate type, subbase treatment, and swelling soil content. A glance at Table 4.1 shows that the crack spacing file must be merged with the master file to supply the needed variables. Since crack spacing data are not available for every section, unmatched master sections must be excluded by an IF statement as in Example 2. The last line performs an analysis of variance (ANOVA), modeling crack spacing as a function of aggregate type, sub-base treatment, and soil characteristics, using the SAS procedure GLM:

```
DATA A;
MERGE SDS.MASTER SDS.CRACK87(IN=OK);
BY CFTR; IF OK; PROC TABULATE;
CLASS CAT SBT SOIL; VAR CRK;
TABLES CAT,SBT*SOIL*CRK*MEAN/RTS=12;
PROC GLM; CLASS CAT SBT SOIL;
MODEL CRK=CAT SBT SOIL;
```

Note that it is unnecessary to re-extract the data to perform a second analysis. The TABULATE procedure may be used to create tables of all sorts, and GLM will

TABLE 4.1. DATABASE CONTENTS

Item	Description	Files*	Item	Description	Files*
CFTR	Section ID Number	M,S,C,D,T	LEN	Length Surveyed (ft)	S
SECT	Subsection Surveyed	S,C,D	FROM	Survey Section Start (Text)	S
DIR	Direction Surveyed	S,C,D	TO	Survey Section End (Text)	S
COUNTY	County Name	M	ACP	Number of Asphalt Patches	S
HWY	Highway Designation	M	PCCP	Portland Cement Patches	S
CTRL	SDHPT Control Number	M	NCRK	Number of Cracks in Section	S
SEC	SDHPT Section Number	M	BF	Bonding Failures	S
JOB	SDHPT Construction Job Number	M	MPO	Minor Punch Outs	S
NJOB	SDHPT Subsequent Job Numbers	M	SPO	Severe Punch Outs	S
CDATE	Construction Date	M	NF	Number of Failures	S
OV1-OV4	Date of First Overlays	M	CRK	Individual Crack Spacing	C
MP1	Beginning Milepost	M	YR	Year of Observation	S,T
MP2	Ending Milepost	M	N	Number of Points Averaged	T
L	Section Lngth (Entire Section, Miles)	M	ADT	Average Daily Traffic	T
D	Pavement Thickness (in.)	M	PTRUCK	Percent Trucks	T
CAT	Coarse Aggregate Type: 1 = SRG,	M	ESAL2	Yearly ESAL, Both Directions	T
	2 = LS, 3 = 1&2, 4 = SLAG,		ATHWL	Avg 10 Heaviest Wheel Loads	T
	5 = 1&4 OR 2&4		PTAND	Percent Tandem Axles	T
SBT	Subbase Type: 1 = Asphalt Treated,	M	CD	Coefficient of Drainage	M
	2 = Cement Treated, 3 = Lime Treated,		CONF	Geophone Configuration (See Text)	D
	4 = Crushed Stone		SS	Sub-section (See Text)	D
SOIL	Y for Swelling Soil, N if Not	M	TDEV	Temperature Device (See Text)	D
TEMP	Yearly Temperature Range (°F)	M	STATION	Station within Sub-section	D
RAIN	Average Annual Rainfall	M	STEMP	Surface Temp (°F)	D
ADT	Average Daily Traffic (Estimated)	M	HEIGHT	FWD Drop Height	D
G	ADT Growth Rate (Estimated)	M	LBS	Load Intensity (lbs)	D
LANE	Number of Lanes (Each Direction)	M	DF1-DF7	Deflection at Each Geophone	D
ST	Surface Type (AC,C&G, etc)	M			
MAIN	Y if Main Lane, N if Shoulder or Acc.	M			
DATE	Date Surveyed	S			
LANES	Number of Lanes	S			
RATER	Rater Code	S			
DFP	Cut/Fill Position	S			
CURVE	Curve (Y or N)	S			
OVR	Overlaid (Y or N)	S,D			

implement various linear regression techniques. See the SAS User's Guide (Refs 21 and 22) for complete information. Table 4.4 shows the results of this example.

Example 4. Self-Documentation

A frequent problem for any computer user is finding current documentation. Often, a researcher finds himself in possession of the data file but not a description of its contents. What is in the file? What are the variable names, when was it created, by whom, and with what program? Since SAS stores all this information within the file itself, a one-line SAS program can provide all the answers:

```
PROC CONTENTS DATA=SDS._ALL_;
```

The output produced by this one statement includes all the information found in Table 4.1, lists the SAS programs that created each file, and gives the time, date, and account information associated with each member file of the CRCP data base. The output is not included here due to its size and because most of the information has been previously listed in the various figures and tables.

Example 5. SAS Graphics

The SAS language also includes a wide range of graphic capability. In this example, a bar chart is produced showing the three additive components of the Z score developed by Chou (Ref 9), for each section of a typical project, for every condition survey year. The results are shown in Fig 4.1, and the program follows:

```
DATA A; SET SDS.CONDSURV;
/*** Calculate minor & severe punchouts,
patches per mile ***/;
MPM=MPO*5280/LEN;
SPM=SPO*5280/LEN;
PPM=(ACP+PCCP)*5280/LEN;
/** Calculate contributions to Z score from each distress type **/;
```

```
Z=.3333-.007*LOG(MPM+1);
SUB='MP'; OUTPUT;
Z=.3333-.3978*LOG(SPM+1);SUB='SP';OUTPUT;
Z=.3333-.4165*LOG(PPM+1);SUB='PA';OUTPUT;
PROC SORT OUT=B; BY CFTR SECT SUB YR;
/**** Set titles and draw chart ****/;
TITLE1 J=C F=XSWISS
'Z-SCORE COMPONENTS';
TITLE2 J=C 'BY SURVEY YEAR';
PROC GCHART; BY CFTR;
FOOTNOTE J=C
'FIGURE 4.1. EXAMPLE 5 OUTPUT';
VBAR SECT/ GROUP=YR TYPE=SUM
SUMVAR=Z DISCRETE
SUBGROUP=SUB AXIS=-1.5 TO 1.5 BY .5
FRAME PATTERNID=SUBGROUP;
```

Example 6. Mapping with SAS

In addition to the usual array of x-y, contour, and three-dimensional plots, SAS contains a built-in database of world geography. Using a subset of Texas map data extracted by T. Tasicone for CTR Project 439, a map of mean Z scores (Ref 9) is shown for Texas SDHPT districts. Data file DMAP.TEXAS contains the Texas map and district outlines. The following short program produces the map shown in Fig 4.2:

```
GOPTIONS COLORS=(BL);
DATA A; SET SDS.CONDSURV;
IF YR=87; MI=5280/LEN;
MPM=MPO*MI;
SPM=SPO*MI; PPM=(ACP+PCCP)*MI;
Z=1-.007*LOG(MPM+1)
-.3978*LOG(SPM+1)
-.4165*LOG(PPM+1);
DIST=INT(CFTR/1000); KEEP Z DIST;
PROC MEANS; BY DIST;
OUTPUT OUT=B MEAN=ZM; VAR Z;
PROC GPROJECT
DATA=DMAP.TEXAS OUT=ALL;
ID DIST;
PROC GMAP ALL MAP=ALL DATA=B;
CHORO ZM; ID DIST;
```

The GOPTIONS statement can be omitted to produce a four-color map. Lines 2-5 calculate Z scores for each 1,000-foot section in the 1987 survey. The MEANS procedure is used to find the average Z score by district, and the last two statements draw the map.

Example 7. Using the Data Base from Other Languages

It should now be apparent that most applications can be easily programmed using the SAS language. When it becomes necessary to provide data from the database as input to an existing program written in another language, a simple PUT statement may be used to create a text file that can be read from Fortran or downloaded to a Macintosh, IBM PC, or other microcomputer. The following SAS program creates a file with the variables CFTR, SOIL, TEMP, and RAIN from sections with SRG or LS aggregate:

```
CMS FI OUT DISK PLAIN DATA A;
DATA A; SET SDS.MASTER; FILE OUT;
IF CAT=1 OR CAT=2 THEN PUT CFTR SOIL
TEMP RAIN; RUN;
```

SUMMARY

The examples given above are intended only as a sample of the many applications possible using the CRCP data base and the SAS language. Users wishing further information are referred to Refs 21 and 22.

TABLE 4.2. EXAMPLE 1 OUTPUT

OBS	COUNTY	CFTR	HWY	CTRL	SEC	JOB
1	Bexar	15021	IH410	521	6	1
2	Bexar	15022	IH410	25	2	40
3	Bexar	15025	US281	73	8	2
4	Bexar	15031	US281	73	8	4
5	Bexar	15032	US281	73	8	8
6	Bexar	15033	US281	73	8	22
7	Bexar	15034	US281	73	8	10
8	Bexar	15035	US281	73	8	9
9	Bexar	15036	US281	73	8	41
10	Bexar	15901	IH35	16	7	75
11	Bexar	15902	IH35	17	10	116
12	Bexar	15903	IH410	521	4	136
13	Bexar	15911	IH35	16	7	89
14	Bexar	15912	IH35	16	7	81
15	Bexar	15913	IH35	16	7	81
16	Bexar	15914	IH35	16	7	81
17	Bowie	19002	IH30	610	7	5
18	Bowie	19003	IH30	610	7	6
19	Bowie	19010	IH30	610	6	5
20	Bowie	19011	IH30	610	7	10
21	Bowie	19014	IH30	610	6	3
22	Bowie	19018	IH30	610	5	8
23	Bowie	19019	IH30	610	5	9
24	Brazos	17011	SH6	49	12	4
25	Carson	4005	IH40	275	2	12
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

TABLE 4.3. EXAMPLE 2 OUTPUT

District	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	36	9.3	36	9.3
2	58	14.9	94	24.2
3	30	7.7	124	32.0
4	30	7.7	154	39.7
5	14	3.6	168	43.3
9	15	3.9	183	47.2
13	50	12.9	233	60.1
15	9	2.3	242	62.4
17	25	6.4	267	68.8
18	59	15.2	326	84.0
19	24	6.2	350	90.2
20	11	2.8	361	93.0
24	27	7.0	388	100.0

Cut/Fill Position

CFP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
C	113	30.1	113	30.1
F	113	30.1	226	60.1
G	110	29.3	336	89.4
T	40	10.6	376	100.0

TABLE 4.4. EXAMPLE 3 OUTPUT

	Subbase Treatment							
	1		2		3		4	
	Swelling (High or Low)		Swelling (High or Low)		Swelling (High or Low)		Swelling (High or Low)	
Coarse Aggregate Type	H CRK MEAN	L CRK MEAN	H CRK MEAN	L CRK MEAN	H CRK MEAN	L CRK MEAN	H CRK MEAN	L CRK MEAN
1	4.27	2.96	3.66	3.18	2.55	2.68	—	3.07
2	5.69	5.99	5.25	6.11	4.94	5.37	5.12	7.02
3	—	—	—	—	—	5.55	—	—

General Linear Models Procedure
Dependent Variable: CRK

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R–Square	C.V.
Model	15	21031.61657852	1402.10777190	157.96	0.0001	0.176145	67.0586
Error	11082	98367.69143677	8.87634826		Root MSE		CRK Mean
Corrected Total	11097	119399.30801529			2.97932010		4.44286319

Source	DF	Type I SS	F Value	PR > F	DF	Type III SS	F Value	PR > F
CAT	2	18771.76236077	1057.40	0.0001	2	9386.4922166	528.74	0.0001
SBT	3	652.65659270	24.51	0.0001	3	671.33750805	25.21	0.0001
CAT*SBT	3	45.88521457	1.72	0.1599	3	170.19740828	6.39	0.0003
SOIL	1	10.92185386	1.23	0.2673	1	123.92325130	13.96	0.0002
CAT*SOIL	1	916.16866538	103.21	0.0001	1	480.00126663	54.08	0.0001
SBT*SOIL	3	535.37675246	20.10	0.0001	3	568.18441743	21.34	0.0001
CAT*SBT*SOIL	2	98.84513879	5.57	0.0038	2	98.84513879	5.57	0.0038

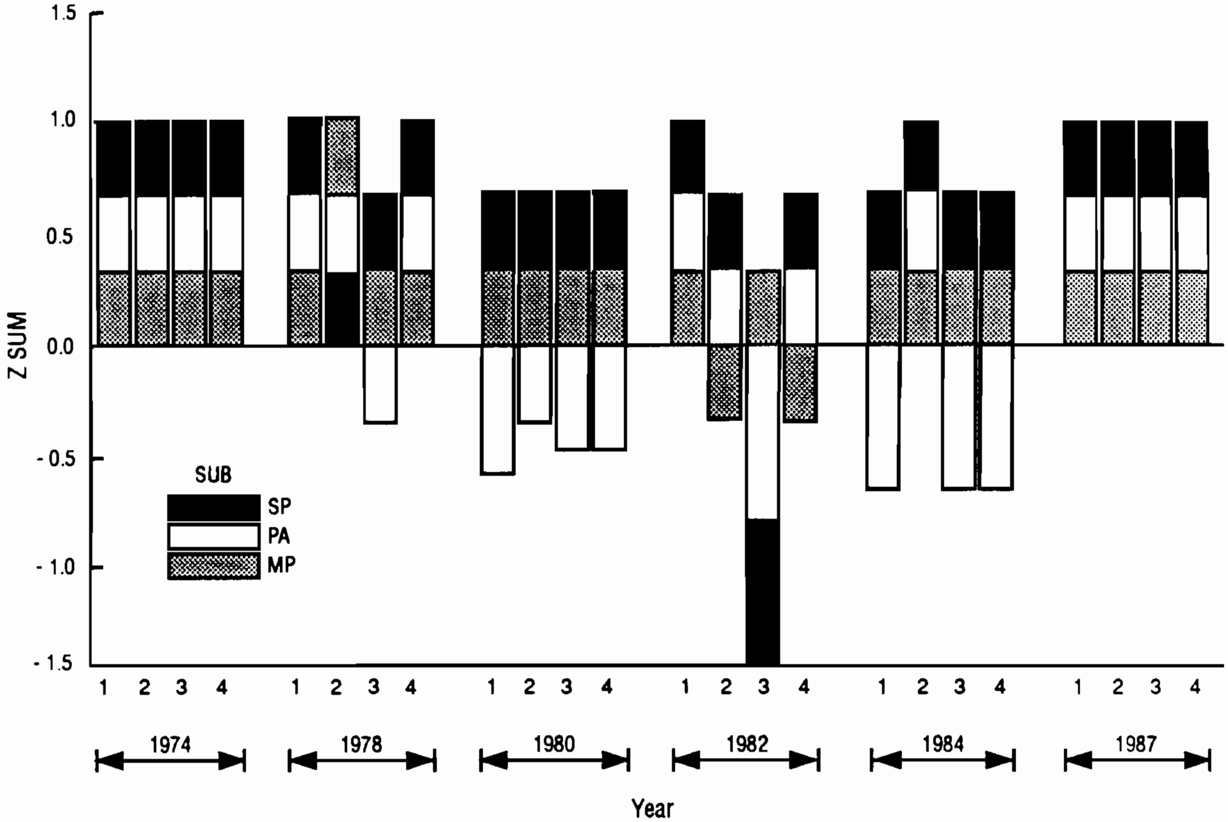


Fig 4.1. Example 5 output.

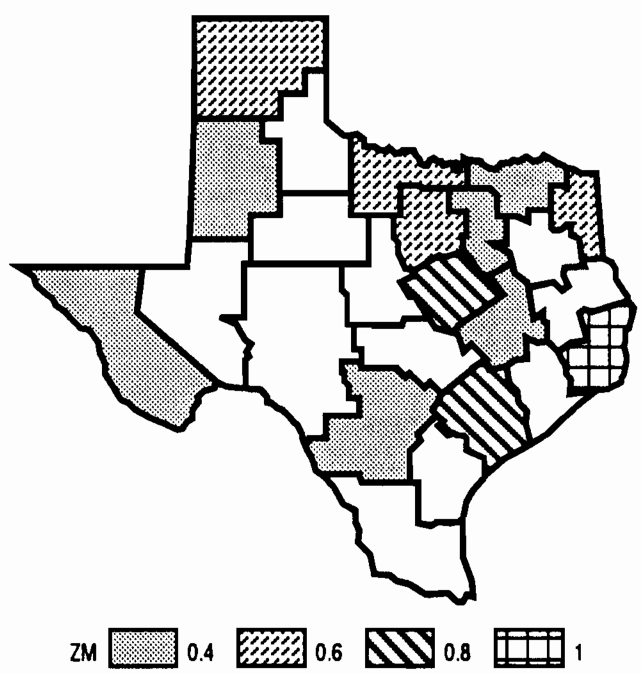


Fig 4.2. Mean Z score by district.

