**SCHOOL OF
CIVIL ENGINEERING
INDIANA
DEPARTMENT OF HIGHWAYS**

JOINT HIGHWAY RESEARCH PROJECT

FHWA/IN/JHRP-89/14

Final Report

**DEVELOPMENT OF AN ASPHALTIC
CONCRETE OVERLAY DESIGN
PROCEDURE FOR RIGID PAVEMENTS
IN INDIANA**

**Norman D. Pumphrey, Jr.
Thomas D. White**

PURDUE UNIVERSITY

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TO: Harold L. Michael, Director
Joint Highway Research Project

July 7, 1989

FROM: Thomas D. White, Research Engineer
Joint Highway Research Project

Project: C-36-55G

File: 2-12-7

Attached is the Final Report on the HPR Part II study titled, "Development of an Asphaltic Concrete Overlay Design Procedure for Rigid Pavements in Indiana." This study presents the results of a study that evaluated nondestructive testing equipment and utilized data collected from the existing highway system to develop a proposed overlay design procedure for rigid pavements.

As the result of the complex performance of asphalt overlays of rigid pavements design procedures have been developed to characterize the structural or functional performance. Guidance based on fatigue criteria is utilized to delineate application of the two performance regimes.

This report is forwarded to INDOT and FHWA in fulfillment of the objectives of the study.

Sincerely yours,

Thomas D. White
Research Engineer

TDW/cah

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DEVELOPMENT OF AN ASPHALTIC CONCRETE OVERLAY
DESIGN PROCEDURE FOR RIGID PAVEMENTS IN INDIANA

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in cooperation with the

Indiana Department of Transportation

and the

U.S. Department of Transportation
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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.

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16. Abstract <p>A overlay study was conducted of thirty jointed reinforced concrete pavements (JRCP) and thirteen continuously reinforced concrete pavements (CRCP). These pavements were selected from the Indiana primary highway system based on an experimental design for levels of major factors affecting pavement performance. An analysis was made of pavement deflection; condition; serviceability; materials; thicknesses; truck traffic; latest overlay thickness; age; climate zone and subgrade type, density and moisture content. Initially, a rational analysis was planned using a back calculated material properties as suggested in the 1986 AASHTO Design Guide. However, this approach was not successful and alternate analysis procedures were utilized.</p> <p>The performance of asphalt overlays of concrete pavement proved to be complex. Fortunately, analysis of the data base built using experimental design techniques helped to explain this complex performance. Based on the performance data several performance regimes were characterized. For example, increased overlay thickness for jointed concrete pavements on stiff foundations was characterized by a relation using a PCI subset of cracking distresses.</p> <p>A statistical analysis was performed on the CRCP pavement data, and an overlay model was developed. However, because of the limited range in thickness, truck traffic, etc. the equation should be used only as a guide for determining overlay thickness.</p> <p>Two statistical models were developed for the JRCP sections. The first is a structural model, to be used for thin to medium thick (6" to 9") PCC pavements with thin AC overlays. The second is a functional model, to be used with thick (>9") PCC pavements or any PCC pavements with thick (>5") AC overlays. A procedure has been formulated for determining which of these equations is applicable for particular AC/PCC thickness combinations.</p>			
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TABLE OF CONTENTS

	Page
LIST OF TABLES.....	vi
LIST OF FIGURES.....	x
LIST OF ABBREVIATIONS.....	xiv
ABSTRACT.....	xvi
CHAPTER 1 - INTRODUCTION.....	1
1.1 Background.....	3
1.2 Problem Statement.....	5
CHAPTER 2 - LITERATURE REVIEW.....	7
2.1 Criteria in Overlay Design.....	8
2.2 Current Overlay Design Methods.....	11
2.3 Other Considerations.....	24
CHAPTER 3 - DATA SUMMARY.....	27
3.1 Data Base Development.....	28
3.2 Climate.....	31
3.3 Traffic.....	34
3.4 Pavement Cores.....	35
3.5 Subgrade Samples.....	36
3.6 Condition and Performance Data.....	41
3.7 NDT Data.....	44
CHAPTER 4 - EMPIRICAL OVERLAY DESIGN ANALYSIS.....	49
4.1 Original Statistical Design.....	49
4.2 Search for Alternative Regression Models.....	51
4.3 Analysis of Individual Models.....	61
4.4 CRCP Model Analysis.....	65
4.5 JRCF Model Analysis and Selection.....	74
4.6 Structural Distress Analysis.....	101

	Page
CHAPTER 5 - BACKCALCULATION OF MODULI.....	109
5.1 Background.....	109
5.2 Moduli Estimates - First Trial.....	111
5.3 Typical Moduli.....	116
5.4 Discussion of Initial Results.....	119
5.5 Estimating the AC Overlay Moduli.....	120
5.6 Moduli Estimates - Second Trial.....	125
5.7 Moduli Estimates - Third Trial.....	128
5.8 Conclusions.....	133
CHAPTER 6 - AASHTO OVERLAY DESIGN ANALYSIS.....	134
6.1 Normal Structural Overlay Design.....	136
6.2 Reflective Crack Reduction Approach.....	140
CHAPTER 7 - OVERLAY THICKNESS CALCULATIONS.....	144
7.1 JRCF Test Sections.....	144
7.2 CRCP Test Sections.....	151
CHAPTER 8 - CONCLUSIONS AND RECOMMENDATIONS.....	155
8.1 Conclusions.....	155
8.2 Recommendations for Further Study.....	158
LIST OF REFERENCES.....	160
APPENDICES	
Appendix A - Data Base, Experiment Design, and Field Tests.....	165
Appendix B - Test Section Descriptions and Locations.....	228
Appendix C - Testing Data Base.....	243
Appendix D - Statistical Overlay Design Program.....	354
Appendix E - Additional Regression Models Considered - JRCF.....	362
Appendix F - Overlay Design Guide.....	377
Appendix G - Asphaltic Concrete Modulus Estimate....	437
Appendix H - Pavement Condition Surveys.....	446

LIST OF TABLES

Table	Page
3.1 Pavement Location and Traffic Data - CRCP Test Sections.....	32
3.2 Pavement Location and Traffic Data - JRCF Test Sections.....	33
3.3 Pavement Cross Section Data - CRCP Test Sections..	37
3.4 Pavement Cross Section Data - JRCF Test Sections..	38
3.5 Pavement Subgrade Data - CRCP Test Sections.....	39
3.6 Pavement Subgrade Data - JRCF Test Sections.....	40
3.7 Pavement Condition and Performance - CRCP Test Sections.....	43
3.8 Pavement Condition and Performance - JRCF Test Sections.....	43
3.9 FWD Sensor 0 Deflections (mils) per 1000# of Load - CRCP Test Sections.....	47
3.10 FWD Sensor 0 Deflections (mils) per 1000# of Load - JRCF Test Sections.....	48
4.1 Models Investigated in Statistical Analysis -- JRCF Structural.....	55
4.2 Models Investigated in Statistical Analysis -- JRCF Functional.....	58
4.3 Sensitivity Analysis of Equation 4.1 -- CRCP Model.....	71
4.4 Sensitivity Analysis of Equation 4.3 -- JRCF Structural Model.....	82
4.5 Sensitivity Analysis of Equation 4.4 -- JRCF Functional Model.....	90

Table	Page
4.6 Additional Overlay Thickness for Various Reliability Levels -- Equation 4.1 (CRCP Model).....	100
4.7 Additional Overlay Thickness for Various Reliability Levels -- Equation 4.3 (JRC Structural Model).....	100
4.8 Additional Overlay Thickness for Various Reliability Levels -- Equation 4.4 (JRC Functional Model).....	100
4.9 Sensitivity Analysis of Equation 4.7 -- CPCI Model.....	106
5.1 Backcalculated Modulus of Elasticity Values (ksi) for CRC Pavement from Spring Test Period.....	112
5.2 Backcalculated Modulus of Elasticity Values (ksi) for JRC Pavement from Spring Test Period.....	113
5.3 Backcalculated Modulus of Elasticity Values (ksi) for CRC Pavement from Summer Test Period.....	114
5.4 Backcalculated Modulus of Elasticity Values (ksi) for JRC Pavement from Summer Test Period.....	115
5.5 Composite Moduli of Asphalt Overlay Layers Used in Backcalculation Analysis with FWD Data.....	123
5.6 Spring BISDEF Backcalculated Modulus Values Using AC Moduli from Estimation Program.....	126
5.7 Summer BISDEF Backcalculated Modulus Values Using AC Moduli from Estimation Program.....	127
5.8 Spring BISDEF Backcalculated Modulus Values Using AC Moduli from Estimation Program and Fixed Subgrade Moduli.....	129
5.9 Summer BISDEF Backcalculated Modulus Values Using AC Moduli from Estimation Program and Fixed Subgrade Moduli.....	131
7.1 Overlay Thickness Required on Selected JRC Pavement Sections Using Empirical Models.....	146

Table	Page
7.2 Overlay Thickness Required on Selected JRC Pavement Sections Using AASHTO Design Guide.....	148
7.3 Overlay Thickness Required on Selected CRC Pavement Sections Using Empirical Model.....	152
7.4 Overlay Thickness Required on Selected CRC Pavement Sections Using AASHTO Design Guide.....	152

Appendix Table

A1 Experiment Factor Levels.....	187
A2 Spring Deflection Testing Equipment Usage.....	197
A3 Summer/Fall Deflection Testing Equipment Usage....	198
A4 Spring FWD Check--Asphalt.....	216
A5 Spring RR2000 Check--Asphalt.....	217
A6 Spring RR400 Check--Asphalt.....	218
A7 Summer RR2000 Check--Asphalt.....	220
A8 Summer RR2000 Check--Concrete.....	221
A9 Summer RR400 Check--Asphalt.....	222
A10 Summer RR400 Check--Concrete.....	223
A11 Summer FWD Check--Concrete.....	224
B1 Description of CRC Pavement Test Sections.....	229
B2 Description of JRC Pavement Test Sections.....	231
B3 County Names and Corresponding Numbers.....	236
E1 Selected Regression Equations Which Were Rejected.	363
E2 Sensitivity Analysis of Equation E.1.....	365
E3 Sensitivity Analysis of Equation E.2.....	366
E4 Sensitivity Analysis of Equation E.3.....	367
E5 Sensitivity Analysis of Equation E.4.....	368

Appendix
Table

Page

F1	Suggested Levels of Reliability.....	406
F2	Visual and Structural Condition Values.....	411
F3	Maximum Annual Temperature Differential (^o F).....	416
F4	Minimum AC Overlay Thickness for PCC Pavements.....	417

LIST OF FIGURES

Figure	Page
2.1 Chart for Selecting Asphalt Concrete Structural Overlay Thickness for PCC Pavement (1).....	16
2.2 Tolerable Deflection Guide for PCC Pavements (16).	19
2.3 Percent Deflection Reduction for AC Overlays (16).	20
2.4 Design Guide for Asphalt Overlay of Rigid Pavement When Subgrade Modulus Ranges from 3 to 5 ksi (16)..	21
4.1 Actual Versus Predicted Overlay Thickness Values -- CRCP Model.....	70
4.2 Sensitivity Analysis of Equation 4.1 -- CRCP Model.....	72
4.3 Actual Versus Predicted Overlay Thickness Values -- JRCP Structural Model.....	80
4.4 Sensitivity Analysis of Equation 4.3 -- JRCP Structural Model -- PSI = 2.0.....	83
4.5 Sensitivity Analysis of Equation 4.3 -- JRCP Structural Model -- PSI = 2.5.....	84
4.6 Sensitivity Analysis of Equation 4.3 -- JRCP Structural Model -- PSI = 3.0.....	85
4.7 Actual Versus Predicted Overlay Thickness Values -- JRCP Functional Model.....	89
4.8 Sensitivity Analysis of Equation 4.4 -- JRCP Functional Model -- AGE = 5 yrs.....	91
4.9 Sensitivity Analysis of Equation 4.4 -- JRCP Functional Model -- AGE = 10 yrs.....	92
4.10 Sensitivity Analysis of Equation 4.4 -- JRCP Functional Model -- AGE = 15 yrs.....	93

Figure	Page
4.11 PCC Versus AC Overlay Chart for Determining Appropriate Empirical Equation.....	97
4.12 Effect of Granular Subbase Thickness on k Value (40).....	103
4.13 Approximate Interrelationships of Soil Classifications and Bearing Values (40).....	103
4.14 Actual Versus Predicted CPCI Values.....	105
4.15 Sensitivity Analysis of Equation 4.7 -- CPCI Model.....	107
5.1 Typical Distribution of PCC Cylinder Strengths (41).....	117

Appendix

Figure

A1 Percent Trucks -- Rural Primary Roads.....	171
A2 Percent Trucks -- Rural and Urban Interstate.....	172
A3 North and South Climate Zones.....	173
A4 Flexible Pavements -- Truck Traffic Distribution...	178
A5 Flexible Pavements -- Asphalt Overlay Thickness Distribution.....	179
A6 Flexible Pavements -- Asphalt Base Thickness Distribution.....	180
A7 CRC Pavements -- Truck Traffic Distribution.....	181
A8 CRC Pavements -- Concrete Thickness Distribution...	182
A9 CRC Pavements -- Ratio of Newest Overlay Thickness to Total Pavement Thickness Distribution.....	183
A10 JRC Pavements -- Truck Traffic Distribution.....	184
A11 JRC Pavements -- Edge Concrete Thickness.....	185
A12 JRC Pavements -- Ratio of Newest Overlay Distribution.....	186
A13 Factorial Design vs. Composite Design.....	189

Appendix Figure	Page
A14 The Dynaflect.....	200
A15 The Road Rater 400.....	201
A16 The Road Rater 2000.....	203
A17 The Dynatest FWD Model AE1030.....	204
A18 Condition Survey Form for Concrete.....	208
A19 Condition Survey Form for Asphalt.....	209
A20 The Reference Beam Fitted With LVDT's.....	212
A21 Checking FWD Against Reference Beam.....	214
B1 Location of Pavement Test Sections in Crawfordsville District.....	237
B2 Location of Pavement Test Sections in Fort Wayne District.....	238
B3 Location of Pavement Test Sections in Greenfield District.....	239
B4 Location of Pavement Test Sections in LaPorte District.....	240
B5 Location of Pavement Test Sections in Seymour District.....	241
B6 Location of Pavement Test Sections in Vincennes District.....	242
F1 Approximate Interrelationships of Soil Classifications and Bearing Values.....	382
F2 Typical NDT Deflection Versus Distance Plot for a Pavement.....	383
F3 Percent Trucks -- Rural Primary Highways.....	384
F4 Percent Trucks -- Rural and Urban Interstates.....	385
F5 Idealized Method for Analysis Unit Delineation.....	387

Appendix
Figure

Page

F6	Effect of Geographic Location on Seasonal Deflection Variation.....	389
F7	Estimating Effective Subgrade M_R	390
F8	Predicted Pavement Temperature.....	393
F9	Temperature Adjustment Factor for Deflections.....	394
F10	Determining Applicable Empirical Model.....	398
F11	Design Chart for Determining SN_y	408
F12	Remaining Life Estimate from Pavement Condition....	410
F13	Remaining Life Factor.....	414
F14	Dense-graded AC Layer Coefficient.....	420
F15	Granular Base Layer Coefficient.....	421
F16	Granular Subbase Layer Coefficient.....	422
F17	Cement-treated Base Layer Coefficient.....	423
F18	Bituminous-treated Base Layer Coefficient.....	424
F19	Condition Survey for Example Problem.....	427

LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Description</u>
AADT	average annual daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	asphaltic concrete
ACI	American Concrete Institute
CBR	California Bearing Ratio
CRC	continuously reinforced concrete
CRCP	continuously reinforced concrete pavement
FAI	federal-aid interstate
FAI	federal-aid primary
FHWA	Federal Highway Administration
FWD	falling weight deflectometer
GLM	general linear model
HPR	highway planning and research
IDOH	Indiana Department of Highways
InDOT	Indiana Department of Transportation
JHRP	Joint Highway Research Project
JPC	jointed plain concrete
JRC	jointed reinforced concrete
JRCP	jointed reinforce concrete pavement

<u>Abbreviation</u>	<u>Description</u>
LTPP	long-term pavement performance
M&T	Materials and Tests
NDT	nondestructive testing
PC	portland cement
PCA	Portland Cement Association
PCC	portland cement concrete
PCI	pavement condition index
PSI	present serviceability index
RR	Road Rater
SAS	Statistical Analysis System
SHRP	Strategic Highway Research Program
SS	sum of squares
WES	U.S. Army Waterway Experiment Station

ABSTRACT

A overlay study was conducted of thirty jointed reinforced concrete pavements (JRCP) and thirteen continuously reinforced concrete pavements (CRCP). These pavements were selected from the Indiana primary highway system based on an experimental design for levels of major factors affecting pavement performance. An analysis was made of pavement deflection; condition; serviceability; materials; thicknesses; truck traffic; latest overlay thickness; age; climate zone and subgrade type, density and moisture content. Initially, a rational analysis was planned using the back calculated material properties as suggested in the 1986 AASHTO Design Guide. However, this approach was not successful and alternate analysis procedures were utilized.

The performance of asphalt overlays of concrete pavement proved to be complex. Fortunately, analysis of the data base built using experimental design techniques helped to explain this complex performance. Based on the performance data several performance regimes were characterized. For example, increased overlay thickness for jointed concrete pavements on stiff foundations was characterized by a relation using a PCI subset of cracking distresses.

A statistical analysis was performed on the CRCP pavement data, and an overlay model was developed. However, because of the limited range in thickness, truck traffic, etc. the equation should be used only as a guide for determining overlay thickness.

Two statistical models were developed for the JRCP sections. The first is a structural model, to be used for thin to medium thick (6" to 9") PCC

pavements with thin AC overlays. The second is a functional model, to be used with thick ($> 9''$) PCC pavements or any PCC pavements with thick ($> 5''$) AC overlays. A procedure has been formulated for determining which of these equations is applicable for particular AC/PCC thickness combinations.

Finally, the AASHTO structural overlay design procedure for flexible overlays of rigid pavements, the minimum thickness reflective cracking reduction technique and the break (crack) and seat process for reflective crack mitigation were examined.

CHAPTER 1 - INTRODUCTION

World War II was a significant turning point in the history of the United States and its people. Not only was the country established as the world's premier military power, but also it had become the major industrial power as well. Gone were the days of the Great Depression and the harsh economic times which accompanied it. The war had given the U.S. economy the boost that it needed to bring more prosperous times. The production of goods began to flourish. People wanted a rapidly increasing number of these goods to make their lives more convenient and enjoyable. With these new desires came the need to efficiently transport products to the marketplace and raw materials to the plants which produced them.

The war also emphasized the need for military readiness. Fast, efficient means of mobilizing men and equipment became the cry of many post-war politicians in Washington. The country, they argued, must have the ability to quickly ready itself for battle if the need should arise.

Thus, the 45,000-mile Interstate and Defense Highway System was born. Construction began throughout the country in the early and mid-1950s. The interstate system was the single-most comprehensive and ambitious project in the history of the surface transportation industry. Because of the need for adequate connection facilities to the interstates, urban road and street systems were improved to handle the increased capacity needs. Many rural highways, which often followed the existing terrain sometimes using sharp horizontal and vertical curves, were now considered inadequate and unsafe. Many were relocated and/or widened to accommodate the needs of drivers. Bypass highways were constructed around smaller cities and towns to allow drivers to reach their destinations more rapidly.

By the mid-1970s the highway boom had ended. The interstate system was virtually complete. The Arab oil embargo had drastically increased the price of crude oil and thus the price of asphalt. Many of the highways built in the 1950s and 1960s were beginning to require major maintenance. By the 1980s few new highways were being constructed. Most state and federal highway dollars were spent on reconstruction, rehabilitation, and maintenance activities. A large portion of this money was being spent for overlays of existing pavements.

Unfortunately, little research was available in the mid-1970s on the design of overlays for either rigid or flexible pavements. Most state highway departments were basically using "seat-of-the-pants" techniques based upon experience with previously overlaid pavements. Although this approach was not entirely without success, little was done to determine why some overlays performed well while others failed miserably. The need for overlaying the pavements quickly to provide the least inconvenience to the traveling public seemed to overshadow the need for comprehensive, systematic analysis of deficient pavements. It was not until the early and mid-1980s that the Asphalt Institute (1), The Portland Cement Association (PCA) (2), the American Association of State Highway and Transportation Officials (AASHTO) (3), and others proposed methods offering different combinations of empirical and rational techniques for analyzing pavements and their rehabilitation needs.

1.1 Background

The Indiana Department of Transportation (IndOT) was not immune to the problem of an aging highway infrastructure. Between 1966 and 1971 several hundred lane-miles of continuously reinforced concrete (CRC) pavement were constructed throughout the state -- most of

it on the interstate system. Punchouts began to appear within a few months after being opened to traffic in locations with heavy truck traffic. This prompted the InDOT during the mid-1970s to engage Professor Eldon J. Yoder (4) through the Joint Highway Research Project (JHRP) at Purdue University to investigate ways to rehabilitate, and save their investment in, the CRC pavement.

Again in 1982 the InDOT contacted Professor Yoder to initiate a project for developing an overlay design procedure for CRC pavements in Indiana. The project began in July 1983, and it provided the foundation for the study of rigid pavements addressed in this document. In the fall of 1984, Dr. Thomas D. White worked with the InDOT through the JHRP to develop a project in which researchers would investigate developing an overlay design procedure for rigid pavements -- CRC, jointed reinforced concrete (JRC), and jointed plain concrete (JPC) pavements -- within the state. This project was approved by the InDOT and the Federal Highway Administration (FHWA) in January 1985 as a Highway Planning and Research (HPR) Part II project. InDOT and FHWA also requested that the project be expanded to include overlays of flexible pavement. An expansion to this proposal was prepared and subsequently approved in May 1985. Details of this analysis of flexible pavement overlays may be found in a report by Dr. Jay K. Lindly (5).

1.2 Problem Statement

After a preliminary investigation of the literature and discussions with InDOT personnel, the goal of this project could be stated quite simply:

Develop an overlay design procedure for rigid pavements in Indiana which is systematic and easy to use and which would result in a reliable estimate of the life expectancy of the overlay.

However, the approach to achieving this goal was just as complex as the goal statement was simple. The InDOT had suggested that the study specifically consider the possible uses of nondestructive testing (NDT) devices for evaluating pavement structural condition. Thus, a set of objectives were developed, which will also serve as the organizational guide to this document.

The objectives were

1. to investigate the literature for the state-of-the-art in overlay design and nondestructive testing of rigid pavements (chapter 2);
2. to develop a systematic approach which would consider the major rigid pavement cross sections, their traffic and location, and other characteristics which might

affect an overlay design (chapter 3);

3. to use available NDT devices for evaluating the rigid and composite pavements in Indiana and to analyze different approaches for using the load and deflection data that they generate (chapters 4, 5, 6 and 7); and
4. to determine the effects of time of year and temperature on the NDT deflections.

The first three of these objectives are addressed in this document as shown by the referenced chapter number. The fourth objective was researched by Mr. Anil Gupta (6) and are not discussed in detail in this document.

CHAPTER 2 - LITERATURE REVIEW

The most common type of overlay for portland cement concrete (PCC) is asphaltic concrete (AC). Unfortunately, this combination is also the least understood both in design and in performance of the overlay (3).

Two situations may occur that cause an AC overlay to be considered for PCC. First, the slab may be cracked, initially causing structural failure and ultimately performance failure. The slab loses much of its integrity, and its structural performance will eventually approach that of a flexible pavement. Structural capacity of the slab will likely control the design and performance of the overlay.

Secondly, the concrete slab may have a performance (roughness) problem. In this case, the concrete can be structurally sound but might have a surface defect, faulted slabs, or other non-structural distress that makes an overlay desirable. The slab should then be analyzed as a rigid structure when determining overlay requirements. Reflective cracking of the PCC joints through the AC may be the primary design concern.

.

A review of the literature reveals that limited research has been accomplished on rigid pavement overlay design. Of the research completed, a significant portion had been conducted in Texas (7, 8, 9, 10, 11, 12, 13, 14, 15), Louisiana (16), and Ohio (17, 18).

2.1 Criteria in Overlay Design

Pavement structural requirements, most recently evaluated using nondestructive testing (NDT) devices, and reflective cracking are the two areas targeted for correction by criteria contained in current overlay design procedures.

2.1.1 Structural Evaluation

Nondestructive deflection testing of pavements is a procedure in which the structural capacity of a pavement system can be ascertained by loading the pavement in some manner (static, impact, or steady-state) and measure the resulting surface deflection. The Benkelman beam, the falling weight deflectometer, and the Dynaflect are examples of NDT equipment currently in use.

NDT has gained worldwide acceptance for use in pavement structural evaluation. However, the majority of the research has concentrated on flexible pavements. In

recent years, as NDT devices have been refined and built to produce heavier loads, researchers and practitioners have begun to realize its use on rigid highway and airport pavements.

The thrust of current overlay design procedures is heavily weighted in favor of using these NDT devices to evaluate pavement load and deflection relationships. Equipment used to apply the load and measure deflections is portable and fast, allowing significant amounts of data to be collected in a short time. However, although the various types of NDT equipment will excite a pavement in a dynamic (impact or cyclic) manner, the input criteria vary in the various analysis methods currently available. Thus, a given procedure may not predict the same overlay thickness requirement for each NDT device data set obtained on a given pavement section (19).

Several studies have been conducted to evaluate the various NDT analysis methods used to determine pavement properties. Among these studies are those conducted by Hall (19), who evaluated airport pavements for the Corps of Engineers; Moore, et. al. (20), who evaluated pavements for the Transportation Research Board; and Andersson (21), who evaluated road bearing capacity for the National Swedish Road and Traffic Research Institute.

2.1.2 Reflective Cracking

Overlay design using reflective cracking criteria has also received attention. Quite often, the reflective cracking of the underlying PCC joints through an AC overlay can cause the functional performance failure of the overlay.

The most common approach to the reflective cracking problem considers a proposed overlay thickness and its AC properties (stiffness of bitumen, bonding to PCC, etc.) and determines its ability to resist reflective cracking over a joint caused by 1) tensile forces in the overlay from horizontal slab movements due to pavement temperature changes and 2) shearing forces in the overlay from vertical slab movement under a design load.

Others have studied embedding reinforcing materials in the AC overlay to aid in resisting these temperature and loading forces. Halim (22), for example, investigates the problem of using a layer of plastic mesh reinforcement placed in the asphalt near the top of the PCC. He concludes that this procedure will only reduce, not solve, the reflective cracking problem.

Several of the current techniques are described in some detail in the following section.

2.2 Current Overlay Design Methods

Following is a sampling of the overlay design procedures that have been developed for AC overlay of PCC pavements.

2.2.1 McCullough and Monismith (11)

McCullough and Monismith presented a design method consisting of two parts: 1) wheel load stresses, which primarily consists of vertical shear due to differential vertical movement of the slabs at the joints, and 2) volume change stresses, which cause tensile and compressive stresses in the asphaltic concrete overlay as the slabs move horizontally as pavement temperature changes. The former was further divided into four phases: 1) the material properties using field deflections and laboratory methods, 2) the remaining life of the existing pavement considering past loadings, 3) the estimated pavement life remaining for future traffic conditions, and 4) the selection of appropriate overlay thickness. The Dynaflect was used to determine pavement deflections.

The latter part consisted of calculating overlay thickness required for reducing volume change stresses to an acceptable level. The greater of the overlay thicknesses designed for either load stresses or thermal stresses was adopted as the design thickness.

2.2.2 Treybig, McCullough, Smith, and von Quintas (15)

Treybig, et al., developed design procedures for flexible and rigid overlays of both jointed reinforced concrete pavements (JRCP) and continuously reinforced concrete pavements (CRCP). In this study the Dynaflect was used to obtain deflection measurements. Condition surveys were conducted prior to the overlay placement to evaluate the existing pavement for signs of visual distress. Traffic, materials, environmental and construction data were compiled.

The computer programs RPOD1 and RFLCR1 were used to determine overlay design thickness for rigid pavements. An elastic layer analysis is used in RPOD1 to compute a pavement response. Pavement response computed from the elastic layer analysis is evaluated with fatigue criteria. First, the pavement is analyzed for remaining life. The remaining life is determined using condition survey data pertaining to the degree and extent of cracking. A PCC layer modulus is assigned for the analysis, with lower moduli assigned for the more highly damaged pavements. Three categories of existing PCC pavement are considered in the analysis:

1. the cracking is minor and not very extensive -- the pavement has some remaining life and is assigned a higher modulus,

2. the cracking is major or extensive -- the pavement has no remaining life and is assigned a reduced modulus, and
3. the PCC slabs are shattered -- the pavement has no remaining life and is assigned a substantially reduced modulus.

Based on the assignment of a modulus, the pavement is analyzed to determine the asphaltic concrete overlay thickness that results in a design stress allowing the overlay to support the predicted number of 18-kip axle load applications during the design life. Basically, the procedure determines an interior stress (σ_{interior}) for the overlay layer i using the following inputs into the elastic layer theory:

$$\sigma_{\text{interior}} = f(E_i, D_i, \mu_i, P, p) \quad 2.1$$

where σ_{interior} = interior stress in pavement due to an 18-kip single axle wheel load

E_i = modulus of elasticity of the overlay

D_i = thickness of the overlay

μ_i = Poisson's ratio of the overlay.

P = wheel load on the pavement

p = tire pressure

The interior stress is converted to the critical design stress (σ) condition (edge loading for CRCP and corner loading for JRCP) using stress adjustment factors for voids under the pavement (C_v) and for the edge or corner position (C_L):

$$\sigma = C_v \times C_L \times \sigma_{\text{interior}} \quad 2.2$$

Finally, a fatigue equation is used which considers this critical design stress (σ) and the flexural concrete strength (f) to determine the number of allowable 18-kip single axle loads (N):

$$N = 23,440 (f/\sigma)^{3.21} \quad 2.3$$

When an asphaltic concrete is used to overlay a PCC pavement, the minimum overlay required to reduce reflective cracking to an appropriate level must also be checked. RFLCR1 determines the minimum overlay required to reduce potential reflective cracking caused by the tensile and shearing forces present in an AC overlay.

Schnitter, et. al. (12), Seeds, et. al. (13), and Treybig (14) conducted research which extended and refined the RPOD1 and RFLCR1 computer models.

2.2.3 Majidzadeh and Suckarieh (18)

An overlay design procedure was proposed by Majidzadeh and Suckarieh which was also based upon a pavement fatigue analysis. Only flexible overlays over rigid pavements were considered. The input to the computer analysis was similar to that in the RPOD1 model (15) - Dynaflect deflection data, traffic factors, material characteristics,

environmental variables, and construction conditions. More emphasis was placed on pavement condition evaluation of the existing pavement prior to overlay placement.

2.2.4 Asphalt Institute (1)

The Asphalt Institute design method for an asphalt overlay of concrete pavement uses limiting deflection as a criteria. A limit of 0.002" is placed on differential corner deflections between adjacent JRCP slabs for representative Benkleman Beam rebound deflections. On CRCP, the deflections must be less than 0.0006 inches. If these values are exceeded, the pavement should be undersealed before the AC overlay is placed. Figure 2.1 is then used to determine the required AC overlay thickness. If the overlay requirements fall into section C, the AI method recommends that the PCC slab be broken into smaller pieces and overlaid with AC (Alternative 2) or that a coarse, open-graded AC hot-mix be placed on the PCC pavement to serve as a crack-relief layer before the AC surface course is placed (Alternative 3). Both of these alternatives help to reduce the reflection of the PCC layer cracks and joints through the AC overlay.

TEMPERATURE DIFFERENTIAL* (°F)						
Slab Length (Ft)	30	40	50	60	70	80
10 or Less	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)
15	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)
20	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	13cm (5 in.)	14cm (5.5 in.)
25	10cm (4 in.)	10cm (4 in.)	10cm (4 in.)	13cm (5 in.)	15cm (6 in.)	18cm (7 in.)
30	10cm (4 in.)	10cm (4 in.)	13cm (5 in.)	15cm (6 in.)	18cm (7 in.)	20cm (8 in.)
35	10cm (4 in.)	11.5cm (4.5 in.)	15cm (6 in.)	18cm (7 in.)	21.5cm (8.5 in.)	Use Alternative 2 or 3
40	10cm (4 in.)	14cm (5.5 in.)	18cm (7 in.)	20cm (8 in.)	Use Alternative 2 or 3	Use Alternative 2 or 3
45	11.5cm (4.5 in.)	15cm (6 in.)	19cm (7.5 in.)	23cm (9 in.)	Use Alternative 2 or 3	Use Alternative 2 or 3
50	13cm (5 in.)	18cm (7 in.)	21.5cm (8.5 in.)	Use Alternative 2 or 3	Use Alternative 2 or 3	Use Alternative 2 or 3
60	15cm (6 in.)	20cm (8 in.)	Use Alternative 2 or 3	Use Alternative 2 or 3	Use Alternative 2 or 3	Use Alternative 2 or 3
	17	22	28	33	39	44
TEMPERATURE DIFFERENTIAL* (°C)						

*Temperature differential (Δt) is the difference between the highest normal daily maximum temperature and the lowest normal daily minimum temperature for the hottest and coldest months, based on a 30-year average. See Tables 1 and 2 for maximum and minimum daily temperature at locations throughout the United States.

NOTE: There are several alternatives to the thicknesses in Sections B and C of this chart. See Art 3.04.

Figure 2.1 Chart for Selecting Asphalt Concrete Structural Overlay Thickness for PCC Pavement (1).

2.2.5 AASHTO (3)

The AASHTO structural method uses NDT deflections, pavement strength characteristics, and projected traffic loadings to design for the required AC overlay thickness. Several different procedures are employed to determine the AC thickness required to withstand reflective cracking forces caused by temperature changes and loading at the joints and cracks of the underlying PCC slab. The procedures used are discussed in greater detail in Chapter 6 of this document.

2.2.6 Kinchen and Temple (16)

Kinchen and Temple developed a method of determining overlay design thicknesses based upon two factors:

1) the number of 18-kip equivalent single axle loads over the design period and 2) structural capacity, as determined using deflections measured by the Dynaflect. Only jointed rigid pavements were considered. Fifteen composite and eleven PCC pavements were tested. The effects of variables such as temperature changes and subgrade moisture content on the Dynaflect deflections were also considered, and correction factors for these variables were developed.

Before testing, roughness of each section was determined using the Mays Ride Meter. Kinchen and Temple then converted these roughness values to Present

Serviceability Index (PSI) values. Pavements showing fatigue cracking and having end-of-life PSI values (2.5) were selected for deflection testing. Deflections were taken at 100-foot intervals over a 1000-foot test section at each site. These deflections were plotted for all sections (Figure 2.2), and a maximum deflection was determined above which rehabilitation of the pavement would be required. A deflection reduction curve was developed (Figure 2.3) to show the effect of different thicknesses of AC on the deflection of flexible, PCC, and composite pavements. Figure 2.4 shows one of the three composite overlay charts developed from Figures 2.2 and 2.3 for three different ranges of subgrade strength.

2.2.7 Seeds, McCullough, and Carmichael (23, 24)

The Arkansas Highway and Transportation Department experimented with crack-relief asphaltic concrete during the mid-1970s. In this procedure, a large aggregate (up to 4" top size) was placed directly on top of the PCC. This layer thickness was six to eight inches on top of which three to four inches of standard AC surface mix were placed. Total thickness was approximately one foot.

Subsequently, a follow-up study and design procedure was developed (23, 24) using both structural and reflective cracking design criteria for AC overlays of PCC. The

Figure 2.2 Tolerable Deflection Guide for PCC Pavements (16).

Figure 2.3 Percent Deflection Reduction for AC Overlays (16).

Figure 2.4 Design Guide for Asphalt Overlay of Rigid Pavement When Subgrade Modulus Ranges from 3 to 5 ksi (16).

reflective cracking criterion basically involves using probabilistic techniques for determining the thickness of asphalt required for obtaining a percentage of reflective cracks within a certain time period. Several reflective cracking mitigation techniques are considered -- bond breakers, stress relief interlayers, undersealing, and increased overlay thickness. The effects of both horizontal movement (temperature related) and differential vertical movement (load related) at the PCC joints on these AC overlays are studied.

For the horizontal slab movement, field measurements were made to correlate air temperatures with slab expansion and contraction. From this analysis, tensile strain and tensile stresses in the AC overlay can be calculated, and a fatigue analysis conducted. From various test sites in Arkansas and Texas, a fatigue equation was developed:

$$N_T = a_1 (\epsilon_T)^{a_2} \quad 2.4$$

where N_T = average number of fixed strain cycles needed to develop a reflection crack at a given location

ϵ_T = AC overlay tensile strain for a given critical temperature drop

$a_1 = (8.072 \times 10^{-4}) \times (EOV)^{-1.118}$

$a_2 = -3.70$

EOV = asphalt concrete overlay creep modulus (psi).

Miner's linear damage hypothesis is used to accumulate damage to the pavement caused by occurrences and magnitudes of daily temperature drops below 50°F, the temperature below which the overlay experiences the most reflective cracking damage. The total damage accumulated in one year is calculated by

$$D = \sum [(n_i) / (N_T)_i] \quad 2.5$$

where i = temperature interval number from temperature distribution data for the location

D = total overlay damage in one year

n_i = average number of days during the year in which the overlay is subjected to strain level $(\epsilon_T)_i$

$(N_T)_i$ = number of fixed strain cycles for interval i

To determine the number of years to failure (Y_T), simply divide D into 1.0 (100% fatigue):

$$Y_T = 1.0 / D \quad 2.6$$

The design thickness used in the temperature analysis is then investigated for effects of vertical slab movement under traffic loads. Deflections are taken in the outside wheel path of the outside lane, with the loading wheels and sensor 1 of the Dynaflect on one side of the joint and the remaining sensors on the other side. A deflection factor (F_w) can then be calculated at each joint:

$$F_w = \frac{w_l - w_u}{w_l + w_u} \quad 2.7$$

where w_l = deflection on the loaded side of the joint

w_u = deflection on the unloaded side of the joint

Applications of 18-kip axle loads with pavement strength and strain characteristics are used to calculate a critical deflection factor. Slabs that are adjacent to any joint having a F_w greater than this critical F_w are required to be undersealed before being overlaid.

2.3 Other Considerations

As newer and more sophisticated techniques begin to emerge, new problems also begin to appear. The design engineer must be aware now more than ever of the limitations which are inherent in the many techniques that are becoming available. Following are brief discussions of some of these problems that are applicable to this study.

2.3.1 Seasonal Variations of Deflections

In their work on developing pavement evaluation and maintenance techniques for the IDOH, Metwali (25), Mohan (26), and Virkler (27) briefly mentioned the effect of seasonal variation on NDT pavement deflections. However, no detailed study has been conducted in Indiana attempting to establish a common basis for comparing these seasonal

variations. Mohan attempted to compare these variations using regression analyses, but was limited by readings from only one fall and one spring.

2.3.2 Temperature Variations of Deflections

Pavement temperature can have a tremendous effect on any pavement component containing asphalt cement. Variations in pavement temperature during a year can be as much as 120°F to 130°F, causing modulus values of the asphaltic concrete to range from 1,000,000+ psi in winter to 50,000- psi in summer. This strength fluctuation can cause some problems in the performance and analysis of composite pavements.

Portland cement concrete strength is not particularly affected by the temperature changes. However, differential temperatures from the top to the bottom of the slab can cause slab warping. At different times during the day, different portions of the slab might be raised slightly above the subgrade causing erroneous readings in deflection measurements.

Gupta (6) has investigated the effects of temperature on warping of a concrete slab. He developed a technique to estimate the amount and location of warping in a concrete slab at various times during the day, so that it could be considered during a NDT testing program. When the warping

effects on the concrete slab are known, the NDT device test location can be conducted such that the slab is in contact with the underlying layer directly under the load, assuming no voids are present under the slab. This knowledge can increase the reliability of the deflection results.

CHAPTER 3 - DATA SUMMARY

A significant effort was devoted to collecting and organizing data. Appendix A includes a paper, which was coauthored with Dr. Jay K. Lindly, containing more details of the topics discussed in this chapter, particularly on the design of experiment and the data collection. However, because the paper in Appendix A includes information on both rigid and flexible (Dr. Lindly's topic) pavements, this chapter is written to focus the reader's attention on the rigid pavement aspects of the study.

Appendix B gives descriptions of study pavement section location for each of the 14 continuously reinforced concrete (CRC) pavements and each of the 30 jointed reinforced concrete (JRC) pavements. Also included are highway maps of Indiana divided by InDOT district. Each map is marked to show the general location of each section.

Finally, Appendix C contains all of the data which was collected during the project life. This data includes descriptions of section location, details on the pavement cross section (including the subgrade), traffic and climate information, pavement condition and serviceability

measurements, and nondestructive testing (NDT) data which was collected for each test section. A maximum of four different NDT devices was used on each pavement section during two separate test periods in 1986 -- spring and summer/fall. Not all pavements were tested by all four NDT devices. The data base description precedes the data and provides the details of each entry in the data base. Two 5-1/4" floppy diskettes contain the entire data base and are available from

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3.1 Data Base Development

Researchers selected the federal-aid interstate (FAI) and primary (FAP) highway systems for testing and analysis since the majority of the miles traveled within the state occurred on these systems. Jointed plain concrete (JPC) pavements were initially considered along with the JRC and CRC pavements ultimately analyzed in this study; however, the JPC pavements were eliminated because of the small number of lane miles present within the state.

Rigid overlays of rigid pavements were not considered in the analysis. Because the state of Indiana had overlaid

its rigid pavements almost exclusively with asphalt, little test data could be collected for rigid overlays.

Once the pavement types had been decided upon, a list of possible factors which might affect the potential overlay thickness determination was developed. It was planned to use some of these factors to develop a statistical design of experiment so that test sections could be selected, test data obtained, and overlay thickness determined. During the planning of the project, the Strategic Highway Research Program (SHRP) was developing its statistical experiment design for the Long-Term Pavement Performance (LTPP) study (28). Thus, the factors investigated in this HPR project were influenced by the factors found in the LTPP design. The initial list of factors were

1. Layer types
2. Layer thicknesses
3. Layer ages
4. Traffic
5. Climate
6. Pavement roughness
7. Subgrade type
8. Pavement distress
9. Layer strength.

The InDOT was then consulted to determine the factors

for which data was readily available or could be easily obtained on all pavements on the FAI and FAP systems. A second constraint in choosing factors involved a limit on the number of test sections which could reasonably be tested within the contract time and budget. Thus, four factors were used in constructing the statistical experiment design:

1. Climate
2. Truck traffic
3. Ratio of overlay thickness to total pavement thickness
4. PC concrete thickness.

In addition, age of the most recent overlay and subgrade type and strength were considered important factors in analysis of the test sections. Age was incorporated into the statistical design by calculating the number of trucks that had crossed each section over the lifetime of the most recent overlay. Subgrade was introduced by analyzing samples obtained from each section selected after the experiment was designed.

There was little variation in the traffic, PC thicknesses, and ratios of newest overlay thickness to total pavement thickness of the CRC pavements; thus, this

design of experiment could not be completed. As a result, thirteen sections representing the CRC pavements from across the state were selected for testing and are listed in Table 3.1. Note that section L-03 was tested only during the first test period. Section S-17 was substituted for L-03 during the second test period when it was discovered that L-03 was to be overlaid before or during the second testing period. There were adequate JRC pavements to satisfy the statistical experiment design. These sections are listed in Table 3.2.

Field testing was conducted in two four-week periods -- one in the spring and one in the late summer and early fall. During these two test periods, data were then obtained and tabulated for each of the test sections. As mentioned previously, a complete listing of this data base is contained in Appendix C. However, the data that were used in the analyses contained in this document are summarized in this chapter for clarity.

3.2 Climate

The primary region of inference was the state of Indiana. The two climate zones are based upon work by Colucci-Rios and Yoder (29). Figure A3 shows the approximate location of the climate boundary line. The 30

Table 3.1 Pavement Location and Traffic Data
- CRCP Test Sections.

Sect. No.	Co. No.	Route	Climate Zone	AADT	Percent Trucks	Trucks per Day	O'lay Age (yr.)	Total Trucks (millions)
C-01	83	SR-63	South	5930	12.0	712	9	2.339
C-02	6	I-65	South	24020	30.0	7206	15	39.453
F-01	52	US-31	South	16100	22.0	1785	1	0.652
F-02	52	US-31	North	15390	22.0	3386	1	1.236
G-01	49	I-465	South	33410	13.0	4343	17	26.948
L-01	50	US-30	North	11660	27.5	3207	3	3.512
L-02	50	US-30	North	12080	27.5	3322	18	21.826
L-03	46	I-94	North	34670	27.5	9534	16	55.679
L-04	45	I-65	North	29260	27.8	8134	4	11.876
S-01	41	I-65	South	26500	30.0	7950	2	5.804
S-02	41	I-65	South	26500	30.0	7950	2	5.804
S-03	41	I-65	South	38000	30.0	7950	10	29.018
S-04	53	SR-37	South	10500	11.0	1155	13	5.480
S-17	49	SR-37	South	20600	11.0	2266	13	10.752

Table 3.2 Pavement Location and Traffic Data
- JRCF Test Sections.

Sect. No.	Co. No.	Route	Climate Zone	AADT	Percent Trucks	Trucks per Day	O'lay Age (yr.)	Total Trucks (millions)
C-03	61	US-41	South	3040	12.0	365	1	0.133
C-04	83	SR-63	South	7580	12.0	910	7	2.235
C-05	11	I-70	South	19350	34.0	6579	2	4.803
C-06	84	US-41	South	27000	11.5	3105	35	39.666
C-07	84	US-41	South	27000	11.5	3105	14	15.867
F-03	17	US-6	North	3540	25.0	885	3	0.969
F-04	20	SR-19	North	8880	27.0	2398	15	13.129
F-05	35	US-224	North	3150	27.5	866	9	2.845
F-06	57	SR-3	North	6480	22.0	1426	10	5.205
F-07	20	US-33	North	13880	27.0	3748	13	17.784
F-08	20	SR-15	North	6460	27.0	1744	4	2.546
F-09	17	I-69	North	14420	31.3	4513	8	13.178
F-10	92	US-30	North	13209	25.0	3302	10	12.052
F-11	20	US-20	North	6030	27.0	1628	10	5.942
F-12	92	US-30	North	12186	25.0	3047	10	11.122
G-02	18	I-69	South	14400	31.3	4507	3	4.935
G-03	30	SR-67	South	9000	15.0	1350	10	4.763
L-05	71	US-20	North	5434	20.0	1087	5	1.984
L-06	71	SR-23	North	3200	20.0	640	1	0.234
L-07	71	US-20	North	11884	20.0	2377	18	15.617
L-08	75	US-30	North	10760	16.5	1775	27	17.493
L-09	50	US-30	North	14360	27.5	3949	2	2.883
S-05	53	SR-45	South	9200	11.0	1012	2	0.739
S-06	72	I-65	South	21930	31.0	6798	8	19.850
S-07	31	SR-135	South	4630	8.0	370	9	1.215
V-01	51	US-150	South	1450	13.0	189	6	0.414
V-02	14	SR-57	South	4680	17.0	796	11	3.196
V-03	63	SR-64	South	1670	17.0	284	8	0.829
V-04	82	US-41	South	20900	5.0	1045	10	3.814
V-05	19	US-231	South	10200	19.5	1989	20	14.520

JRC sections are equally divided -- 15 in the north and 15 in the south. In an attempt to strengthen any climatic effects, these sections were selected on the basis of being as far removed from the climatic boundary line as possible.

Because the limited number of CRC pavements precluded satisfying the design of experiment no attempt was made to satisfy the climatic boundaries. In fact, the distribution of CRC pavements within the state resulted in a majority of the sections being located in the center of the state (near Indianapolis). Tables 3.1 and 3.2 also include climate zones for the CRC and JRC pavements, respectively.

3.3 Traffic

Traffic data were obtained from traffic maps obtained through the Program Development Division of the InDOT. Percent trucks for each pavement test section was estimated for each county using the work of Sharaf (30). These percentages and the annual average daily traffic (AADT) values were used to determine the total trucks which had passed over the newest overlay during its lifetime. The AADT was multiplied by the percent trucks, by the age of the newest overlay in years, and by 365 days per year to obtain these total trucks. The result was then divided by 1,000,000 before it was used in the statistical experiment

analysis. Tables 3.1 and 3.2 contain this traffic information for the CRC and JRC pavements, respectively.

3.4 Pavement Cores

One of the major areas of concern in developing this project was the accuracy of the pavement cross section data in the road life records data base. Thus, after the pavement test sections were chosen, the InDOT Materials and Tests (M&T) Division was asked to obtain two pavement cores from approximately the third points of each section. These cores were used to check the thicknesses of the various pavement layers. The cores were examined to determine the various overlay and original pavement thicknesses. An average of the layer thicknesses was taken and compared to the road life record information. As a result, many thicknesses obtained originally and used in the experiment design were changed.

At the time of coring, observations were made of the material found below the original concrete for verification of the base type, if any. The results were then used to recalculate two of the factors used in the statistical experiment design -- the ratio of newest overlay thickness to the total pavement thickness and the thickness of the original portland cement concrete (PCC). Tables 3.3 and

3.4 contain pavement cross section data, as well as surface contract number and the year in which the newest overlay was placed, for the CRC and JRC pavements, respectively.

3.5 Subgrade Samples

The foundation of a pavement -- the subgrade -- plays a critical role in pavement design and structural performance. Thus, a knowledge of the properties of the subgrade material is important when structurally evaluating the pavement. As a final step in the pavement coring operation, the InDOT M&T Division sampled the pavement subgrade to a depth of four feet below the bottom of the pavement structure. In a core hole, two 2-foot shelby tubes, 3" in diameter, were pushed into the subgrade, when possible. In the laboratory, dry unit weight, moisture content, specific gravity, grain-size distribution, and Atterberg limits were determined. From this information, the soil was classified using the Unified (31) and the AASHTO (32) classification systems. An estimate was made of the California bearing ratio (CBR) as a measure of strength. These results are summarized in Tables 3.5 and 3.6 for CRC and JRC pavements, respectively. Although it was not one of the original factors used in the statistical experiment design, CBR was considered in the analyses.

Table 3.3 Pavement Cross Section Data - CRCP Test Sections.

Sect. No.	Surface Contract Number	Newest O'lay (yr)	Layer Newest O'lay	Thicknesses (in)			Type Sub- base
				AC Base	PCC	Sub- base	
C-01	10093	77	3.7	0.0	8.5	4.0	gran
C-02	8208	71	0.0	0.0	9.3	7.5	gran
F-01	14724	85	5.1	0.0	8.4	6.0	gran
F-02	14724	85	5.2	0.0	8.8	6.0	gran
G-01	7596	69	0.0	0.0	8.5	6.0	gran
L-01	13898	83	5.2	0.0	8.8	2.5	gran
L-02	7842	68	0.0	0.0	9.1	2.5	gran
L-03	8476	70	0.0	0.0	9.1	6.0	gran
L-04	13465	82	4.9	0.0	9.5	6.0	gran
S-01	14249	84	5.3	0.0	9.1	6.0	gran
S-02	14249	84	4.6	0.0	9.0	6.0	gran
S-03	10229	76	4.6	0.0	9.0	6.0	gran
S-04	8783	73	0.0	0.0	8.1	4.0	gran
S-17	8815	73	0.0	0.0	8.0	10.0	gran

Table 3.4 Pavement Cross Section Data - JRCF Test Sections.

Sect. No.	Surface Contract Number	Newest O'lay (yr)	<u>Layer Thicknesses (in)</u>				Type Sub- base
			Newest O'lay	AC Base	PCC	Sub- base	
C-03	15106	85	1.9	5.3	6.8	0.0	none
C-04	11629	79	3.7	0.0	8.2	7.5	gran
C-05	13724	84	4.2	0.0	9.7	6.0	gran
C-06	3239	51	0.0	0.0	7.1	14.0	gran
C-07	8996	72	1.9	2.3	6.8	0.0	none
F-03	10470	83	1.5	5.3	7.6	3.5	gran
F-04	8660	71	1.0	2.5	8.0	3.5	gran
F-05	10561	77	1.1	5.3	7.5	1.5	gran
F-06	10359	76	1.0	4.4	7.3	0.0	none
F-07	8806	73	4.5	0.0	7.0	11.0	gran
F-08	13411	82	2.8	0.0	9.3	2.4	gran
F-09	11298	78	4.3	0.0	10.3	7.0	gran
F-10	10483	76	3.6	2.0	7.0	11.0	gran
F-11	10528	76	2.8	4.4	7.0	2.4	gran
F-12	10112	76	3.2	0.0	9.1	3.5	gran
G-02	13279	83	4.2	0.0	10.0	4.0	gran
G-03	10530	76	1.0	4.4	7.0	4.5	gran
L-05	12850	81	1.8	4.5	7.0	0.0	none
L-06	14821	85	1.2	3.6	7.1	0.0	none
L-07spr	7744	68	2.3	0.0	7.3	0.0	none
L-07sum	16034	86	2.8	2.3	7.3	0.0	none
L-08	4401	59	0.0	0.0	9.4	0.0	none
L-09	13899	84	5.9	0.0	9.4	0.0	none
S-05	14936	84	2.5	5.1	8.5	0.0	none
S-06	11239	78	3.7	0.0	10.2	3.5	gran
S-07	11065	77	2.6	1.2	6.2	0.0	none
V-01	12429	80	1.9	4.9	6.0	2.5	gran
V-02	10192	75	0.9	4.2	8.8	2.5	gran
V-03	11525	78	4.0	0.0	8.2	6.0	gran
V-04	10207	76	4.7	0.0	7.2	2.5	gran
V-05	6887	66	0.0	0.0	9.6	5.0	gran

Table 3.5 Pavement Subgrade Data - CRCP Test Sections.

Sect. No.	Classification		γ_d (pcf)	W (%)	Est. CBR (%)	LL (%)	PL (%)	G_s
	AASHTO	Unified						
C-01	A-6(7)	CL	130.2	11.3	6	34.5	16.9	2.75
C-02	A-7-6(14)	CL	104.4	22.0	5	40.7	15.7	2.72
F-01	A-6(16)	CL	113.7	17.8	7	34.0	17.3	2.67
F-02	A-7-6(17)	CL	120.1	16.5	5	46.8	15.8	2.74
G-01	A-4(4)	CL	125.3	13.0	8	21.3	13.1	2.65
L-01	A-4(2)	SC	135.1	9.4	14	20.8	10.8	2.71
L-02	A-6(8)	CL	117.9	16.3	8	30.2	15.9	2.65
L-03	A-6(10)	CL	118.2	17.9	6	31.6	15.4	2.74
L-04	N	O		D	A	T	A	
S-01	A-6(7)	CL	109.8	18.7	8	26.8	15.0	2.70
S-02	A-6(4)	CL	124.8	14.2	8	27.5	14.7	2.67
S-03	A-6(6)	CL	122.2	13.5	7	25.2	14.3	2.70
S-04	A-7-6(20)	CH	88.3	20.8	3	58.0	21.8	2.64
S-17	A-2-6(1)	SC	121.1	12.0	15	32.9	12.7	2.71

Table 3.6 Pavement Subgrade Data - JRCP Test Sections.

Sect. No.	Classification		γ_d (pcf)	W (%)	Est. CBR (%)	LL (%)	PL (%)	G_s
	AASHTO	Unified						
C-03	A-4(7)	CL	91.1	28.0	9	29.0	19.2	2.68
C-04	A-7-6(20)	CH	97.8	25.2	3	61.1	20.4	2.71
C-05	A-6(12)	CL	106.0	21.6	6	37.2	15.6	2.67
C-06	A-4(5)	ML-CL	110.2	18.0	10	22.5	16.4	2.69
C-07	A-4(8)	CL	97.5	22.3	8	27.7	18.7	2.68
F-03	A-7-6(16)	CL	97.9	25.9	5	48.5	24.1	2.66
F-04	A-1-b(0)	SM	117.2	14.3	38	20.8	NP	2.66
F-05	A-2-6(0)	SC	130.9	9.1	13	25.0	14.2	2.70
F-06	A-6(10)	CL	122.3	13.3	6	28.6	13.2	2.73
F-07	A-1-b(0)	SM	132.9	9.2	23	NP	NP	2.67
F-08	A-1-b(0)	SW-SM	92.8	8.7	40	NP	NP	2.70
F-09	A-6(2)	SC	113.1	19.5	10	36.9	19.4	2.71
F-10	A-6(7)	CL	115.3	18.7	5	31.4	12.0	2.71
F-11	A-2-4(0)	SM	120.8	10.3	30	NP	NP	2.65
F-12	A-6(11)	CL	122.1	15.1	6	30.5	14.2	2.83
G-02	A-6(8)	CL	105.4	20.6	6	29.8	16.1	2.67
G-03	A-7-6(15)	CL	104.7	20.7	6	46.8	19.4	2.57
L-05	A-2-4(0)	SM	102.9	11.1	28	NP	NP	2.65
L-06	A-3(0)	SP-SM	106.5	7.4	25	NP	NP	2.65
L-07	A-2-4(0)	SM	112.0	8.7	38	NP	NP	2.65
L-08	A-3(0)	SP-SM	111.0	13.6	25	NP	NP	2.65
L-09	A-2-4(0)	SP-SM	107.2	15.4	32	NP	NP	2.65
S-05	A-6(10)	CL	105.1	20.6	6	31.9	16.8	2.65
S-06	A-6(11)	CL	112.9	13.4	6	32.8	14.0	2.69
S-07	A-7-6(19)	CH	99.0	26.6	3	52.6	19.5	2.71
V-01	A-4(8)	ML-CL	115.4	15.7	8	22.8	16.3	2.66
V-02	A-6(11)	CL	110.9	18.2	5	33.8	15.6	2.73
V-03	A-6(3)	SC	120.0	12.5	12	27.0	14.5	2.70
V-04	A-4(10)	ML	109.6	18.4	9	23.8	NP	2.67
V-05	A-4(8)	ML	101.4	24.8	12	5.3	3.5	2.75

Test results were submitted to the InDOT M&T Division for their records at the end of the project.