REFERENCES

1. Haas, R. C., and W. R. Hudson, *Pavement Management Systems*, McGraw-Hill Book Co., New York, 1978.

2. Dossey, T., "Condition Survey Data Base," Tech Memo 472-23, Center for Transportation Research, The University of Texas at Austin, February 25, 1989.

3. Weissmann, A. J., and T. Dossey, "Comprehensive User-Directed Description of the Statewide CRCP Condition Survey Data Base," Tech Memo 472-30, Center for Transportation Research, The University of Texas at Austin, September 1988.

4. Weissmann, A. J., "Storage System and Nature of the 1988 Survey Data," Tech Memo 472-32, Center for Transportation Research, The University of Texas at Austin, November 1988.

5. Weissmann, A. J., "Diagnostic Data Definitive Address of the Data Sets," Tech Memo 472-34, Center for Transportation Research, The University of Texas at Austin, December 1988.

6. Strauss, P. J., and B. Frank McCullough, "A Performance Survey of Coninuously Reinforced Concrete Pavements in Texas," Research Report 21-1F, Center for Transportation Research, The University of Texas at Austin, November 1974.

7. Taute, A., and B. Frank McCullough, "Manual for Condition Survey of Continuously Reinforced Concrete Pavements," Research Report 177-19, Center for Transportation Research, The University of Texas at Austin, February 1981.

8. Guiterrez de Velasco, M., and B. Frank McCullough, "Rigid Pavement Network Rehabilitation Scheduling Using Distress Quantities," Research Report 249-5, Center for Transportation Research, The University of Texas at Austin, August 1983.

9. Chou, Chia-pei, B. Frank McCullough, W. R. Hudson, and C. L. Saraf, "Development of a Long-Term Monitoring System for Texas CRC Pavement Network," Research Report 472-2, Center for Transportation Research, The University of Texas at Austin, October 1988.

10. Gutierrez de Velasco, M., "Collection and Preparation of Condition Survey Data for Analysis," Tech Memo 249-36, Center for Transportation Research, The University of Texas at Austin, October 1981.

11. Torres-Verdin, V., B. Frank McCullough, and C. Saraf, "Evaluation of the Effect of Survey Speed on Network Level Collection of Rigid Pavement Distress Data," Research Report 388-2, Center for Transportation Research, The University of Texas at Austin, May 1985.

12. Saraf, C., W. R. Hudson, and B. Frank McCullough, "Condition Survey and Pavement Evaluation of Existing and Overlaid Rigid Pavements," Research Report 388-5F, Center for Transportation Research, The University of Texas at Austin, November 1985.

13. Weissmann, A. J., et al, "Development of Procedures for a CRCP Diagnostic Survey," Research Report 472-3, Center for Transportation Research, The University of Texas at Austin, 1989.

14. Weissmann, A. J., et al, "A Statewide Diagnostic Survey of Continuously Reinforced Concrete Pavements in Texas," Research Report 472-5, Center for Transportation Research, The University of Texas at Austin, 1989.

15. Hankins, K., "Data Collection on CRCP Sections - Statewide Summer 1988," Tech Memo 472-31, Center for Transportation Research, The University of Texas at Austin, August 31, 1988.

16. *AASHTO Guide for Pavement Structures*, Vol 1, 1986.

17. Shyam, V., "Development of Drainage Parameters for the State of Texas," Master's Thesis, The University of Texas at Austin, 1989.

18. Shyam, V., "Procedure to Obtain Traffic Data from the Highway Department," Tech Memo 1169-6, Center for Transportation Research, The University of Texas at Austin, May 1988.

19. Dossey, T., "Estimation of ESAL from Available Traffic Data," Tech Memo 472-35, Center for Transportation Research, The University of Texas at Austin, May 1988.

20. Weissmann, A., "Sources of Data for the Performance Prediction Model," Tech Memo 472-36, Center for Transportation Research, The University of Texas at Austin, January 1989.

21. SAS Institute, Inc., *SAS User's Guide: Basics, Version 5 Edition*, Cary, NC: SAS Institute, Inc., 1985, pp 1290.

22. SAS Institute, Inc., *SAS User's Guide: Basics, Version 5 Edition*, Cary, NC: SAS Institute, Inc., 1985, pp 956.

APPENDIX A. SURVEY FORMS

District	Control	Section	Highway	County	Leave Blank	Date Month - Day

Leave Blank	Location From	To	Raters

Mile Post	Mile Point	Transverse Cracks (%) M				Transverse Cracks (%) S				Localized Cracks (%) M				Localized Cracks (%) S			
		1-5	6-20	20-50	50-100	1-5	6-20	20-50	50-100	1-5	6-20	20-50	50-100	1-5	6-20	20-50	50-100

Spalling (%) M				Spalling (%) S				Pumping (%) M				Pumping (%) S			
1-5	6-20	20-50	50-100	1-5	6-20	20-50	50-100	1-5	6-20	20-50	50-100	1-5	6-20	20-50	50-100

Punch Outs (ft) M				Punch Outs (ft) S				Repair Patches (sq ft) AC				Repair Patches (sq ft) PCC			
1 - 3	4 - 9	10 - 19	> 20	1 - 3	4 - 9	10 - 20	> 20	1 - 15	16 - 120	121 - 240	> 241	1 - 15	16 - 120	121 - 240	> 241

5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

M = Minor S = Severe AC = Asphalt PCC = Portland Cement

Condition of Shoulder ______

General Comments ______

Fig A.1. 1974 survey form.

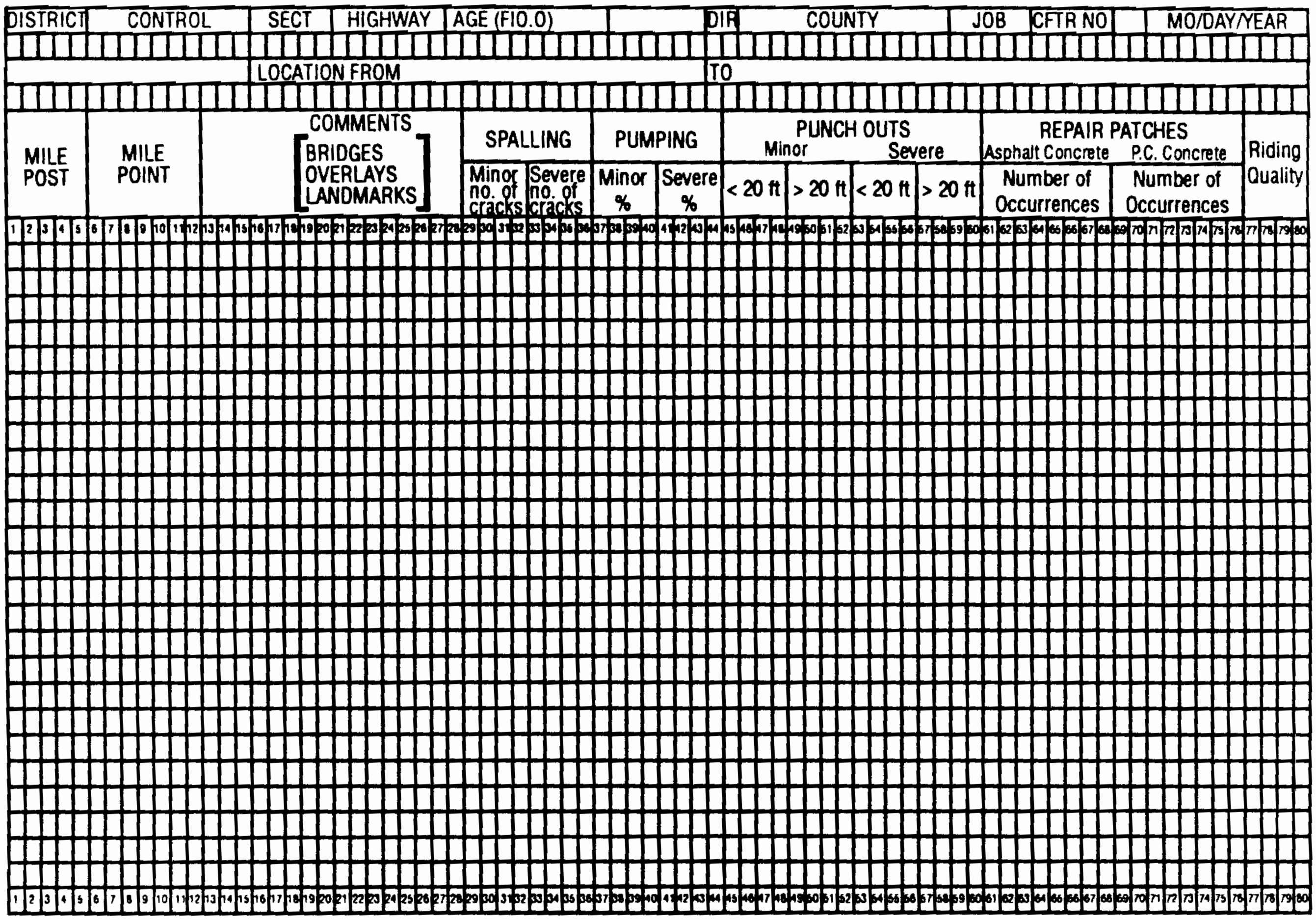


Fig A.2. 1978 survey form.

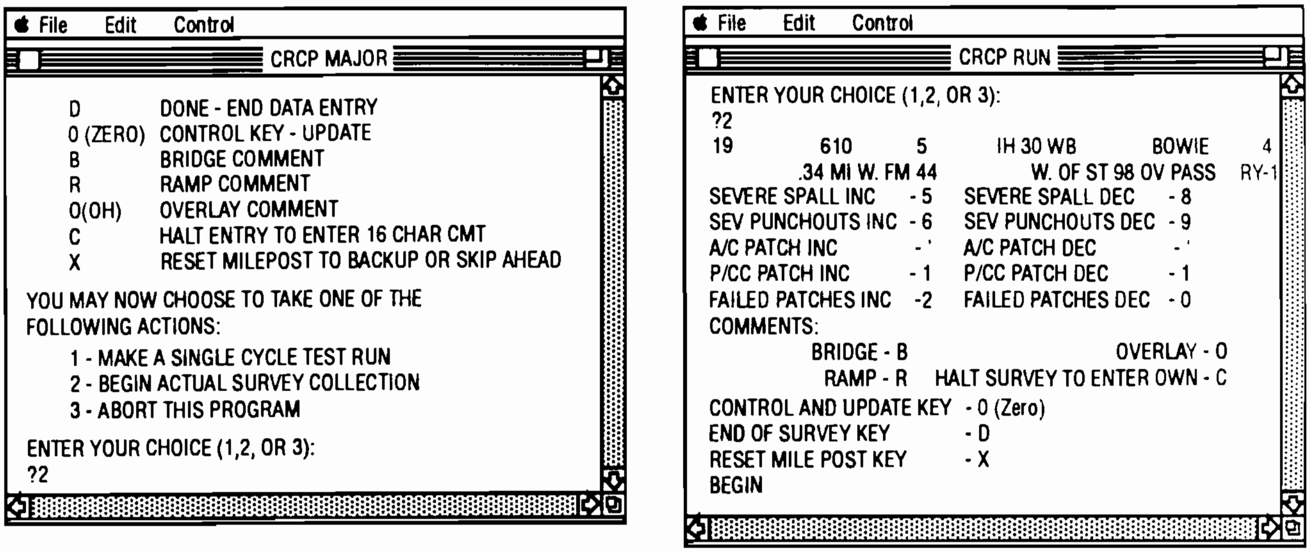


Fig A.3. Typical screens from the 1984 survey.

District	Control - Section - Job	Highway	CFTR No.	Dir	County	Date Mo/Day/Yr
	– –					/ /

Location From	To	No. of Lane	Raters

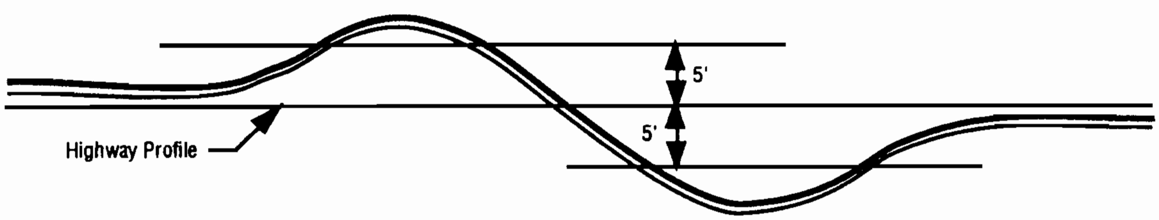


Fig A.4. Identification form for 1987 condition survey for both non-overlaid and overlaid sections.

CFTR No.	Dir
-	

CRCP PERFORMANCE SURVEY (Non-Overlaid)

Milepost	Start Point (ft)	Punchout (ft)		Repair Patches AC (ft^2)			PCC			Transverse Cracks	
		M	S	1 - 50	51 - 150	> 150	1 - 50	51 - 150	> 150	No. of Cracks	Crack Spacing (Accumulative Distance from the Starting Point to each Crack) for the First 200 ft Only
•	0 • 0										
•	200 • 0										
•	400 • 0										
•	600 • 0										
•	800 • 0										

M - Minor AC - Asphalt Concrete
S - Severe PCC - Portland Cement Concrete

Condition of Shoulder____________________

General Comments____________________

Fig A.5. 1987 survey form for non-overlaid pavements.

CFTR No.	Dir.
-	

CRCP PERFORMANCE SURVEY (Overlaid)

Milepost	Start Point (ft)	Bond Failures (Y or N)	Failures (No.)	Patches AC (ft^2)			PCC			Reflected Cracks (Transverse)	
				1 - 50	51 - 150	>150	1 - 50	51 - 150	>150	No. of Cracks	Crack Spacing (Accumulative Distance from the Starting Point to each Crack) for the First 200 ft Only
•	0 • 0										
•	200 • 0										
•	400 • 0										
•	600 • 0										
•	800 • 0										

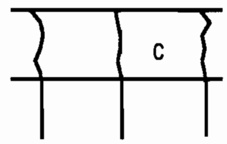
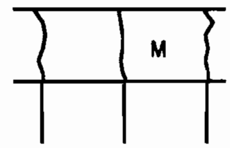
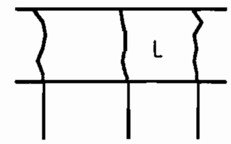
M - Minor AC - Asphalt Concrete
S - Severe PCC - Portland Cement Concrete

Condition of Shoulder ____________________

General Comments ____________________

Fig A.6. 1987 survey form for overlaid pavements.

Instructions for Filling Out the Crack Width Form	Date	Test Section Identification			
	Mo/Day/88	Hwy	CFTR Number	Test Section#	Bound

Crack	Closely Spaced	Medium Spaced	Widely Spaced
Crack Spacing			
Microscope Readings			

Special Situations

Tick if Applicable

Closely Spaced	Medium Spaced	Widely Spaced
☐ Spacing Smaller Than Expected	☐ Spacing Smaller Than Expected	☐ Spacing Smaller Than Expected
☐ Spalled or Stepped Crack	☐ Spalled or Stepped Crack	☐ Spalled or Stepped Crack
☐ Unable to Find - Big Patch	☐ Unable to Find - Big Patch	☐ Unable to Find - Big Patch

☐ Overlay / Seal Coat ☐ Sealed Cracks

☐ Crack Spacing Approximately Constant

☐ Test Section Marks Were Not Visible

Other (Please Describe)

Fig A.7. Crack width form.