3.6 Condition and Performance Data

Current pavement condition is an important indicator of pavement performance. Pavement condition can be established by characterizing the type, severity and extent of distresses. The Pavement Condition Index (PCI) developed by Shahin and Kohn (33) was adopted to determine a relative condition of the pavement test sections. A representative length of each test section was examined during the summer/fall test period. The resulting PCI was evaluated in the statistical analysis as a factor which could be significant in explaining overlay performance.

One limitation of the PCI technique is that it was developed for roads and parking lots on U.S. military bases. For the purposes of this study, the application was extended to highways.

The Present Serviceability Index (PSI), developed during the AASHO Road Test, was used for analyzing relative pavement performance for the test sections. The InDOT Research Division routinely performs roughness measurements on all state highways throughout Indiana. From this roughness information, the equivalent PSI can be determined

from a statistical relationship developed by the InDOT for pavements within Indiana. Unfortunately, new asphaltic concrete overlays often show a roughness number which equates to a PSI value greater than the maximum of 5. A typical value of PSI for newly resurfaced asphaltic concrete roads is between 4.2 and 4.5 (34). To accommodate this discrepancy if the calculated PSI using the InDOT correlation equaled or exceeded 5, it was reduced to the range of typical (i.e. 4.2 to 4.5) PSI values for new asphaltic concrete surfaced roads. The procedure followed was to reduce PSI value which exceeded 5 the greatest amount to 4.5; the one which exceeded 5 the least was reduced to 4.2. The remainder of the PSI values which exceeded 5 prorated between 4.2 and 4.5. Those PSI values equated from roughness numbers to be between 4.2 and 5 were reduced to 4.2. Finally, if the PSI of a test section was below 4.2, it was used without adjustment. These adjusted values were then used as input in the statistical analysis for predicting overlay thickness.

Tables 3.7 and 3.8 contain values for PCI and PSI on CRC and JRC test pavements, respectively.

Table 3.7 Pavement Condition and Performance
- CRCP Test Sections.

Sect. No.	PCI	PSI
C-01	65	2.8
C-02	70	2.8
F-01	100	3.6
F-02	92	3.9
G-01	73	2.8
L-01	86	3.4
L-02	71	2.4
L-03	73	3.4
L-04	73	3.4
S-01	67	3.6
S-02	97	3.5
S-03	81	3.0
S-04	70	4.5
S-17	69	4.5

Table 3.8 Pavement Condition and Performance
- JRCF Test Sections.

Sect. No.	PCI	PSI	Sect. No.	PCI	PSI
C-03	88	3.2	G-02	63	3.6
C-04	41	2.8	G-03	37	2.5
C-05	33	3.6	L-05	56	4.4
C-06	43	1.7	L-06	63	4.3
C-07	69	2.4	L-07	100	4.5
F-03	51	2.6	L-08	40	1.9
F-04	26	4.3	L-09	82	3.3
F-05	29	4.2	S-05	77	3.6
F-06	72	4.2	S-06	65	3.4
F-07	43	2.9	S-07	60	4.3
F-08	59	2.8	V-01	74	4.3
F-09	79	2.8	V-02	60	2.6
F-10	42	2.6	V-03	91	3.0
F-11	51	4.3	V-04	63	2.9
F-12	57	2.7	V-05	-	2.8

3.7 NDT Data

Four different nondestructive deflection testing devices were used during both the spring and the summer/fall test periods. These devices were a Dynatest FWD, two Road Raters (Models 400 and 2000), and a Dynaflect. A complete discussion of the testing procedure may be found in Appendix A, descriptions of the test sections are located in Appendix B, and all deflection data for each test section collected during the project are compiled in Appendix C.

Of the four devices used in this study, the data collected from each of the Road Rater models was not complete. During the spring test period, a data collection equipment malfunction in the Model 2000 caused data obtained in one of the five weeks of the test period to be useless. Also, the Model 2000 was used only on test sections located in the southern climate zone during the summer/fall test period.

The Road Rater Model 400 was used on most of the test sections, except that the deflection readings often varied erratically among the deflection sensors under a given load and frequency of application. For example, occasionally one of the sensor readings away from the load would register a deflection substantially higher than those

nearer the load. Also, several of the test sections were not tested with the Model 400 during both the spring and the summer/fall test periods because of equipment breakdowns. Thus, both the models of Road Rater were eliminated from the analysis when developing the empirical overlay design equation, backcalculating pavement layer moduli, and computing required overlay thickness using the AASHTO method.

The Dynaflect performed well on all test sections during both the test periods. However, because of the low loading level used to produce the deflections and because of the configuration of the load application (two steel wheels instead of the circular plate), the Dynaflect was also excluded from the empirical model formulation, the backcalculation of pavement layer moduli, and the overlay thickness analysis.

Thus, the Dynatest FWD was selected for all analyses conducted in this study. The load and the deflection under the load center (Sensor 0) for all test sections in both the spring and the summer/fall test periods were used in the backcalculation of the pavement layer moduli. The deflection values used were not corrected for viscosity changes in the asphaltic concrete layers caused by pavement temperature variation. Similarly, the load and the Sensor 0 deflection were used both in the AASHTO overlay design

procedure and in the development of the empirical overlay design method. However, the deflections in this case were normalized (corrected) to a standard pavement temperature of 70 degrees Fahrenheit before being used in the design equation.

Tables 3.9 and 3.10 contain the uncorrected and temperature corrected FWD deflection data obtained using approximately a 14,000 pound load. Because the load varied somewhat among the test sections, the deflections per 1000 pounds of load were calculated and used in the analyses. These are the values reported in the table. No temperature corrected deflection readings are necessary for those sections which have no AC overlay.

Table 3.9 FWD Sensor 0 Deflections (mils) per 1000#
of Load - CRCP Test Sections.

Sect. No.	<u>Spring</u>		<u>Summer/Fall</u>	
	Corrected	Uncorrected	Corrected	Uncorrected
C-01	0.51	0.50	0.72	0.76
C-02	----	0.54	----	0.99
F-01	0.54	0.51	0.53	0.54
F-02	0.54	0.53	0.52	0.54
G-01	----	0.59	----	0.53
L-01	0.71	0.63	0.67	0.71
L-02	----	0.59	----	----
L-03	----	0.65	----	0.55
L-04	0.44	0.40	0.55	0.60
S-01	0.43	0.40	0.50	0.51
S-02	0.44	0.40	0.45	0.47
S-03	0.43	0.41	0.44	0.46
S-04	----	0.54	----	0.62
S-17	----	----	----	0.55

Table 3.10 FWD Sensor 0 Deflections (mils) per 1000#
of Load - JRCP Test Sections.

Sect. No.	<u>Spring</u>		<u>Summer/Fall</u>	
	Corrected	Uncorrected	Corrected	Uncorrected
C-03	1.53	1.61	1.46	1.54
C-04	1.32	1.28	1.18	1.22
C-05	0.62	0.56	0.60	0.66
C-06	0.82	0.82	0.72	0.72
C-07	0.98	0.90	0.75	0.64
F-03	1.26	1.27	1.13	1.17
F-04	1.00	1.02	1.07	1.08
F-05	2.50	2.50	2.05	2.11
F-06	1.41	1.32	1.14	1.14
F-07	0.91	0.89	1.11	1.19
F-08	0.70	0.68	0.52	0.50
F-09	0.62	0.60	0.47	0.49
F-10	0.99	0.93	0.93	0.95
F-11	1.10	1.12	1.09	1.11
F-12	0.57	0.55	0.47	0.49
G-02	0.55	0.56	0.62	0.49
G-03	0.92	0.92	0.88	0.71
L-05	1.90	1.83	1.70	1.73
L-06	1.03	1.05	1.05	1.11
L-07	1.04	0.94	1.20	1.30
L-08	0.94	0.94	0.56	0.56
L-09	0.71	0.71	0.69	0.70
S-05	0.69	0.63	0.75	0.77
S-06	0.48	0.45	0.53	0.58
S-07	1.12	1.11	1.01	1.05
V-01	1.37	1.33	2.12	2.28
V-02	0.90	0.85	1.09	1.19
V-03	0.74	0.73	0.91	0.94
V-04	0.81	0.79	0.68	0.76
V-05	0.63	0.63	1.00	1.00

CHAPTER 4 - EMPIRICAL OVERLAY DESIGN ANALYSIS

Statistical analysis is a powerful tool when considering relationships between different variables which work together in a pavement system. Although statistics alone cannot be used to determine cause and effect relationships, the combination of sound engineering judgment and statistics can provide valuable insights into pavement performance and design.

This chapter discusses the "building blocks" for an empirical overlay design procedure based upon data from FAP and FAI pavements throughout the state. It does not pretend to be a panacea for all AC over PCC overlay design problems, but it provides a sound basis which can be refined and expanded as more data become available.

4.1 Original Statistical Design

In addition to the original design variables -- climate, traffic, ratio of most recent overlay thickness to total pavement thickness, and PCC thickness -- data were collected on several pavement-related factors which were not originally considered primary factors in designing the

statistical experiment:

1. Age of most recent overlay
2. Asphalt base thickness (asphaltic concrete below newest overlay and above the PCC)
3. Subbase thickness and type
4. Subgrade dry unit weight, moisture content, and estimated CBR
5. Distress survey data
6. Present Serviceability Index (PSI)
7. Pavement deflections
8. Pavement surface temperature.

The original experimental design was satisfied by selecting sections with the desired variable attributes using InDOT Road Life Records (RLR). All of the data subsequently collected was to be analyzed statistically -- the original factors as main factors and the additional factors as covariates. However, discrepancies began to surface when RLR data were compared to information from the pavement cores taken in the field.

The primary problem encountered when checking the RLR data was the discrepancies in layer thicknesses. Total

asphalt overlays measured from field cores varied as much as several inches from the recorded data. Overall PCC thicknesses were less variable; however PCC thickness variations were greater for the older concrete pavements.

As a result, two of the design factors (PCC thickness and ratio of newest overlay thickness to total pavement thickness) on many of the pavement test sections no longer fell within the ranges in which they were initially placed (i.e., a PCC thickness originally considered thin might have changed to the medium or thick range). Many of the factor combinations of the experimental design disappeared, while others became over-represented. At this point, it was obvious that the planned orthogonal analysis was impossible. As a result, standard regression analysis techniques were applied.

4.2 Search for Alternative Regression Models

Several different analyses of the data were made to determine the statistical suitability of sets of independent variables (pavement data, traffic, etc.) for predicting the value of the dependent variable (overlay thickness). For instance, because a limited number of CRC and JRC pavement sections were tested (13 sections and 30 sections, respectively) the number of independent variables

had to be limited for the statistical techniques used to be valid.

Additionally, concern developed during the model search that more than one relationship might be required for JRC pavements. A structural relation was considered possible for thinner PCC pavements with relatively thin overlays and, possibly, thick PCC pavements with no overlay. On the other hand, PCC pavement with thicker overlays and good subgrade support would not generally be structurally deficient but might fail functionally. Ultimately, two separate models resulted -- one primarily structural and one primarily functional. A technique was also developed to determine when each was applicable. This procedure involves establishing a limiting stress due to a surface load for a pavement with particular strength characteristics. It is discussed in greater detail later in this chapter.

The following techniques were used repeatedly to choose appropriate regression terms for predicting overlay thickness from the many independent variables that were available when the analysis of data was begun. Each of the steps contained in this section was used in selecting the appropriate structural and functional equations. Discussion of the individual equations and when each is applicable may be found in later sections of this chapter.

4.2.1 Normality Check of Residuals

Common regression analysis techniques assume that the residual values of the dependent variable are normally distributed around a mean (μ) with a certain standard deviation (σ) or variance (σ^2). Therefore, one of the tests that should be run on the data is the test for normality of these residuals.

Anderson and McLean (35) suggest using the Shapiro-Wilk test of normality. The hypothesis of normality was tested at a significance level (α) of 0.05. If the distribution failed the test (was not normally distributed), the variable was transformed (for example, by taking the logarithm of the values) and again checked for normality. If normality was accepted after the initial transformation, this new variable was analyzed. If normality was again rejected, another transformation was attempted and checked for normality. This process was continued until an acceptable transformed variable was found to satisfy the test for normality.

4.2.2 Analysis of Variance

Analysis of variance techniques may be used to determine the applicability of including an independent variable in a regression model. The Statistical Analysis System (SAS) (36) computer software was used extensively in

this and other portions of the investigation.

The General Linear Model (GLM) component of SAS proved useful for analyzing the data to find which of the independent variables should be kept. In the GLM procedure, the Type III sum of squares (SS) is calculated for each independent variable as it is added to regression model. If the level of significance is low, then the probability that the coefficient for that independent variable would approach zero is low, and the variable would likely have a significant impact in the regression equation. The level of significance of 0.25 was selected as the cutoff when choosing independent variables for further analysis.

Structural Models. The GLM analysis process was modified for the analysis of potential JRCP structural models because of the large number of independent variables of interest and the small number of pavement sections tested (data sets obtained). Typically, seven independent variables (Table 4.1) were chosen for intensive analysis using GLM. Five of these variables -- total truck traffic on the latest overlay, PCC thickness, total asphaltic concrete (AC) thickness on top of the PCC, CBR of the subgrade, and age of the latest overlay -- were included in the model investigation each time that a GLM analysis was run. Two other variables were included in the analysis --

Table 4.1 Models Investigated in Statistical Analysis — JRCP Structural.

No.	Dependent Variable	Independent Variables Investigated in the Models *
1	OLAY	NTOTTRK NCONTHK NASPTHK NCBR NAGE NPCI NCSNO
2	OLAY	NTOTTRK NCONTHK NASPTHK NCBR NAGE NPCI NSPD
3	OLAY	NTOTTRK NCONTHK NASPTHK NCBR NAGE NPSI NCSNO
4	OLAY	NTOTTRK NCONTHK NASPTHK NCBR NAGE NPSI NSPD

OLAY = most recent overlay thickness in inches

TOTTRK = total trucks over most recent overlay in millions
 $= (\text{Trk/day})(365 \text{ days/yr})(\text{AGE}) / 1,000,000$

CONTHK = thickness of PC concrete layer in inches

ASPTHK = total thickness of all AC layers placed on PCC in inches
 (before overlay)

CBR = estimated California Bearing Ratio of subgrade in %

AGE = age of most recent overlay in years

PCI = pavement condition index

CSNO = temperature corrected deflection of sensor at center of
 load in mils per 1000#

PSI = present Serviceability Index

SPD = spreadability of deflection readings

$= (\text{summation of sensor deflections}) / (\text{no. of sensors})(\text{CSNO})$

NXXX = centered value of XXX variable

$= (\text{variable value}) - (\text{variable mean})$

* Note that all main factors, two-factor interactions, and second order terms were considered when analyzing the models.

a pavement condition or performance variable (either PCI or PSI) and a pavement deflection variable (either spreadability or temperature corrected deflection sensor at the NDT load).

Additionally, all two-factor interactions and squared terms of these main factors were of interest when determining if the model developed should be linear or nonlinear (quadratic). Thus, 35 terms might be analyzed for possible inclusion in the model.

Ideally, all possible independent variables should be included in a GLM run so that the effects of all other variables on each individual variable can be assessed. Because the number of independent variables exceeded the number of test sections in this study, the variables were analyzed in groups using GLM, with a minimum of 4 degrees of freedom allowed for the error term in the analysis of variance. After the first application of the GLM, the five variables showing the highest levels of significance which exceeded 0.25 were replaced with five new variables, and the GLM was run again. This procedure continued until all of the main factors, their two-factor interactions, and their squared terms had been included in an analysis at least once. Then, the independent variables which had a level of significance of 0.25 or less in at least one of the runs were included in the next analysis step.

Functional Models. Potential JRCP functional models were also analyzed using the GLM procedure. In most cases, the JRC and AC pavement data were combined for the analysis. This step was taken because a functional relationship was being formulated for sections with "thick" (≥ 6 ") AC total thickness over the PCC layer. Justification for this combination will be expanded upon below. Since many of the composite JRC pavements did not have 6" or more of total AC overlay thickness, they were included in the same analysis with the AC sections that exceeded this minimum AC thickness requirement. This combination of data assumes that the thick AC on the PCC reduces the stress in the PCC to the point that the stress is insignificant. Thus, the PCC layer is assumed to be a strong "base" for the asphaltic concrete. Section 4.4.5 discusses this stress concept in greater detail.

The JRCP sections were also analyzed as a separate group to identify applicable functional models. No viable functional models were obtained from this analysis.

Typically, five independent variables (Table 4.2) were chosen for analysis. Three of these variables -- total trucks which had passed over the latest overlay, present serviceability index (PSI), and latest overlay age -- were considered in virtually every model in the initial GLM run. However, pavement condition index (PCI) was adjusted to

Table 4.2 Models Investigated in Statistical
Analysis -- JRCP Functional.

<u>No.</u>	<u>Dependent Variable</u>	<u>Independent Variables Investigated in the Models</u> *
1	OLAY	TOTTRK PSI AGE CBR PCI
2	OLAY	TOTTRK PSI AGE CBR CPCI
3	OLAY	TOTTRK PSI AGE CCBR PCI
4	OLAY	TOTTRK PSI AGE CCBR CPCI

OLAY = most recent overlay thickness in inches

TOTTRK = total trucks over most recent overlay in millions
= (Trk/day)(365 days/yr)(AGE) / 1,000,000

PSI = present serviceability index

AGE = age of most recent overlay in years

CBR = estimated California Bearing Ratio of subgrade in %

PCI = pavement condition index

CPCI = pavement condition index including only transverse,
longitudinal, reflective, and block cracking

CCBR = combined CBR including the effects of the subgrade
and a granular base, when present

NXXX = centered value of variable xxx; occasionally used
instead of actual variable value
= (variable value) - (variable mean)

* Note that all main factors, two-factor interactions, and second
order terms were considered when analyzing the models.

reflect only reflective, block, longitudinal, and transverse cracking (CPCI). It was occasionally substituted for PCI in some analyses.

CBR of the subgrade was also corrected to a "combined" value when granular subbase was found above the subgrade. This combined CBR was sometimes substituted for CBR in an analysis. The thickness of the AC pavement and the PCC pavement were omitted, since pavement layer thickness is more appropriate in a structural analysis.

Additionally, all two-factor interactions and squared terms were included in each initial GLM run. All terms could be included in a run, since there was always eight or more degrees of freedom for the error term, depending on the data set.

Actual and centered values of the terms were also investigated in the various analyses. Centered values were used only when highly correlated coefficients occurred for terms in the regression model.

4.2.3 Stepwise Regression

The SAS package was also employed to analyze the possible models created during the GLM study. A forward stepwise regression procedure using the MAXR option determined the "best" combination of independent variables.

The MAXR option begins with a one-factor model (plus the y-intercept term) and concludes with a model containing as many factors as was included from the GLM analysis. The "best" combination in the MAXR option is that combination of independent variables which produces the largest coefficient of multiple determination (R^2). Thus, for example, if 15 variables were selected from the GLM analysis for possible inclusion in a regression model, the four-factor model identified by MAXR would consist of the 4 variables of the 15 possible which produced the largest R^2 .

At this point in the analysis, two constraints were considered when selecting models which would be considered for the "best" empirical overlay design equation. First, for each independent term, the SAS STEPWISE regression procedure calculates the Type II SS, which is the sum of squares that would be added to the error SS if that independent term was removed from the equation. The level of significance associated with the Type II SS was not allowed to exceed 0.10 for any independent variable in the final regression model.

Secondly, the number of independent variables in a regression model was not allowed to exceed approximately one-third of the total number of data sets used as the basis for developing the model. The reason for this

restriction is simple. If, for example, there are thirty data sets and thirty independent variables, a perfect fit ($R^2 = 1$) results. By limiting the number of independent variables the R^2 would not be artificially large.

4.3 Analysis of Individual Models

After selection of the individual models for final analysis, several tests were employed to determine acceptability as a final empirical design equation. Four areas were checked.

1. Total square error (Mallow's C_p) (37)
2. Correlation of independent variable coefficients (37)
3. Source of variation in dependent variable (37)
4. Sensitivity analysis.

4.3.1 Total Square Error

The total square error check, commonly referred to as the Mallow's C_p test, indicates the amount of undesirable statistical bias that might be present in a regression equation. (Bias (37) is defined as the difference between the expected value of the estimator and the population quantity that is being estimated.) If all variation from the statistical mean of the dependent variable is due to random error, then the equation is said to contain no bias. A C_p value of p , where $p-1$ is the number of independent

variables in the equation, indicates that no bias exists. C_p is calculated in the stepwise portion of the SAS program.

4.3.2 Correlation of Independent Variable Coefficients

The SAS program also contains a program called CORR, which calculates the correlation between the coefficients of any two terms in a regression equation. A correlation coefficient (r_{ij}) of +1 or -1 indicates that the independent variable coefficients are exactly correlated. Conversely, a r_{ij} of zero shows no correlation between the two variables, and the two variables are completely independent in their effects on the dependent variable. High correlation between terms is undesirable, since it indicates that an effect on the dependent variable is "double counted" if both independent terms are included in the equation. One of the terms should be removed or transformed to rid the equation of the correlation. A correlation coefficient (r_{ij}) of plus or minus (+/-) 0.90 was set in this analysis. Any r_{ij} which algebraically exceeds +/- 0.90 was considered unacceptable.

4.3.3 Source of Variation in the Dependent Variable

The coefficient of multiple determination (R^2) measures the proportion of the total variation in the dependent variable which is associated with the independent

variables in the equation. Thus, an R^2 of 0.70 means that 70% of the variation in the dependent variable is associated with the independent terms.

An increase in the R^2 can be expected as more independent variables are added to the equation. Quite often an adjusted R^2 is reported, which recognizes the number of terms used in the equation relative to the number of data sets from which the regression model is derived. In statistical terms, the adjusted R^2 is based upon mean squares, whereas R^2 is based upon the sum of squares.

The SAS STEPWISE program calculates and reports the R^2 and the SAS regression program (REG) calculates and reports the adjusted R^2 .

4.3.4 Sensitivity Analysis

Sensitivity of the dependent variable to changes in the independent variable can indicate the adequacy of the equation. For example, as the number of total trucks (independent variable) that will be applied to a proposed overlay increases, the overlay thickness (dependent variable) should also increase. If it does not, then the trend is inappropriate, and the equation cannot be used.

A sensitivity analysis can also give information on the magnitude of the effect that total trucks, for example,

will have on the predicted overlay thickness.

In a sensitivity analysis, care should be taken that the values of the independent variables are within the inference space of the statistical model. All other variables are held constant while the value of the variable in question is changed over its range in the inference space. The inference space is the range in levels of the independent variable combinations. For example, if the PCC thickness ranges from 7.0" to 10.0" for all test sections tested, the model developed from the data on these test sections is only strictly applicable on other pavements with PCC thicknesses of 7.0" to 10.0". This assumes that all other independent variables fall within their appropriate ranges of applicability (i.e., the ranges of values found in the data set from which the regression equation was developed). If an overlay is to be placed on a 12" thick PC concrete slab, then the equation should not be used or, at best, should be used with caution.

Questions on the amount of change in the dependent variable and the significance of that change should be answered in the sensitivity analysis. In this analysis, a change of 0.1" in overlay thickness over the entire range of an independent variable will likely be considered insignificant, and the variable removed from the equation. However, a change of 0.5" might be sufficient to warrant

the independent variable being retained in the equation.

4.4 CRCP Model Analysis

Statistical analysis of CRC pavement sections presented particularly difficult problems which ultimately could not be totally overcome. The problems experienced with the analysis and suggestions for proceeding in future analyses are included in this discussion.

4.4.1 Normality of the Residuals

The Shapiro-Wilk test indicated that the overlay thickness residuals were not normally distributed for an α of 0.05. In fact, Table 3.3 shows that five of the 13 sections tested in each test period had an overlay of 0.0", while the remaining eight have overlays ranging from 3.7" to 5.3".

Two possible solutions to the normality problem were considered, but neither proved successful in correcting the problem. First, transforming the dependent variables using an accepted technique was considered. However, the residual values were so far-removed from normality that the transformation attempts were finally eliminated.

Secondly, eliminating the nonoverlaid sections from the analysis was considered. The resulting Shapiro-Wilk

analysis showed that the remaining eight residuals were normally distributed. Unfortunately, the range between high and low overlay thickness was only 1.6" (from 3.7" to 5.3"), which severely limited the range of applicability. Also, reducing the number of pavement sections included in the analysis from 13 to eight further complicated an already serious deficiency of test data.

4.4.2 Problems with Independent Variables

Several of the independent variables presented difficulties in potential statistical analysis of CRC pavement data.

1. The PCC pavement thicknesses were essentially uniform, ranging only from 8.1" to 9.5"
2. Six of the eight overlaid CRC pavements had been overlaid within the last 4 years. Section S-3, which was listed as being overlaid 10 years ago, was questionable. This section was virtually adjacent to Section S-1 and S-2 and appeared to have been overlaid at the same time (2 years prior to testing).
3. Except for the problem section (S-3) previously mentioned, the maximum number of total trucks passing over the latest overlay for one of the overlaid sections was 11.9 million. This value is possibly

only 40% to 50% of the total number of trucks likely to pass over an overlay during its lifetime. Therefore, a regression model would not have adequate inference space for this variable.

4. The PCI values were all very high. The lowest value recorded was 65, which can be considered within the "good" range. However, patched areas were purposely avoided on the nonoverlaid pavements because it was considered that NDT results would be erratic since the patches often had different cross sections.

4.4.3 Model Selection

Despite all of these potential limitations a model was developed to predict the overlay required for CRC pavements.

$$\text{OLAY} = -0.0138 + 1.264(\text{PSI}) + 0.0677(\text{CBR}) \quad 4.1$$

where OLAY = required thickness in inches of AC overlay

PSI = terminal present serviceability index

CBR = estimated California Bearing Ratio of subgrade in %

As discussed above, one of the problems with this equation is that the inference space for the variables is very small because of the relative homogeneity of the pavement sections. The independent variables and their ranges of inference are

1. PSI - 2.8 through 3.9
2. CBR - 5% through 14%

4.4.4 Model Analysis

The model in equation 4.1 was analyzed using the techniques found in Sections 4.2 and 4.3.

Normality of overlay values. The Shapiro-Wilk test statistic (W) was calculated at 0.830. For a level of significance (α) of 0.05 and the number of overlay values (n) used in the model development equal to 7 (one of the eight overlaid sections had no subgrade CBR data available), $W(0.05, 7) = 0.803$. Since $0.830 > 0.803$, the residuals of the data set are considered normally distributed.

Total square error (C_p). Because $C_p = 2.79$ and $p = 3$, the regression equation contains little bias.

Correlation of independent variable coefficients. The correlation coefficients did not algebraically exceed the limiting value of ± 0.90 . The r_{ij} between the terms CBR and PSI had a correlation coefficient of -0.015, a finding of virtually no correlation.

Source of variation in dependent variable. The $R^2 = 0.816$, and the adjusted $R^2 = 0.723$. These values indicate a good fit of the data. However, these high R^2 values are

somewhat misleading since only 7 data points are being fit by the regression model.

Figure 4.1 shows a scatter plot of actual versus predicted overlay values. Ideally, if all points fell on a 45° line, the model would be perfect ($R^2 = 1.0$).

Sensitivity Analysis. Table 4.3 and Figure 4.2 contain sensitivity analyses of change in AC overlay thickness through ranges of each independent variable.

The overlay was significantly sensitive to both the CBR and the PSI variables. In all cases in Table 4.3, the change in PSI from 2.0 to 3.0 resulted in a change in thickness of 1.26". Similarly, a change in CBR from 3% to 40% resulted in an AC overlay thickness change of 2.5" in all cases.

Trends in the equation were also considered in the analysis. An increase in terminal PSI for a given design period should result in an increase in AC overlay thickness. Field observations have also shown that a higher CBR generally causes higher pavement distress and thus will require a thicker overlay. These trends are confirmed in the CRCP model.

Figure 4.1 Actual Versus Predicted Overlay Thickness Values
-- CRCP Model.

Table 4.3 Sensitivity Analysis of Equation 4.1
 -- CRCP Model.

<u>Case No. 1</u>		<u>Case No. 2</u>	
PSI=2.5	CBR = 20%	PSI=2.0	CBR = 3%
Predicted Thickness = 4.50"		Predicted Thickness = 2.72"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>	<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
PSI=2.0	3.87"	PSI=2.5	3.35"
PSI=3.0	5.13"	PSI=3.0	3.98"
CBR=3%	3.35"	CBR=20%	3.87"
CBR=40%	5.85"	CBR=40%	5.22"

<u>Case No. 3</u>	
PSI=3.0	CBR=40%
Predicted Thickness = 6.48"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
PSI=2.0	5.22"
PSI=2.5	5.85"
CBR=3%	3.98"
CBR=20%	5.13"

Figure 4.2 Sensitivity Analysis of Equation 4.1 -- CRCP Model.

4.4.5 Recommendations

The regression model developed in this section can be used as a guide for determining AC overlay thickness. However, because of the problems previously mentioned -- particularly the small sample size and the narrow inference space -- it should be used with caution. Alternatively, the JRCP model developed in the next section could be used as a guide for AC overlay of CRCP sections, as long as the designer is aware that this model was developed for JRC and not CRC pavements.

Since 1986, when this testing was completed, several additional CRC pavements have been overlaid with thicknesses different from those reported here. Thus, in a short number of years, the data base from which a regression model can be developed will be substantial for CRC pavements. In two to four years, the overlays in place when this study was conducted will be approaching the end of their useful lives and will have experienced a large amount of truck traffic. A study similar to the one reported here could be implemented at that time which could validate the proposed equation or provide a new equation.

Different analysis techniques for CRC pavements should also be investigated. Chapter 6 uses the data collected in this study for a structural analysis using the AASHTO

Pavement Design Guide (3). A second procedure which could be applicable to design of overlays on CRC pavements is one based upon pavement condition. Condition of the pavement, particularly if it is monitored over time, can be an adequate indicator of the need for an overlay.

4.5 JRCP Model Analysis and Selection

Jointed reinforced concrete pavement comprises a large percentage of the composite pavements throughout the state of Indiana. Many of the original pavements placed during the 1930s and 1940s were JRCP. Although most of these pavements have been overlaid several times throughout the years and are 50 to 60 years old, many of the concrete slabs are often found intact and still performing as part of the pavement structure. Thus, these older pavements are included in the analysis with the newer JRCP.

Initially, the statistical analysis was performed directly on the independent variables, their two-factor interactions, and their squared terms. However, when the correlation analysis was run on the coefficients of the independent variables, many of the variables were found to be correlated (Pearson's coefficient > 0.90). This was particularly true for the main factors and their squared terms. Since the investigation would be severely limited

by this fact, transformation of the terms was necessary.

4.5.1 Centering the Independent Variables

The technique selected for transforming the variables involved using the variable means ($\bar{x}_i$). Each independent variable value (x_i) was centered to the variable mean by subtracting the mean from the actual value.

$$\text{centered } x_i = (x_i - \bar{x}_i) \quad 4.2$$

This type of transformation was chosen because of its effect on the correlation between main factors and their squared terms. By subtracting the mean of the independent variables from the actual variable, the lower values were transformed to a negative number and the higher values a positive number. When these terms were squared, the squared terms were all positive. After centering the data the correlation was again checked, and the main factor/square term correlation had disappeared.

The centered main variables which were used in this analysis are shown in Table 4.1. As discussed in detail in Section 4.1.2, the two-factor interactions and squared terms of these main independent variables were also included. Climate was considered in several of the early analyses but was omitted in later runs since it was not shown to be significant.

Each model in Table 4.1 was run four times -- once each for Dynaflect spring tests, FWD spring tests, Dynaflect summer/fall tests, and FWD summer/fall tests -- using the GLM and STEPWISE procedures from the SAS computer package.

4.5.2 Structural and Functional Model Selection

Many regression models were investigated and sensitivity analyses run to locate the "best" model. The equation that was accepted as the structural empirical design model is a hybrid of centered and noncentered terms and of structural and performance terms.

$$\text{OLAY} = 4.407 - 0.410(\text{ASPTHK}) + 1.021(\text{NPSI}) - 0.088(\text{XTRKPSI}) - 1.735(\text{NPSI})^2 \quad 4.3$$

where OLAY = required thickness in inches of AC overlay

ASPTHK = total thickness in inches of AC currently on the PCC (before overlay)

NPSI = centered value of terminal present serviceability index (PSI) desired for the overlay (or $\text{PSI} - 3.283$)

XTRKPSI = two-factor interaction between 1) total trucks (TOTTRK) in millions that will pass over the new overlay during its lifetime and 2) NPSI (or $\text{TOTTRK} * \text{NPSI}$)

$$\text{where TOTTRK} = \frac{(\text{Trks per day})(365)(\text{AGE})}{1,000,000}$$

AGE = age in years that the new overlay should last

$$\text{NPSI}^2 = \text{NPSI} * \text{NPSI}$$

A FORTRAN 77 computer program of equation 4.3 was

written (Appendix D) that can be used on either a mainframe or a personal computer, assuming that a FORTRAN compiler is available. The program is interactive so that the designer may easily change one variable while keeping the others constant, and thus perform a sensitivity analysis.

However, as mentioned earlier in this chapter, the inference space of each variable should not be violated, or the results will have no sound statistical basis. The independent variables and their ranges of inference are

1. Asphalt thickness (inches) - 0" through 8" (experience has shown that a minimum 3" overlay directly on concrete is required)
2. PSI - 1.7 through 4.5
3. Trucks per day - 400 through 5000 (or TOTTRK - 0.15 million through 25 million)
4. Age - 0 years to 15 years

A transition occurred at this point from structural overlay design requirements to functional requirements. The primary measure used to determine where this change will occur in a concrete pavement is flexural stress at the bottom of the PCC. If this stress becomes large enough so that fatigue of the pavement occurs, then the structural equation above should be used. If this stress is such that little pavement fatigue will result under a given load, a functional relationship is more appropriate. Details of this stress analysis can be found in Section 4.4.5.

Therefore, a functional model was developed to design AC overlays of thicker ($\geq 9"$) PCC pavements and of composite pavements with thick (generally $\geq 6"$) AC overlays already in place.

$$\text{OLAY} = 0.712 + 0.0118(\text{TOTTRK})^2 + 0.000153(\text{PCI})^2 + 0.00329(\text{AGE})^2 + 0.393(\text{TYPE}) \quad 4.4$$

where OLAY = required thickness in inches of AC overlay (experience has shown that a minimum 3" overlay directly on concrete is required)

TOTTRK = the total trucks in millions that will pass over the new overlay in its lifetime (see equation 4.3 for the formula for calculating total trucks)

PCI = pavement condition index (33)

AGE = design lifetime in years of the proposed overlay

TYPE = type of pavement (1 = JRCP or composite JRCP, 0 = AC)

Note that the TYPE variable was found to be significant and was included in the model. Thus, this equation can be used for AC pavements as well as JRCP to estimate AC overlay thickness.

The inference space for which the functional model is statistically sound is as important in this model as it was for the structural model. The independent variables and their ranges of inference are

1. Trucks per day - 100 through 3000 (or TOTTRK - 0.15 million through 11 million)
2. PCI - 29 through 100

3. AGE - 0 years through 15 years
4. TYPE - When analyzing JRC or JRC composite pavements, TYPE always equals 1

4.5.3 Structural Model Analysis

The structural model in equation 4.3 was analyzed using the techniques discussed in Sections 4.1 and 4.2.

Normality of overlay values. The Shapiro-Wilk test statistic (W) was calculated at 0.940. For a level of significance (α) of 0.05 and an n of 27, $W(0.05, 27) = 0.923$. Since $0.940 > 0.923$, the residuals of the data set are considered normally distributed.

Total square error (C_p). Because $C_p = 4.47$ and $p = 5$, the regression equation contains little bias.

Correlation of independent variable coefficients. No correlation coefficient algebraically exceeds the limiting value of ± 0.90 . The highest r_{ij} is -0.746 which is between the terms XTRKPSI and NPSI. Therefore, no term is considered highly correlated with any other term.

Source of variation in dependent variable. The $R^2 = 0.781$, and the adjusted $R^2 = 0.742$. These results indicate that the fit of the curve to the data is satisfactory.

Figure 4.3 shows a plot of predicted overlay values from equation 4.3 versus the actual thicknesses measured

Figure 4.3 Actual Versus Predicted Overlay Thickness Values -- JRCP Structural Model.

from the pavement cores.

Sensitivity Analysis. Table 4.4 and Figures 4.4 through 4.6 contain a sensitivity analysis of change in the overlay thickness through a range of values for each independent variable. (Note that Trk/day and AGE are variables used to calculate the total trucks, which is a component of the two-factor interaction XTRKPSI.) There are three cases of various variable combinations shown.

The overlay thickness was significantly sensitive to all the independent variables used in the model, particularly for ASPTHK and PSI. As ASPTHK ranged from 0" to 8", the change in overlay thickness changed 3.21" in each case.

The effect of PSI, because it was present in three of the four independent variable term, varied for each of the three cases. For a PSI range of 2.0 to 3.0, the change in overlay thickness ranged from 2.13" in case 2 from Table 4.4 to 3.58" in case 1. The latter value was even more significant than the change caused by the change in ASPTHK.

The Trucks per day and AGE variables, though not as significant as ASPTHK and AGE, produced substantial changes in OLAY as each of their ranges changed. Trucks per day ranged from 500 to 5000 and produced overlay thicknesses from 1.13" (cases 1 and 2) to 1.85" (case 3). AGE ranged

Table 4.4 Sensitivity Analysis of Equation 4.3
-- JRCF Structural Model.

<u>Case No. 1</u>		<u>Case No. 2</u>	
ASPTHK=4"	Trk/day=500	ASPTHK=4"	Trk/day=5000
PSI=2.5	AGE=10 yrs	PSI=2.5	AGE=10 yrs
Predicted Thickness = 1.07"		Predicted Thickness = 2.20"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>	<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
ASPTHK=0"	2.67	ASPTHK=0"	3.80
ASPTHK=2"	1.87	ASPTHK=2"	3.00
ASPTHK=6"	0.26	ASPTHK=6"	1.40
ASPTHK=8"	-0.54	ASPTHK=8"	0.59
PSI=2.0	-1.16	PSI=2.0	0.70
PSI=3.0	2.42	PSI=3.0	2.83
Trk/day=2500	1.57	Trk/day=500	1.07
Trk/day=5000	2.20	Trk/day=2500	1.57
AGE=5 yrs	1.00	AGE=5 yrs	1.57
AGE=15 yrs	1.13	AGE=15 yrs	2.83

Case No. 3

ASPTHK=0" Trk/day=2500
PSI=2.0 AGE=10 yrs

Predicted Thickness = 1.27"

<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
ASPTHK=2"	0.47
ASPTHK=4"	-0.33
ASPTHK=6"	-1.13
ASPTHK=8"	-1.94
PSI=2.5	3.17
PSI=3.0	4.21
Trk/day=500	0.45
Trk/day=5000	2.30
AGE=5 yrs	0.76
AGE=15 yrs	1.79

Figure 4.4 Sensitivity Analysis of Equation 4.3 — JRCP Structural Model -- PSI = 2.0.

Figure 4.5 Sensitivity Analysis of Equation 4.3 -- JRCP Structural Model -- PSI = 2.5.

Figure 4.6 Sensitivity Analysis of Equation 4.3 -- JRCF Structural Model -- PSI = 3.0.

from 5 years to 15 years and caused thicknesses from an insignificant 0.13" in case 1 from Table 4.4 to a more significant 1.26" in case 2.

Trends in the overlay thickness calculations versus changes in the independent variables were also considered to assure that the calculations were logical. Logical trends investigated were

1. As ASPTHK increases, does OLAY decrease?
2. As desired PSI increases, does OLAY increase?
3. As trucks per day increase, does OLAY increase?
4. As AGE increases, does OLAY increase?

Each of the independent terms behaved as was expected.

Finally, as ASPTHK became thicker, the required overlay often became negative, particularly when the desired terminal PSI was lower than normal or when the trucks per day were low. This tendency would indicate that many of the pavements are structurally sound and can support the load; however, a thin overlay could probably be placed on the pavement after milling or another technique is used to remove the surface irregularities. These projects might be prime candidates for asphalt recycling.

This prediction of negative overlay thicknesses which sometimes occurs as ASPTHK increases was a major concern, since many of the existing sections in Indiana have a thick

AC layer already in place over a PCC layer. Thus, a prediction model base upon functional requirements was also developed. This functional relationship and a technique for deciding when to use it is discussed in the following sections.

4.5.4 Functional Model Analysis

The functional model from equation 4.4 was analyzed using techniques found in Sections 4.1 and 4.2.

Normality of overlay values. the W statistic was calculated at 0.950. For an α of 0.05 and n of 32, $W(0.05, 32) = 0.930$. Since $0.950 > 0.930$, the residuals of the data set are considered normally distributed.

Total square error (C_p). Because $C_p = 5.0$ and $p = 5$, the regression equation contains little bias.

Correlation of independent variable coefficients. No correlation coefficient algebraically exceeded the limiting value of ± 0.90 . The highest r_{ij} occurred between the terms AGE^2 and $TOTTRK^2$ (0.413). Therefore, this model safely met the correlation criteria.

Source of variation in the dependent variable. The R^2 of the model is 0.518, with an adjusted R^2 of 0.447. These values are relatively low, but they are among the best R^2 values obtained for the possible models for this functional

analysis. This level of R^2 is not considered unrealistic for real field data.

Figure 4.7 contains a plot of predicted overlay thicknesses from equation 4.4 versus the actual overlay values in the data set. Again, perfect fit of the data would be represented by a 45° line.

Sensitivity Analysis. Table 4.5 and Figures 4.8 through 4.10 contain the results of sensitivity analyses for the change of overlay thickness through a range of independent variable values.

The overlay thickness is significantly sensitive to the AGE^2 and $TOTTRK^2$ variables, but is less sensitive to the PCI^2 variable. The change in AC thickness was 0.12" in all cases from Table 4.5 as the PCI varied from 35 to 45. In Figures 4.8 through 4.10, PCI was allowed to vary from 35 to 55, with a maximum change in overlay of about 0.3" occurring in Figure 4.10.

As AGE varies from 5 to 15 years, both Table 4.5 and Figure 4.8 through 4.10 show the overlay thickness varying several inches in all cases, qualifying age as the variable which most significantly affects the overlay thickness. The number of trucks also affects the overlay thickness quite appreciably. As the number of trucks per day increases from 500 to 5000, the overlay thickness increases

Figure 4.7 Actual Versus Predicted Overlay Thickness Values
-- JRCP Functional Model.

Table 4.5 Sensitivity Analysis of Equation 4.4
— JRCP Functional Model.

<u>Case No. 1</u>		<u>Case No. 2</u>	
Trk/day=2500 PCI=35	AGE=10 yrs TYPE=1	Trk/day=500 PCI=40	AGE=10 yrs TYPE=1
Predicted Thickness = 2.61"		Predicted Thickness = 1.72"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>	<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
Trk/day=500	1.67"	Trk/day=2500	2.67"
Trk/day=5000	5.56"	Trk/day=5000	5.62"
PCI=40	2.67"	PCI=35	1.67"
PCI=45	2.73"	PCI=45	1.79"
AGE=5 yrs	1.63"	AGE=5 yrs	1.45"
AGE=15 yrs	4.25"	AGE=15 yrs	2.19"

<u>Case No. 3</u>	
Trk/day=5000 PCI=45	AGE=10 yrs TYPE=1
Predicted Thickness = 5.68"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
Trk/day=500	1.79"
Trk/day=2500	2.73"
PCI=35	5.56"
PCI=40	5.62"
AGE=5 yrs	2.49"
AGE=15 yrs	11.00"

Figure 4.8 Sensitivity Analysis of Equation 4.4 -- JRCP Functional Model -- AGE = 5 yrs.

Figure 4.9 Sensitivity Analysis of Equation 4.4 -- JRCF Functional Model -- AGE = 10 yrs.

Figure 4.10 Sensitivity Analysis of Equation 4.4 -- JRCP Functional Model -- AGE = 15 yrs.

about 3.9" as shown in Table 4.5. This magnitude of change is also noted in all plots shown in Figure 4.8 through 4.10.

The trends in change of AC overlay thickness due to changes in the independent variable values were all as expected:

1. As AGE increased, overlay thickness increased.
2. As trucks per day increased, the overlay thickness increased.
3. As desired terminal PCI increased for a given AGE, the overlay thickness increased.
4. As TYPE of pavement being analyzed changed from AC to JRCP, the overlay thickness increased.

4.5.5 Transition from Structural to Functional Equation

At some point the AC overlay of a PCC pavement becomes sufficiently thick so that the flexural stress at the bottom of the PCC under a surface load is structurally insignificant. This load will cause little or no structural damage to the pavement as long as subgrade support is maintained. Thus, it is important to 1) determine the "breakpoint" for different combinations of AC overlay and PCC thicknesses and 2) obtain a functional equation to use in lieu of the structural model when this stress becomes insignificant. The last two sections discussed the structural and functional models. This section will discuss the technique used to ascertain which

model to use for determining the "breakpoints" mentioned above.

The Bitumen Structures Analysis in Roads (BISAR) linear elastic program (38) was used to calculate the interior stress at the bottom of the PCC slab for various combinations of AC overlay and PCC thicknesses. These interior stresses were then converted to edge stresses by multiplying by 1.5 from Westergaard theory (39).

Surface loads of 20 kips on a single axle with dual tires and 40 kips on a tandem axle with two sets of dual tires were used to evaluate stresses in the pavement. Moduli for the PCC (E_c) and AC (E_{ac}) layers were 3,120,000 psi and 314,000 psi, respectively, and were obtained from the analysis done in Chapter 5. The modulus for concrete with a compressive strength of 3000 psi was estimated using equation 4.6b below. The AC modulus was determined as the average E_{ac} value for AC at a standard temperature of 70°F, as calculated in Chapter 5 using the pavement test sections from this study. Poisson's ratios for the concrete, asphalt, and subgrade layers were 0.15, 0.35, and 0.5, respectively (39).

Finally, the concept of stress ratio was used from the Portland Cement Association (PCA) design guides for road (2) and airfield (40) pavements. Stress ratio (SR) is

defined as the actual edge stress (σ_a) at the bottom of a PCC pavement layer due to a load divided by the flexural stress (σ_f) of the concrete, or

$$SR = \frac{\sigma_a}{\sigma_f} \quad 4.5$$

Specifications generally state a required minimum compressive strength of concrete (σ'_c) for PCC pavement. A σ'_c of 3000 psi is typical of this minimum. Mindess and Young (41) state that

$$\sigma_f = 7.5(\sigma'_c)^{0.5} \quad 4.6a$$

$$E_c = 57,000(\sigma'_c)^{0.5} \quad 4.6b$$

Thus, an estimate of σ_f and E_c may be obtained from the compressive strength of the concrete. When no direct test results are available.

The PCA highway pavement guide (2) shows that a stress ratio of 0.45 is the critical point above which structural damage accumulates and below which the structural damage is considered insignificant. Figure 4.11 shows the combinations of AC overlay and PCC thicknesses which correspond to this $SR = 0.45$ breakpoint for various subgrade strengths. Thus, for all combinations to the left of the line drawn for a given subgrade strength, the structural model should be used. Similarly, for all combinations to the right of that line, the functional equation should be used. In particular, note that for a

Figure 4.11 PCC Versus AC Overlay Chart for Determining Appropriate Empirical Equation.

PCC thickness greater than 9", the functional equation always controls.

4.5.6 Reliability of the Model

Because of the strong statistical base of the data, reliability concepts were applied to the relations developed. Reliability has its roots in probability theory. As a basic definition for this project, reliability is the probability that an overlay thickness will perform as expected subject to basic criteria from which it was developed.

Equations 4.1, 4.3, and 4.4 allow the overlay thickness to be calculated. This thickness is essentially the mean of the sample data from which it was developed. As such, the reliability is 50% that the pavement will perform as expected. For example, if an overlay thickness of 3" is calculated for 100 different pavement sections using equation 4.3, then 50 of them might be expected to perform better and 50 could be expected to perform worse than the average performance. Statistical analysis is such that this mean can be predicted and applied if the user understands that it is just the mean of a distribution of overlay values. Blindly using the calculated overlay thickness as the thickness that should be constructed in the field will lead to disappointment half the time.

Overlay thicknesses for various levels of reliability (greater than or less than 50 percent) may be estimated. The SAS computer package can be used to predict the additional thickness that should be added to the mean to obtain a desired confidence or reliability (i.e., 95 percent). Application of the SAS routine gave thicknesses that should be added to the value calculated from equations 4.1, 4.3, and 4.4 to achieve varying reliability levels. Summaries of the results are given in Tables 4.6, 4.7, and 4.8 for the CRCP, JRCF structural, and JRCF functional models, respectively.

Chapter 7 contains samples of overlay thicknesses calculated for several different pavement sections using equation 4.3 and 4.4. These thicknesses are then compared to values determined from an AASHTO structural design technique (Chapter 6).

4.5.7 Models Rejected

Appendix E contains four of the regression models that were investigated and their corresponding sensitivity analyses. Each of these models showed promise throughout the GLM and stepwise procedures, but each was ultimately rejected. These equations are included to show some of the reasoning behind the analysis of the many potential regression models.

Table 4.6 Additional Overlay Thickness for Various Reliability Levels -- Equation 4.1 (CRCP Model).

<u>Relia-</u> <u>bility</u> (%)	<u>Additional</u> <u>Thickness</u> (in.)
99	2.8
95	2.0
90	1.5
80	1.0
70	0.6
60	0.3

Table 4.7 Additional Overlay Thickness for Various Reliability Levels -- Equation 4.3 (JRCP Structural Model).

<u>Relia-</u> <u>bility</u> (%)	<u>Additional</u> <u>Thickness</u> (in.)
99	1.8
95	1.3
90	1.0
80	0.7
70	0.4
60	0.2

Table 4.8 Additional Overlay Thickness for Various Reliability Levels -- Equation 4.4 (JRCP Functional Model).

<u>Relia-</u> <u>bility</u> (%)	<u>Additional</u> <u>Thickness</u> (in.)
99	3.0
95	2.1
90	1.7
80	1.1
70	0.7
60	0.3

4.6 Structural Distress Analysis

One of the trends that has recently been commented on by engineers monitoring pavement performance is that PCC pavements with stronger support tend to show more signs of structurally related distress. The performance data collected and analyzed in this study also reflects an increased thickness with increased CBR. A hypothesis was developed that if this reflection is true, then the distress survey data should include the effect. Thus, the data for the JRC pavements were analyzed for indications of this effect.

First, the PCI values were adjusted to reflect only those distress types which are directly related to the underlying concrete. The distress types included were transverse, longitudinal, reflection, and block cracking. Most notably excluded from the adjusted PCI calculation were edge cracks, which were assumed to be over the edge of the underlying concrete and rutting, which was considered to be an AC problem. These adjusted PCI values were then used as the dependent variables indicating structural distress.

Next, the combined CBR values (CCBR) were estimated if the PCC slab rested on a granular subbase instead of lying directly on the subgrade. The combined CBR was considered

more representative of the actual support provided to the pavement system.

To perform this task, the subgrade CBR values from Table 3.6 were applied to Figure 4.13 to convert CBR to modulus of subgraded reaction (k). Information from Table 3.4 was used to determine 1) if a subbase existed on a pavement section and 2) the thickness of that subbase. All subbases, when present, were granular. With the thickness of granular subbase and subgrade CBR, the combined k was obtained from Figure 4.12. Finally, Figure 4.13 was re-entered to convert this combined k to a combined CBR value. For those sections with no granular base, subgrade CBR and combined CBR were considered equal.

The SAS GLM procedure and the SAS STEPWISE technique with MAXR option were used to determine the best of the variables which would possibly have an effect on the adjusted PCI values. The variables chosen for analysis were AGE, TOTTRK, CCBR, OLAY, ASPTHK, their interactions, and their squared terms. This procedure generally followed that described in Section 4.1.

The model ultimately chosen as the best fit was

$$\text{CPCI} = 72.41 + 3.547(\text{OLAY}) - 0.00987(\text{CCBR})^2 \quad 4.7$$

where all terms have been previously defined. Surprisingly, AGE did not contribute significantly to a

Figure 4.12 Effect of Granular Subbase Thickness on k Value (40).

Figure 4.13 Approximate Interrelationships of Soil Classifications and Bearing Values (40).

decrease in the CPCI, as was expected before the analysis was begun.

Although the analysis of this equation was not as rigorous as that performed on equations 4.3 and 4.4, several tests were considered:

1. The W test: $W = 0.981 > 0.920 = W(0.05, 26)$, so the residuals of the dependent variable are normally distributed.
2. $C_p = 2.30$ and $p = 3$, so little bias exists.
3. The correlation coefficient between $CCBR^2$ and OLAY was 0.103, which was well below 0.90, so little correlation existed.
4. R^2 was 0.413, and the adjusted R^2 was 0.362. These values were relatively low, indicating that a highly reliable prediction could not be made with this equation. However, it is high enough to indicate that the trends in the data are developed. Figure 4.14 shows actual versus predicted CPCI values. Note the wide scatter, which reflects the lower R^2 value.
5. Table 4.9 and Figure 4.15 show the trends and sensitivity of CPCI to both CCBR and OLAY. Both variables affect CPCI quite significantly, and the trend of these effects were as expected. As the

Figure 4.14 Actual Versus Predicted CPCI Values.

Table 4.9 Sensitivity Analysis of Equation 4.7
— CPCI Model.

<u>Case No. 1</u>		<u>Case No. 2</u>	
OLAY=2"	CCBR=3%	OLAY=6"	CCBR=20%
Predicted CPCI = 79.4		Predicted CPCI = 89.7	
<u>Sensitivity</u>	<u>New CPCI</u>	<u>Sensitivity</u>	<u>New CPCI</u>
OLAY=1"	75.9	OLAY=1"	72.1
OLAY=4"	86.5	OLAY=2"	75.5
OLAY=6"	93.5	OLAY=4"	82.6
OLAY=8"	100.6	OLAY=8"	96.8
CCBR=20%	75.5	CCBR=3%	93.5
CCBR=40%	63.7	CCBR=40%	77.8

<u>Case No. 3</u>	
OLAY=4"	CCBR=40%
Predicted CPCI = 70.8	
<u>Sensitivity</u>	<u>New CPCI</u>
OLAY=1"	60.1
OLAY=2"	63.7
OLAY=6"	77.8
OLAY=8"	84.9
CCBR=3%	86.5
CCBR=20%	82.6

Figure 4.15 Sensitivity Analysis of Equation 4.7 -- CPCI Model.

overlay thickness increases, the CPCI value tends to increase. Conversely, a higher support for the slab (higher CCBR) results in lower CPCI values.

Finally, the model was not necessarily produced to predict the CPCI value that might be expected in a pavement and probably should not be used for that purpose. However, it does support the original hypothesis that led to this analysis -- more JRCF structural distress occurs when stiffer pavement support is present.

CHAPTER 5 - BACKCALCULATION OF MODULI

Techniques for backcalculating elastic moduli of pavement layers from pavement NDT deflection data have become increasingly popular during the past decade.

5.1 Background

Two computer programs were investigated initially in this project when determining whether backcalculation of moduli techniques should be pursued in developing an overlay design procedure. Both procedures use BISAR (38) as their basis. The first program used in this analysis was developed at Purdue University by graduate student Brian Coree as a part of the research in which he was involved. Hereafter, this program will be referred to as the Purdue method. BISDEF (38, 42), the second technique used, was developed at the U.S. Army Corps of Engineers Waterways Experiment Station (WES).