APPENDIX B. DATA BASE CREATION PROGRAMS

TABLE B.1. MASTER FILE CREATION PROGRAM

```
/***************************************************************************
*                                                                          *
* CREATEM.SAS                                                              *
*                                                                          *
* READ PAVEMENT DATA BASE MASTER FILE AND CREATE SAS DATA SET              *
*                                                                          *
*     10/28/87  T. DOSSEY  ORIGINAL VERSION                                *
*      1/05/89  T. DOSSEY  MODIFIED TO CALCULATE DRAINAGE                  *
*                                                                          *
***************************************************************************/
OPTIONS REPLACE;
CMS FI IN DISK MASTER DATA C;
CMS FI SDS DISK DUMMY DUMMY C;
DATA TEST; INFILE IN;
LENGTH COUNTY $ 9 NJOB $ 16 CFTR 3 CTRL 3 SEC 3 L 3 D 3 CAT 3
     SBT 3 SOIL $ 1 TEMP 4 RAIN 4 CDATE 4 OV1-OV4 4 MP1-MP2 4
     ADT85 4 G 4 LANE $ 6 ST $ 2 MAIN $ 1 CD 4;
INPUT HWY $ CFTR COUNTY $ CTRL SEC JOB $ NJOB $ L D CAT SBT SOIL $
    TEMP RAIN CDATE OV1-OV4 MP1 MP2 ADT85 G LANE $ ST $ MAIN $;
LABEL CFTR=CFTR SECTION ID;
LABEL HWY=HIGHWAY DESIGNATION;
LABEL COUNTY=COUNTY NAME;
LABEL CTRL=SDHPT CONTROL NUMBER;
LABEL SEC=SDHPT SECTION NUMBER;
LABEL JOB=CONSTRUCTION JOB NUMBER;
LABEL NJOB=SUBSEQUENT JOB NUMBERS;
LABEL L=SECTION LENGTH;
LABEL D=PAVEMENT THICKNESS;
LABEL CAT=COARSE AGGREGATE TYPE;
LABEL SBT=SUBBASE TREATMENT;
LABEL SOIL=SWELLING (HIGH OR LOW);
LABEL TEMP=SEASONAL TEMPERATURE CHANGE;
LABEL RAIN=AVERAGE RAINFALL;
LABEL CDATE=DATE OF CONSTRUCTION;
LABEL OV1=DATE OF FIRST OVERLAY;
LABEL OV2=DATE OF 2ND OVERLAY;
LABEL OV3=DATE OF 3RD OVERLAY;
LABEL OV4=DATE OF 4TH OVERLAY;
LABEL MP1=BEGINNING MILEPOST;
LABEL MP2=ENDING MILEPOST;
LABEL ADT85=1985 AVERAGE DAILY TRAFFIC;
LABEL G=TRAFFIC ANNUAL GROWTH RATE;
LABEL LANE=NUMBER OF LANES IN EACH DIRECTION;
LABEL ST=SHOULDER TYPE;
LABEL MAIN=MAIN LANE(YES OR NO);
LABEL CD=COEFFICIENT OF DRAINAGE;
```

(continued)

TABLE B.1. (CONTINUED)

```
/***** CALCULATE DRAINAGE COEFFICIENTS GIVEN BY V. SHYAM *****/
S=1.806; IF SBT=2 THEN S=1.893; IF SBT=3 THEN S=1.707;
CD=S-.0149*RAIN; DROP S;
/**********   AT PRESENT, KEEP ONLY MAIN LANES      *************/
IF MAIN='Y';
PROC SORT DATA=TEST OUT=SDS.MASTER; BY CFTR; RUN;
PROC PRINT; VAR CFTR COUNTY HWY CTRL SEC JOB NJOB CDATE OV1-OV4
        MP1 MP2 L D CAT SBT SOIL CD TEMP RAIN ADT85 G LANE ST MAIN;
PROC CONTENTS DATA=SDS.MASTER; RUN;
PROC FREQ; TABLES HWY; RUN;
```

TABLE B.2. SURVEY FILE CREATION PROGRAM

```
/******************************************************************************
*                                                                             *
*  PROGRAM CREATEC / PROJECT 472 / T. DOSSEY / 10/21/1987                    *
*                                                                             *
*     THIS PROGRAM READS IN THE 1987 CONDITION SURVEY DATA                    *
*     AND CREATES THE SURVEY DATABASE FOR PROJECT 472.                        *
*                                                                             *
******************************************************************************/
OPTIONS REPLACE;
CMS FI COND DISK COND87 DATA C;
CMS FI SDS DISK DUMMY DUMMY C;
DATA TEMP; INFILE COND;
INPUT CFTR 1-5 SECT 6 DIR $ 7 DATE $ 8-13 LANES 14 RATER 15 CFP $ 16
    CURVE $ 17 OVR $ 18 LEN 19;
/****** LABEL VARIABLES FROM COND. SVY. FILE *******/
LABEL CFTR=CFTR ID NUMBER;
LABEL SECT=SURVEY SECTION NUMBER;
LABEL DATE=DATE SURVEYED;
LABEL LANES=NUMBER OF LANES;
LABEL RATER=RATER NO.;
LABEL CFP=CUT/FILL POSITION;
LABEL OVR=OVERLAID?;
LABEL LEN=SECTION LENGTH (FT);
/****** ADJUST FOR DATA ENTRY CONVENIENCES ******/
IF LEN=. THEN LEN=10; LEN=LEN*100;
IF OVR=' ' THEN OVR='N';
IF CURVE='C' THEN CURVE='Y'; ELSE CURVE='N';
/****** INPUT LOCATION INFORMATION ******/
INPUT FROM $ 1-25; INPUT TO $ 1-25;
/****** DEFINE NEW TOTAL VARIABLES *****/
ACP=0;PCCP=0;NCRK=0;BF=0;NF=0;MPO=0;SPO=0;
LABEL ACP=ASPHALT PATCHES;
LABEL PCCP=CEMENT PATCHES;
LABEL NCRK=NUMBER OF CRACKS;
LABEL BF=BONDING FAILURE? (OVERLAY ONLY);
LABEL NF=NUMBER OF BOND FAILURES (OVERLAY ONLY);
LABEL MPO=MINOR PUNCH OUTS (NON-OVERLAID ONLY);
LABEL SPO=SEVERE PUNCH OUTS (NON-OVERLAID ONLY);
/******* TOTAL DISTRESS ACROSS EACH 200 FT. SECTION *****/
   DO I=1 TO 5;
      INPUT X1-X9;
      BF=BF+X1;
      NF=NF+X2;
      MPO=MPO+X1;
      SPO=SPO+X2;
      ACP=ACP+X3+X4+X5;
      PCCP=PCCP+X6+X7+X8;
      NCRK=NCRK+X9;
   END;
```

(continued)

TABLE B.2. (CONTINUED)

```
/***** X1 & X2 ARE BF AND NF, OR MPO AND SPO, DEPENDING IF OVERLAID ****/
IF (OVR='Y') THEN DO; SPO=.; MPO=.; END;
   ELSE DO; BF=.; NF=.; END;
DROP X1-X9 I;
/********** SORT THE FILE BY CFTR, DIRECTION, AND SECTION ********/
PROC SORT DATA=TEMP OUT=SDS.COND87; BY CFTR DIR SEC; RUN;
/********** PRINT THE ENTIRE FILE AND SHOW THE DATASET STRUCTURE */
PROC PRINT; RUN;
PROC CONTENTS; RUN;
```

TABLE B.3. CRACK SPACING FILE CREATION PROGRAMS

```
C*****************************************************************************
C* P472READ.FORTRAN                                                          *
C*  9/22/87 T.DOSSEY - THIS PROGRAM READS PROJECT 472 CRACK SPACING          *
C*     DATA AS ENTERED ON PC (ENTRY FORMAT) AND CONVERTS TO SAS INPUT        *
C*     FORMAT WHILE CHECKING FOR SOME ENTRY ERRORS                           *
C*****************************************************************************
      DIMENSION CR(200)
      CHARACTER*1 DIR,POS
      CHARACTER*6 DATE
      WRITE(6,610)
  610 FORMAT('***** CONVERSION BEGINS *****')
    1 READ(1,100,END=99)ID,ID2,DIR,DATE,POS,N
  100 FORMAT(I5,I1,A1,A6,A1,I3)
      WRITE(6,628)ID,ID2,DIR,DATE,POS,N
  628 FORMAT(I5,'-',I1,A1,' ',A6,' ',A1,I5)
C***** CHECK FOR 0 OR 1 CRACKS (N) *****
      IF(N.GE.2)GO TO 2
      READ(1,100)
      GO TO 1
C***** CRACKS PRESENT, READ AND CALCULATE INTER-CRACK DISTANCES *****
    2 READ(1,*)(CR(I),I=1,N)
      DO 10 I=2,N
      X=CR(I)/10.
      Y=CR(I-1)/10.
C*****  CHECK FOR PATCH (NEG. NUMBER ) *****
      IF(X.GE.0..AND.Y.GE.0.)GO TO 3
      WRITE(6,631)X,Y
  631 FORMAT('*** WARNING *** - PATCH SKIPPED',2F8.1)
      GO TO 10
    3 C=X-Y
      IF(C.LE.0.)WRITE(6,620)ID,ID2,DIR,X,Y
  620 FORMAT('*** ERROR ***  NEGATIVE CRACK DISTANCE FOUND'/'ID=',I5,
     +      '-',I1,A1,2F8.1)
      WRITE(2,200)ID,ID2,DIR,C
  200 FORMAT(I5,I1,A1,F5.1)
   10 CONTINUE
      GO TO 1
   99 STOP
      END

/***********************************************************************
*                                                                      *
* CREATECR.SAS  T. DOSSEY  10/87  USE AFTER P472READ.FORTRAN           *
*                                                                      *
***********************************************************************/
OPTIONS REPLACE;
CMS FI IN DISK CRACK87 SDATA C;
CMS FI SDS DISK DUMMY DUMMY C;
DATA TEST;LENGTH CFTR 3 SECT 2 DIR $ 1 CRK 4;
INFILE IN; INPUT CFTR 1-5 SECT 6 DIR $ 7 CRK 8-12; RUN;
PROC SORT DATA=TEST OUT=SDS.CRACK87; BY CFTR DIR SECT; RUN;
PROC CONTENTS DATA=SDS.CRACK87; RUN;
PROC MEANS DATA=SDS.CRACK87; VAR CRK; BY CFTR ; RUN;
```

TABLE B.4. TRAFFIC FILE CREATION PROGRAM

```
/*****************************************************************************
* CREATET.SAS   T. DOSSEY  12/1/88                                           *
*                                                                            *
* READS SDHPT TRAFFIC INFO COLLECTED BY V. SHYAM FOR PROJECT 1169            *
* INTO SAS DATABASE, THEN AVERAGES BY CFTR SECTION TO MATCH CTR              *
* RIGID PAVEMENT DATABASE KEY.                                               *
*                                                                            *
*****************************************************************************/
OPTIONS REPLACE;
CMS FI IN DISK TRAFB DATA C; /* TRAFFIC INFORMATION */
/********** READ IN KEYPUNCHED TRAFFIC INFO ************/
DATA INFO; INFILE IN; INPUT CFTR SECT YR X1-X5; RUN;
/********** AVERAGE EACH YEAR BY CFTR ******************/
PROC SORT DATA=INFO; BY CFTR YR; RUN;
PROC MEANS NOPRINT; BY CFTR YR; VAR X1-X5;
OUTPUT OUT=TEMP N=N MEAN=ADT PTRUCK ESAL2 ATHWL PTAND; RUN;
/********** RENAME AND LABEL THE VARIABLES ************/
DATA SDS.TRAFFIC;
LENGTH N 2 CFTR 3 YR 2 ADT 4 PTRUCK 2 ESAL2 4 ATHWL 4 PTAND 2;
SET TEMP;
LABEL N='NUMBER OF TRAFFIC SECTIONS AVERAGED';
LABEL CFTR='SECTION ID';
LABEL YR='OBSERVATION YEAR';
LABEL ADT='AVERAGE DAILY TRAFFIC';
LABEL PTRUCK='PERCENT TRUCKS';
LABEL ESAL2='TWO DIRECTION ESAL';
LABEL ATHWL='AVG. OF 10 HEAVIEST WHEEL LOADS (LBS)';
LABEL PTAND='PERCENT TANDEMS IN ATHWL';
RUN;
PROC CONTENTS DATA=SDS.TRAFFIC; RUN;
PROC MEANS  DATA=SDS.TRAFFIC; RUN;
PROC TABULATE DATA=SDS.TRAFFIC; VAR N; CLASS CFTR YR;
TABLES CFTR,YR*N*MEAN/RTS=12; RUN;
OPTIONS OBS=200; PROC PRINT; RUN;
```

APPENDIX C. PARTIAL FILE LISTINGS

TABLE C.1. MASTER FILE

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1	OV2	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
1	1001	Hopkins	IH30	10	2	23	(50)	128.4	134.4	1964.00	86.67	.	.	.		AC	Y	6.0	8	2	2	H	43	30.7	16000	3.53	1.44
2	1002	Hopkins	IH30	610	1	3	()	134.6	136.2	1964.42	.	.	.	.		AC	Y	1.6	8	2	2	H	43	30.7	13700	.	1.44
3	1003	Hopkins	IH30	610	1	4	(13)	136.2	142.4	1965.00	86.67	.	.	.		AC	Y	6.2	8	2	2	H	43	30.7	12600	3.53	1.44
4	1004	Franklin	IH30	610	2	4	(23)	142.4	148.0	1965.99	85.25	.	.	.		AC	Y	5.6	8	2	2	H	44	30.0	13400	3.53	1.45
5	1005	Franklin	IH30	610	2	4	(23)	148.0	153.0	1965.00	85.25	.	.	.			Y	5.0	8	2	2	L	44	30.0	13200	3.53	1.45
6	1008	Grayson	US75	47	13	5	(11)	22.1	30.9	1967.67	87.58	.	.	.		AC	Y	8.8	8	2	4	L	36	30.0	16000	5.15	1.36
7	1011	Grayson	US75	47	13	5	(11)	30.9	31.3	1969.83	87.58	.	.	.		AC	Y	0.4	8	2	4	L	36	30.0	2800	.	1.36
8	1012	Lamar	US271	136	7	30	()	11.0	12.8	1971.42	.	.	.	.		AC	Y	1.8	8	1	3	H	44	30.2	8300	1.42	1.26
9	1013	Lamar	US271	136	8	23	()	0.0	10.0	1971.00	.	.	.	.			Y	10.0	8	1	3	H	44	30.2	7200	1.42	1.26
10	1015	Grayson	US82	45	19	4	()	18.0	21.2	1975.00	.	.	.	.			Y	3.2	8	2	3	L	36	30.0	10700	1.42	1.26
11	2002	Parker	IH30	8	3	18	(48)	414.4	422.8	1949.50	78.83	.	.	.	1	AC	Y	11.7	8	3	3	L	32	33.0	35000	6.12	1.22
12	2012	Tarrant	IH30	1068	1	22	(67/86)	.	.	1960.25	71.58	74.83	.	.	2	C&	Y	0.3	8	3	3	L	32	33.0	.	.	1.22
13	2018	Tarrant	IH820	8	13	6	(128)	.	.	1963.33	87.33	.	.	.	2	AC	Y	2.3	8	3	4	H	32	33.0	.	.	1.31
14	2019	Tarrant	US287	172	6	7	()	.	.	1963.58	.	.	.	.	3	AC	Y	1.8	8	3	3	L	32	33.0	.	.	1.22
15	2020	Tarrant	IH820	8	13	7	(128)	.	.	1963.75	87.33	.	.	.	2	AC	Y	3.4	8	3	4	H	32	33.0	.	.	1.31
16	2021	Tarrant	IH820	8	13	9	(128)	.	.	1963.75	87.33	.	.	.	2-3	AC	Y	4.6	8	2	4	H	32	33.0	.	.	1.31
17	2022	Tarrant	IH30	1068	1	36	()	.	.	1964.08	.	.	.	.	1.5	AC	Y	1.2	8	2	3	L	32	33.0	.	.	1.22
18	2023	Tarrant	SH121	363	3	4	(29)	.	.	1964.17	85.92	.	.	.	4	AC	Y	0.8	8	2	3	L	32	33.0	.	.	1.22
19	2024	Tarrant	US287	172	6	12	()	.	.	1964.58	.	.	.	.	3	AC	Y	0.9	8	3	3	L	32	33.0	.	.	1.22
20	2026	Tarrant	IH820	8	13	13	(77)	.	.	1965.58	75.17	78.58	.	.		AC	Y	2.1	8	3	4	H	32	33.0	.	.	1.31
21	2027	Tarrant	IH820	8	14	2	(61)	.	.	1965.58	75.17	.	.	.	1	AC	Y	1.9	8	3	4	H	32	33.0	.	.	1.31
22	2028	Johnson	IH35W	14	3	19	()	28.2	37.4	1965.92	.	.	.	.	1	AC	Y	8.9	8	2	4	H	32	33.0	17200	1.11	1.31
23	2029	Tarrant	US287	172	6	18	()	.	.	1966.17	.	.	.	.	1.5	AC	Y	0.5	8	3	4	L	32	33.0	.	.	1.31
24	2030	Tarrant	IH35W	14	16	57	()	.	.	1966.33	.	.	.	.	2	AC	Y	2.8	8	2	4	L	32	33.0	.	.	1.31
25	2031	Tarrant	IH820	8	14	3	(62)	16.8	20.6	1966.67	86.58	.	.	.	1	AC	Y	3.4	8	1	3	L	32	33.0	63000	11.55	1.22
26	2032	Tarrant	IH30	1068	1	46	(114)	422.8	431.7	1967.08	81.99	.	.	.	2	AC	Y	4.8	8	2	4	L	32	33.0	33000	6.12	1.31
27	2033	Tarrant	IH35W	14	16	65	()	.	.	1967.25	.	.	.	.	2	AC	Y	3.6	8	2	4	L	32	33.0	.	.	1.31
28	2034	Tarrant	IH35W	81	12	1	()	.	.	1967.25	.	.	.	.	2	AC	Y	0.5	8	2	4	L	32	33.0	.	.	1.31
29	2035	Tarrant	SH121	364	1	7	(59)	.	.	1967.50	86.92	.	.	.	3	AC	Y	0.6	8	2	1	L	32	33.0	.	.	1.31
30	2036	Tarrant	SH121	364	1	12	(59)	11.5	14.1	1970.83	86.92	.	.	.	3	AC	Y	2.4	8	2	1	L	32	33.0	110000	1.11	1.31
31	2038	Tarrant	SH121	363	3	9	(29)	.	.	1967.67	85.92	.	.	.	3	AC	Y	1.8	8	3	1	L	32	33.0	.	.	1.31
32	2039	Tarrant	IH35W	81	12	2	()	.	.	1967.67	.	.	.	.	2	AC	Y	6.9	8	2	1	L	32	33.0	.	.	1.31
33	2040	Tarrant	SH121	363	3	11	(29)	.	.	1968.50	85.92	.	.	.	3	AC	Y	2.8	8	2	1	L	32	33.0	.	.	1.31
34	2041	Tarrant	US287	172	6	26	()	22.4	25.2	1970.25	.	.	.	.		AC	Y	1.5	8	2	1	H	32	33.0	43000	1.11	1.31
35	2043	Tarrant	SH121	364	1	13	(59)	.	.	1972.08	86.92	.	.	.	3	AC	Y	1.6	8	2	1	L	32	33.0	.	.	1.31
36	2044	Wise	US287	13	8	44	(64)	19.7	30.0	1969.25	80.75	.	.	.	2	AC	Y	10.3	8	2	1	L	30	28.6	16100	5.15	1.38
37	2045	Tarrant	IH820	8	14	11	()	.	.	1969.99	.	.	.	.	2	AC	Y	1.3	8	2	1	L	32	33.0	.	.	1.31
38	2046	Tarrant	SH121	363	3	12	(29)	20.8	23.6	1970.25	85.92	.	.	.	3	AC	Y	2.8	8	1	1	L	32	33.0	75000	1.11	1.31
39	2047	Parker	IH20	314	1	32	()	.	.	1970.42	.	.	.	.		AC	Y	0.5	8	2	1	L	30	29.9	.	.	1.36
40	2048	Parker	IH20	314	7	5	()	.	.	1970.42	.	.	.	.		AC	Y	11.6	8	2	1	L	30	29.9	.	.	1.36
41	2049	Tarrant	US287	14	15	2	()	0.0	7.2	1971.42	.	.	.	.	1	AC	Y	7.2	8	2	1	L	32	33.0	15400	11.55	1.31
42	2050	Tarrant	US287	14	16	87	()	7.2	9.6	1971.42	.	.	.	.	1	AC	Y	2.4	8	2	1	L	32	33.0	16000	11.50	1.31
43	2051	Parker	IH20	314	2	6	()	389.0	390.2	1971.42	.	.	.	.			Y	1.2	8	2	2	L	29	32.1	13700	3.69	1.41
44	2052	Parker	IH20	314	1	33	()	390.4	402.2	1971.50	.	.	.	.			Y	11.0	8	2	1	L	30	29.9	15000	3.69	1.36
45	2053	Wise	US287	13	8	51	(78)	.	.	1971.83	77.83	87.50	.	.	1	AC	Y	3.0	8	2	1	L	30	28.6	.	.	1.38
46	2054	PaloPinto	IH20	314	2	20	()	.	.	1972.08	.	.	.	.		AC	Y	7.9	8	2	1	L	29	32.1	.	.	1.33
47	2056	Tarrant	IH20	2374	5	2	()	.	.	1972.17	.	.	.	.	3	AC	Y	0.4	8	2	1	H	32	33.0	.	.	1.31
48	2058	PaloPinto	IH20	314	3	17	()	370.0	380.0	1972.33	.	.	.	.		AC	Y	10.0	8	2	1	L	29	32.1	12900	3.69	1.33
49	2059	Erath	IH20	314	4	15	()	363.6	369.4	1972.33	.	.	.	.	2	AC	Y	5.8	8	2	1	L	29	32.1	12900	3.69	1.33
50	2060	Tarrant	IH20	2374	5	3	()	444.2	446.0	1973.25	.	.	.	.	4	AC	Y	1.8	8	2	1	H	32	33.0	72500	15.80	1.31

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1
51	2063	Tarrant	SH114	353	3	27	( )	.	.	1973.83	.
52	2066	Tarrant	SH360	2266	2	41	( )	.	.	1985.25	.
53	2068	Tarrant	IH20	2374	5	4	( )	.	.	1974.92	.
54	2069	Tarrant	US287	172	9	3	( )	.	.	1975.50	.
55	2070	Tarrant	IH20	2374	5	5	(14)	.	.	1975.83	80.67
56	2073	Tarrant	SP35	364	5	4	(23,24)	.	.	1972.08	86.92
57	2074	Tarrant	SH360	2266	2	25	(47)	.	.	1976.99	87.42
58	2075	Tarrant	IH35W	14	2	20	( )	37.6	44.2	1976.92	.
59	2078	Wise	US287	13	8	48	( )	31.1	33.3	1972.33	.
60	2089	Tarrant	US287	172	9	6	( )	.	.	1982.33	.
61	2093	Tarrant	IH820	8	15	4	( )	.	.	1975.75	.
62	2094	Tarrant	IH820	8	15	6	( )	.	.	1982.17	.
63	2096	Tarrant	IH820	8	15	8	( )	.	.	1976.17	.
64	2097	Tarrant	IH820	8	14	31	( )	.	.	1978.33	.
65	2098	Tarrant	IH820	8	14	22	( )	10.6	14.4	1976.58	.
66	3001	Wichita	US277	156	7	2/3	(41)	8.4	11.4	1964.67	87.50
67	3003	Wichita	US277	156	7	4	(41)	6.6	8.4	1964.67	87.50
68	3004	Wichita	US277	156	7	5	(41)	0.0	5.0	1964.99	87.50
69	3005	Wichita	US277	156	7	6	(41)	5.0	6.6	1964.99	87.50
70	3006	Wichita	US287	44	1	34	(62)	.	.	1967.42	87.08
71	3007	Wichita	US287	44	1	35	( )	.	.	1967.17	.
72	3008	Clay	US287	44	2	27/28	(58)	.	.	1967.92	87.08
73	3010	Wichita	US287	43	8	22	( )	0.0	9.1	1968.83	.
74	3011	Wilbarge	US287	43	7	15	( )	0.0	0.8	1968.83	.
75	3012	Wichita	US281	249	1	12	( )	16.5	20.2	1968.75	.
76	3014	Wilbarger	US287	43	5	43	( )	0.0	0.2	1969.75	.

OBS	OV2	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
51	.	.	.	1.5	AC	Y	2.3	8	2	1	H	32	33.0	.	.	1.31
52	.	.	.	1	C&	Y	1.7	8	2	1	H	32	33.0	.	.	1.31
53	.	.	.	4	AC	Y	4.3	8	2	1	L	32	33.0	.	.	1.31
54	.	.	.	2	AC	Y	5.7	8	3	1	L	32	33.0	.	.	1.31
55	.	.	.		AC	Y	5.3	8	3	1	H	32	33.0	.	.	1.31
56	.	.	.	3	AC	Y	3.2	8	3	1	L	32	33.0	.	.	1.31
57	.	.	.	3	AC	Y	1.2	8	3	1	L	32	33.0	.	.	1.31
58	.	.	.	3	AC	Y	6.6	8	2	1	H	32	33.0	57500	1.11	1.31
59	.	.	.	2	AC	Y	3.6	8	2	1	L	32	33.0	16200	5.15	1.31
60	.	.	.	2	AC	Y	4.0	8	3	1	H	32	33.0	.	.	1.31
61	.	.	.	3	AC	Y	1.3	8	2	1	H	32	33.0	.	.	1.31
62	.	.	.	3	CO	Y	1.8	10	2	1	L	32	33.0	.	.	1.31
63	.	.	.	3	AC	Y	2.1	8	2	1	L	32	33.0	.	.	1.31
64	.	.	.	1.5	AC	Y	1.6	8	2	1	L	32	33.0	.	.	1.31
65	.	.	.	3	AC	Y	3.8	8	2	1	L	32	33.0	46000	11.50	1.31
66	.	.	.	2	AC	Y	3.0	8	2	2	L	27	28.4	15000	0.08	1.47
67	.	.	.	2	AC	Y	1.8	8	2	2	L	27	28.4	12900	0.08	1.47
68	.	.	.	2	AC	Y	5.0	8	2	1	L	27	28.4	12900	0.08	1.38
69	.	.	.	2	AC	Y	1.5	8	2	1	L	27	28.4	12900	0.08	1.38
70	.	.	.	2	AC	Y	2.9	8	2	2	L	27	28.4	25000	.	1.47
71	.	.	.	2	AC	Y	0.9	8	2	2	L	27	28.4	13100	.	1.47
72	.	.	.	2	AC	Y	1.4	8	2	2	L	28	28.2	13100	.	1.47
73	.	.	.	1	AC	Y	9.1	8	2	2	L	27	28.4	9600	0.68	1.47
74	.	.	.	2	AC	Y	0.8	8	2	2	L	25	23.8	8700	0.68	1.54
75	.	.	.	2	AC	Y	3.7	8	2	2	L	27	28.4	18600	0.08	1.47
76	.	.	.	2	AC	Y	0.9	8	2	1	L	25	23.8	7300	.	1.45

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1
77	3015	Wilbarger	US70	146	7	8	()	.	.	1969.75	.
78	3016	Wichita	US287	43	8	26	(39/40/46/48)	.	.	1970.75	78.00
79	3017	Montague	US287	13	5	17	()	0.0	0.8	1972.67	.
80	3018	Montague	US287	13	5	18	()	0.8	8.8	1972.67	.
81	3019	Clay	US287	224	1	16	()	13.0	13.5	1972.75	.
82	3020	Clay	US287	224	1	17	(37)	13.5	23.5	1972.75	87.08
83	3022	Wilbarger	US287	43	7	23	(36)	1.0	11.2	1973.67	87.08
84	4002	Potter	IH40	275	1	11	(83)	70.2	72.2	1964.83	83.99
85	4003	Potter	IH40	275	1	12	()	69.0	70.0	1965.92	.
86	4004	Potter	IH40	275	1	21	()	67.2	68.8	1966.67	.
87	4005	Carson	IH40	275	2	12	()	85.2	93.1	1966.92	.
88	4006	Carson	IH40	275	3	15	()	93.4	98.6	1966.92	.
89	4007	Potter	IH40	275	1	22	(83)	72.4	77.8	1966.99	83.99
90	4008	Potter	IH40	90	5	32	(41)	62.1	62.5	1969.08	69.50
91	4009	Potter	IH40	275	1	20	()	62.6	67.0	1969.08	.
92	4010	Potter	IH40	275	1	31	(83/88)	78.6	82.8	1968.99	83.99
93	4011	Potter	IH40	90	5	44	()	54.8	61.8	1972.50	.
94	4021	Carson	IH40	275	4	26	()	109.9	114.2	1980.67	.
95	4022	Gray	IH40	275	5	19	()	114.2	115.5	1978.00	.
96	4023	Donley	IH40	275	8	18	()	123.4	125.0	1980.67	.
97	4024	Gray	IH40	275	9	16/17	()	126.7	127.4	1978.92	80.99
98	4025	Donley	IH40	275	10	17	()	127.4	129.5	1978.00	.
99	4026	Gray	IH40	275	11	38/39	()	129.6	134.7	1978.92	80.99
100	4027	Gray	IH40	275	11	42	()	134.7	141.8	1982.67	.
101	4028	Gray	IH40	275	11	49	()	141.8	146.6	1984.67	.
102	5001	Lubbock	IH27	67	7	59	()	.	.	1981.41	.

OBS	OV2	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
77	.	.	.	3	C&	Y	1.4	8	2	1	L	25.0	23.8	3600	.	1.45
78	81.00	82	85	1	AC	Y	5.1	8	2	1	L	27.0	28.4	9600	.	1.38
79	.	.	.	1	AC	Y	0.7	8	2	1	L	28.0	28.2	11700	0.08	1.39
80	.	.	.	1	AC	Y	8.2	8	2	1	L	28.0	28.2	11700	0.08	1.39
81	.	.	.	2	AC	Y	0.5	8	2	2	H	28.0	28.2	10200	0.08	1.47
82	.	.	.	2-1	AC	Y	9.4	8	2	2	L	28.0	28.2	10500	0.08	1.47
83	.	.	.	1	AC	Y	10.2	8	2	2	L	25.0	23.8	8700	0.68	1.54
84	.	.	.	4-3	AC	Y	2.0	8	1	4	L	18.0	21.7	62000	2.61	1.48
85	.	.	.	3	AC	Y	1.1	8	1	2	L	18.0	21.7	57000	2.61	1.57
86	.	.	.	3	AC	Y	1.7	8	1	2	L	18.0	21.7	39000	.	1.57
87	.	.	.	2	AC	Y	7.9	8	1	3	L	19.0	21.5	8700	2.61	1.39
88	.	.	.	2	AC	Y	5.2	8	1	1	L	19.0	21.5	8500	2.61	1.49
89	.	.	.	3	AC	Y	5.0	8	3	2	L	18.0	21.7	14600	.	1.57
90	.	.	.	2	AC	Y	0.6	8	1	2	L	18.0	21.7	10700	.	1.57
91	.	.	.	2-3	AC	Y	4.4	8	1	2	L	18.0	21.7	39000	2.61	1.57
92	85.50	.	.	2	AC	Y	4.2	8	1	1	L	18.0	21.7	14600	2.61	1.48
93	.	.	.	2	AC	Y	7.0	8	1	2	L	18.0	21.7	10700	2.61	1.57
94	.	.	.	2	AC	Y	4.3	9	1	1	L	19.0	22.0	8150	.	1.48
95	.	.	.	2	CO	Y	1.3	9	1	1	L	20.0	22.5	8200	2.61	1.47
96	.	.	.			Y	1.6	8	1	1	L	21.0	23.0	8200	2.61	1.46
97	.	.	.	2	CO	Y	0.7	8	1	1	L	21.0	23.0	8700	.	1.46
98	.	.	.			Y	2.2	8	1	1	L	21.0	23.0	8500	2.61	1.46
99	.	.	.	2	CO	Y	5.1	8	1	1	L	21.0	23.0	8500	.	1.46
100	.	.	.	1	CO	Y	7.1	10	1	1	L	21.0	23.0	7700	.	1.46
101	.	.	.	1	CO	Y	4.7	10	1	1	L	21.0	23.0	8600	.	1.46
102	.	.	.	2	CO	Y	6.8	9	3	1	L	18.0	24.3	10650	.	1.44

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1	OV2
103	5002	Hale	IH27	67	6	32	( )	.	.	1981.50	.	.
104	5003	Lubbock	IH27	67	7	60	( )	.	.	1982.17	.	.
105	5004	Hale	IH27	67	6	33	( )	.	.	1982.17	.	.
106	5005	Hale	IH27	67	5	28	( )	39.0	44.2	1982.17	.	.
107	5006	Hale	IH27	67	6	34	( )	.	.	1982.92	.	.
108	5007	Hale	IH27	67	5	32	( )	37.5	39.0	1982.92	.	.
109	5008	Hale	IH27	67	4	27	( )	53.8	58.6	1984.17	.	.
110	5009	Swisher	IH27	67	3	39	( )	58.8	60.2	1984.17	.	.
111	9001	Falls	IH35	15	3	10	(22)	313.6	315.4	1960.17	78.41	.
112	9002	McLennan	IH35	15	2	18	(37)	315.4	319.4	1960.17	78.41	.
113	9004	McLennan	IH35	15	1	25	( )	331.5	333.4	1964.99	.	.
114	9005	McLennan	IH35	15	1	30	(108)	333.4	334.0	1965.58	81.67	.
115	9006	Hill	IH35	48	9	4	( )	371.4	378.8	1966.25	.	.
116	9007	McLennan	IH35	15	1	34	( )	334.2	335.0	1966.75	.	.
117	9008	McLennan	IH35	15	1	45	( )	335.0	336.0	1970.58	.	.
118	9009	McLennan	IH35	15	1	51	( )	336.0	337.0	1971.33	.	.
119	9010	McLennan	IH35	15	1	60	( )	337.0	338.3	1972.58	.	.
120	10001	VanZandt	IH20	495	2	3	(26)	523.5	527.1	1963.33	84.41	.
121	10002	Smith	IH20	495	4	3	(33)	543.7	550.3	1963.50	85.33	.
122	10003	Smith	IH20	495	4	4	(29/36)	550.3	556.3	1963.92	84.50	86.83
123	10004	VanZandt	IH20	495	3	4	(36)	535.5	543.5	1963.92	85.67	.
124	10005	VanZandt	IH20	495	3	3	(27)	527.1	535.5	1964.67	84.41	.
125	10006	VanZandt	IH20	495	2	5	(26)	513.5	518.5	1965.58	84.41	.
126	10007	VanZandt	IH20	495	2	7	(26)	518.5	523.7	1965.58	84.41	.
127	10008	Gregg	IH20	495	7	1	(35)	580.0	584.6	1965.67	85.33	.
128	10009	Smith	IH20	495	5	3	( )	556.3	564.6	1965.99	.	.