5.1.1 Features of the Programs

The BISDEF program contains some features which many other similar programs do not include. First, a modulus

can be input as a fixed value for a given layer, if an accurate estimate of this modulus can be made. Thus, fewer unknowns (the layer moduli) result, and the likelihood of convergence to a solution is increased. Secondly, BISDEF permits upper and lower bounds to be set for layer moduli. Thus, these limits should be fixed so that the range includes only reasonable values for a particular layer material. In the Purdue method, layer moduli cannot be fixed, and the moduli can vary through an unlimited range.

5.1.2 General Description

Generally, backcalculation procedures use multilayer linear elastic layer theory with inputs of pavement cross section, pavement deflection under a given NDT load, initial estimates of the layer moduli, and Poisson ratios. The moduli and Poisson ratio estimates are initially used with the cross section data and NDT load to predict displacements at each of the NDT displacement transducers. These predicted displacements are compared to the field measured displacements, and a difference is calculated. If the difference falls within a predetermined range of acceptability for each of the sensors, the moduli values are considered accurate estimates of the actual values. If not, new modulus values for the pavement layers are calculated, and the process is repeated until the range of acceptability in displacement difference is satisfied at

each of the sensors.

5.2 Moduli Estimates - First Trial

Layer moduli were calculated using both the Purdue method and BISDEF with spring and summer FWD data. The heaviest of the FWD drops (approximately 14,000 lbf) and corresponding displacement readings at 0, 1, 2, 3, and 4 feet from the load center were used. The 85th percentile load and deflections were calculated for the six locations tested in each pavement section and were input in both of the backcalculation programs. An average of thicknesses for the pavement layers was obtained from the two pavement cores taken in each section.

Layer moduli for the CRC and JRC pavements were determined using the two techniques described above. Tables 5.1 through 5.4 contain the results of these initial backcalculation runs. For many of the test sections, convergence to a solution was not possible for a four-layer system. When this situation occurred, the subbase layer was omitted so that values could be calculated for the remaining layers. This compromise may have affected the computed moduli of other layers, particularly that of the subgrade although this potential effect is difficult to substantiate.

Table 5.1 Backcalculated Modulus of Elasticity Values
(ksi) for CRC Pavement from Spring Test Period.

Section Number	BISDEF Modulus (ksi)				Purdue Method Modulus (ksi)			
	Asph	Conc	Sub- base	Sub- grade	Asph	Conc	Sub- base	Sub- grade
C-01	1000	3167	--	18.4	2507	4550	--	27.1
C-02	N/A	4916	5.0	16.8	NF	NF	NF	NF
F-01	762	2500	150	17.2	748	6004	--	25.7
F-02	514	2500	--	19.1	5069	95.7	12712	27.1
G-01	NF	NF	NF	NF	NF	NF	NF	NF
L-01	373	2500	--	16.4	2207	536	81009	24.3
L-02	N/A	4175	5.0	15.0	NF	NF	NF	NF
L-03	N/A	4344	5.0	14.0	NF	NF	NF	NF
L-04	1000	4569	--	18.1	1594	7106	--	27.7
S-01	1000	7000	--	14.8	2998	9156	--	23.9
S-02	1000	5283	--	18.6	2436	7438	--	28.3
S-03	1000	3953	--	18.8	10276	4425	--	28.5
S-04	N/A	7000	8.4	15.3	NF	NF	NF	NF

N/A not applicable, layer does not exist in pavement system
 -- layer exists in pavement system, but was removed to
 facilitate moduli calculation
 NF values for section not able to be calculated

Table 5.2 Backcalculated Modulus of Elasticity Values
(ksi) for JRC Pavement from Spring Test Period.

Section Number	BISDEF Modulus (ksi)				Purdue Method Modulus (ksi)			
	Asph	Conc	Sub- base	Sub- grade	Asph	Conc	Sub- base	Sub- grade
C-03	200	2509	N/A	6.9	138	3410	N/A	10.6
C-04	1000	2756	--	4.0	5089	4152	--	6.7
C-05	550	5523	--	10.6	907	7669	1.0	28.8
C-06	N/A	7000	5.0	12.1	NF	NF	NF	NF
C-07	407	3251	N/A	11.3	640	4706	N/A	15.9
F-03	200	2500	--	8.3	193	190	46600	12.0
F-04	200	2500	--	10.7	1294	306	25800	15.3
F-05	200	2596	--	5.2	521	7.9	--	12.4
F-06	200	2500	N/A	8.7	239	1970	N/A	14.1
F-07	270	2500	9.2	14.9	420	3619	21.9	20.6
F-08	942	3398	--	10.0	121000	185	--	14.9
F-09	688	3406	--	9.4	3953	4011	--	15.7
F-10	361	5094	5.0	8.9	413	6524	--	13.3
F-11	215	3708	--	7.7	255	6240	--	11.4
F-12	1000	3444	--	13.8	68970	825	--	20.9
G-02	407	2500	--	17.0	805	3477	2.2	33.3
G-03	266	4814	--	9.8	341	6531	--	14.2
L-05	200	2506	N/A	7.5	287	468	N/A	14.2
L-06	252	2895	N/A	9.7	379	3853	N/A	13.9
L-07	458	6826	N/A	6.4	606	8333	N/A	10.3
L-08	N/A	4090	N/A	7.1	N/A	3657	N/A	11.0
L-09	200	2500	N/A	17.6	624	1199	N/A	28.9
S-05	470	2500	N/A	13.2	603	5374	N/A	20.3
S-06	1000	4233	--	14.4	6465	5235	--	22.6
S-07	254	2500	N/A	11.4	1767	2650	N/A	15.5
V-01	200	2500	--	6.4	393	1750	--	11.7
V-02	594	2500	--	7.9	943	4267	--	12.4
V-03	256	7000	5.0	10.5	505	5911	--	15.8
V-04	661	6587	--	7.9	2242	8358	--	12.2
V-05	N/A	2500	150	13.7	N/A	1851	9273	19.0

N/A not applicable, layer does not exist in pavement system

-- layer exists in pavement system, but was removed to
facilitate moduli calculation

NF values for section not able to be calculated

Table 5.3 Backcalculated Modulus of Elasticity Values
(ksi) for CRC Pavement from Summer Test Period.

Section Number	BISDEF Modulus (ksi)				Purdue Method Modulus (ksi)			
	Asph	Conc	Sub- base	Sub- grade	Asph	Conc	Sub- base	Sub- grade
C-01	200	2500	5.0	19.3	362	2163	--	24.7
C-02	N/A	2874	11.4	7.5	N/A	3028	1.6	15.4
F-01	534	2500	150	18.7	476	6242	10.2	29.9
F-02	403	4228	--	17.4	2292	212	20602	24.0
G-01	N/A	7000	5.0	14.7	NF	NF	NF	NF
L-01	204	2535	--	17.5	385	2437	--	25.1
L-03	N/A	7000	5.0	13.0	NF	NF	NF	NF
L-04	1000	2500	5.0	12.9	3469	2775	--	20.5
S-01	382	6227	--	15.1	459	7921	--	22.8
S-02	452	6274	--	17.4	639	7409	--	25.8
S-03	676	4160	--	18.0	932	6116	--	26.1
S-04	N/A	7000	5.0	12.9	N/A	8041	0.2	1216
S-17	N/A	3685	5.0	36.3	NF	NF	NF	NF

N/A not applicable, layer does not exist in pavement system
 -- layer exists in pavement system, but was removed to
 facilitate moduli calculation
 NF values for section not able to be calculated

Table 5.4 Backcalculated Modulus of Elasticity Values
(ksi) for JRC Pavement from Summer Test Period.

Section Number	BISDEF Modulus (ksi)				Purdue Method Modulus (ksi)			
	Asph	Conc	Sub- base	Sub- grade	Asph	Conc	Sub- base	Sub- grade
C-03	200	2528	N/A	7.6	126	3790	N/A	11.3
C-04	327	3736	--	5.2	510	4346	--	8.1
C-05	200	3793	5.0	15.9	299	3954	--	20.6
C-06	N/A	5883	27.2	12.5	N/A	6421	9.8	21.6
C-07	676	5201	N/A	14.0	888	8381	N/A	19.9
F-03	200	2500	--	9.3	190	311	43994	13.4
F-04	200	2500	--	10.0	219	2756	--	14.4
F-05	200	2500	--	6.5	527	15.0	--	14.8
F-06	200	2500	N/A	11.0	222	2422	N/A	16.7
F-07	200	2500	5.0	18.3	160	1140	196	21.1
F-08	1000	5251	--	12.5	86280	3441	--	19.1
F-09	1000	2980	--	13.5	8170	3802	--	21.5
F-10	200	4581	--	10.6	248	6105	--	15.1
F-11	272	6268	--	5.7	334	8855	--	9.1
F-12	1000	4538	--	14.7	20220	4612	--	22.5
G-02	1000	2500	--	17.1	1788	3080	--	27.7
G-03	255	5761	--	15.1	364	6920	--	21.3
L-05	200	2500	N/A	8.3	300	457	N/A	15.6
L-06	238	2639	N/A	9.4	351	3662	N/A	13.4
L-07	200	2500	N/A	7.4	297	3299	N/A	10.8
L-08	N/A	5241	N/A	14.4	N/A	4613	N/A	20.8
L-09	200	2500	N/A	19.3	397	1521	N/A	30.8
S-05	270	2500	N/A	12.8	286	4700	N/A	19.3
S-06	350	3500	--	15.0	327	4490	--	21.4
S-07	364	2500	N/A	11.5	874	3682	N/A	15.5
V-01	200	2702	--	4.7	237	17.7	43396	10.6
V-02	270	2500	--	5.8	461	3307	--	9.0
V-03	393	2500	53.3	8.6	573	4112	4.1	14.4
V-04	731	3945	7.8	10.3	9607	3091	--	15.2
V-05	N/A	3250	--	6.2	NF	NF	NF	NF

N/A not applicable, layer does not exist in pavement system

-- layer exists in pavement system, but was removed to
facilitate moduli calculation

NF values for section not able to be calculated

5.3 Typical Moduli

5.3.1 Portland Cement Concrete

For concrete, the most common measure of strength is the compressive strength (σ'_c). An often specified value for σ'_c in pavement concrete is 3000 psi. However, the range of concrete strengths found in the field is likely to range from around 2500 psi to 6000 psi, since most contractors want to insure that they meet the 3000 psi specification. Figure 5.1 contains a typical distribution of concrete compressive strengths (41) on a paving job with reasonably good quality control of the concrete mix. Most of the cylinder strengths will be above the required strength, resulting in a strength distribution similar to that mentioned above.

Concrete compressive strength has been empirically related to the secant elastic modulus of concrete (E_c). Mindess and Young (41) point out that for normal-weight concrete with a density of 145 pounds per cubic foot, this relationship as stated in the American Concrete Institute (ACI) Building Code is

$$E_c = 57,000 \times (\sigma'_c)^{0.5} \quad 5.1$$

where the units for E_c and for σ'_c are psi. Therefore, for the range in compressive strength of 2500 psi to 6000 psi,

Figure 5.1 Typical Distribution of PCC Cylinder Strengths (41).

the corresponding range in E_c is 2.85 million psi to 4.42 million psi. Any modulus values outside of this range might be considered unreasonable if the concrete pavement is known to be intact. The upper and lower limits for modulus of concrete in the BISDEF program were set at 2.0 and 7.0 million psi, respectively.

5.3.2 Asphaltic Concrete

Because most of the concrete pavements in Indiana are overlaid with asphaltic concrete, the strength of these layers are also important in the NDT field testing of pavements. Yoder and Witczak (39) use 600,000 psi quite extensively throughout their text as an average value for an AC layer.

Asphalt cement is a visco-elastic material. As such, the stiffness of the asphalt cement is dependent upon the time of loading and the temperature at which loading occurs. At high rates of loading, the asphalt cement exhibits higher stiffness since it does not have time to appreciably strain. At lower rates of loading, the asphalt cement has time to strain, so the stiffness is higher. At low temperatures, asphalt cement is stiff; at high temperatures, the stiffness is relatively low.

As a primary component in the asphalt mixture composing the AC pavement layer, the cement affects the

mixture stiffness, or the elastic modulus, of the layer. Values of 0.2 and 1.0 million psi were input as the upper and lower range limits, respectively, in the BISDEF program for calculating AC layer moduli. This range in modulus allowed the AC to vary over a wide band of pavement temperatures.

5.4 Discussion of Initial Results

Thirteen CRC and 30 JRC pavement sections were tested both in the spring and in the summer/fall. Thus, 86 concrete pavement NDT data sets were available for analysis. Of these data sets, only 16% produced moduli estimates within the previously stated ranges for AC and PCC layers using the Purdue method. In 12% of the data sets, the solutions never converged, and no information was obtained.

In the BISDEF analysis, 19% of the data sets resulted in moduli values within the range considered reasonable for AC and PCC layers. Only one of the data sets did not converge to a solution. However, most of the solutions contained one or more layers which was pegged at an upper or lower limit and were thus considered unacceptable.

The computed subgrade moduli values were reasonable for both the Purdue and BISDEF techniques. Typically, the

Purdue technique produced higher estimates of subgrade modulus, but most were in the range of possibility for the particular soil types which they represented.

The fact that less than 20% of the NDT data sets produced reasonable results indicates that problems exist in using multilayer linear elastic theory and backcalculation procedures for predicting pavement strength. Other proven techniques, such as the one discussed in the following section, might be used in conjunction with these backcalculation procedures to obtain more accurate measures of pavement layer moduli.

5.5 Estimating the AC Overlay Moduli

Bonnaure, et. al. (42) studied asphaltic concrete mixes and concluded that the stiffness of the mix is primarily affected by temperature, time of loading, hardness and temperature susceptibility of the binder, and volume of the mix components. This method of determining mix stiffness has been used as the basis for estimating asphalt layer moduli in a procedure developed by graduate student Brian Coree at Purdue University. On older PC concrete pavements, the AC overlay is composed of different asphaltic concrete layers which had often been placed under different contracts. This procedure involves calculating

the composite modulus for the entire AC thickness.

5.5.1 Obtaining Input

Surface temperature of the pavement sections was measured during testing. The technique described by Gupta (6) was used to estimate the average pavement temperature. Time of loading for the FWD was 0.02 seconds, a value obtained from equipment specifications. However, information on binder hardness and component volume was more difficult to ascertain.

The hardness, as measured by the standard penetration test, of the asphalt cement was not available from asphalt plant or construction records. The mixes investigated covered a large number of years and, most likely, a wide variety of asphalt cement sources. Thus, the penetration for all bitumens was assumed to be an average value of 80.

Binder content was estimated using a probabilistic technique developed by Rosenblueth (43). The specifications under which the pavement layer was placed were obtained from contract construction records. These specifications usually included the specification year applicable when the contract was let, type of aggregate, and type of asphalt. From these three inputs, the range of bitumen allowed was obtained from the appropriate

construction specification book. With these maximum and minimum asphalt contents, the Rosenblueth method was employed, and the bitumen content most likely to be present in the mix was determined. This content is then used in modulus determination of the AC mix.

5.5.2 Moduli Estimates

Table 5.5 contains the results of the moduli estimation. Note that the values range from a low of 4152 psi on section V-4 in the summer/fall testing period to a high of 1.38 million psi on section G-2 in the summer/fall test period. Although these extremes might be somewhat unrealistic (i.e., they may not indicate the actual extreme values in the field), the fact that asphaltic concrete strength can vary widely throughout the year is emphasized. Assuming that traffic conditions remain relatively constant, the performance of the pavement structure is, therefore, significantly different at different times of the year.

The spring testing occurred over six weeks from mid-March through late April. Thus, a wide variety of pavement temperatures were experienced, resulting in a large range of AC moduli. During the four-week summer/fall test period from mid-August through mid-September, the temperatures were warm but fairly constant, causing more consistent AC

Table 5.5 Composite Moduli of Asphalt Overlay Layers
Used in Backcalculation Analysis with FWD Data.

Sect. No.	Asphalt Thickness (in)	Composite Modulus (psi)*		
		Actual Spring	Pvt. Temp. Summer	70°F Pvt. Temp.
C-01	3.7	429959	131894	341477
C-03	7.2	165595	95433	340868
C-04	3.7	562260	190944	341477
C-05	4.2	816584	16804	242070
C-07	4.2	958228	1212587	344296
F-01	5.1	685344	301482	340333
F-02	5.2	478286	203893	340276
F-03	6.8	269280	156761	304656
F-04	3.5	223745	238767	270997
F-05	6.4	325458	158121	288356
F-06	5.4	872015	364183	364183
F-07	4.5	393815	53197	311417
F-08	2.8	663102	766738	435052
F-09	4.3	564703	132662	343136
F-10	5.6	803903	238426	368327
F-11	7.2	258281	241973	351798
F-12	3.2	517530	96522	245332
G-02	4.2	173558	1382389	242070
G-03	5.4	273309	1320725	273309
L-01	5.2	1049022	129384	336078
L-04	4.9	999035	44825	343771
L-05	6.3	588535	204558	320466
L-06	4.8	244926	93550	314693
L-07	5.1	993705	43628	312922
L-09	5.9	315043	229224	334628
S-01	5.3	688913	161111	241126
S-02	4.6	724039	120258	241675
S-03	4.6	625973	111292	241675
S-05	7.6	856708	177820	300059
S-06	3.7	840076	48679	388782
S-07	3.8	435346	155658	366934
V-01	6.8	506584	37883	304316
V-02	5.1	573724	24164	260905
V-03	4.0	439572	196012	349517
V-04	4.7	309139	4152	241586

* Rate of loading used in analysis was 0.02 sec.

moduli on most test sections. However, test sections C-7, G-2, and G-3 were missed in August because of an equipment breakdown. They were finally tested during late October with the temperature near freezing, and moduli values were significantly higher than the other test sections.

Moduli of the AC layers were also standardized at 70°F, using a technique described by Gupta (6), for comparison among the sections. All inputs were constant for all sections except for layer thickness, asphalt type and content, and aggregate type. The estimated values at 70°F ranged from 241,126 psi for section S-1 to 435,052 psi for section F-8. However, the F-8 value was almost 50,000 psi greater than any modulus calculated for the other sections. The AC moduli for the remaining 34 test sections included values in a fairly narrow band from 240,000 psi to 390,000 psi.

5.5.3 Conclusions

How do the results of this estimation method for AC layer moduli affect strength parameters used as input into asphaltic concrete pavement design methods? Obviously, the binder content and pavement temperature have a considerable effect on the strength of the pavement layers. Average pavement strength for AC layers should be determined on a regional or local level. Inputs to this strength

calculation might be pavement temperature; asphalt type, content, and hardness; aggregate type and volume; and volume of voids. Too often values for design are taken from sources where conditions affecting AC pavement performance are totally different from those conditions present at the site where the pavement is to be constructed. This area is one which demands further study.

5.6 Moduli Estimates - Second Trial

The BISDEF program was again employed to estimate pavement layer moduli. This time, however, the asphaltic concrete layer modulus was fixed for each AC overlaid layer using the estimated spring and summer/fall values located in Table 5.5. All layer moduli except the fixed AC moduli were calculated from the BISDEF program, and the results for the test sections were again analyzed.

Pavement sections which consisted of nonoverlaid PC pavements were obviously excluded from this step. As in the first trial, many of the subbase layers were omitted to aid BISDEF in converging to a solution.

Results of the BISDEF analysis are shown in Tables 5.6 and 5.7 for spring and summer/fall, respectively. Again, considering the 86 data sets, which include the 70 AC overlaid sections from Tables 5.6 and 5.7 and the 16

Table 5.6 Spring BISDEF Backcalculated Modulus Values
Using AC Moduli from Estimation Program.

Section Number	Asphalt	<u>Modulus</u> (ksi)		Subgrade
		Concrete	Base	
C-01	430	4687	---	18.5
C-03	166	1251	N/A	7.3
C-04	562	4513	---	3.7
C-05	817	3739	150.0	10.5
C-07	958	1498	N/A	11.3
F-01	685	2351	150.0	17.3
F-02	478	2084	150.0	15.6
F-03	269	100	150.0	10.0
F-04	224	1816	150.0	10.8
F-05	325	100	5.0	7.3
F-06	872	228	N/A	10.0
F-07	395	1136	35.1	13.4
F-08	663	4008	---	9.3
F-09	565	3889	5.0	10.2
F-10	804	491	97.7	8.0
F-11	258	4146	5.0	7.3
F-12	518	4838	5.0	14.1
G-02	174	3810	---	16.2
G-03	273	5329	---	9.7
L-01	1049	799	19.7	16.5
L-04	999	4757	---	17.5
L-05	589	100	N/A	9.7
L-06	245	2975	N/A	9.7
L-07	994	3152	N/A	6.7
L-09	315	545	N/A	20.5
S-01	689	9511	---	14.2
S-02	724	6560	---	18.4
S-03	626	5487	---	18.6
S-05	857	944	N/A	13.7
S-06	840	4777	---	14.1
S-07	435	1596	N/A	11.5
V-01	507	312	150.0	7.9
V-02	574	3393	5.0	7.2
V-03	440	3532	150.0	10.5
V-04	309	1036	---	7.3

N/A Layer does not exist in pavement system

--- Layer was removed in BISDEF input to
obtain output

Table 5.7 Summer BISDEF Backcalculated Modulus Values
Using AC Moduli from Estimation Program.

Section Number	Modulus (ksi)			Subgrade
	Asphalt	Concrete	Base	
C-01	132	2400	---	17.8
C-03	95	3182	N/A	7.6
C-04	191	4631	---	5.0
C-05	17	12000	---	9.5
C-07	1213	3611	N/A	13.8
F-01	301	5000	---	18.7
F-02	204	7340	---	15.9
F-03	157	787	150.0	10.5
F-04	239	1539	150.0	10.3
F-05	158	100	5.0	10.1
F-06	364	5739	N/A	12.2
F-07	53	2943	5.0	20.3
F-08	767	6522	---	11.8
F-09	133	9630	---	10.7
F-10	238	4021	29.4	9.9
F-11	242	7155	---	5.5
F-12	97	12000	---	11.9
G-02	1382	1316	11.0	19.0
G-03	1321	587	150.0	14.8
L-01	129	2858	---	17.5
L-04	45	10592	---	9.6
L-05	205	100	N/A	11.5
L-06	94	5070	N/A	8.7
L-07	44	7092	N/A	6.1
L-09	229	853	N/A	22.2
S-01	161	12000	---	12.8
S-02	120	12000	---	15.1
S-03	111	12000	---	14.8
S-05	178	3967	N/A	12.8
S-06	49	12000	---	9.9
S-07	156	3983	N/A	11.3
V-01	38	1833	---	7.8
V-02	24	12000	---	3.3
V-03	196	4107	5.0	8.8
V-04	4	7694	---	9.8

N/A Layer does not exist in pavement system

--- Layer was removed in BISDEF input to
obtain output

nonoverlaid sections from Tables 5.1 through 5.4, 22% of the sections contained PCC moduli values within the range established in section 5.3, as well as reasonable moduli values for the base and subgrade materials.

This 22% level represents an improvement over the 19% from the first trial, where no values were fixed. However, 22% acceptability does not instill much confidence.

5.7 Moduli Estimates - Third Trial

When inspecting the moduli values in Tables 5.1 through 5.4, 5.6, and 5.7, it was noted that the subgrade values were fairly consistent. Thus, a third trial using the BISDEF program was initiated with fixed moduli values for both the AC layers and the subgrade soils. If the subgrade moduli calculated in the second trial for the same section were within 500 psi for spring and summer/fall data sets, the average subgrade modulus was used for that section in the third trial. If not, the value calculated for each test period was used in the corresponding test period calculation for trial three. The results of this analysis are contained in Tables 5.8 and 5.9.

All subbase layers which were omitted in the first and second trials were now input into the process. As a result, eight of the 86 data sets did not converge to a

Table 5.8 Spring BISDEF Backcalculated Modulus Values
Using AC Moduli from Estimation Program
and Fixed Subgrade Moduli.

Section Number	<u>Modulus (ksi)</u>			
	Asphalt	Concrete	Base	Subgrade
C-01	430	4372	131.0	18.0
C-02	N/A	4854	5.8	16.5
C-03	166	1110	N/A	7.5
C-04	562	3500	30.0	4.0
C-05	817	6931	150.0	8.5
C-06	N/A	6088	6.2	12.0
C-07	958	1405	N/A	11.5
F-01	685	3500	30.0	17.5
F-02	478	3966	150.0	15.7
F-03	269	618	5.0	10.3
F-04	224	1983	150.0	10.5
F-05	325	100	5.0	7.5
F-06	872	225	N/A	10.0
F-07	395	1240	30.7	13.5
F-08	663	---	---	9.5
F-09	565	3637	5.0	10.5
F-10	804	1300	58.1	8.0
F-11	258	3500	30.0	7.5
F-12	518	4715	5.0	14.0
G-01	N/A	1773	5.0	14.5
G-02	174	3946	19.0	16.0
G-03	273	4618	23.0	10.0
L-01	1049	788	15.7	16.5
L-02	N/A	4021	6.2	15.0
L-03	N/A	4097	5.1	14.0
L-04	999	4072	84.1	17.5
L-05	589	100	N/A	9.5
L-06	245	3500	N/A	9.5
L-07	994	3500	N/A	6.5
L-08	N/A	3500	N/A	7.0
L-09	315	550	N/A	20.5

N/A Layer does not exist in pavement system

--- Values not able to be calculated by BISDEF

Table 5.8, continued.

Section Number	Asphalt	Modulus (ksi)		Subgrade
		Concrete	Base	
S-01	689	9384	36.8	14.0
S-02	724	6580	15.2	18.5
S-03	626	5571	24.0	18.5
S-04	N/A	6339	30.0	15.5
S-05	857	1034	N/A	13.5
S-06	840	4773	20.2	14.0
S-07	435	1432	N/A	11.5
V-01	507	573	5.0	8.0
V-02	574	3500	30.0	7.0
V-03	440	3959	52.5	10.5
V-04	309	---	---	7.5
V-05	N/A	3613	9.2	14.0

N/A Layer does not exist in pavement system

--- Values not able to be calculated by BISDEF

Table 5.9 Summer BISDEF Backcalculated Modulus Values
Using AC Moduli from Estimation Program
and Fixed Subgrade Moduli.

Section Number	<u>Modulus (ksi)</u>			
	Asphalt	Concrete	Base	Subgrade
C-01	132	2399	17.5	18.0
C-02	N/A	2995	10.7	7.5
C-03	95	3226	N/A	7.5
C-04	191	4624	7.2	5.0
C-05	50	12000	12.3	9.5
C-06	N/A	6206	19.0	12.5
C-07	1213	3994	N/A	13.5
F-01	301	4862	27.7	18.5
F-02	204	7245	32.5	15.7
F-03	157	2210	5.0	10.3
F-04	239	1979	9.8	10.5
F-05	158	100	5.0	10.0
F-06	364	622	N/A	12.0
F-07	53	2964	5.1	20.0
F-08	767	---	---	11.5
F-09	133	11226	5.0	10.5
F-10	238	3500	30.0	10.0
F-11	242	---	---	5.5
F-12	97	---	---	12.0
G-01	N/A	5123	150.0	14.5
G-02	1382	1282	12.7	19.0
G-03	1321	546	150.0	15.0
L-01	129	2992	12.5	17.5
L-03	N/A	6610	7.8	13.0
L-04	50	12000	5.0	9.5
L-05	205	100	N/A	11.5
L-06	94	5369	N/A	8.5
L-07	50	5809	N/A	6.5
L-08	N/A	4312	N/A	14.5
L-09	229	901	N/A	22.0

N/A Layer does not exist in pavement system

--- Values not able to be calculated by BISDEF

Table 5.9, continued.

Section Number	Asphalt	<u>Modulus (ksi)</u>		Subgrade
		Concrete	Base	
S-01	161	12000	14.2	13.0
S-02	120	12000	30.4	15.0
S-03	111	12000	16.2	15.0
S-04	N/A	6353	10.2	13.0
S-05	178	4248	N/A	12.5
S-06	50	---	---	10.0
S-07	156	3684	N/A	11.5
S-17	N/A	3706	5.0	36.0
V-01	50	1283	7.6	8.0
V-02	50	---	---	3.5
V-03	196	3914	5.0	9.0
V-04	50	---	---	10.0
V-05	N/A	3330	17.8	6.0

N/A Layer does not exist in pavement system

--- Values not able to be calculated by BISDEF

solution of moduli for the two layers -- the PC concrete and the subbase -- whose moduli were allowed to vary. However, 30% of the 86 data sets produced solutions which contained PC concrete moduli between 2.85 psi and 4.42 psi, as discussed in section 5.3 and reasonable subbase moduli. These results are an improvement over the 22% success obtained in the second BISDEF trial.