OBS	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
103	.	.	2	CO	Y	8.2	9	1	1	L	19.0	22.8	6500	.	1.47
104	.	.	2	CO	Y	7.7	9	3	1	L	18.0	24.3	7800	.	1.44
105	.	.	2	CO	Y	1.4	9	2	1	L	19.0	22.8	7500	.	1.47
106	.	.	1.5		Y	5.2	9	1	4	L	19.0	22.8	7200	4.40	1.47
107	.	.	2	CO	Y	6.4	9	2	1	L	19.0	22.8	6700	.	1.47
108	.	.	1.5		Y	1.5	9	2	1	L	19.0	22.8	6700	4.40	1.47
109	.	.	2		Y	4.8	9	1	1	L	19.0	22.8	6800	4.40	1.47
110	.	.	2	AC	Y	1.4	9	1	2	L	18.0	21.5	6700	4.40	1.57
111	.	.	2	AC	Y	1.8	8	2	3	L	40.0	33.0	24000	5.30	1.22
112	.	.	2	AC	Y	4.0	8	2	3	L	34.0	35.7	24000	5.30	1.18
113	.	.	2	AC	Y	1.9	8	1	4	L	34.0	35.7	47000	5.30	1.27
114	.	.	2	AC	Y	0.6	8	3	4	L	34.0	35.7	54000	.	1.27
115	.	.	2	CO	Y	7.4	8	3	3	H	33.0	32.5	14100	.	1.22
116	.	.	3	AC	Y	0.8	8	3	3	H	34.0	35.7	54000	.	1.18
117	.	.	3	AC	Y	1.0	8	2	3	L	34.0	35.7	54000	.	1.18
118	.	.	3	AC	Y	1.0	8	1	1	L	34.0	35.7	5600	3.38	1.27
119	.	.	3	CO	Y	1.3	8	3	1	L	34.0	35.7	54000	.	1.27
120	.	.	2	AC	Y	3.6	8	3	2	L	42.4	32.1	19300	.	1.41
121	.	.	2	AC	Y	6.6	8	2	3	L	43.0	33.5	20000	.	1.21
122	.	.	2	AC	Y	6.0	8	3	2	L	43.0	33.5	22000	.	1.39
123	.	.	2	AC	Y	8.0	8	3	3	L	42.4	32.1	19300	.	1.23
124	.	.	2	AC	Y	8.4	8	3	2	L	42.4	32.1	19300	.	1.41
125	.	.	2	AC	Y	5.0	8	3	2	L	42.4	32.1	20000	.	1.41
126	.	.	2	AC	Y	5.2	8	3	2	L	42.4	32.1	19500	.	1.41
127	.	.	2	AC	Y	4.6	8	4	2	L	46.5	33.0	19500	.	1.40
128	.	.	2	AC	Y	8.3	8	3	2	L	43.0	33.5	17800	.	1.39

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1	OV2
129	10010	Smith	IH20	495	5	5	()	564.1	571.5	1966.25	.	.
130	10011	Gregg	IH20	495	7	2	(35)	584.7	588.5	1966.58	85.33	.
131	10012	Gregg	IH20	495	7	3	(35)	588.5	594.9	1967.33	85.33	.
132	10013	Gregg	IH20	495	7	6	()	594.9	596.7	1967.33	.	.
133	10014	Smith	IH20	495	6	1	(17)	571.5	579.7	1966.08	87.50	.
134	12107	FortBend	US59	27	12	28/30	()	.	.	1976.25	.	.
135	12901	Harris	BE8	3256	2	13	()	.	.	1986.67	.	.
136	12902	Harris	BE8	3256	2	14	()	.	.	1986.58	.	.
137	12903	Harris	BE8	3256	3	12	()	.	.	1985.41	.	.
138	12904	Harris	BE8	3256	3	13	()	.	.	1985.41	.	.
139	12905	Harris	BE8	3256	1	19	()	.	.	1985.67	.	.
140	13001	Colorado	IH10	271	1	8	(35)	697.2	699.4	1964.42	81.42	.
141	13002	Colorado	IH10	535	8	4	(37/40)	689.8	697.0	1964.42	81.42	82.92
142	13003	Colorado	IH10	271	1	9	(40)	699.6	711.8	1966.92	83.08	.
143	13005	Victoria	LP175	88	5	12	(44/42)	0.0	8.6	1968.75	84.42	87.58
144	13006	Fayette	IH10	535	7	6	(25)	674.6	679.4	1969.25	86.50	.
145	13007	Fayette	IH10	535	8	12	(48)	679.4	689.4	1969.25	86.50	.
146	13008	Victoria	LP175	88	5	14	()	8.8	12.0	1969.58	.	.
147	13009	Victoria	US77	371	1	30	(39/52)	28.6	29.4	1969.58	74.67	85.58
148	13010	Victoria	SP91	371	6	3	(10)	12.2	13.6	1969.58	85.58	.
149	13011	Fayette	IH10	535	7	9	()	668.4	674.4	1969.58	.	.
150	13012	Wharton	US59	89	8	39	(66)	.	.	1969.67	73.08	80.41
151	13013	Fayette	IH10	535	6	5	()	662.4	667.8	1970.41	.	.
152	13014	Fayette	IH10	535	7	10	()	667.8	668.2	1970.41	.	.
153	13015	Fayette	IH10	535	6	8	()	656.6	662.2	1971.83	.	.
154	13016	Gonzales	IH10	535	5	7	()	653.0	656.6	1971.83	.	.

OBS	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
129	.	.	2	AC	Y	7.4	8	3	2	L	43.0	33.5	17500	.	1.39
130	.	.	2	AC	Y	3.8	8	4	2	H	46.5	33.0	19500	.	1.40
131	.	.	2	AC	Y	6.4	8	4	2	H	46.5	33.0	19500	.	1.40
132	.	.	2	AC	Y	1.8	8	4	2	L	46.5	33.0	19500	.	1.40
133	.	.	2	AC	Y	8.2	8	3	2	L	43.0	33.5	19500	.	1.39
134	.	.	2	AC	Y	6.8	10	1	2	H	44.0	41.3	39000	.	1.28
135	.	.			Y	5.1	13	1	2	H	45.0	39.2	47000	7.46	1.31
136	.	.			Y	1.6	13	1	2	H	45.0	39.2	47000	7.46	1.31
137	.	.			Y	0.3	10	1	2	H	45.0	39.2	.	.	1.31
138	.	.			Y	2.5	10	1	2	H	45.0	39.2	.	.	1.31
139	.	.			Y	2.4	10	2	2	H	44.0	39.2	.	.	1.31
140	.	.	2	AC	Y	2.2	8	1	2	H	41.0	40.0	22000	5.45	1.30
141	.	.	2	AC	Y	7.2	8	1	2	L	38.0	39.6	13300	5.45	1.30
142	.	.	2	AC	Y	12.2	8	1	2	L	41.0	40.0	20000	.	1.30
143	.	.	2	AC	Y	8.6	8	1	2	H	38.0	43.5	93000	.	1.24
144	.	.	2	AC	Y	4.8	8	1	2	H	38.0	39.6	12300	5.45	1.30
145	.	.	2	AC	Y	10.0	8	1	2	L	38.0	39.6	13200	5.45	1.30
146	.	.	2	AC	Y	3.2	8	1	2	H	38.0	43.5	9100	.	1.24
147	.	.	2	AC	Y	1.8	8	1	2	L	38.0	43.5	2000	.	1.24
148	.	.	2	AC	Y	1.1	8	1	2	H	38.0	43.5	8800	.	1.24
149	.	.	2	AC	Y	6.0	8	1	2	H	38.0	39.6	12200	.	1.30
150	80.81	87.5	2	AC	Y	2.6	8	1	2	H	42.0	40.1	14100	.	1.30
151	.	.	2	AC	Y	5.4	8	1	2	H	38.0	39.6	12100	5.45	1.30
152	.	.	2	AC	Y	0.4	8	1	2	L	38.0	39.6	12100	.	1.30
153	.	.	2	AC	Y	5.6	8	2	2	H	38.0	39.6	12200	5.45	1.30
154	.	.	2	AC	Y	3.6	8	2	1	H	34.0	40.7	11700	5.45	1.20

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1	OV2
155	13017	Gonzales	IH10	535	4	7	()	634.6	643.0	1972.17	.	.
156	13018	Victoria	US59	89	1	36	(61)	0.2	8.0	1972.25	86.83	.
157	13019	Jackson	US59	89	3	37	(58)	18.0	22.6	1972.25	83.42	.
158	13020	Gonzales	IH10	535	4	8	()	643.2	645.0	1972.41	.	.
159	13021	Gonzales	IH10	535	5	9	()	645.2	653.0	1972.41	.	.
160	13022	Wharton	US59	89	6	29/30	()	25.5	27.7	1973.58	.	.
161	13023	Wharton	US59	89	7	75/76	(100)	20.6	25.4	1973.58	87.58	.
162	13024	Wharton	US59	89	7	75	(97)	17.5	18.9	1973.58	79.83	.
163	13025	Wharton	US59	89	8	52	()	6.5	6.9	1972.33	.	.
164	13026	Wharton	US59	89	8	51	()	7.0	9.8	1975.33	.	.
165	13027	Wharton	US59	89	7	81	()	10.0	10.4	1975.33	.	.
166	13028	Wharton	US59	89	7	80	()	10.6	14.0	1975.33	.	.
167	13029	Jackson	US59	89	5	19	(31)	0.0	4.8	1974.58	87.58	.
168	13030	Jackson	US59	89	4	34	()	4.8	7.0	1974.58	.	.
169	13031	Jackson	US59	89	4	41	(51/48)	7.0	8.8	1976.00	84.83	87.58
170	13032	Jackson	US59	89	4	33	()	8.8	13.8	1974.50	.	.
171	13033	Jackson	US59	89	3	42	()	14.1	16.3	1974.50	.	.
172	15021	Bexar	IH410	521	6	1	(52)	.	.	1964.92	87.42	.
173	15022	Bexar	IH410	25	2	40	()	.	.	1964.92	.	.
174	15025	Bexar	US281	73	8	2	(85)	140.6	141.8	1967.67	84.75	.
175	15031	Bexar	US281	73	8	4	(63/75)	.	.	1969.67	81.25	82.30
176	15032	Bexar	US281	73	8	8	(85)	143.0	144.2	1972.17	84.75	.
177	15033	Bexar	US281	73	8	22	(85)	141.8	143.0	1972.00	84.75	.
178	15034	Bexar	US281	73	8	10	(99)	.	.	1976.50	86.92	.
179	15035	Bexar	US281	73	8	9	(98)	.	.	1976.50	86.92	.
180	15036	Bexar	US281	73	8	41	(99)	145.4	148.2	1978.25	86.92	.

OBS	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
155	.	.	2	AC	Y	8.4	8.0	2	2	L	34	40.7	11700	5.45	1.29
156	.	.	2	AC	Y	7.8	8.0	1	2	H	38	43.5	13600	.	1.24
157	.	.	2	AC	Y	4.6	8.0	1	2	H	41	43.0	12300	5.28	1.25
158	.	.	2	AC	Y	1.8	8.0	2	1	L	34	40.7	11700	.	1.20
159	.	.	2	AC	Y	7.8	8.0	2	1	H	34	40.7	12100	5.45	1.20
160	.	.	2	AC	Y	2.2	8.0	1	2	H	42	40.1	11500	.	1.30
161	.	.	2	AC	Y	4.8	8.0	1	1	L	42	40.1	11800	5.28	1.21
162	.	.	2	AC	Y	6.0	8.0	1	1	H	42	40.1	14100	5.28	1.21
163	.	.	2	AC	Y	0.4	8.0	1	2	H	42	40.1	12600	.	1.30
164	.	.	2	AC	Y	2.8	8.0	1	2	H	42	40.1	12600	.	1.30
165	.	.	1	AC	Y	0.4	8.0	1	2	H	42	40.1	11600	.	1.30
166	.	.	1	AC	Y	3.4	8.0	1	2	H	42	40.1	10600	5.28	1.30
167	.	.	2	AC	Y	4.8	8.0	1	3	H	41	43.0	11100	5.28	1.07
168	.	.	1	AC	Y	2.2	8.0	1	3	L	41	43.0	10300	5.28	1.07
169	.	.	2	AC	Y	1.8	8.0	1	1	H	41	43.0	10900	5.28	1.17
170	.	.	2	AC	Y	5.0	8.0	1	2	L	41	43.0	10900	5.28	1.25
171	.	.	2	AC	Y	2.2	8.0	1	2	L	41	43.0	12600	5.28	1.25
172	.	.	2	AC	Y	3.6	8.0	3	2	L	30	39.8	.	.	1.30
173	.	.	3	AC	Y	1.4	8.0	3	2	L	30	39.8	.	.	1.30
174	.	.	3	AC	Y	1.2	8.0	2	3	L	30	39.8	66000	7.84	1.11
175	.	.	4-3-2	AC	Y	6.0	8.0	3	2	L	30	39.8	.	.	1.30
176	.	.	4	AC	Y	1.2	8.0	2	2	L	30	39.8	96000	7.84	1.30
177	.	.	4	AC	Y	1.2	8.0	2	2	L	30	39.8	8700	7.84	1.30
178	.	.	3	AC	Y	1.6	8.0	2	2	H	30	39.8	.	.	1.30
179	.	.	4	AC	Y	1.6	8.0	2	2	L	30	39.8	.	.	1.30
180	.	.	3	AC	Y	2.8	8.0	2	2	H	30	39.8	89000	7.82	1.30