5.8 Conclusions

The backcalculation techniques using linear elastic layer theory which were investigated in this study are not producing adequate results for analyzing PC concrete and composite pavements. Users of the technique will not have confidence in the solutions generated when seven out of every ten runs produce unreasonable results.

Linear elastic layer methods, such as BISAR, used to calculate pavement stresses generally assume that a static load is applied to produce the deflections. Because the load applied by the FWD is an impact load, the assumptions for both loading and deflection are not met. Thus, including the impact loading and resulting deflection pattern is a much needed, though extremely complex, refinement to current available techniques.

CHAPTER 6 - AASHTO OVERLAY DESIGN ANALYSIS

The AASHTO Guide for Design of Pavement Structures (3) incorporates detailed information on the design of flexible overlays of rigid pavements. Unfortunately, however, of the four typical overlay types -- flexible over flexible, flexible over rigid, rigid over flexible, and rigid over rigid -- the flexible over rigid design is the least understood (3).

Usually, the portland cement concrete (PCC) pavement which requires an overlay has begun to crack, thus losing some of its rigid structural integrity. A PCC pavement in this condition is usually no longer rigid in that the cracks prevent a slab from working as a unit as it once did. However, unless it is badly broken, the rigid pavement does not act exactly as a flexible pavement might under load. Thus, the broken rigid pavement performs somewhere in between these two conditions, or it might be said that it is "semi-rigid" in its performance under load (3).

How should it be analyzed if it is neither flexible or rigid? The AASHTO Guide suggests that the thickness deficiency approach under the flexible conditions are more

appropriate than that of the rigid conditions approach. The material contained in this chapter will thus follow this flexible design approach when determining the normal structural overlay required on an existing PCC pavement.

Flexible overlays of rigid pavements also are characterized by "reflection" cracking of joints or cracks in the PCC pavement through to the surface of the flexible overlay. This phenomenon usually results in a loss of structural integrity by providing a point of entry for moisture into the pavement structure or of structural integrity by initiating roughness which often progresses around the crack. It will likely cause rapid deterioration of the pavement performance. This reflective cracking is caused by both the vertical movement of the joints or cracks under load and by the horizontal movement of the joints or cracks under expansion and contraction of the PCC due to temperature changes. Quite often the thickness required for prevention of reflective cracking dominates that required for adequate structural performance. Thus, after the structural overlay requirements are considered, the overlay necessary to reduce reflective cracking should also be considered.

Two techniques contained in the AASHTO guide for reflective crack reduction are discussed in this chapter -- the minimum thickness and the break and seat approaches.

6.1 Normal Structural Overlay Design

The normal structural overlay design technique was first used to determine the thickness of AC overlay required to make the PCC or composite pavement structurally sound for the design load. The structural capacity equation upon which the design is based is

$$SN_{OL} = SN_y - F_{RL} SN_{xeff} \quad 6.1$$

where SN_{OL} = structural number required to be added to the existing PCC or composite pavement using an AC overlay to achieve the required SN

SN_y = total structural number required to support the projected overlay traffic for the existing subgrade condition

F_{RL} = the remaining life factor which considers the damage of the existing pavement and the desired amount of damage to the AC overlay after the design traffic has been applied to the pavement

SN_{xeff} = the effective structural number immediately before the AC overlay is placed. This term accounts for the damage which has been inflicted on the existing pavement prior to the overlay.

The AASHTO Design Guide (3) provides a six-step procedure for determining the variables found in equation 6.1 and the length of pavement (analysis unit) for which a given set of inputs are applicable.

1. Analysis unit delineation - What are the lengths of pavement which have very similar characteristics of cross section, subgrade, traffic, etc.?

2. Traffic analysis - What is the cumulative 18-kip equivalent single axle load (ESAL) that will be applied during the design period?
3. Materials and environmental study - What is the strength of the pavement and subgrade layers for the existing pavement?
4. Effective structural capacity analysis - What is the capacity of the pavement to support traffic loads based upon the materials analysis results?
5. Future overlay structural capacity analysis - What is the structural capacity required of a pavement to carry the desired number of 18-kip ESALs for the design period?
6. Remaining life factor determination - What is the remaining life of the existing pavement, and what will be the remaining life of the overlaid pavement structure after all the design ESALs have been applied to the pavement?

Appendix F is presented as an overlay design aid for these steps and contains a complete discussion of the procedure used for the design of the AC overlay of PCC pavement. Steps 1, 2, 5, and 6 are straightforward and are thus not discussed in this chapter. Steps 3 and 4, however, provide two methods to determining the current strength parameters of the existing pavement and subgrade. Both methods involve using NDT deflection test results to obtain strength information and will theoretically result in identical overlay thicknesses (3).

6.1.1. NDT Method 1

Method 1 involves using backcalculated layer moduli values to determine the effective structural capacity of the existing pavement. Chapter 5 of this document is devoted exclusively to this subject. It concludes that the backcalculated moduli values are suspect for all layers above the subgrade. The calculated subgrade layer moduli tended to be consistent for most of the pavement sections tested during the various backcalculation runs. They were thus considered to be reliable estimates of the actual subgrade moduli.

Because the pavement layer values could not be determined accurately, the Method 1 approach was abandoned in favor of Method 2, which is described in the next section.

6.1.2 NDT Method 2

Method 2 is not normally applicable to rigid pavements. However, because a rigid pavement requiring an AC overlay usually suffers from some structural distress (primarily cracks), it can often be considered "semi-rigid" and can be analyzed using flexible pavement techniques.

In Method 2, the effective structural capacity is analyzed in terms of structural number. This technique

involves using the subgrade modulus and the maximum measured pavement deflection corrected for temperature effects on any AC layer present. Subgrade moduli can be estimated from 1) analytical (computerized) backcalculation procedures or 2) manual solutions using the outer NDT geophone if the distance from the load to the outer geophone exceeds the effective radius of subgrade stress (3). (Effective radius of subgrade stress is the distance from the point of load beyond which any measured deflection is affected by the subgrade only.)

The effects of the "semi-rigid" condition of the PCC pavement became immediately apparent when the effective radius of subgrade stress was calculated for several of the PCC and composite test sections. Because these effective radii were determined to be several hundred inches and because the outer geophone for the FWD was only 84" from the load point, this technique for determining the subgrade modulus was discarded in favor of the backcalculated values determined in Chapter 5.

The temperature-corrected maximum deflection can then be used to determine SN_{xeff} using equations from Appendix PP of the AASHTO Design Guide (3). These equations are of the form:

$$F_b = f(SN_{\text{xeff}}, a_c, E_{\text{RS}}) \quad 6.2$$

$$d_o = f(P, h_t, a_c, SN_{\text{xeff}}, \mu_{\text{RS}}, F_b, E_{\text{RS}}) \quad 6.3$$

where F_b = Boussinesq one layer deflection factor

SN_{xeff} = previously defined

a_c = radius of the NDT loading-plate

E_{RS} = subgrade (roadbed soil) modulus

P = NDT load

h_t = total thickness of all pavement layers above the subgrade

μ_{RS} = Poisson's ratio (assumed to be 0.5 in many cases)

A trial-and-error approach must be used to obtain SN_{xeff} since it appears in both equations 6.2 and 6.3.

The remaining variables found in equation 6.1 (F_{RL} and SN_y) may be calculated using the same procedure in both Methods 1 and 2. The SN_{OL} is then calculated and converted to AC overlay thickness using the appropriate structural layer coefficient. The complete procedure for using Method 2 and an example problem may be found in Appendix F.

6.2 Reflective Crack Reduction Approach

The AASHTO Design Guide (3) mentions several techniques for design of AC overlays of rigid pavements which limit reflective cracking distress. These methods are

- Use of thick AC overlays,
- Crack and seat approach,
- Saw cutting matching transverse joints in overlay,
- Use of crack relief layers,
- Stress-absorbing membrane interlayers with the overlay, and
- Fabric/membrane interlayers with the overlay.

The guide gives detailed guidance for design using the first two of these approaches.

6.2.1 Thick AC Overlay Approach

The thick AC overlay approach gives a minimum thickness of asphaltic concrete which has performed well in the past in locations around the country. It is primarily, therefore, an empirical approach giving AC thicknesses that have been found to resist the vertical pavement movement at PCC joints under load and the horizontal pavement movement at the joints caused by temperature and moisture changes. This method uses maximum annual air temperature differential and slab length as inputs. Details of this approach and an example problem may be found in Appendix F.

6.2.2 Crack and Seat Approach

The crack and seat (break and seat) approach involves breaking the existing PCC slabs into smaller concrete pieces. In concept horizontal movement of the PCC pieces

due to temperature differential are small enough so that the tensile strength of the AC overlay is not exceeded. Also, these PCC pieces are seated into the material below the pavement so that vertical movements under load do not exceed the AC tensile strength. As a result, the reflective cracking potential is reduced, however the structural support provided by the PCC pavement is lost in the cracking process and must be compensated for by increasing the thickness of the AC overlay.

The formula used in the crack and seat approach has the same format as that used for the normal structural design (equation 6.1). This formula may be stated as

$$SN_{OL} = SN_y - 0.7(0.4D_o + SN_{\text{xeff-rp}}) \quad 6.4$$

where D_o = the original slab thickness before cracking (inches)

$SN_{\text{xeff-rp}}$ = the existing structural number of all layers above the subgrade excluding the PCC

Note that the SN_{xeff} term from equation 6.1 has been replaced by $(0.4D_o + SN_{\text{xeff-rp}})$ and that the F_{RL} term has been fixed at 0.7. This occurs because the design approach assumes that a 30" nominal size of PCC pieces (a "common state of damage") is achieved in the cracking operation. This piece size is assigned an SN value equal to .4 times the original slab thickness, a fact which implies that the original PCC contributed an SN of 1 per inch of thickness.

The SN_y is determined using the same approach as that used in the normal structural design. The SN_{OL} may then be calculated as before.

Details of this approach and an example calculation may be found in Appendix F.

CHAPTER 7 - OVERLAY THICKNESS CALCULATIONS

Several test sections from the test program were selected and the required overlay was calculated using the empirical, structural, and reflective cracking techniques. This process was not a check using the exact data from which the empirical method was formulated. The AC overlay thickness calculated was the new amount required to be placed on the existing pavement structure. In essence, the sections were looked at in terms of future performance and not in terms of past performance as was done in the model formulation.

7.1 JRCP Test Sections

Ten pavement test sections with PSI values less than or equal to 2.8 were selected from the JRCP data set. For each of these pavements, the overlay thickness was calculated using the empirical design method from Chapter 4 (equations 4.3 and 4.4), the AASHTO Design Guide structural method, and the AASHTO Design Guide Procedure for two reflective cracking techniques -- the minimum AC thickness and the break and seat approaches.

7.1.1 Empirical Method

Results of the empirical analysis are shown in Table 7.1. Note that columns two through eight of this table contain the design inputs. The PSI and PCI values entered are the terminal value desired, and the overlay age is the desired lifetime of the overlay. Column nine contains PSI data that existed at the time the data was taken, column ten shows the type of equation used, and the last column contains the required overlay thickness.

It is imperative that there be some method in place that would signal the need for an overlay on a given pavement section. The indicator might be a limiting PSI, condition index (PCI or other of choice), or deflection parameter from NDT test data. Once the list of priorities has been fixed, the empirical model can be employed. As mentioned previously, the PSI value was used in this chapter as the flag for selecting the test sections which would be analyzed for required overlay thickness.

The predicted thicknesses using the empirical equation are thin for AC overlays of PCC pavement. However, two items must be considered when analyzing the predicted thicknesses. First, the value calculated is that which gives a reliability of 50%. Tables 4.7 and 4.8 must be used to obtain additional thickness for a higher

Table 7.1 Overlay Thickness Required on Selected
JRC Pavement Sections Using Empirical Models.

Sect. No.	Subgr. CBR	AC (in.)	PCC (in.)	Term. PSI	Term. PCI	Trucks per Day	O'lay Life	PSI Now	Eq'n* Type	O'lay Req'd
C-04	3	3.7	8.2	2.5	35	910	10	2.8	F	1.75"
C-06	10	0.0	7.1	2.5	35	3105	10	1.7	S	3.32"
C-07	8	4.2	6.8	2.5	35	3105	10	2.4	F	3.14"
F-03	5	6.8	7.6	2.5	35	885	10	2.6	F	1.74"
F-08	40	2.8	9.3	2.5	35	1744	10	2.8	F	2.10"
F-10	5	5.6	7.0	2.5	35	3302	10	2.6	F	3.34"
F-12	6	3.2	9.1	2.5	35	3047	10	2.7	F	3.08"
G-03	6	5.4	7.0	2.5	35	1350	10	2.5	F	1.91"
L-08	25	0.0	9.4	2.5	35	1775	10	1.9	F	2.12"
V-02	5	5.1	8.8	2.5	35	796	10	2.6	F	1.72"

* S = structural equation, F = functional equation

reliability.

Secondly, a design to reduce the rate of reflective cracking in the asphalt overlay is not considered in this model. The required AC thickness to reduce reflective cracking will likely be greater than that predicted by this equation.

If the empirical model is used with these items in mind, the results obtained should be useful.

7.1.2 AASHTO Design Guide

As mentioned previously, the AASHTO structural design procedure and two reflective cracking reduction techniques are investigated to determine required AC overlay thickness of PCC. The results of these calculations are shown in Table 7.2.

The AASHTO structural design procedure requires a substantial number of design inputs which are too numerous to show in Table 7.2. These inputs, the values of which may be found in Chapter 3, include 18-kip EALs expected over the overlay design life, subgrade M_R and Poisson's ratio, NDT load applied to the existing pavement and the maximum deflection caused by this load, existing pavement layer thicknesses, reliability and overall standard deviation of performance for the overlaid pavement, change

Table 7.2 Overlay Thickness Required on Selected
JRC Pavement Sections Using AASHTO Design Guide.

Section No.	Structural Thickness (in.)	Reflective Cracking	
		Min. Thick- ness (in.)*	Break & Seat Thickness (in.)
C-04	-1.75	4.5	5.11
C-06	-3.17	8.0	3.02
C-07	-0.01	8.0	4.99
F-03	-0.36	8.0	2.94
F-08	-6.79	8.0	2.44
F-10	-1.22	8.0	4.86
F-12	-14.43	8.0	3.18
G-03	-1.53	8.0	2.70
L-08	-3.66	7.0	1.96
V-02	-8.73	4.5	6.36

* AASHTO recommends using another technique, because reflective cracking cannot be reduced by increasing the overlay thickness over these 40' slabs with the existing maximum annual temperature differential. However, many of the 40' slabs on these sections have cracked at about midslab.

in serviceability over the overlay life, and structural layer coefficients of existing and anticipated pavement layers.

In all ten cases, the required AC overlay for the structural analysis is a negative number. This indicates that all of the pavement sections considered are not structurally deficient. The problem with this analysis and the results obtained is that the analysis assumes full foundation support. However, temperature and moisture as well as erosion can cause a loss of support and the structural capacity is reduced. An alternate consideration is that overlays are related to functional deterioration.

On sections C-07 and F-03, the calculated structural overlay is near zero, indicating that the current pavement cross section is sufficient for the design inputs and should last the expected design life. The remaining pavement sections have negative calculated overlay thicknesses and are structurally overdesigned, theoretically lasting well past the expected design life.

Other techniques, such as the reflective cracking reduction approaches, must also be considered so that a design engineer may make an informed judgment when designing the pavement overlay. The two reflective cracking procedures considered produced the AC overlay

thicknesses shown in Table 7.2. The first approach (minimum AC thickness) assumes that the underlying slabs are properly repaired and are essentially intact before the overlay is placed. The required overlay is often thick, particularly if the PCC slabs are long and if the temperatures are drastically different between the warm and cool seasons for the given pavement location. Seven of the ten pavement sections analyzed result in a minimum AC overlay thickness of eight inches required to reduce the rate of reflective cracking. In fact, because of this large required thickness for each of these seven sections, the AASHTO Guide recommends cracking and seating as an alternative.

The cracking and seating procedure involves breaking the PCC pavement into pieces small enough to eliminate excessive tensile forces which the PCCP can apply to the AC overlay, thus causing reflective cracking to be eliminated (see Chapter 6). The design technique used for cracking and seating is a structural analysis which generally calculates a thickness of AC overlay that is less than the thickness to mitigate reflective cracking as shown in Table 7.2.

Appendix F provides input and calculation details for both the empirical, structural, reflective cracking reduction and crack and seat methods.

7.2 CRCP Test Sections

An analysis was made of four CRC pavement sections with PSI values less than or equal to 3.0. As discussed in Chapter 4, the data set was uniform in terms of existing PCC thickness and existing AC overlay thickness. As a result, the empirical relationship (equation 4.1) developed from this data should be used with caution.

Four sections were chosen to test this model. Design inputs and calculated AC overlay thicknesses are shown in Table 7.3. The narrow range of CBR values for these sections caused the calculated overlay thicknesses to be almost the same for all sections considered. As it was in the JRC pavement model, this overlay value is for a 50% reliability. Table 4.6 should be used to increase the overlay thickness and, thus, the reliability of the predicted overlay.

The sections were also analyzed using the AASHTO Design Guide techniques previously discussed in section 7.1.2 except for the crack and seat option. The resulting AC overlay thicknesses may be found in Table 7.4. Inputs used in these AASHTO methods are the same as those found for JRC pavements.

In three of the four test sections, the normal structural overlay method resulted in a negative required

Table 7.3 Overlay Thickness Required on Selected
CRC Pavement Sections Using Empirical Model.

Section No.	Terminal PSI	Subgrade CBR	PSI Now	Overlay Req'd
C-01	2.5	6	2.8	3.55"
C-02	2.5	5	2.8	3.48"
G-01	2.5	8	2.8	3.69"
S-03	2.5	7	3.0	3.62"

Table 7.4 Overlay Thickness Required on Selected
CRC Pavement Sections Using AASHTO Design Guide.

Section No.	Structural Thickness (in.)	Reflective Cracking	
		Min. Thick- ness (in.)	Break & Seat Thickness (in.)
C-01	-3.95	4.0	-0.08
C-02	2.53	4.0	8.17
G-01	-5.21	4.0	4.78
S-03	-7.77	4.0	5.25

AC overlay thickness, indicating that performance failure superseded the structural needs of the pavement. However, a 2.5 inch overlay was predicted for the fourth section (C-02) to provide additional structural support for the traffic projected over the 10-year design life.

The design procedures for the reflective cracking was more difficult to use for the CRC pavement sections than for the JRC pavement sections. The cracks in the CRCP were more numerous but were usually much less severe and more closely spaced than the joints and cracks in a typical JRC pavement. Thus, the temperature effects on the CRC slab would not be pronounced.

In contrast, loading failure in the form of punchouts has been a major problem with many CRC pavements in Indiana. Quite often when the pavement has been overlaid, the pavement continues to have these punchout failures, and the cracks in the PCC are reflected through the AC overlay.

The minimum asphalt thickness required to retard reflective cracking was calculated for a crack spacing (slab length) of 18" to 36". For these conditions the required minimum thickness on each of the pavement test sections is four inches. This thickness should be sufficient for a CRCP which has been properly repaired and which was initially constructed to support the traffic

loads. However, four-inch overlays placed on properly repaired CRC pavements in Indiana prior to this research project have performed structurally with varying degrees of success, indicating possible failure due to inadequate pavement cross section or lack of uniform subgrade support.

CHAPTER 8 - CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

8.1.1 General Conclusions

1. Techniques for designing flexible overlays for rigid pavements are inadequate at present, except for special cases. Reflective cracking, not structural capacity, is most often the controlling factor.
2. Planning and implementing a NDT testing project of this magnitude can be an experience within itself and can teach valuable lessons in project management.
3. Highway agency data files on pavement construction should be verified if at all possible. Resulting problems with unexpected cross section characteristics might be significant during both NDT testing and the analysis of the results.
4. A significant amount of research is needed to find backcalculation or other techniques which can be used to determine pavement layer strength parameters with some degree of confidence.

8.1.2 Specific Conclusions

1. Too few different CRC pavement sections were found to study properly. Also, the attempts to analyze the data was further complicated by the fact that the data for several of the variables was too uniform, particularly for the overlay thickness dependent variable. The model developed needs more supporting and refining data before it can be used with confidence.
2. In three of the four CRC and CRC composite pavements analyzed by the AASHTO structural design method, the required AC overlay thickness was negative. This indicates that the current cross section of these three test pavements should structurally support the design 18-kip EAL for the 10-year design period.
3. The empirical structural design model (equation 4.3) from Chapter 4 is satisfactory in predicting the required overlay thickness for certain JRC and JRC composite pavements. Similarly, the functional design model (equation 4.4) is reasonable for use in obtaining the required overlay thickness for those pavements not structurally deficient. However, consideration should be given to 1) the inference space over which the model is appropriate, 2) the AC

thickness from Table 4.7 or 4.8 to increase the reliability of the prediction, 3) the sensitivity of the structural equation to the existing AC overlay thickness, and 4) the fact that the thickness will be less than that required to reduce the migration of reflective cracks.

4. The modulus backcalculation techniques using elastic layer theory were not successful in computing the modulus values for the various layers. Even after using methods for estimating and fixing the modulus for the AC pavement on top of the JRCP and recalculating the PCC modulus, only 30% of the PCC modulus values were within a normal range.
5. Most failures of JRC and JRC composite pavements would not be structurally related if the contact between the PCC and the subgrade/subbase could be properly maintained. In all ten cases analyzed by the AASHTO normal structural design method, the test pavements should last an additional ten years under the projected 18-kip EAL loadings. However, pumping tends to cause more rapid PCC slab fatigue under load because of reduced slab support, and faulting causes deterioration of pavement performance (PSI reduction), causing earlier failure than that predicted.

6. Reflective cracking in JRC composite pavements can be a major contributor to pavement failure, particularly to functional failure. The break and seat followed by AC overlay appears to be a most promising procedure to retard reflective cracking.

8.2 Recommendations for Further Study

1. Additional CRC pavements are currently being overlaid with AC thickness greater than those found in this study. In several years, a variety of CRC composite pavements with more widely distributed overlay ages, thicknesses, and total truck traffic will be available for testing. A follow-up to this study that considers only CRC pavement would be desirable.
2. Additional NDT testing, performed at least yearly, on the test sections considered in this study would provide long-term performance data on many sections that are representative of the FAI and FAP pavements throughout the state.
3. Continued work on modulus backcalculation techniques for composite pavements is badly needed.
4. The seasonal variation in subgrade strength for various locations and subgrade types around the state

should be defined through several years of
comprehensive field testing.

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APPENDICES

Appendix A - Data Base, Experiment Design, and Field Tests

The Indiana Department of Highways (IDOH), through the Joint Highway Research Project (JHRP) at Purdue University, initiated a project to develop overlay design procedures for jointed reinforced concrete (JRC), continuously-reinforced concrete (CRC), and flexible pavements. The results of this study are expected to fill the IDOH's need for a standardized, practical overlay design procedure.

To collect the necessary data for developing the overlay design procedure an extensive field testing and evaluation program was planned based on statistical design of experiment concepts. A statistically based design of experiment greatly reduces the number of pavements that need to be tested while maintaining the significance of the results. Part of the testing and evaluation program involved use of several non-destructive testing (NDT) devices. The NDT devices utilized were the Dynaflect, falling-weight deflectometer (FWD), and two model of the Road Rater (RR) devices (RR400 and RR2000).

NDT testing of each pavement section selected to satisfy the design of experiment was conducted twice in 1986: once during the spring thaw when the pavement subgrade is at its weakest and once in the summer/fall.

During both test periods, the 4 NDT devices tested the pavement within approximately forty minutes of each other so that results from the 4 devices could be compared on an equal basis.

Other data gathered for each pavement test section included:

1. Surface roughness
2. Distress type, extent and severity
3. Layer thickness
4. Layer age
5. Subgrade classification and estimated strength
6. Traffic
7. Climatic data

This appendix outlines the steps that were taken to design the experiment, select the test sections, and obtain the NDT results and other data for each test section.

Scope of Experiment

The road and highway system in Indiana consists of 91,500+ miles of public streets and highways (1). Of this mileage, approximately 11,350 miles are maintained by the IDOH and sustain almost 60% of the vehicle miles traveled. Because of the large number of sample test sections that

would be required to analyze the entire state system, it was decided to include only those highways on the Federal-aid Interstate (FAI) and Federal-aid Primary (FAP) systems. Thus, the total pavement population to be analyzed was reduced to approximately 6,200 miles of the most highly traveled highways in Indiana.

In a general review of the highway system inventory, four broad types of pavements can be identified.

1. Flexible pavements
2. Jointed reinforced concrete pavements (JRCP)
3. Continuously reinforced concrete pavements (CRCP)
4. Jointed plain concrete pavements (JPCP).

Since initial construction, most of the pavements have been overlaid one or more times with 1" to 5" of asphalt per overlay.

After studying the inventory, consideration of JPC pavements was discontinued due to the limited number of these types of pavements in the highway system. Ultimately, the overlay research focused on the following pavement types:

1. Overlaid flexible pavements
2. JRC pavements with and without overlays
3. CRC pavements with and without overlays.

Data Requirements

After determining the highway population to be considered in the analysis, attention was turned to the factors which most affect overlay performance. Initially, a list of possible factors was compiled. In compiling this list, particular attention was given to a similar list included in the preliminary experimental design plan for the long-term pavement performance (LTPP) area of the Strategic Highway Research Program (SHRP) (2). The general list of factors considered for both flexible and rigid pavements follows:

1. Layer thicknesses
2. Layer ages
3. Layer types
4. Traffic
5. Climate
6. Pavement roughness
7. Subgrade type
8. Pavement distress
9. Layer strength.

System Inventory and Data Base Construction

To obtain values for the pavement characteristics listed above, the Planning Division of the IDOH was

consulted. The Planning Division maintains a set of paper files called Road Life Records which contains basic construction and major maintenance data for every state-maintained highway in Indiana. For each county in the state, Road Life Records contains a line-drawing of each highway along with data cards describing construction dates, construction materials, and layer thicknesses, plus information on pavement widenings, overlays, etc. Eight man-months of effort were required to convert information about the FAI and FAP systems in the Road Life Records to a computer data base. Information concerning 1747 different pavement sections was recorded. These sections range in length from several one-hundredths of a mile to 20 or 30 miles. Two additional man-months were spent entering the data for the 1747 different pavement sections into a data base resident on an IBM XT personal computer. The data was entered using a data base management software package (6) for ease of data retrieval and manipulation. Approximately 500,000 bytes of memory were required for the data base.

The Planning Division also maintains traffic data (3). In each year of a three-year cycle, annual average daily traffic (AADT) data are recorded for a different one-third of Indiana highways. Seasonal and yearly adjustment factors are applied to this data, but no adjustment is made to account for vehicles of more than two axles.

Number of trucks per day is the crucial traffic parameter for this study. To obtain trucks/day for each section of highway, Sharaf's (4) values for percentage of total traffic which is truck traffic were multiplied by total AADT to obtain trucks/day values for each highway section.

Sharaf reported percent truck data for the thirty-one and seventeen truck count station locations on the federal-aid rural primary and the rural and urban interstate highway systems, respectively. From the truck data collected at these stations, the percent trucks was determined. This percentage is assumed to be constant for the highway system within a given county. Percent trucks for counties which did not contain count station were assumed based on counted values in adjacent counties and on counties with similar population characteristics. Figures A1 and A2 show actual values and assumed values (in parenthesis) for the rural primary and interstate systems.

Work by Colucci-Rios and Yoder (5) was used to divide the state into two major climate zones. Factors such as annual snowfall and rainfall amounts, Thornwaithe Moisture Index, and freezing indexes were considered when establishing this dividing line between the two zones. Figure A3 shows the general climatic boundary location. In general, the boundary begins just northwest of Kentland at

Figure A1 Percent Trucks -- Rural Primary Roads.

Figure A2 Percent Trucks -- Rural and Urban Interstate.

the Illinois/Indiana state line and proceeds as a straight line east-southeasterly to just south of Logansport, then to just north of Marion, and ending northeast of Trinity at the Ohio/Indiana state line.

Most highways in Indiana were constructed before adequate or easily-accessible records were kept concerning subgrade soil type. Lacking this information, subgrade type was not considered during data base development. Pavement distress and layer strength data were also unavailable. These data were gathered later for the pavement test sections selected.

Statistical Experiment Design

The primary advantage of using a statistical experiment design is that it allows one to obtain desired information about a population with relatively few samples from that population. A savings in time and finances and an increase in efficiency of the data collection procedure results when a proper experiment design is conducted.

When an experiment is designed (in this case, when the pavement test sections are selected), the size of the experiment depends upon the number of design factors considered in the experiment, the number of levels used within each factor, and the number of repeats desired. In

this study, the list of factors includes layer thicknesses, traffic, and climate zone.

Levels refer to the number of levels within each factor which will be considered. For example, if AADT is chosen as a design factor, two levels of traffic would be "low" and "high". If three levels are considered, they would be the low, medium, and high levels of AADT. As either number of test factors or number of levels increases, the size of the experiment increases.

If test sections are selected based upon three of their characteristics (factors) and if each factor has two levels, the number of sections selected for a full design is 2^3 or 8. If four factors at three levels are used, 3^4 or 81 sections must be selected. In this type of experimental design, called a complete factorial, all levels of each factor are represented with all levels of each other factor.

If only two levels per factor are chosen, only linear relationships can be calculated during analysis of test data. If three levels per factor are used, curved relationships can be determined. Three levels per factor were selected so that curvature could be detected in a relationship, if present.

Because the state was broken into two climate zones, a total of six different experiments were to be designed: an experiment in each climate zone for JRCP, for CRCP, and for flexible pavements.

Another consideration was that the first field test series was to be performed during the spring thaw period when excess water can be present beneath the pavement, resulting in the pavement's weakest condition. It was estimated that only a total of 65-70 sections could be tested during this month-long period. Thus, while three levels of each factor must be considered, only 10-12 test sites could be selected for each of the six experiments. Thus, only two factors could be used if complete factorial experiments were to be conducted. ($3^2 = 9$, which is acceptable. $3^3 = 27$, which is too high.)

The list of potential factors was scrutinized. Despite the fact that the resulting number of test sections would be too high in a complete factorial design, it was decided that three factors were required for each experiment. For flexible pavements, the following factors were chosen:

1. Traffic
2. Thickness of most recent overlay
3. Total asphalt thickness beneath most recent overlay.

For both JRCP and CRCP, the following three factors were

chosen:

1. Traffic
2. Ratio of overlay thickness to total pavement thickness
3. PC concrete thickness.

Once the factors were selected, the levels of each factor for the experiment could be established. The previously-referenced data base management software was used to compile data for the plots in Figures A4-A12 for flexible, JRC, and CRC pavements. Using the information presented on these plots, the total range of each factor could be determined. Then, within the total range, values for high, medium, and low levels for that factor could be set. For example, in Figure A5, the thickness of most recent overlay of flexible pavements ranged from 0.75" to 4.75". However, almost all of the overlays were from 0.75" to 3.25" thick. This smaller range was used to set the levels of most recent asphalt overlay thickness because an insufficient number of the thicker overlay pavement was available for testing.

In a similar manner, levels were set for the other factors considered in the experiment. The list of factor levels is shown in Table A1. The selection of three factors meant that a complete factorial experiment could not be run, because 162 test sections would be required for

Figure A4 Flexible Pavements -- Truck Traffic Distribution.

Figure A5 Flexible Pavements -- Asphalt Overlay Thickness Distribution.

Figure A6 Flexible Pavements -- Asphalt Base Thickness Distribution.

Figure A7 CRC Pavements -- Truck Traffic Distribution.

Figure A8 CRC Pavements -- Concrete Thickness Distribution.

Figure A9 CRC Pavements -- Ratio of Newest Overlay Thickness to Total Pavement Thickness Distribution.

Figure A10 JRC Pavements -- Truck Traffic Distribution.

Figure A11 JRC Pavements -- Edge Concrete Thickness.

Figure A12 JRC Pavements -- Ratio of Newest Overlay Distribution.

Table A1 Experiment Factor Levels.

<u>Pavement Type</u>	<u>Factor</u>	<u>Low Level</u>	<u>Mid Level</u>	<u>High Level</u>
Flexible	Trucks per day	300	1450	2600
Flexible	Overlay thickness	1 in.	2 in.	3 in.
Flexible	Asphalt beneath overlay	3 in.	8 in.	13 in.
JCRP	Trucks per day	1075	3750	6425
JCRP	Ratio of most recent overlay thickness to total pvt. thickness	0.030	0.175	0.320
JCRP	PCC thickness	7.5 in.	8.5 in.	9.5 in.

6 of the 3^3 designs. Instead, composite designs (7) for each of the six experiments were selected. This type of design is a compromise. Although not as much information is obtained as in a complete factorial design, significantly fewer test sections are required to gain that information. Unlike a complete factorial design, in a composite design not all levels of each factor are represented with all levels of each other factor.

Figure A13 illustrates the differences between a factorial design using three factors at three levels and a composite design for three factors at three levels for test pavement selection. In both Figures A13a and A13b, the x, y, and z axes represent the three factors. The circles each represent a different selected test section. Thus, in Figure A13a, (the complete factorial) test section #1 has factor x at a high level, factor y at a medium level, and factor z at a low level. Figure A13b represents the composite design. As may be noted, many of the mid-level test sections are missing, which means that this design does not provide as much information as the complete design. (In technical terms, it provides fewer error degrees of freedom.) In the composite design, the number of test sections (n) may be determined by

$$n = 2^k + 2k + 1 \quad (1)$$

where k is the number of factors to be considered (3 in

Figure A13 Factorial Design vs. Composite Design.

this case). Equation 1 gives the number of test sections if no factor combination is to be tested twice (repeated). The basis for the design is the 2^k factorial. The 2^3 pavement sections are at the 6 corners of the cube in Figure A13b, and they are called factorial points. However, because only two levels of each factor are included in a 2^k design, only linear effects of these factors may be determined when regression is employed. Thus, to investigate curvature in a regression relationship, more levels of each factor must be obtained. In this case, $2k + 1 = 7$ additional points are included to allow curvature determination -- one combination is at the center level of all three factors, and six combinations are "star", or extreme, points that are located on lines which radiate from the center point through the midpoints of each of the six faces of the cube. The distance from the center point to each of these points is fixed so that the orthogonal nature of the design is maintained.

Therefore, in the proposed design, 15 test sections are required for each of the 6 experiments, for a total of 90 test sections -- a more reasonable number of sections to test in the allotted time and a considerable reduction from the 162 sections required by the 3^3 factorial design.

Thus far in the experiment design, no factor level combination was repeated (replicated). Ninety sections

were considered the maximum for the testing time and financial constraints. However, some replication was still considered to be necessary. Thus, 3 of the 6 star points were eliminated from the design and were replaced by 3 replicates. Two of the eliminated star points were used to replicate two of the factorial points, and one was used to replicate a star point. During data analysis, these replicates will allow estimation of whether a first order (linear) polynomial is a complete fit or whether a second order (quadratic) should be applied. This estimation technique is called a lack-of-fit analysis.

Technical Discussion of Composite Design

What is the premise which allows one to reduce the number of test sections in the experiment by using the composite design? Although the detailed mathematical analysis is not required by the engineer using this technique, it is helpful to have a basic understanding of the underlying concepts before using the procedure.

The basic regression equation for the composite design when $k=3$ (15 factor level combinations) is

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_{12} X_1 X_2 + \beta_{13} X_1 X_3 + \beta_{23} X_2 X_3 + \beta_{11} X_1^2 + \beta_{22} X_2^2 + \beta_{33} X_3^2 + \epsilon \quad (2)$$

where $X_{1,2,3}$ are factor values, the betas (β s) are least square regression coefficients, and y is the dependent

variable (deflection, roughness, or any other measured result). The error term has 5 degrees of freedom because the number of observations in the experiment (15) minus the number of beta terms (10) equals 5. (Note that the three factor interaction, $X_1X_2X_3$, and the two-factor, second-order interactions (e.g., $X_1^2X_2$) are considered zero and are left out of equation 2 as is often the case.) By comparison, a three-leveled factorial design will have 17 degrees of freedom in the error term if all two-factor, second order interactions and three-factor interactions are considered zero. The additional degrees of freedom would allow more confidence in the analysis but would require greater investment of time and finances because now $3^3 = 27$ factor level combinations must be tested instead of merely 15. The 5 degrees of freedom provided by the composite design are considered adequate for this analysis.

Detailed discussion of orthogonal polynomials and their advantages may be obtained from textbooks on statistical experimental design and response surface methodology (7,8).

Test Section Selection

As stated previously, three equally-spaced levels were chosen for each factor. Subsequently, test sections were

to be selected which satisfy the 15 combinations of these factor levels used in the composite design. In reality, even though there were 1,747 pavement sections to choose from, no section satisfies a factor combination exactly, and, in some cases, the closest fit was not as good as the researchers would have desired. Thus, during test section selection, sections were chosen whose factor values fell as close as possible to the desired factor levels.

Using the data base manager software, the computer was queried to supply pavement sections which complied with the requirements for each of the 15 different test sections in each of the six experimental designs. From one to perhaps 20 or 30 candidates were found for each description. These sections were plotted in 15 different colors on six separate maps. Final selection of test sections was based upon two criteria:

1. Sections in the extreme north or extreme south climate zones were favored which would tend to bring out the effects of the climate zone factor.
2. Sections were selected that were relatively close together which would minimize travel time between sites during field testing.

Unfortunately, there is not sufficient variation in CRCP in Indiana to fill out the desired experimental

design. For example, low, medium, and high levels of traffic are desired. However, the CRC pavements were constructed for use as high-volume roads. Consequently test sections are not available in the low-volume categories. A similar situation occurs for the other factors as well. Overall, only 13 different CRCP sections were found in the state and were included in the test program. A general regression analysis will be performed to determine if the various factors have an effect on the pavement test (independent) variables.

Overall, thirty flexible test sections (15 in the north climate zone; 15 in the south climate zone), 30 JRCP sections, and 13 CRCP sections were selected for a total of 73 test sections.

In subsequent visits to the offices of each of the six highway districts in Indiana, the selected test sections were compared to lists of projected major maintenance projects for 1986. If a test section was scheduled to be overlaid in 1986, an alternate pavement section was selected. During these visits, arrangements were made to core the test sections to verify construction and maintenance records in the data base.

In addition, each test section was visited. Inside each test section (which could be as long as several miles)

the beginning and end of a 1250' final test section were marked. Markings consisted of yellow arrows painted on the centerline for 2-lane pavements; for multi-lane pavements, the yellow arrows were painted just off the pavement on the right shoulder. The 1250' sections were chosen to be representative of the entire section, to avoid obstructions such as bridges, culverts, and railroad beds, and to provide sufficient sight distance for safety during testing.

Field NDT Testing

For any one pavement test section, tests were conducted on the same day at the same time with four NDT test devices in the following order: Dynaflect, Road Rater Model 400 (RR400), Road Rater Model 2000 (RR2000), and Dynatest FWD Model AE1030. Testing was usually accomplished within a 40-minute period. If mechanical or electronic troubles were encountered, the test period stretched to as long as 1.5 hours. During the spring test period, pavement surface temperature was measured twice at each section with an infrared temperature sensor (Omega Engineering, Inc., Model OS 600). During the summer/fall test period, readings were taken three times at each section.

Due to mechanical breakdowns, some pavements were not tested on the same day by all test devices. For a summary of the test schedule, see Tables A2 and A3.

Six sites were tested with each device within each 1250' test section. The sites were normally 120' to 180' apart and were located in the outside wheel path of the outside lane. On rigid or composite pavement sections, the distance from the nearest joint or crack was noted.

The spring series of test results were obtained during a five-week period in the early spring (3/17/86 - 4/25/86) when pavement deflections tend to peak due to pavement layer and subgrade thaw. Climatological data (9) from the National Oceanic and Atmospheric Administration (NOAA) indicated that the southern portion of Indiana begins spring thaw approximately two weeks before northern Indiana. Therefore, testing began in the south climate zone after spring thaw was well underway and moved north. Yellow x's were painted on the six test sites within each section so that the same sites would be tested during the summer/fall test period.

The bulk of the summer/fall test period was completed from 8/5/86 to 9/5/86. However, due to equipment breakdowns, some devices had to go back at a later date to test pavements that had already been tested by the other

Table A2 Spring Deflection Testing Equipment Usage.

	<u>Ft. Wayne</u>	<u>LaPorte</u>	<u>Green- field</u>	<u>Crawfords- ville</u>	<u>Seymour</u>	<u>Vincennes</u>
All Equip.	1,2,5 ⁺ ,6,9, 10,12,13,14,15, 16,17,18,19	3,4,5,6,7, 8,9,10,11, 12,15,17	1,3	1,2,3,4	3,9,11	--
Dynalect, RR400,2000	7,8,11	--	--	--	6,7,8, 12,15	1,2,3, 5,6
Dynalect, RR2000,FWD	--	--	--	--	10,13,14	--
Dynalect, RR400,FWD	3	1,2,13, 14,16	2	5,6,7,8	1,2,4 [*] , 5,16	--
FWD, RR400,2000	--	--	--	--	--	4,8
Dynalect, RR400	--	--	--	--	--	7
Dynalect, RR2000	4	--	--	--	--	--
FWD,RR400	--	--	--	--	--	9,10
Dynalect	--	--	--	--	--	4,8,9,10
FWD	4,7,8,11	--	--	--	6,7,8, 12,15	1,2,3 5,6,7

⁺FWD used only in right wheelpath, not midlane

^{*}FWD completed first three sites only

Table A3 Summer/Fall Deflection Testing Equipment Usage.

	<u>Ft. Wayne</u>	<u>LaPorte</u>	<u>Green- field</u>	<u>Crawfords- ville</u>	<u>Seymour</u>	<u>Vincennes</u>
All Equip.	--	--	--	1, 3, 4, 5, 8	1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16	1, 2, 3, 4, 5, 6, 7, 8
Dynalect, RR400, FVD	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17	--	--	--	--
Dynalect, RR400, 2000	--	--	1, 2, 3	--	--	9, 10
Dynalect, RR2000, FVD	--	--	--	--	7, 8	--
Dynalect, RR400	--	--	--	2, 6, 7	17	--
FVD	--	--	1, 2, 3	2, 6, 7	17	9, 10

* Only three sites tested. These were all that could be found after overlay.

devices. Testing with the RR400 and the Dynaflect was conducted in this manner on 10/30/86, and the FWD on 11/17/86, 11/18/86, and 11/24/86.

In addition, the RR2000 was only made available for the first two weeks of the test period in the summer/fall test period. During that time, only test sections in the south climate zone were tested.

Test Devices

The Dynaflect (Figure A14) is also a steady state deflection device with only one dynamic force and one frequency for the dynamic force. Thus, all deflection readings throughout the test sequence reflect a 2000-lb static weight and a 1000-lb peak-to-peak dynamic load applied at 8 Hz. Deflections were recorded at the center of the load and at 1', 2', 3', and 4' from the center.

The RR400 (Figure A15) is a steady state dynamic device which applies an initial static load of 1800-lb and a peak-to-peak dynamic load which can vary from 500-lb to 2800-lb with a frequency that can be varied from 5 Hz to 70 Hz. For this research project, sites 1 to 5 were tested at 25 Hz at each of 3 different dynamic loads: 600-lb, 1200-lb, and 1800-lb. Deflection readings were recorded for each of the three dynamic load levels at each site. At

Figure A14 The Dynaflect.

Figure A15 The Road Rater 400.

site 6, the 600, 1200, and 1800-lb loads were each tested at 15 Hz, at 25 Hz, and at 35 Hz. Velocity sensors measured deflection for each loading at each frequency. The sensors are located at the center of the load and at 1', 2', and 3' from the center.

The RR2000 (Figure A16) is a larger version of the RR400, with a static load of 3800-lb and a wider range of dynamic loads. On sites 1-5 of each test section, peak-to-peak dynamic forces of 600, 1200, 1800, 2400, and 3600-lb were each applied to the pavement at 25 Hz, and deflection readings were taken for each force. On site 6, a frequency sweep was conducted: readings were taken for each of the dynamic loadings at 15 Hz, at 25 Hz, and at 35 Hz. The velocity sensors for the RR2000 are also located directly under the load and 1', 2', and 3' from the load.

The Dynatest FWD Model AE1030 (Figure A17) is an impulse load NDT device. In this research project, the load was dropped from four different heights, imparting impact loads of approximately 3000-lb, 6500-lb, 10000-lb, and 14000-lb. Deflection sensors are located at the point of load and at two offset distances. The sensor at the load is fixed while the other two are moveable. On sites 1-4 of each test section, the 6500 and 14000-lb dynamic loads were each applied twice, with the movable sensors set at 1' and 3' from the load for the first drop and at 2' and

Figure A16 The Road Rater 2000.

Figure A17 The Dynatest FWD Model AE1030.

4' for the second drop. At the fifth site, the 6500 and 14000-lb loads were each applied three times, with the deflection sensors moved to 5' and 7' for the third drop. Finally, at site 6, each of the four dynamic loads was applied twice, first with the sensors at 1' and 3', then with the sensors at 2' and 4'.

Pavement Cores and Soil Borings

Two pavement cores and one set of two shelby tube samples were taken for each of the test sections. The IDOH district offices obtained 6-inch diameter pavement cores at approximately the one-third points of the test sections. The actual pavement layer thicknesses from these two cores were averaged, and the results were assumed to be the thicknesses of the pavement layers throughout each test section. These insitu layer thicknesses replaced the values for thickness found in Road Life Records and were used in the subsequent statistical analysis.

Because the subgrade is a controlling factor for pavement behavior and performance, it was deemed necessary to obtain information on the subgrade soil. The IDOH Materials and Tests Division obtained shelby tube samples at each test section. Although sampling at several locations throughout each test section was desirable, time

and personnel constraints dictated one boring per section. In Fort Wayne, LaPorte, Greenfield, and Vincennes Districts, a new pavement core was drilled (in addition to the two which had previously been taken) and four feet of 3-inch diameter shelby tube was pushed into the subgrade. In the remaining two districts, Seymour and Crawfordsville, the tubes were pushed in existing core holes after the filler material was removed. Boring logs included descriptions and thicknesses of the pavement materials, the granular layers below the asphalt or concrete, and the subgrade soil. The top two feet of the subgrade sample was tested for density, moisture content, gradation, and Atterberg limits. This information was used to classify the soil and to estimate its in-place strength. The estimated subgrade strength was then incorporated into the statistical analysis for overlay design.

Condition Surveys

During summer/fall field testing, condition surveys were performed on each individual pavement test section. These surveys determine the extent and severity of pavement surface distresses such as rutting, polishing, various types of cracking, etc. The PAVER (10) condition survey method was adopted for this research. PAVER deducts values for each distress depending on the extent and severity from an initial score of 100 and calls the result the Pavement Condition Index (PCI). Thus, a pavement with a PCI of 90 is in excellent condition, while one with a PCI of 24 is in very poor condition.

Example survey forms for concrete-surfaced and for asphalt-surfaced pavements are given in Figure A18 and Figure A19. The forms list all the distresses to be recorded.

Each pavement test section is approximately 1250' long. Within each section, six test sites are located 120'-180' apart. A condition survey of 120'-180' requires up to one-half hour, which consumes most of the time required to complete NDT testing. Thus, for each of the 73 test sections, one of the intervals between test sites was randomly selected to be surveyed.

FORM A

CONCRETE PAVEMENT INSPECTION SHEET

BRANCH MARSHALL AVE. SECTION 1
 DATE 10/3/79 SAMPLE UNIT 1
 SURVEYED BY SK SLAB SIZE 15 x 20

10			
9			
8			
7			
6			
5		23L	
		38L	
4		23M	
		38L	
3		22L	
2		22M	
1		28M	
	1	2	3

Distress Types				
21. Blow-Up	31. Polished			
Buckling/Shattering	Aggregate			
22. Corner Break	32. Popouts			
23. Divided Slab	33. Pumping			
24. Durability ('D')	34. Punchout			
Cracking	35. Rutting			
25. Faulting	Crossing			
26. Joint Seal Damage	36. Sealing/Map			
27. Lane/Shoulder Drop Off	Cracking/Crazing			
28. Linear Cracking	37. Shrinkage Cracks			
29. Patching, Large &	38. Spalling, Corner			
Util Cuts	39. Spalling, J			
30. Patching, Small	Joint			

DIST. TYPE	SEV.	NO. ** SLABS	% SLABS	DEDUCT VALUE
25*	M	1	5	4
22	L	1	5	4
22	M	1	5	8
29	L	1	5	3
29	M	2	10	9
38	L	2	10	1
DEDUCT TOTAL $\Sigma = 2$				29
CORRECTED DEDUCT VALUE (CDV)				24
PCI = 100 - CDV =				76
RATING =				VERY GOOD

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 25, Which Is Rated For The Entire Sample Unit.

** Total Number of Slabs Containing Each Distress of Same Severity

Figure A18 Condition Survey Form for Concrete.

FORM B

ASPHALT PAVEMENT INSPECTION SHEET

BRANCH MOTORPOOL RD SECTION 1
 DATE 10/2/79 SAMPLE UNIT 1
 SURVEYED BY SK AREA OF SAMPLE 2500

Distress Types					SKETCH:	
1. Alligator Cracking	*10. Long & Trans Cracking					
2. Bleeding	11. Patching & Util Cut Patching					
3. Block Cracking	12. Polished Aggregate					
*4. Bumps and Sags	*13. Potholes					
5. Corrugation	14. Railroad Crossing					
6. Depression	15. Rutting					
*7. Edge Cracking	16. Shoving					
*8. Jt Reflection Cracking	17. Slippage Cracking					
*9. Lane/Shoulder Drop Off	18. Swell					
	19. Weathering and Raveling					
EXISTING DISTRESS TYPES						
	(12)	(1)	(15)	(6)		
	10L	1x6L	2x25L	6x4L		
	5	2x8M				
	15L					
	5M					
	10L					
	5M					
TOTAL SEVERITY	L	70	6	50	24	
	M	10	16			
	L					
PCI CALCULATION						
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <u>67</u>		
1	0.24	L	4			
1	0.64	M	17			
5	0.96	L	4			
10	1.60	L	4			
10	0.4	M	3			
15	2.0	L	13	$RATING =$ <u>GOOD</u>		
DEDUCT TOTAL		$\Sigma = 2$	45			
CORRECTED DEDUCT VALUE (CDV)			33			

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 is Measured In Number of Potholes.

Figure A19 Condition Survey Form for Asphalt.

Two adjustments were made in the PAVER survey method. First, only one pavement lane was surveyed, not the entire pavement surface. Thus, to be consistent, longitudinal cracking between the lane to be surveyed and the adjoining lane in asphalt pavements was always included among the distresses noted. Secondly, PAVER does not include a specific method for evaluating CRC pavements. Pavements with CRC surfaces were evaluated as JRC pavements with imaginary, perfect, transverse joints at 20' intervals.

Pavement Roughness Data

Pavement roughness data for 1986 was obtained from the IDOH Division of Research & Training (R&T) (11). R&T tests pavements with one Cox Model B, PCA roadmeter and one Cox Model E, PCA roadmeter. The basic pavement roughness test result is the roughness number (RN) which gives a measure of the size and number of bumps experienced by an automobile passenger traveling over a length of road. The RN is translated into a Present Serviceability Index (PSI) value through regression equations developed by R&T (12).

The range of PSI values is from 0 to 5, with 5 being a perfect pavement and 0 an exceedingly poor one. However, when using the R&T regression equations, PSI's of greater than 5 may be calculated. When this occurs, the PSI value

is reported as 5.

For some test sections, 1985 roughness data (PSI values) is used in place of 1986 data. This substitution occurred for one of two reasons:

1. Although all Indiana highways are tested annually, some portions of pavement are missed. If this occurred for one of the test sections, 1985 data was used.
2. If a test section was chip sealed in 1986 after NDT testing but before roughness was measured, the 1986 roughness data is not compatible with the NDT data. In this case, 1985 data is used.

Checking Deflection Readings

A device and procedure was utilized to check the deflection measured by the sensors used with the four NDT devices. Four direct current linear variable differential transformers (LVDT's) were mounted on an 8-foot long wooden beam similar to that used by Baladi (13). This "reference beam" is shown in Figure A20. The LVDT's were carefully calibrated in the laboratory. In operation, the LVDT's were located adjacent to the deflection sensors for the NDT devices, a test load was applied, and the readings from the two sets of sensors were recorded and compared.

Figure A20 The Reference Beam Fitted with LVDT's.

The LVDT's gaging range was ± 0.25 inches; with a sensitivity of 41.1 volts/inch. Leads from the LVDT's ran to a 12-channel light beam oscillograph recorder with a maximum sensitivity of 0.05 volts/inch. The oscillograph recorded the displacements on light-sensitive paper. Once mounted, the accuracy of the LVDT's was confirmed by comparing their output against a micrometer caliper of 0.0005 inch accuracy.

In tests of all four NDT devices on both asphalt and concrete pavements conducted at the IDOH Research & Training Center in W. Lafayette, Indiana, the reference beam was positioned as shown in Figure A21. The beam was supported on a 4-inch diameter section of pipe which was placed 6-7 feet away from the NDT loading point (this distance kept the support of the beam out of the deflection basin of the load). The beam was leveled by raising or lowering a jack which was placed under the end of the beam. After being leveled, the beam was locked in position by placing a weight on the beam above the jack.

Extendable screwjacks were placed between the tip of the LVDT probe and the pavement surface. The probe tip matched an indentation in the top of the screw jack. A zero was obtained for each LVDT by adjusting the height of the screwjacks.

Figure A21 Checking FWD Against Reference Beam.

During project planning, it was hoped that the LVDT's on the beam could be simultaneously positioned next to the sensors on the NDT devices. In practice, the NDT devices geometries did not allow this. Thus, in the field, every individual NDT sensor except at the point of load was tested separately after re-positioning the #1 beam LVDT as close as possible to an NDT sensor and at an equal distance from the load center.

Field tests were performed during one day of the spring test period. On that day, the following tests were completed:

1. The FWD was tested only on flexible pavement.
2. The RR2000 was only tested on flexible pavement.
3. The RR400 was only tested on flexible pavement.
4. The Dynaflect was tested on flexible and concrete pavement.

Deflection test results are shown in Tables A4-A6. They indicate that, within a reasonable error, the FWD sensors were providing accurate deflection readings. The results also show that the LVDT readings did not agree with deflection readings of either Road Rater.

Although some pattern in the Road Rater data may be detected, e.g. the similarity in the "% difference" column

Table A4 Spring FWD Check--Asphalt.

<u>Test #</u>	<u>Sensor Loc.</u>	<u>Load(KPa)</u>	<u>FWD</u>		<u>LVDT</u>		<u>% Diff.</u>
			<u>Defl. (mils)</u>		<u>Defl. (mils)</u>		
1	1 ft.	414	7.5		7.3		-2.7
2	1 ft.	414	7.0		6.8		-2.9
3	1 ft.	414	7.0		6.8		-2.9
4	1 ft.	890	16.2		16.4		1.2
5	1 ft.	890	16.2		16.2		0.0
6	1 ft.	890	16.3		16.5		1.2
7	3 ft.	414	----		VOID		----
8	3 ft.	414	3.07		2.76		-11.0
9	3 ft.	414	3.03		2.84		-6.7
10	3 ft.	414	3.07		2.84		-8.1
11	3 ft.	890	7.20		7.30		1.4
12	3 ft.	890	7.24		7.06		-2.6
13	3 ft.	890	7.24		7.14		-1.4

Table A5 Spring RR2000 Check--Asphalt.