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1	OV2	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
233	18079	Dallas	IH635	2374	1	11	()	26.2	32.2	1968.92	.	.	.	.	4	AC	Y	6.0	8	2	1	L	34	34.9	14100	6.98	1.29
234	18080	Denton	IH35W	81	13	5	()	71.0	83.8	1969.67	.	.	.	.	2	AC	Y	12.8	8	2	1	H	34	31.8	12200	5.15	1.33
235	18081	Dallas	US67	261	3	19	()	.	.	1969.67	.	.	.	.	2-3	AC	Y	3.0	8	2	1	L	34	34.9	.	.	1.29
236	18086	Denton	IH35W	81	13	6	()	84.0	85.4	1970.50	.	.	.	.	2	AC	Y	1.4	8	2	4	H	34	31.8	13000	5.15	1.33
237	18088	Dallas	IH635	2374	2	5	(49)	18.2	21.6	1971.08	.	.	.	.	4	AC	Y	3.4	8	2	2	H	34	34.9	8600	12.49	1.37
238	18093	Dallas	IH45	92	14	8/25	()	284.0	285.0	1972.16	.	.	.	.	2.5		Y	1.0	8	2	1	L	34	34.9	54000	4.79	1.29
239	18100	Dallas	IH45	92	14	14	()	.	.	1973.92	.	.	.	.	2.5	AC	Y	0.5	8	2	2	L	34	34.9	.	.	1.37
240	18101	Dallas	US67	261	3	21	()	.	.	1973.92	.	.	.	.	2	AC	Y	0.5	8	2	1	L	34	34.9	.	.	1.29
241	18103	Dallas	IH20	2374	3	12	()	.	.	1974.25	.	.	.	.	4	AC	Y	0.9	8	2	2	L	34	34.9	.	.	1.37
242	18106	Dallas	IH20	2374	4	2	()	463.6	467.4	1974.58	.	.	.	.	4	AC	Y	3.8	8	2	2	L	34	34.9	54000	15.80	1.37
243	18107	Dallas	IH20	2374	4	3	()	454.8	458.6	1974.67	.	.	.	.	4	AC	Y	3.8	8	2	2	H	34	34.9	62000	15.80	1.37
244	18110	Dallas	IH20	2374	4	5	(17)	.	.	1975.99	85.75	.	.	.	4	AC	Y	5.0	8	2	2	H	34	34.9	.	.	1.37
245	18117	Dallas	SH114	353	6	4	()	1.4	10.2	1971.16	.	.	.	.	4	AC	Y	8.8	8	2	2	H	34	34.9	47500	6.98	1.37
246	18118	Dallas	SH114	353	4	29	()	.	.	1973.42	.	.	.	.	1-3	AC	Y	4.4	8	2	2	H	34	34.9	.	.	1.37
247	18119	Dallas	SH114	353	4	28	()	.	.	1973.84	.	.	.	.	3	AC	Y	1.3	8	2	2	H	34	34.9	.	.	1.37
248	19001	Harrison	IH20	495	10	3	(41)	642.4	649.4	1964.84	84.75	.	.	.	2	AC	Y	7.0	8	1	1	L	46	33.3	17900	4.08	1.31
249	19002	Bowie	IH30	610	7	5	(39)	217.6	223.0	1965.42	82.42	.	.	.	2	AC	Y	5.4	8	1	2	H	47	29.0	27000	.	1.46
250	19003	Bowie	IH30	610	7	6	(39)	223.0	223.4	1965.42	85.42	.	.	.	2	AC	Y	0.4	8	1	2	H	47	29.0	35000	.	1.46
251	19004	Harrison	IH20	495	10	8	(38)	634.4	642.4	1965.84	83.84	.	.	.	2	AC	Y	8.0	8	1	1	L	46	33.3	15400	.	1.31
252	19005	Titus	IH30	610	3	3	(40)	153.0	162.4	1966.75	86.67	.	.	.	2	AC	Y	9.4	8	5	1	L	45	29.8	13600	.	1.36
253	19006	Harrison	IH20	495	9	4	(26)	627.2	634.0	1966.75	81.75	.	.	.	2	AC	Y	6.8	8	1	3	H	46	33.3	16900	4.08	1.21
254	19007	Harrison	IH20	495	10	9	()	634.0	634.2	1966.75	.	.	.	.			Y	0.2	8	1	3	H	46	33.3	14000	.	1.21
255	19008	Harrison	IH20	495	8	5	(36)	617.2	627.0	1966.84	81.75	.	.	.	2	AC	Y	9.8	8	1	3	H	46	33.3	17100	.	1.21
256	19009	Harrison	IH20	495	8	4	(48)	610.2	617.2	1966.92	85.50	.	.	.	2	AC	Y	7.0	8	5	2	L	46	33.3	18700	.	1.40
257	19010	Bowie	IH30	610	6	5	(25/33)	205.8	211.4	1967.42	78.33	83.84	.	.	2	AC	Y	5.6	8	1	2	H	47	29.0	20000	3.53	1.46
258	19011	Bowie	IH30	610	7	10	(39/42)	211.6	217.4	1967.42	82.42	83.84	.	.	2	AC	Y	5.8	8	1	2	H	47	29.0	23000	3.53	1.46
259	19014	Bowie	IH30	610	6	3	(25/33)	198.0	205.8	1967.67	78.33	83.84	.	.	2	AC	Y	7.8	8	1	2	H	47	29.0	18100	.	1.46
260	19015	Titus	IH30	610	3	4	(40)	162.4	165.8	1967.92	86.67	.	.	.	2	AC	Y	3.2	8	5	3	L	45	29.8	13100	.	1.26
261	19017	Titus	IH30	610	3	15	(42)	165.8	173.2	1970.67	86.75	.	.	.	2	AC	Y	7.4	8	5	2	L	45	29.8	13000	.	1.45
262	19018	Bowie	IH30	610	5	8	()	181.0	188.0	1971.75	.	.	.	.	2	AC	Y	7.0	8	5	2	L	47	29.0	13100	.	1.46
263	19019	Bowie	IH30	610	5	9	(21)	188.0	198.0	1972.42	86.33	.	.	.	2	AC	Y	10.0	8	1	2	H	47	29.0	13600	3.53	1.46
264	19020	Morris	IH30	610	4	6	(15)	173.6	181.0	1972.08	86.75	.	.	.	2	AC	Y	7.4	8	5	2	H	45	29.0	12800	.	1.46
265	20001	Jefferson	SH73	508	4	30	()	5.0	5.5	1963.16	.	.	.	.	2	AC	Y	0.5	8	1	2	H	54	42.0	27000	.	1.27
266	20002	Jefferson	SH347	667	1	28	()	0.0	1.6	1963.25	.	.	.	.	2-3	AC	Y	1.6	7	1	3	H	54	42.0	20400	.	1.08
267	20003	Jefferson	SH73	508	4	24	()	1.2	5.0	1963.42	.	.	.	.	2	AC	Y	3.8	8	1	2	H	54	42.0	25000	3.76	1.27
268	20004	Jefferson	IH10	739	2	6	(56/87)	839.4	848.6	1963.50	75.67	84.42	.	.	2	AC	Y	9.2	8	1	3	H	54	42.0	22000	3.76	1.08
269	20005	Jefferson	SH347	667	1	32	()	2.8	4.8	1963.58	.	.	.	.	2	AC	Y	2.0	7	1	3	H	54	42.0	21000	.	1.08
270	20006	Jefferson	SH347	667	1	31	()	4.8	5.5	1964.58	.	.	.	.	2	AC	Y	0.7	7	1	3	H	54	42.0	14100	.	1.08
271	20009	Jefferson	IH10	739	2	9	(78/82)	831.4	839.2	1964.92	81.42	82.25	.	.	2	AC	Y	7.8	8	2	2	L	54	42.0	22000	3.76	1.27
272	20011	Jefferson	US96	65	8	72	(140)	3.4	6.4	1965.08	86.84	.	.	.	2	AC	Y	3.0	8	2	2	H	54	42.0	26000	3.76	1.27
273	20012	Jefferson	SH347	667	1	36	()	1.6	2.8	1965.33	.	.	.	.	2	AC	Y	0.8	7	2	2	H	54	42.0	21000	.	1.27
274	20013	Jefferson	US96	65	8	70	()	9.2	9.6	1965.33	.	.	.	.	2	AC	Y	0.4	10	2	2	H	54	42.0	30500	.	1.27
275	20014	Jefferson	US96	65	8	71	()	6.4	9.2	1965.84	.	.	.	.	2	AC	Y	2.8	8	1	2	H	54	42.0	32000	.	1.27
276	20015	Liberty	US59	177	3	27	(62/65)	0.0	2.6	1966.67	85.16	86.84	.	.	2	AC	Y	2.7	8	1	2	L	50	39.8	18600	.	1.30
277	20016	Liberty	US59	177	3	28	(62/65)	2.6	3.2	1966.67	85.16	86.84	.	.	2	AC	Y	0.6	8	1	2	L	50	39.8	23000	.	1.30
278	20017	Jefferson	US90	28	6	31	()	7.4	8.1	1967.50	.	.	.	.	2	AC	Y	0.7	8	1	2	H	54	42.0	15100	.	1.27
279	20018	Jefferson	US90	28	6	32	()	4.6	7.4	1967.92	.	.	.	.	2	AC	Y	2.8	8	1	2	H	54	42.0	9800	.	1.27
280	20019	Hardin	US96	65	5	58	()	0.0	2.2	1967.75	.	.	.	.	1	AC	Y	2.2	8	2	2	H	53	40.0	8400	.	1.30
281	20020	Hardin	US96	65	5	59	()	2.4	2.8	1967.75	.	.	.	.	1	AC	Y	0.4	8	2	2	H	53	40.0	7000	.	1.30
282	20021	Jefferson	US90	28	6	35	()	0.0	4.6	1969.58	.	.	.	.	2	AC	Y	5.6	8	1	2	H	54	42.0	5900	.	1.27

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1
181	15901	Bexar	IH35	16	7	75	( )	167.2	168.3	1983.67	.
182	15902	Bexar	IH35	17	10	116	( )	165.5	166.4	1983.67	.
183	15903	Bexar	IH410	521	4	136	(193)	.	.	1983.67	87.08
184	15911	Bexar	IH35	16	7	89	( )	.	.	1987.42	.
185	15912	Bexar	IH35	16	7	81	( )	.	.	1984.99	.
186	15913	Bexar	IH35	16	7	81	( )	.	.	1984.99	.
187	15914	Bexar	IH35	16	7	81	( )	.	.	1984.99	.
188	17001	Walker	IH45	675	7	4	(36)	100.8	112.2	1961.58	84.58
189	17002	Walker	IH45	675	6	8	(46)	118.8	132.0	1963.92	85.33
190	17003	Leon	IH45	675	4	5	(20)	152.2	164.0	1967.75	85.84
191	17004	Madison	IH45	675	5	6	(20)	146.4	152.2	1967.67	85.84
192	17005	Madison	IH45	675	5	3	(27)	.	.	1965.84	87.25
193	17006	Freestone	IH45	675	1	4	( )	.	.	1968.84	.
194	17007	Leon	IH45	675	3	5	( )	165.0	181.0	1969.67	.
195	17008	Freestone	IH45	675	1	7	( )	.	.	1971.92	.
196	17009	Freestone	IH45	675	1	6	( )	.	.	1971.50	.
197	17010	Freestone	IH45	675	2	5	(18)	.	.	1971.50	85.75
198	17011	Brazos	SH6	49	12	4	( )	3.0	15.6	1972.50	.
199	18001	Dallas	US75	47	7	16	(82/90)	14.0	15.0	1949.58	73.92
200	18002	Dallas	US75	47	7	14	(82/90)	13.2	14.0	1949.58	73.92
201	18003	Dallas	US75	47	7	17	(82/90)	12.0	13.2	1950.08	73.92
202	18005	Dallas	US75	47	7	22	(82/90)	.	.	1951.50	73.92
203	18006	Dallas	US75	47	7	12	(82/90)	9.2	10.4	1952.33	73.92
204	18007	Dallas	US75	47	7	24	(82/90)	.	.	1953.17	73.92
205	18008	Dallas	US75	47	7	26	(82/90)	.	.	1953.17	73.92
206	18009	Dallas	US75	47	7	23	(82/90)	.	.	1953.25	73.92

OBS	OV2	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
181	.	.	.	2	AC	Y	1.1	13.0	2	3	H	30	39.8	95000	5.80	1.11
182	.	.	.	2-3	AC	Y	0.9	13.0	2	3	L	30	39.8	10700	5.80	1.11
183	.	.	.	2	AC	Y	0.8	13.0	2	3	H	30	39.8	.	.	1.11
184	.	.	.	2	AC	Y	2.0	11.5	2	3	H	30	39.8	.	.	1.11
185	.	.	.	2	AC	Y	0.3	9.0	2	1	H	30	39.8	.	.	1.21
186	.	.	.	2	AC	Y	1.8	7.0	2	3	H	30	39.8	.	.	1.11
187	.	.	.	2	AC	Y	0.4	11.5	2	3	H	30	39.8	.	.	1.11
188	.	.	.	2	AC	Y	11.4	8.0	2	3	L	44	38.8	23500	7.46	1.13
189	.	.	.	2	AC	Y	13.2	8.0	2	1	L	44	38.8	17100	7.46	1.23
190	.	.	.	2	AC	Y	11.8	8.0	1	1	L	40	37.1	16500	7.46	1.25
191	.	.	.	2	AC	Y	5.8	8.0	1	1	H	40	38.8	16700	7.46	1.23
192	.	.	.	2	AC	Y	12.7	8.0	3	1	H	40	38.8	16200	.	1.23
193	.	.	.	2	AC	Y	2.1	8.0	3	1	L	39	34.7	14500	.	1.29
194	.	.	.	2	AC	Y	16.0	8.0	1	1	L	40	37.1	15500	7.46	1.25
195	.	.	.	2	AC	Y	12.4	8.0	2	3	L	39	34.7	14400	.	1.19
196	.	.	.	2	AC	Y	0.5	8.0	1	1	L	39	34.7	14900	.	1.29
197	.	.	.	2	AC	Y	17.0	8.0	1	1	L	39	34.7	14000	.	1.29
198	.	.	.	2	AC	Y	12.6	8.0	1	1	H	39	39.3	19500	4.51	1.22
199	78.42	.	.	2	C&	Y	1.0	9.0	2	3	L	34	34.9	148000	4.79	1.19
200	78.42	.	.	2	C&	Y	0.8	9.0	1	3	L	34	34.9	148000	4.79	1.19
201	78.42	.	.	2	C&	Y	1.2	9.0	2	3	L	34	34.9	148000	4.79	1.19
202	78.42	.	.	2	C&	Y	0.2	9.0	2	3	L	34	34.9	.	.	1.19
203	78.42	.	.	2	C&	Y	1.2	9.0	2	3	L	34	34.9	12300	4.79	1.19
204	78.42	.	.	2	C&	Y	1.4	9.0	2	3	L	34	34.9	.	.	1.19
205	78.42	.	.	2	C&	Y	0.4	9.0	2	3	L	34	34.9	.	.	1.19
206	78.42	.	.	2	C&	Y	0.4	9.0	2	3	L	34	34.9	.	.	1.19

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1
207	18010	Dallas	US75	47	7	35	(82/90)	.	.	1953.50	73.92
208	18011	Dallas	US75	47	7	34	(82/90)	.	.	1953.58	73.92
209	18013	Oallas	US75	47	7	36	(82/90)	.	.	1954.33	73.92
210	18015	Dallas	US75	47	7	39	(82/90)	.	.	1955.33	73.92
211	18019	Dallas	US75	47	7	47	(82/90)	.	.	1958.75	73.92
212	18040	Dallas	IH30	9	11	19	()	.	.	1960.00	.
213	18049	Dallas	IH30	9	11	20	(77/93,96/122)	.	.	1961.33	73.99
214	18053	Dallas	IH35E	442	2	25	(55)	.	.	1962.17	70.84
215	18054	Dallas	IH30	9	11	22	(77/93,96/122)	49.4	50.8	1962.84	73.99
216	18055	Dallas	IH30	9	11	23	(77/93,96/122)	.	.	1963.16	73.99
217	18058	Dallas	IH35E	442	2	38	()	.	.	1963.58	.
218	18060	Dallas	IH30	9	11	41	()	.	.	1964.84	.
219	18061	Dallas	IH35E	442	2	33	()	.	.	1964.84	.
220	18062	Dallas	IH30	9	11	35	()	44.8	45.4	1965.50	.
221	18064	Dallas	IH35E	442	2	38	()	432.2	425.4	1965.00	.
222	18065	Dallas	IH30	9	11	45	()	.	.	1965.84	.
223	18066	Dallas	IH35E	442	2	36	()	421.0	423.2	1965.84	.
224	18067	Ellis	IH35E	48	8	3	(19)	.	.	1966.08	84.16
225	18069	Dallas	IH30	9	11	49	()	.	.	1966.42	.
226	18070	Ellis	IH35E	48	8	6	(13/19)	.	.	1966.50	78.99
227	18071	Denton	IH35W	81	13	3	()	67.8	71.0	1966.75	.
228	18072	Dallas	IH635	2374	1	2	()	37.2	40.4	1967.25	.
229	18073	Dallas	IH635	2374	1	3	()	33.2	37.2	1967.58	.
230	18074	Dallas	US75	8	8	41	()	.	.	1967.58	.
231	18077	Dallas	US75	2374	2	2	()	.	.	1968.92	.
232	18078	Dallas	IH635	2374	2	6	()	.	.	1968.92	.

OBS	OV2	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	ADT85	G	CD
207	78.42	.	.	2	C&	Y	1.3	9	3	3	L	34	34.9	.	.	1.19
208	78.42	.	.	2	C&	Y	1.5	9	3	3	L	34	34.9	.	.	1.19
209	78.42	.	.	2	C&	Y	2.2	10	3	3	L	34	34.9	.	.	1.19
210	78.42	.	.	2	C&	Y	3.0	10	3	3	L	34	34.9	.	.	1.19
211	78.42	.	.	2	C&	Y	1.0	10	3	3	L	34	34.9	.	.	1.19
212	.	.	.			Y	1.4	8	2	3	L	34	34.9	.	.	1.19
213	77.84	79.42	84.92	4	AC	Y	1.8	11	2	3	L	34	34.9	.	.	1.19
214	.	.	.	4	C&	Y	1.0	8	2	3	L	34	34.9	.	.	1.19
215	77.84	79.42	84.92	4	C&	Y	1.4	8	2	3	L	34	34.9	130000	2.39	1.19
216	77.84	79.42	84.92	4	AC	Y	1.0	8	2	3	L	34	34.9	.	.	1.19
217	.	.	.	4-3	AC	Y	1.9	8	2	4	L	34	34.9	.	.	1.29
218	.	.	.	4	C&	Y	0.9	8	3	2	L	34	34.9	.	.	1.37
219	.	.	.	3-2	AC	Y	2.6	8	2	4	L	34	34.9	.	.	1.29
220	.	.	.	3	C&	Y	0.6	8	2	2	L	34	34.9	100000	2.39	1.37
221	.	.	.			Y	2.2	8	2	4	L	34	34.9	125000	3.55	1.29
222	.	.	.	3	C&	Y	0.4	8	2	2	H	34	34.9	.	.	1.37
223	.	.	.	3	AC	Y	2.2	8	2	4	L	34	34.9	64000	3.55	1.29
224	.	.	.	2	AC	Y	8.8	8	3	4	L	36	33.9	.	.	1.30
225	.	.	.	3	C&	Y	0.7	8	2	2	H	34	34.9	.	.	1.37
226	84.16	.	.	2	AC	Y	9.3	8	3	3	L	36	33.9	.	.	1.20
227	.	.	.	2	AC	Y	3.2	8	2	3	L	34	31.8	.	.	1.23
228	.	.	.	4	AC	Y	3.2	8	2	4	H	34	34.9	12700	5.15	1.29
229	.	.	.	4	AC	Y	4.0	8	2	4	L	34	34.9	190000	6.98	1.29
230	.	.	.	3	AC	Y	1.6	8	2	4	L	34	34.9	.	.	1.29
231	.	.	.	4	AC	Y	2.2	8	3	4	L	34	34.9	.	.	1.29
232	.	.	.	4	AC	Y	1.6	8	2	1	L	34	34.9	.	.	1.29

TABLE C.1. (CONTINUED)

OBS	CFTR	COUNTY	HWY	CTRL	SEC	JOB	NJOB	MP1	MP2	CDATE	OV1	OV2	OV3	OV4	LANE	ST	MAIN	L	D	CAT	SBT	SOIL	TEMP	RAIN	AOT85	G	CO
283	20022	Jefferson	US69	200	14	22	( )	0.0	1.2	1969.50	.	.	.	.	2	AC	Y	1.2	8	1	2	L	54	42.0	31000	.	1.27
284	20023	Jefferson	US69	200	14	26	( )	0.0	2.0	1971.42	.	.	.	.	2	AC	Y	1.0	8	1	2	L	54	42.0	50000	3.76	1.27
285	20026	Jefferson	SH87	306	3	54	( )	4.8	5.4	1972.16	.	.	.	.	2	CR	Y	0.6	8	1	2	H	54	42.0	7600	.	1.27
286	24002	ElPaso	IH10	2121	2	1	( )	.	.	1962.00	.	.	.	.			Y	1.0	8	2	3	H	8	28.9	.	.	1.28
287	24003	ElPaso	IH10	2121	2	18	( )	20.2	21.0	1969.92	.	.	.	.	3	AC	Y	0.8	8	2	2	H	8	28.9	121000	5.06	1.46
288	24004	ElPaso	IH10	2121	2	6	( )	21.0	23.8	1964.00	.	.	.	.			Y	2.8	8	2	3	H	8	28.9	122000	5.06	1.28
289	24005	ElPaso	IH10	2121	2	9	(71)	.	.	1968.50	86.75	.	.	.	5	AC	Y	1.4	8	2	2	H	8	28.9	.	.	1.46
290	24006	ElPaso	IH10	2121	2	19	( )	18.0	19.4	1968.75	.	.	.	.	4	AC	Y	1.4	8	2	2	H	8	28.9	66000	5.06	1.46
291	24007	ElPaso	IH10	2121	2	7	( )	13.8	18.0	1969.00	.	.	.	.			Y	4.2	8	2	3	H	8	28.9	63000	5.06	1.28
292	24008	ElPaso	IH10	2121	2	8	( )	.	.	1964.84	.	.	.	.	4	AC	Y	2.0	8	2	2	H	8	28.9	.	.	1.46
293	24009	Culberson	IH10	3	3	19	(29)	176.4	179.2	1969.58	87.08	.	.	.	2	AC	Y	2.8	8	2	1	L	11	30.4	7800	1.78	1.35
294	24010	JeffDavis	IH10	3	4	22	(32,33)	179.2	186.2	1969.58	87.08	86.84	.	.	2	AC	Y	7.0	8	2	3	L	12	32.0	7800	1.78	1.23
295	24011	Culberson	IH10	3	3	20	(29)	166.4	176.2	1970.16	87.08	.	.	.	2	AC	Y	9.8	8	2	3	L	11	30.4	.	.	1.25
296	24012	Culberson	IH10	3	2	16	(27)	165.2	166.4	1970.16	87.08	.	.	.	2	AC	Y	1.2	8	2	3	L	11	30.4	7800	1.78	1.25
297	24014	Culberson	IH10	3	2	17	(27)	153.4	165.4	1971.99	87.08	.	.	.	2	AC	Y	12.0	8	2	3	L	11	30.4	7900	1.78	1.25
298	24015	Culberson	IH10	3	1	18	(33)	152.8	153.2	1971.99	87.08	.	.	.	2	AC	Y	0.4	8	2	3	L	11	30.4	.	.	1.25
299	24020	Culberson	IH10	3	1	23	(33)	141.4	152.8	1974.33	87.08	.	.	.	2	AC	Y	11.4	8	1	3	L	11	30.4	.	.	1.25
300	24022	Culberson	IH10	2	11	25	( )	138.0	140.0	1975.84	.	.	.	.	2	AC	Y	2.0	8	1	3	L	11	30.4	7600	1.78	1.25
301	24023	Culberson	IH10	3	1	22	(33)	140.2	141.8	1975.84	87.08	.	.	.	2	AC	Y	1.6	8	1	3	L	11	30.4	8000	1.78	1.25
302	24027	ElPaso	US54	167	1	41	( )	.	.	1980.08	.	.	.	.	2		Y	1.3	8	2	3	L	8	28.9	.	.	1.28
303	24028	ElPaso	US54	167	1	40	( )	3.9	7.1	1980.08	.	.	.	.	2		Y	3.2	8	2	3	L	8	28.9	52000	6.65	1.28
304	24029	ElPaso	US54	167	1	35	( )	1.7	3.9	1978.75	.	.	.	.	3	AC	Y	2.2	8	2	3	L	8	28.9	52000	6.65	1.28
305	24030	ElPaso	US54	167	1	24	( )	.	.	1973.75	.	.	.	.	3	AC	Y	0.2	8	2	3	L	8	28.9	.	.	1.28
306	24031	ElPaso	US54	167	1	25	( )	.	.	1973.75	.	.	.	.	3	AC	Y	0.1	8	2	3	H	8	28.9	.	.	1.28
307	24032	ElPaso	US54	167	4	3	( )	0.0	1.8	1981.16	.	.	.	.	5	AC	Y	0.6	8	2	3	H	8	28.9	41000	6.65	1.28
308	25001	Wheeler	IH40	275	12	20	( )	146.2	159.8	1968.50	.	.	.	.	2	AC	Y	13.6	8	3	1	L	22	20.0	8600	.	1.51
309	25002	Wheeler	IH40	275	13	24	(43)	163.8	175.8	1970.42	.	.	.	.	2	AC	Y	12.0	8	3	1	H	22	20.0	7800	.	1.51
310	25003	Wheeler	IH40	275	12	31	( )	160.0	162.4	1973.50	.	.	.	.	2	AC	Y	2.4	8	3	1	L	22	20.0	9200	.	1.51
311	25004	Wheeler	IH40	275	13	29	( )	162.4	163.8	1973.50	.	.	.	.	2	AC	Y	1.4	8	3	1	L	22	20.0	7400	.	1.51
312	25005	Wheeler	IH40	275	13	33	( )	176.0	176.6	1975.00	.	.	.	.	2	AC	Y	0.6	8	3	1	L	22	20.0	7500	.	1.51

TABLE C.2. CONDITION SURVEY DATA (PARTIAL LISTING)

OBS	LANES	RATER	CFP	CURVE	OVR	LEN	ACP	PCCP	NCRK	BF	NF	MPO	SPO	CFTR	SECT	DIR	DATE	FROM	TO	YR
1	2	.	C	N		1000	.	.	.	.	.	.	.	1001	1	W	082087	MILE 133.8	MILE 133.6	74
2	2	.	C	N		1000	0	0	.	.	.	0	0	1001	1	W	082087	MILE 133.8	MILE 133.6	78
3	2	.	C	N		1000	0	0	.	.	.	0	0	1001	1	W	082087	MILE 133.8	MILE 133.6	80
4	2	.	C	N		1000	0	0	.	.	.	0	0	1001	1	W	082087	MILE 133.8	MILE 133.6	82
5	2	.	C	N		1000	0	0	.	.	.	0	0	1001	1	W	082087	MILE 133.8	MILE 133.6	84
6	2	.	C	N		1000	0	0	0	.	.	0	0	1001	1	W	082087	MILE 133.8	MILE 133.6	87
7	2	.	T	Y		1000	.	.	.	.	.	.	.	1001	2	W	082087	MILE 133.5	MILE 133.3	74
8	2	.	T	Y		1000	0	0	.	.	.	0	0	1001	2	W	082087	MILE 133.5	MILE 133.3	78
9	2	.	T	Y		1000	0	0	.	.	.	0	0	1001	2	W	082087	MILE 133.5	MILE 133.3	80
10	2	.	T	Y		1000	0	0	.	.	.	0	0	1001	2	W	082087	MILE 133.5	MILE 133.3	82
11	2	.	T	Y		1000	0	0	.	.	.	0	0	1001	2	W	082087	MILE 133.5	MILE 133.3	84
12	2	.	T	Y		1000	0	0	0	.	.	0	0	1001	2	W	082087	MILE 133.5	MILE 133.3	87
13	2	.	G	N		1000	.	.	.	.	.	.	.	1001	3	W	082087	MILE 132.7	MILE 132.5	74
14	2	.	G	N		1000	0	0	.	.	.	0	0	1001	3	W	082087	MILE 132.7	MILE 132.5	78
15	2	.	G	N		1000	0	0	.	.	.	2	1	1001	3	W	082087	MILE 132.7	MILE 132.5	80
16	2	.	G	N		1000	0	0	.	.	.	0	0	1001	3	W	082087	MILE 132.7	MILE 132.5	82
17	2	.	G	N		1000	0	0	.	.	.	0	0	1001	3	W	082087	MILE 132.7	MILE 132.5	84
18	2	.	G	N		1000	0	0	0	.	.	0	0	1001	3	W	082087	MILE 132.7	MILE 132.5	87
19	2	.	C	N		1000	.	.	.	.	.	.	.	1001	4	W	082087	MILE 131.6	MILE 131.4	74
20	2	.	C	N		1000	0	0	.	.	.	0	0	1001	4	W	082087	MILE 131.6	MILE 131.4	78
21	2	.	C	N		1000	1	0	.	.	.	1	0	1001	4	W	082087	MILE 131.6	MILE 131.4	80
22	2	.	C	N		1000	1	0	.	.	.	3	0	1001	4	W	082087	MILE 131.6	MILE 131.4	82
23	2	.	C	N		1000	2	0	.	.	.	0	1	1001	4	W	082087	MILE 131.6	MILE 131.4	84
24	2	.	C	N		1000	0	0	0	.	.	0	0	1001	4	W	082087	MILE 131.6	MILE 131.4	87
25	2	.	F	Y		1000	.	.	.	.	.	.	.	1001	5	W	082087	MILE 130.4	MILE 130.2	74
26	2	.	F	Y		1000	0	0	.	.	.	0	0	1001	5	W	082087	MILE 130.4	MILE 130.2	78
27	2	.	F	Y		1000	0	0	.	.	.	0	0	1001	5	W	082087	MILE 130.4	MILE 130.2	80
28	2	.	F	Y		1000	0	0	.	.	.	0	0	1001	5	W	082087	MILE 130.4	MILE 130.2	82
29	2	.	F	Y		1000	0	0	.	.	.	0	0	1001	5	W	082087	MILE 130.4	MILE 130.2	84
30	2	.	F	Y		1000	0	0	0	.	.	0	0	1001	5	W	082087	MILE 130.4	MILE 130.2	87
31	2	.	F	N		1000	.	.	.	.	.	.	.	1001	6	W	082087	JUST AFTER MP 130	MP 129.8	74
32	2	.	F	N		1000	0	0	.	.	.	0	0	1001	6	W	082087	JUST AFTER MP 130	MP 129.8	78
33	2	.	F	N		1000	0	0	.	.	.	1	0	1001	6	W	082087	JUST AFTER MP 130	MP 129.8	80
34	2	.	F	N		1000	0	0	.	.	.	1	0	1001	6	W	082087	JUST AFTER MP 130	MP 129.8	82
35	2	.	F	N		1000	1	0	.	.	.	0	0	1001	6	W	082087	JUST AFTER MP 130	MP 129.8	84
36	2	.	F	N		1000	0	0	0	.	.	0	0	1001	6	W	082087	JUST AFTER MP 130	MP 129.8	87
37	2	.	G	N		1000	.	.	.	.	.	.	.	1003	1	W	082087	1000 FT E OF MP 142	MP 142	74
38	2	.	G	N		1000	0	0	.	.	.	0	0	1003	1	W	082087	1000 FT E OF MP 142	MP 142	78
39	2	.	G	N		1000	3	0	.	.	.	6	0	1003	1	W	082087	1000 FT E OF MP 142	MP 142	80
40	2	.	G	N		1000	2	0	.	.	.	7	0	1003	1	W	082087	1000 FT E OF MP 142	MP 142	82
41	2	.	G	N		1000	5	0	.	.	.	0	0	1003	1	W	082087	1000 FT E OF MP 142	MP 142	84
42	2	.	G	N		1000	0	0	0	.	.	0	0	1003	1	W	082087	1000 FT E OF MP 142	MP 142	87
43	2	.	C	N		1000	.	.	.	.	.	.	.	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	74
44	2	.	C	N		1000	0	0	.	.	.	0	0	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	78
45	2	.	C	N		1000	0	0	.	.	.	3	0	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	80
46	2	.	C	N		1000	0	0	.	.	.	0	0	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	82
47	2	.	C	N		1000	0	0	.	.	.	0	0	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	84
48	2	.	C	N		1000	0	0	0	.	.	0	0	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	87
49	2	.	C	N		1000	.	.	.	.	.	.	.	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	74
50	2	.	C	N		1000	0	0	.	.	.	0	0	1003	2	W	082087	1000 FT E OF MP 141	APPROX MP 141	78

TABLE C.3. TRAFFIC FILE (PARTIAL LISTING)

OBS	N	CFTR	YR	ADT	PTRUCK	ESAL2	ATHWL	PTAND
1	1	1001	64	5250	18.0	497478	13100	40
2	1	1001	65	6410	15.5	506265	13200	40
3	1	1001	66	6000	18.0	584597	13200	40
4	1	1001	67	6330	18.0	657260	13300	40
5	1	1001	68	7180	20.0	873369	13500	40
6	1	1001	69	7420	23.0	1011146	13600	30
7	1	1001	70	8230	18.0	926323	13500	40
8	1	1001	71	9160	20.0	1112714	13700	30
9	1	1001	72	9410	21.0	1221526	13800	30
10	1	1001	73	10080	24.0	1549904	13900	30
11	1	1001	74	9460	26.0	1590435	13900	30
12	1	1001	75	10050	26.0	1689627	14000	30
13	1	1001	76	10560	26.0	1768775	14000	30
14	1	1001	77	11340	25.0	1800289	14000	30
15	1	1001	78	11940	26.0	1962643	14000	30
16	1	1001	79	11620	25.0	2040551	13400	60
17	1	1001	80	11800	31.0	2573578	13600	60
18	1	1001	81	13000	29.0	2748687	13700	60
19	1	1001	82	13800	25.0	1967062	13200	70
20	1	1001	83	15000	26.0	2179826	13300	70
21	1	1001	84	16000	23.0	2100293	13300	70
22	1	1001	85	16000	29.0	2464237	13400	70
23	1	1001	86	15100	28.0	2347248	13000	70
24	2	1002	65	5220	19.0	654437	13150	55
25	2	1002	66	4845	20.0	613038	13100	55
26	2	1002	67	4940	20.0	629737	13150	55
27	2	1002	68	5825	19.0	714493	13200	50
28	2	1002	69	6515	18.0	744105	13250	50
29	2	1002	70	7135	17.0	771950	13300	50
30	2	1002	71	7755	18.0	930272	13450	40
31	2	1002	72	8030	18.0	953063	13500	40
32	2	1002	73	9235	19.0	1150009	13650	40
33	2	1002	74	8740	25.0	1408024	13900	30
34	2	1002	75	9230	26.0	1622912	13900	30
35	2	1002	76	9795	26.0	1671808	13950	30
36	2	1002	77	10005	27.0	1756611	14000	30
37	2	1002	78	10845	26.0	1814285	14000	30
38	2	1002	79	10445	27.0	1926714	13350	60
39	2	1002	80	10300	23.0	1757042	13200	60
40	2	1002	81	11250	24.0	1920116	13300	60
41	2	1002	82	11250	25.0	1675102	13250	80
42	2	1002	83	12300	29.0	2054438	13550	70
43	2	1002	84	13850	29.0	2330994	13700	70
44	2	1002	85	13850	22.0	1840708	12600	70
45	2	1002	86	13500	23.0	1841912	12200	80
46	1	1003	66	4480	19.0	551662	13000	60
47	1	1003	67	4600	19.0	569340	13100	60
48	1	1003	68	5550	20.0	700922	13200	50
49	1	1003	69	6270	18.0	732535	13200	50
50	1	1003	70	6820	17.0	758080	13300	50

TABLE C.4. DEFLECTION FILE (PARTIAL LISTING)

OBS	CONF	DIR	OVR	SS	TDEV	CFTR	DF1	DF2	DF3	DF4	DF5	DF6	DF7	HEIGHT	LBS	SECT	STATION	STEMP
1	C	W	Y	L	D	1001	4.86	2.47	2.18	1.82	1.46	1.12	0.88	1	5920	1	1	123.8
2	C	W	Y	L	D	1001	4.02	1.82	1.69	1.42	1.19	0.95	0.76	1	5912	1	2	131.0
3	C	W	Y	M	D	1001	4.18	2.59	2.30	1.86	1.46	1.12	0.84	1	5856	1	1	123.8
4	C	W	Y	M	D	1001	3.90	2.11	1.85	1.58	1.30	0.99	0.80	1	5856	1	2	131.0
5	C	W	Y	N	D	1001	4.82	2.43	2.14	1.74	1.38	1.04	0.84	1	5808	1	1	123.8
6	C	W	Y	N	D	1001	3.57	1.78	1.60	1.33	1.11	0.87	0.72	1	5848	1	2	131.0
7	C	W	Y	O	D	1001	3.90	3.04	2.63	2.14	1.70	1.24	0.96	1	5976	1	1	123.8
8	C	W	Y	O	D	1001	3.98	2.51	2.26	1.86	1.46	1.16	0.88	1	5984	1	2	131.0
9	C	W	Y	P	D	1001	3.86	2.31	1.97	1.62	1.30	0.95	0.76	1	5928	1	1	123.8
10	C	W	Y	P	D	1001	3.65	1.90	1.60	1.29	0.99	0.75	0.56	1	5776	1	2	130.1
11	C	W	Y	Q	D	1001	4.22	2.27	1.97	1.62	1.26	0.91	0.72	1	5864	1	1	116.6
12	C	W	Y	Q	D	1001	4.10	1.78	1.56	1.29	1.07	0.79	0.64	1	5872	1	2	130.1
13	C	W	Y	R	D	1001	4.58	2.63	2.38	1.94	1.54	1.16	0.92	1	6072	1	1	116.6
14	C	W	Y	R	D	1001	4.06	1.82	1.64	1.42	1.19	0.91	0.76	1	5864	1	2	130.1
15	C	W	Y	S	D	1001	4.62	2.15	1.97	1.66	1.34	1.08	0.84	1	5912	1	1	116.6
16	C	W	Y	S	D	1001	5.54	1.90	1.73	1.50	1.19	0.91	0.76	1	5840	1	2	130.1
17	C	W	Y	T	D	1001	4.38	2.51	2.22	1.78	1.34	0.99	0.72	1	5840	1	1	116.6
18	C	W	Y	T	D	1001	3.81	2.19	1.93	1.62	1.30	1.04	0.84	1	5784	1	2	130.1
19	C	W	Y	U	D	1001	7.03	3.44	2.96	2.39	1.86	1.37	1.08	1	5816	1	1	116.6
20	C	W	Y	U	D	1001	4.78	2.92	2.75	2.35	1.98	1.58	1.24	1	5784	1	2	130.1
21	C	W	Y	L	D	1001	4.18	3.04	2.67	2.10	1.66	1.29	0.96	1	5904	2	1	127.4
22	C	W	Y	L	D	1001	4.58	2.43	2.18	1.78	1.46	1.12	0.92	1	5808	2	2	125.6
23	C	W	Y	M	D	1001	5.42	3.36	2.92	2.39	1.86	1.37	1.04	1	5832	2	1	127.4
24	C	W	Y	M	D	1001	3.98	2.03	1.85	1.54	1.26	0.95	0.72	1	5840	2	2	125.6
25	C	W	Y	N	D	1001	3.73	2.84	2.43	1.94	1.50	1.12	0.84	1	6088	2	1	127.4
26	C	W	Y	N	D	1001	3.69	2.15	1.97	1.66	1.34	1.04	0.80	1	5864	2	2	125.6
27	C	W	Y	O	D	1001	5.06	3.24	2.84	2.26	1.78	1.33	1.04	1	5952	2	1	127.4
28	C	W	Y	O	D	1001	4.38	2.55	2.22	1.82	1.50	1.16	0.96	1	5736	2	2	125.6
29	C	W	Y	P	D	1001	3.81	3.08	2.67	2.18	1.70	1.29	1.00	1	5960	2	1	127.4
30	C	W	Y	P	D	1001	3.53	2.03	1.77	1.46	1.19	0.87	0.68	1	5888	2	2	122.9
31	C	W	Y	Q	D	1001	4.22	2.84	2.38	1.90	1.50	1.12	0.88	1	5888	2	1	127.4
32	C	W	Y	Q	D	1001	3.49	2.35	2.01	1.70	1.34	0.99	0.80	1	5800	2	2	122.9
33	C	W	Y	R	D	1001	4.90	3.48	3.00	2.43	1.90	1.41	1.08	1	5848	2	1	127.4
34	C	W	Y	R	D	1001	3.29	2.67	2.26	1.86	1.50	1.12	0.84	1	5856	2	2	122.9
35	C	W	Y	S	D	1001	5.94	4.82	4.23	3.56	2.93	2.28	1.81	1	5848	2	1	130.1
36	C	W	Y	S	D	1001	3.21	2.92	2.63	2.30	1.94	1.58	1.29	1	5904	2	2	122.9
37	C	W	Y	T	D	1001	5.34	4.50	4.03	3.44	2.85	2.24	1.85	1	5936	2	1	130.1
38	C	W	Y	T	D	1001	3.61	3.08	2.79	2.39	2.06	1.66	1.37	1	5912	2	2	122.9
39	C	W	Y	U	D	1001	5.66	4.90	4.40	3.60	2.96	2.32	1.85	1	5856	2	1	130.1
40	C	W	Y	U	D	1001	3.49	2.75	2.47	2.10	1.78	1.45	1.16	1	5880	2	2	122.9
41	C	W	Y	L	D	1001	4.86	3.81	3.25	2.67	2.13	1.62	1.29	1	5880	3	1	122.9
42	C	W	Y	L	D	1001	4.18	2.67	2.38	2.06	1.70	1.37	1.12	1	5752	3	2	122.9
43	C	W	Y	M	D	1001	4.66	4.01	3.41	2.75	2.09	1.66	1.33	1	5864	3	1	122.9
44	C	W	Y	M	D	1001	3.41	2.67	2.34	1.94	1.62	1.24	1.00	1	5800	3	2	122.0
45	C	W	Y	N	D	1001	4.50	2.96	2.51	2.06	1.62	1.29	1.04	1	5832	3	1	122.9
46	C	W	Y	N	D	1001	4.42	2.39	2.10	1.78	1.46	1.16	0.96	1	5792	3	2	122.0
47	C	W	Y	O	D	1001	3.81	3.00	2.51	2.06	1.66	1.33	1.08	1	5824	3	1	122.9
48	C	W	Y	O	D	1001	3.65	2.43	2.10	1.74	1.42	1.08	0.88	1	5736	3	2	122.0
49	C	W	Y	P	D	1001	4.74	3.36	2.92	2.43	1.98	1.53	1.24	1	5792	3	1	122.9
50	C	W	Y	P	D	1001	3.57	2.43	2.26	1.86	1.54	1.24	1.00	1	5824	3	2	119.3

TABLE C.5. CRACK SPACING FILE (PARTIAL LISTING)

OBS	CFTR	SECT	DIR	CRK
1	1013	1	N	1.7
2	1013	1	N	1.9
3	1013	1	N	2.9
4	1013	1	N	2.1
5	1013	1	N	1.4
6	1013	1	N	1.7
7	1013	1	N	1.2
8	1013	1	N	3.1
9	1013	1	N	2.7
10	1013	1	N	3.9
11	1013	1	N	2.2
12	1013	1	N	2.2
13	1013	1	N	2.3
14	1013	1	N	2.3
15	1013	1	N	1.7
16	1013	1	N	2.5
17	1013	1	N	3.5
18	1013	1	N	2.9
19	1013	1	N	2.4
20	1013	1	N	1.9
21	1013	1	N	1.7
22	1013	1	N	1.3
23	1013	1	N	4.0
24	1013	1	N	3.4
25	1013	1	N	0.9
26	1013	1	N	4.9
27	1013	1	N	0.8
28	1013	1	N	2.9
29	1013	1	N	2.7
30	1013	1	N	1.5
31	1013	1	N	2.8
32	1013	1	N	2.3
33	1013	1	N	1.9
34	1013	1	N	2.8
35	1013	1	N	1.8
36	1013	1	N	4.2
37	1013	1	N	4.1
38	1013	1	N	1.4
39	1013	1	N	0.5
40	1013	1	N	2.7
41	1013	1	N	2.2
42	1013	1	N	2.6
43	1013	1	N	3.0
44	1013	1	N	2.0
45	1013	1	N	2.4
46	1013	1	N	3.0
47	1013	1	N	2.8
48	1013	1	N	1.6
49	1013	1	N	2.1
50	1013	1	N	2.9

TABLE C.6. CRACK WIDTH FILE (PARTIAL LISTING)

OBS	CFTR	SECT	DIR	SPACING	SPALL	SPL	SPR	WIDTH
1	1015	1	E	CLOSE	YES	11	14	55
2	1015	1	E	CLOSE	YES	11	14	50
3	1015	1	E	CLOSE	YES	11	14	40
4	1015	1	E	CLOSE	YES	11	14	55
5	1015	1	E	CLOSE	YES	11	14	35
6	1015	1	E	CLOSE	YES	11	14	16
7	1015	1	E	MEDIUM	YES	25	32	50
8	1015	1	E	MEDIUM	YES	25	32	61
9	1015	1	E	MEDIUM	YES	25	32	49
10	1015	1	E	MEDIUM	YES	25	32	88
11	1015	1	E	MEDIUM	YES	25	32	31
12	1015	1	E	MEDIUM	YES	25	32	35
13	1015	1	E	WIDE	YES	71	63	52
14	1015	1	E	WIDE	YES	71	63	55
15	1015	1	E	WIDE	YES	71	63	55
16	1015	1	E	WIDE	YES	71	63	47
17	1015	1	E	WIDE	YES	71	63	35
18	1015	1	E	WIDE	YES	71	63	61
19	1015	2	E	MEDIUM	YES	36	12	21
20	1015	2	E	MEDIUM	YES	36	12	36
21	1015	2	E	MEDIUM	YES	36	12	54
22	1015	2	E	MEDIUM	YES	36	12	60
23	1015	2	E	MEDIUM	YES	36	12	58
24	1015	2	E	MEDIUM	YES	36	12	39
25	1015	2	E	MEDIUM	YES	25	30	45
26	1015	2	E	MEDIUM	YES	25	30	40
27	1015	2	E	MEDIUM	YES	25	30	22
28	1015	2	E	MEDIUM	YES	25	30	36
29	1015	2	E	MEDIUM	YES	25	30	57
30	1015	2	E	MEDIUM	YES	25	30	47
31	1015	2	E	WIDE	YES	100	111	76
32	1015	2	E	WIDE	YES	100	111	69
33	1015	2	E	WIDE	YES	100	111	42
34	1015	2	E	WIDE	YES	100	111	38
35	1015	2	E	WIDE	YES	100	111	51
36	1015	2	E	WIDE	YES	100	111	54
37	1015	3	W	CLOSE	YES	21	12	25
38	1015	3	W	CLOSE	YES	21	12	33
39	1015	3	W	CLOSE	YES	21	12	75
40	1015	3	W	CLOSE	YES	21	12	80
41	1015	3	W	CLOSE	YES	21	12	22
42	1015	3	W	CLOSE	YES	21	12	55
43	1015	3	W	MEDIUM	YES	33	36	65
44	1015	3	W	MEDIUM	YES	33	36	30
45	1015	3	W	MEDIUM	YES	33	36	30
46	1015	3	W	MEDIUM	YES	33	36	10
47	1015	3	W	MEDIUM	YES	33	36	17
48	1015	3	W	MEDIUM	YES	33	36	40
49	1015	3	W	WIDE	YES	74	90	20
50	1015	3	W	WIDE	YES	74	90	30

TABLE C.7. SLAB TEMPERATURE FILE (PARTIAL LISTING)

OBS	CFTR	DIR	DATE	TIME	TOP	MID	BOT	SUR
1	2002	E	72888	830	91.6	90.2	88.6	98.0
2	2002	W	72888	830	91.6	90.2	88.6	98.0
3	2002	E	72888	1350	104.6	121.6	128.6	133.0
4	2002	W	72888	1350	104.6	121.6	128.6	133.0
5	2002	E	72888	1555	112.4	121.8	128.2	138.0
6	2002	W	72888	1555	112.4	121.8	128.2	138.0
7	2028	N	80288	930	87.0	85.6	84.0	90.0
8	2028	S	80288	930	87.0	85.6	84.0	90.0
9	2028	N	80288	1200	88.6	102.1	106.9	133.0
10	2028	S	80288	1200	88.6	102.1	106.9	133.0
11	2028	N	80288	1600	88.2	98.6	105.4	142.0
12	2028	S	80288	1600	88.2	98.6	105.4	142.0
13	2032	E	80888	1125	82.8	101.0	116.8	140.0
14	2032	W	80888	1125	82.8	101.0	116.8	140.0
15	2032	E	80888	1430	102.4	117.4	122.4	149.0
16	2032	W	80888	1430	102.4	117.4	122.4	149.0
17	2032	E	80888	1530	106.8	114.0	121.0	136.0
18	2032	W	80888	1530	106.8	114.0	121.0	136.0
19	2044	N	80188	805	80.0	79.4	78.8	81.0
20	2044	S	80188	805	80.0	79.4	78.8	81.0
21	2044	N	80188	1355	90.2	101.6	108.0	130.0
22	2044	S	80188	1355	90.2	101.6	108.0	130.0
23	2044	N	80188	1500	90.0	103.0	109.0	132.0
24	2044	S	80188	1500	90.0	103.0	109.0	132.0
25	2044	N	80188	449	90.8	97.6	104.0	108.0
26	2044	S	80188	449	90.8	97.6	104.0	108.0
27	2049	N	80388	925	89.2	89.6	87.0	90.0
28	2049	S	80388	925	89.2	89.6	87.0	90.0
29	2049	N	80388	1430	105.2	114.4	116.8	121.0
30	2049	S	80388	1430	105.2	114.4	116.8	121.0
31	2049	N	80388	1630	106.0	110.8	115.2	135.0
32	2049	S	80388	1630	106.0	110.8	115.2	135.0
33	2098	E	80488	815	79.4	80.2	79.4	91.0
34	2098	W	80488	815	79.4	80.2	79.4	91.0
35	2098	E	80488	1415	89.6	109.0	102.8	145.0
36	2098	W	80488	1415	89.6	109.0	102.8	145.0
37	2098	E	80488	1600	92.6	100.4	106.8	134.0
38	2098	W	80488	1600	92.6	100.4	106.8	134.0
39	3001	N	81688	900	83.4	82.1	81.3	89.0
40	3001	S	81688	900	83.4	82.1	81.3	89.0
41	3001	N	81688	1155	113.9	125.1	131.3	116.0
42	3001	S	81688	1155	113.9	125.1	131.3	116.0
43	3001	N	81688	1500	106.3	115.2	121.9	120.0
44	3001	S	81688	1500	106.3	115.2	121.9	120.0
45	3001	N	81688	1600	118.0	119.9	128.6	106.7
46	3001	S	81688	1600	118.0	119.9	128.6	106.7
47	3010	N	81688	815	82.4	81.6	80.2	86.0
48	3010	S	81688	815	82.4	81.6	80.2	86.0
49	3010	N	81688	1230	114.2	123.4	130.2	118.0
50	3010	S	81688	1230	114.2	123.4	130.2	118.0