Test #	Sensor	Loc.	Load(1b)	RR2000		LVDT		% Diff.
				Defl. (mils)	Defl. (mils)	Defl. (mils)	Defl. (mils)	
1	1	1 ft.	1200	1.04		0.49		-112.0
2	1	1 ft.	1200	----		VOID		-----
3	1	1 ft.	1200	1.01		0.50		-102.0
4	1	1 ft.	2400	2.17		2.17		0.0
5	1	1 ft.	2400	2.19		2.14		-2.3
6	1	1 ft.	2400	2.20		2.26		2.7
7	1	1 ft.	3600	3.45		3.77		8.5
8	1	1 ft.	3600	3.43		3.65		6.0
9	1	1 ft.	3600	3.42		3.77		9.3
10	2	2 ft.	1200	0.70		1.30		46.2
11	2	2 ft.	1200	0.69		1.38		50.0
12	2	2 ft.	1200	0.71		1.26		43.7
13	2	2 ft.	2400	1.48		2.43		39.1
14	2	2 ft.	2400	1.47		2.43		39.5
15	2	2 ft.	2400	1.48		2.35		37.0
16	2	2 ft.	3600	2.26		3.41		33.7
17	2	2 ft.	3600	2.24		3.41		34.3
18	2	2 ft.	3600	2.23		3.45		35.4
19	3	3 ft.	1200	0.41		0.78		47.4
20	3	3 ft.	1200	0.42		0.78		46.2
21	3	3 ft.	1200	0.42		0.83		49.4
22	3	3 ft.	2400	0.88		1.55		43.2
23	3	3 ft.	2400	0.87		1.55		43.8
24	3	3 ft.	2400	0.88		1.55		43.2
25	3	3 ft.	3600	1.37		2.28		39.9
26	3	3 ft.	3600	1.36		2.28		40.4
27	2	2 ft.	3600	1.37		2.28		39.9

Table A6 Spring RR400 Check--Asphalt.

Test #	Sensor Loc.	Load (lb)	RR400		LVDT		% Diff.
			Defl. (mils)	Defl. (mils)	Defl. (mils)	Defl. (mils)	
1	1 ft.	1200	1.26		1.54		18.2
2	1 ft.	1200	1.26		1.46		13.7
3	1 ft.	1200	1.26		1.46		13.7
4	1 ft.	1800	2.05		2.43		15.6
5	1 ft.	1800	2.04		2.60		21.5
6	1 ft.	1800	----		VOID		-----
7	2 ft.	1200	0.64		1.14		43.8
8	2 ft.	1200	0.63		1.14		44.7
9	2 ft.	1200	0.63		1.14		44.7
10	2 ft.	1800	1.26		1.78		29.2
11	2 ft.	1800	1.20		1.78		32.6
12	2 ft.	1800	1.20		1.82		34.1
13	3 ft.	1200	0.54		0.41		-31.7
14	3 ft.	1200	0.55		0.45		-22.2
15	3 ft.	1200	0.55		0.41		-34.1
16	3 ft.	1800	1.22		1.30		6.2
17	3 ft.	1800	1.25		1.34		6.7
18	3 ft.	1800	1.25		1.38		9.4

for sensors two feet and three feet from load for the RR2000, the general lack of agreement between the LVDT's and the sensors was disturbing.

No data is given for the Dynaflect. During tests, the oscillograph output remained flat, indicating that no deflection was being measured by the beam. Dynaflect loads are small and result in correspondingly small deflections that were on an order of 0.0001 inch. Such small deflections are outside the capability of the LVDT's used on the reference beam.

Due to the problems encountered in the first test session, one day in the summer/fall test period was also set aside for reference beam testing:

1. The RR2000 was tested on both asphalt and concrete pavements.
2. The RR400 was tested on both asphalt and concrete pavements.
3. The FWD was tested on only concrete pavement.

Test results were similar to spring results and are shown in Tables A7-A11. Again, the FWD sensors appear to give reasonable agreement with the LVDT's. A consistent, general trend was not identified for the Road Raters when comparing the same device from spring test date to summer

Table A7 Summer RR2000 Check--Asphalt.

Test#	Sensor	Loc.	Load(lb)	RR2000		LVDT		% Diff.
				Defl. (mils)	Defl. (mils)	Defl. (mils)	Defl. (mils)	
1	1	ft.	1800	2.27		2.00*		-13.5
2	1	ft.	1800	2.21		2.34*		5.6
3	1	ft.	1800	2.27		1.27		78.7
4	1	ft.	1800	----		VOID*		----
5	1	ft.	2400	3.07		2.92*		-5.1
6	1	ft.	2400	3.07		2.87		-7.0
7	2	ft.	2400	1.47		2.86		48.6
8	2	ft.	2400	1.49		2.70		44.8
9	2	ft.	3600	2.25		4.26		47.2
10	2	ft.	3600	2.25		4.30*		47.7
11	3	ft.	1800	0.49		0.29*		-69.0
12	3	ft.	1800	0.50		0.44		-13.6
13	3	ft.	2400	0.69		1.22		43.4
14	3	ft.	2400	0.68		1.46		53.4
15	3	ft.	3600	1.05		2.80		61.4
16	3	ft.	3600	1.05		2.77		62.1

* Possible reference beam system malfunction.

Table A8 Summer RR2000 Check--Concrete.

<u>Test #</u>	<u>Sensor Loc.</u>	<u>Load(lb)</u>	<u>RR2000</u>		<u>LVDT</u>	
			<u>Defl. (mils)</u>	<u>Defl. (mils)</u>	<u>Defl. (mils)</u>	<u>% Diff.</u>
1	1 ft.	1800	1.32		4.62	71.4
2	1 ft.	1800	1.32		4.62	71.4
3	1 ft.	2400	1.77		7.42	76.1
4	1 ft.	2400	1.78		7.30	75.6
5	2 ft.	1800	1.17		3.77	68.9
6	2 ft.	1800	1.15		3.83	70.0
7	2 ft.	2400	1.55		5.32	70.8
8	2 ft.	2400	1.56		5.47	71.4
9	3 ft.	1800	0.91		3.22	71.7
10	3 ft.	1800	0.92		3.28	71.9
11	3 ft.	2400	1.23		4.27	71.1
12	3 ft.	2400	1.22		4.51	72.9

Table A9 Summer RR400 Check--Asphalt.

<u>Test #</u>	<u>Sensor Loc.</u>	<u>Load(lb)</u>	<u>RR400</u>		<u>LVD</u>	
			<u>Defl. (mils)</u>	<u>Defl. (mils)</u>	<u>Defl. (mils)</u>	<u>% Diff.</u>
1	1 ft.	1200	1.69		2.31	26.8
2	1 ft.	1200	1.69		2.62	35.5
3	1 ft.	1800	3.83		4.59	16.6
4	1 ft.	1800	3.83		4.68	18.2
5	2 ft.	1200	----		VOID	----
6	2 ft.	1200	1.02		1.82	44.0
7	2 ft.	1800	----		VOID	----
8	2 ft.	1800	----		VOID	----
9	3 ft.	1200	0.64		1.31	51.1
10	3 ft.	1200	0.64		1.34	52.2
11	3 ft.	1800	1.32		1.82	27.5
12	3 ft.	1800	1.32		1.82	27.5

Table A10 Summer RR400 Check--Concrete.

Test #	Sensor Loc.	Load(lb)	RR400		LVDT	
			Defl. (mils)	Defl. (mils)	Defl. (mils)	% Diff.
1	1 ft.	1200	1.59	2.19	27.4	
2	1 ft.	1200	1.59	2.19	27.4	
3	1 ft.	1800	----	VOID	----	
4	1 ft.	1800	----	VOID	----	
5	2 ft.	1200	0.91	1.46	37.6	
6	2 ft.	1200	0.91	1.46	37.6	
7	2 ft.	1200	0.91	1.34	32.1	
8	2 ft.	1800	1.44	3.02	52.3	
9	2 ft.	1800	1.44	3.35	57.0	
10	3 ft.	1200	0.74	1.58	53.2	
11	3 ft.	1200	0.74	1.58	53.2	
12	3 ft.	1800	1.93	2.23	13.4	
13	3 ft.	1800	1.93	2.23	13.4	

Table All Summer FVD Check--Concrete.

Test #	Sensor Loc.	Load(KPa)	FVD		LVD		% Diff.
			Defl. (mils)	Defl. (mils)	Defl. (mils)	Defl. (mils)	
1	1 ft.	414	3.42		3.25		-5.2
2	1 ft.	414	3.46		3.41		-1.5
3	1 ft.	414	3.50		3.59		2.5
4	1 ft.	890	7.95		8.18		2.8
5	1 ft.	890	7.91		8.18		3.3
6	1 ft.	890	7.91		8.08		2.1
7	3 ft.	414	1.69		1.46		-15.7
8	3 ft.	650	2.83		2.51		-12.7
9	3 ft.	650	2.83		2.55		-10.9
10	3 ft.	650	2.87		2.55		-12.5
11	3 ft.	900	3.90		3.53		-10.6
12	3 ft.	900	3.90		3.50		-11.4
13	3 ft.	900	3.94		3.53		-11.6
14	3 ft.	999	4.37		3.89		-12.3

test date. However, the summer RR2000 concrete pavement deflection test data showed consistency.

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Appendix B - Test Section Descriptions and Locations

This appendix contains written (Tables B1, B2 and B3) and pictorial (Figures B1 through B6) descriptions of all CRC and JRC pavement sections tested during this project.

Table B1 Description of CRC Pavement Test Sections.

<u>Section*</u>	<u>Co.</u>	<u>Route</u>	<u>General Description and Length</u>	<u>Test Section** Description</u>
C-1	83	SR 63	From 4.0 mi. north of US 36 northerly (NORTHBOUND LANES) - 0.41 mi.	From CR 150S (4.5 mi. north of Jct US 36) northerly in NORTHBOUND lanes (NB)
C-2	6	I 65	From 0.5 mi. north of Jct. SR 47 to Boone/Clinton Co. Line - 3.65 mi.	From CR 700N overpass (1.1 mi. north of Jct. SR 47 between MP 147 & 148) northerly in NORTHBOUND lanes (NB)
F-1	52	US 31	From Jct. SR 18 northerly (SOUTHBOUND LANES) - 1.90 mi.	From 0.25 mi. north of /to CR 1150S (CR 1150S is 1.0 mi. north of Jct. SR 18) in SOUTHBOUND lanes (SB)
F-2	52	US 31	From 3.81 mi. north of SR 18 to appr. 0.5 mi. north of Nead - 5.87 mi.	From 2.0 mi. north of SR 218 WEST, proceeding southerly in SOUTHBOUND lanes (SB)
G-1	49	I 465	From 62nd St. to just south of 96th St. (between I 65 and north leg of I 465) - 4.06 mi.	From 79th St. overpass (1.0 mi. north of Jct. 71st St.) northerly in NORTHBOUND lanes (NB)
L-1	50	US 30	From appr. 5.15 mi. west of SR 331 to 0.53 mi. west of SR 331 - 4.62 mi.	From Gumwood Rd. (3.0 mi. west of SR 331 & 5.8 mi. east of US 31) easterly in EASTBOUND lanes (EB)
L-2	50	US 30	From appr. SR 331 to the Marshall/Kosciusko Co. Line - 3.65 mi.	From Beech Rd. (1.1 mi. west of Marshall/Kosciusko Co. Line & 2.6 mi. east of SR 331) easterly in EASTBOUND lanes (EB)
L-3	46	I 94	From Porter/LaPorte Co. Line to 0.40 mi. east of Jct. US 421 - 2.36 mi.	From appr. 1.3 mi. west of Jct. US 421 bridges westerly in WESTBOUND lanes (WB)

Table B1, Continued.

<u>Section</u>	<u>Co.</u>	<u>Route</u>	<u>General Description and Length</u>	<u>Test Section Description</u>
L-4	45	I 65	From 0.6 mi. south of Jct. SR 53 to 0.4 mi. north of US 30 - 6.51 mi.	From just south of MP 252 southerly (begins between 1.0 to 1.5 mi. south of Jct. US 30) in SOUTHBOUND lanes (SB)
S-1	41	I 65	From 0.5 mi. north of Jct. Whiteland Road northerly - 2.01 mi.	From 1.7 mi. north of Jct. Whiteland Road northerly (between MP 96 & 97) in NORTHBOUND lanes (NB)
S-2	41	I 65	From 2.5 mi. north to 3.9 mi. north of Whiteland Road - 1.38 mi.	From CR 750N overpass (2.9 mi. north of Jct. Whiteland Road between MP 97 & 98) northerly in NORTHBOUND lanes (NB)
S-3	41	I 65	From Jct. Greenwood Road northerly 0.44 mi. (NORTHBOUND LANES) - 0.44 mi.	From 0.05 mi. north of Greenwood Road bridge northerly 0.15 mi. to acceleration ramp merge point in NORTHBOUND lanes (NB)
S-4	53	SR 37	From 6.4 mi. north of Lawrence/Monroe Co. Line to Jct. SR 45 - 4.81 mi.	From Rockport Road (2.2 mi. south of Jct. SR 45) southerly in SOUTHBOUND lanes (SB)
S-17	49	SR 37	From Johnson/Marion Co. Line northerly 4.06 mi. in SOUTHBOUND lanes - 4.06 mi.	From Banta Road (2.0 mi. So. of I 465) southerly in SOUTHBOUND lanes (SB)

* C = Crawfordsville District, F = Fort Wayne, G = Greenfield,
L = LaPorte, S = Seymour, V = Vincennes

** All test sections are approximately 0.25 mi. long, except where noted. Limits are yellow arrows painted on the pavement. Tests were run in the right wheel path of the outside lane (if more than 2-lane highway). The lane direction for the test is shown in parenthesis (NB = northbound, etc.).

Table B2 Description of JRC Pavement Test Sections.

<u>Section*</u>	<u>Co.</u>	<u>Route</u>	<u>General Description and Length</u>	<u>Test Section** Description</u>
C-3	61	US 41	From Jct. SR 163 to south C/L of Rockville (4.27 mi., then 0.93 mi. exception, then 5.70 mi.) - 9.97 mi.	From CR 150W (8.9 mi. north of Jct. SR 163) northerly (SB)
C-4	83	SR 63	From 1.9 mi. north of US 36 northerly 2.43 mi. - 2.43 mi.	From CR 300S (3.2 mi. north of Jct. US 36) northerly in NORTHBOUND lanes (NB)
C-5	11	I 70	From Vigo/Clay Co. Line to 0.4 mi. east of Jct. SR 59 - 6.56 mi.	From 1.0 mi. west of Jct. SR 59 westerly in WESTBOUND lanes (WB)
C-6	84	US 41	From 0.5 mi. north of Honey Creek to south C/L of Terre Haute - 1.88 mi.	From 0.5 mi. north of Honey Creek (2.3 mi. south of Jct. I 70) northerly in NORTHBOUND lanes (NB)
C-7	84	US 41	From 200' south of Honey Creek northerly 0.5 mi. (NORTHBOUND LANES) - 0.50 mi.	From 0.2 mi. north of Honey Creek (2.6 mi south of Jct. I 70) northerly in NORTHBOUND lanes (NB)
F-3	17	US 6	From east C/L of Butler to the Indiana/Ohio State Line - 3.04 mi.	From CR 75 (1.3 mi. east of Butler C/L) easterly (EB)
F-4	20	SR 19	From northern Elkhart C/L to Indiana/Michigan State Line - 3.96 mi.	From Indiana/Michigan State line southerly (SB)
F-5	35	US 224	From 0.28 mi. east of SR 5 to appr. 2 mi. west of I 69 - 4.32 mi.	From CR 200E (3.3 mi. west of I 69 and 3.6 mi. east of Jct. SR 5) southeasterly (EB)

Table B2, Continued.

<u>Section</u>	<u>Co.</u>	<u>Route</u>	<u>General Description and Length</u>	<u>Test Section Description</u>
F-6	57	SR 3	From Noble/DeKalb Co. Line northerly 5.86 mi. - 5.86 mi.	From 0.15 mi. south of CR 100S southerly (CK 100S is 3.5 mi. north of SR 205) (NB)
F-7 ⁺	20	US 33	From appr. the south-east Elkhart C/L to the west Goshen C/L - 2.90 mi.	From emergency turnout by Showalter GMC-Buick (0.4 mi. north of Goshen C/L) northerly 2 turnouts in NORTHBOUND lanes - 0.35 mi. (NB)
F-8	20	SR 15	From 6.07 mi. north of Elkhart/Kosciusko Co. Line to Goshen C/L - appr. 3.5 mi.	From CR 29 (6.2 mi. north of Elkhart/Kosciusko County Line northerly to just short of the bridge (NB)
F-9	17	I 69	From 3.9 mi. north of Allen/Dekalb Co. Line to 10.9 mi. south of Dekalb/Steuben Co. Line - 3.29 mi.	From 2.0 mi. north of Jct. CR 11-A (Garrett exit) northerly in NORTHBOUND lanes (NB)
F-10	92	US 30	From Kosciusko/Whitley Co. Line to appr. Jct. SR 5 (EASTBOUND LANES) - 1.38 mi.	From Kosciusko/Whitley Co. Line (3.0 mi. east of Jct. SR 13) easterly in EASTBOUND lanes (EB)
F-11	20	US 20	From appr. 10.6 mi. east of St. Joseph/Elkhart Co. Line to near Jct. SR 15 - 3.72 mi.	From 1.25 mi. west of SR 15 easterly (WB)
F-12	92	US 30	From appr. 4.32 mi. west of/to Columbia City C/L - 4.32 mi.	From Lincoln Way (6.3 mi. east of SR 5) easterly in EASTBOUND lanes (EB)

Table B2, Continued.

<u>Section</u>	<u>Co.</u>	<u>Route</u>	<u>General Description and Length</u>	<u>Test Section Description</u>
G-2	18	I 69	From Delaware/Grant Co. Line to Madison/Delaware Co. Line - 20.55 mi.	From the Delaware/Madison Co. Line (5.1 mi. north of Jct. SR 9 NORTH between MP 31 and 32) northerly in NORTHBOUND lanes (NB)
G-3	30	SR 67 US 36	From Jct. SR 234 to Hancock/Madison Co. Line with the exception of the town of Fortville - 4.95 mi.	From CR 500W (1.2 mi. east of Jct. SR 234 in Woodbury) easterly to East Drive (NB)
L-5	71	US 20	From appr. New Carlisle to Jct. US 31 - 7.90 mi.	From Rose Rd. (2.6 mi. west of concrete section beginning west of US 31) easterly (EB)
L-6	71	SR 23	From appr. 0.5 mi. north of No. Liberty northeasterly - 4.70 mi.	From "New Road" (north of No. Liberty) northerly (SB)
L-7	71	US 20	From 5.07 mi. west of /to St. Joseph/Elkhart Co. Line - 5.07 mi.	From Birch Rd. easterly to just east of Beech Rd. (Beech Rd. is 1.0 mi. west of St. Joseph/Elkhart Co. Line at SR 219) (WB)
L-8	75	US 30	From LaPorte/Starke Co. Line easterly 3.73 mi. - 3.73 mi.	From CR 50E (0.5 mi. east of LaPorte/Starke Co. Line) easterly in EASTBOUND lanes (EB)
L-9	50	US 30	From appr. Starke/Marshall Co. Line easterly - 4.69 mi.	From Union Rd. (1.15 mi. east of Starke/Marshall Co. Line) easterly - 0.3 mi. in EASTBOUND lanes (skip box culvert in middle) (EB)

Table B2, Continued.

<u>Section</u>	<u>Co.</u>	<u>Route</u>	<u>General Description and Length</u>	<u>Test Section Description</u>
S-5	53	SR 45	From Greene/Monroe Co. Line to Jct. SR 37 - 7.28 mi.	From Harmony Road or Garrison Chapel Road (4.4 mi. from Jct. SR 37) southerly to near Elwren Drive (SB)
S-6	72	I 65	From Scott/Clark Co. Line to near Jct. SR 56 - 5.25 mi.	From Leoto Road overpass (7.5 mi. north of Jct. SR 160 between MP 27 & 28) northerly in NORTHBOUND lanes (NB)
S-7	31	SR 135	From Jct. SR 64 southerly 5.53 mi. to 0.4 mi. north of Jct. I 64 - 5.53 mi.	From Old SR 135 (4.0 mi. south of Jct. SR 64) southerly (NB)
V-1	51	US 150	From east of SR 550 easterly to the beginning of the concrete section - 4.88 mi.	From 3.15 mi. west of Martin/Orange Co. Line westerly 0.15 mi. to a pt. appr. 3.2 mi. east of Jct. SR 550 (EB)
V-2	14	SR 57	From north Washington C/L northerly - 0.54 mi.	From "Airport 3 mi." sign (at Washington C/L, 1.3 mi. north of Jct. US 50/150) northerly - 0.3 mi. (skip big culvert during testing) (NB)
V-3	63	SR 64	From 3.23 mi. east of/to the Pike/Dubois Co. Line - 3.23 mi.	From 2.55 mi. east of Jct. SR 257 easterly to a pt. appr. 2.7 mi. west of Jct. SR 161 (WB)
V-4	82	US 41	From appr. 10.96 mi. (at SR 57) south of/to 6.13 mi. south of Vanderburgh/Gibson Co. Line (NORTHBOUND LANES) - 4.83 mi.	From MP 10 (1.1 mi. north of Jct. SR 57) northerly in NORTHBOUND lanes (NB)

Table B2, Continued.

<u>Sec-</u> <u>tion</u>	<u>Co.</u>	<u>Route</u>	<u>General Descrip-</u> <u>tion and Length</u>	<u>Test Section</u> <u>Description</u>
V-5	19	US 231	From 1.6 mi. north of Huntingburg (9.8 mi. from Spencer/Dubois Co. Line) northerly to 3.7 mi. north of Huntingburg - 2.08 mi.	From 1.8 mi. north of Jct. SR 64 (1.5 mi. north of the beginning of the concrete) north- erly (NB)

* C = Crawfordsville District, F = Fort Wayne, G = Greenfield,
L = LaPorte, S = Seymour, V = Vincennes

** All test sections are approximately 0.25 mi. long, except
where noted. Limits are yellow arrows painted on the pavement.
Tests were run in the right wheel path of the outside lane (if
more than 2-lane highway). The lane direction for the test is
shown in parenthesis (NB = northbound, etc.).

+ Section F-7 was tested in the right wheel path of the
inside (passing) lane. The inside lanes have a JRC pavement
underlying the asphalt. The outside lanes were added later and
were constructed entirely of asphalt.

Table B3 County Names and Corresponding Numbers.

<u>County Name</u>	<u>No.</u>	<u>County Name</u>	<u>No.</u>	<u>County Name</u>	<u>No.</u>
Adams	1	Hendricks	32	Pike	63
Allen	2	Henry	33	Porter	64
Bartholomew	3	Howard	34	Posey	65
Benton	4	Huntington	35	Pulaski	66
Blackford	5	Jackson	36	Putnam	67
Boone	6	Jasper	37	Randolph	68
Brown	7	Jay	38	Ripley	69
Carroll	8	Jefferson	39	Rush	70
Cass	9	Jennings	40	St. Joseph	71
Clark	10	Johnson	41	Scott	72
Clay	11	Knox	42	Shelby	73
Clinton	12	Kosciusko	43	Spencer	74
Crawford	13	Lagrange	44	Starke	75
Daviess	14	Lake	45	Steuben	76
Dearborn	15	LaPorte	46	Sullivan	77
Decatur	16	Lawrence	47	Switzerland	78
Dekalb	17	Madison	48	Tippecanoe	79
Delaware	18	Marion	49	Tipton	80
Dubois	19	Marshall	50	Union	81
Elkhart	20	Martin	51	Vanderburgh	82
Fayette	21	Miami	52	Vermillion	83
Floyd	22	Monroe	53	Vigo	84
Fountain	23	Montgomery	54	Wabash	85
Franklin	24	Morgan	55	Warren	86
Fulton	25	Newton	56	Warrick	87
Gibson	26	Noble	57	Washington	88
Grant	27	Ohio	58	Wayne	89
Greene	28	Orange	59	Wells	90
Hamilton	29	Owen	60	White	91
Hancock	30	Parke	61	Whitley	92
Harrison	31	Perry	62

Figure B1 Location of Pavement Test Sections in Crawfordville District.

FORT WAYNE DISTRICT

Figure B2 Location of Pavement Test Sections in Fort Wayne District.

GREENFIELD DISTRICT

Figure B3 Location of Pavement Test Sections in Greenfield District.

Figure B4 Location of Pavement Test Sections in LaPorte District.

Figure B5 Location of Pavement Test Sections in Seymour District.

Figure B6 Location of Pavement Test Sections in Vincennes District.

Appendix C - Testing Data Base

A significant amount of data was collected during the 3-year duration of the overlay design study conducted for InDOT. The data base containing this data which follows includes complete information on section location, traffic, cross section, subgrade soil, climate zone, and deflection testing dates, times, temperatures, and values. A great deal of care was taken in organizing the data to facilitate accessing and manipulating the data. Note that the data is essentially free format for maximum flexibility. The complete set is also available on 5-1/4" floppy diskettes from the Transportation Area, School of Civil Engineering, Purdue University, West Lafayette, IN 47907.

Following is an entry-by-entry explanation of each value found in the data set:

Line No. 1 - Location, Traffic, and Climate Zone Data

Test Section Number (Entry 1). The test sections in each InDOT district (C = Crawfordsville, F = Fort Wayne, G = Greenfield, L = LaPorte, S = Seymour, and V = Vincennes) are numbered consecutively in the following order: CRCP, JRCP, and Asphalt.

County Number (Entry 2). This entry identifies the county

in which the test section is located. The 92 counties are numbered consecutively in alphabetical order. Appendix B contains a list of corresponding county names and numbers.

Route Type (Entry 3). The route types (I = Interstate, US = United States, and SR = State Road) correspond to those used in route signing by the State of Indiana.

Route Number (Entry 4). The route numbers correspond to those used in route signing by the State of Indiana.

Average Annual Daily Traffic (AADT) (Entry 5). The InDOT Division of Program Development maintains traffic information by highway. Each highway in each county is divided into several sections, and the AADT is determined for each section. The InDOT updates the traffic information for each route every three years.

Percent Trucks (Entry 6). This entry shows the percent of the AADT which is composed of trucks. Percent truck data was obtained from a Ph.D thesis by E.A. Sharaf titled "Analysis of Highway Maintenance Costs" (Purdue University, August 1984). Seventeen interstate and thirty-one primary rural highway counting sites were located in various counties throughout the state. At each of these stations, periodic traffic counts were made for both trucks and automobiles during several consecutive years. The percent trucks was calculated at each count station. This value

was considered representative of all similar highway types throughout the county in which the station was located. In counties which had no count station, percent trucks was extrapolated or interpolated from adjacent counties or from counties with similar traffic and demographic characteristics.

Number of Trucks (Entry 7). This value was obtained by multiplying AADT by percent trucks on each test section.

Climate Zone (Entry 8). The state was divided into two climate zones (N = north and S = south). The dividing line begins near Kentland in the west and extends to near the Jay/Adams county line in the east. Factors included when determining this boundary include temperature, precipitation, and ground moisture.

Line No. 2 - General Pavement Section Data

General Section Description (Entry 1). A pavement section is considered to have the same cross section throughout its length. Sections were identified by construction or maintenance contract number found in Road Life Records, Division of Program Development, InDOT. A 1250' test section was selected within the boundaries of this general section. A list of definitions of the abbreviations used in the descriptions follows:

F. = From	m. = miles
CL = county line	n. = north
C/L = city limit	e. = east
NB = northbound	s. = south
EB = eastbound	w. = west
SB = southbound	se. = southeast
WB = westbound	CR = county road

Length of the General Section (Entry 2). The length is given in miles.

Line No. 3 - Pavement Test Section Data

Test Section Description (Entry 1). The location of each pavement test section is described. Deflection, condition, serviceability, traffic, subgrade, and climate data for this project were collected on each section. Definitions of abbreviations are the same as listed in the General Section Description.

Length of Test Section (Entry 2). The length is given in miles and is approximately 0.25 miles for every test section.

Line No. 4 - Pavement Cross Section Data

Cross Section Type (Entry 1). A number from 1 to 7 is shown.

1 = bituminous pavement (see Lindly's thesis(5))

2 = asphalt on JRCP

3 = asphalt on JPCP

4 = asphalt on CRCP

5 = non-overlaid JRCP

6 = non-overlaid JPCP

7 = non-overlaid CRCP

Contract Number (Entry 2). This contract number is the one under which the newest overlay was constructed.

Year Construction Ended (Entry 3). Listed are the last two digits of the year in which the contract for the newest overlay was completed.

Age of Newest Overlay (Entry 4). Testing during this study was conducted in 1986. The overlay age is calculated by subtracting the year construction ended from 1986. If no overlay has been placed on the original pavement, this value is the age of the original pavement.

Latest Overlay Thickness (Entry 5). The thicknesses shown for the newest asphaltic concrete overlay are in inches. If a pavement has not been overlaid, zero is shown.

Ratio of Newest Overlay Thickness to Total Pavement Thickness (Entry 6). For example, if the newest overlay thickness is 2" and the total pavement thickness is 10", this ratio would be 0.2. Total pavement thickness is

determined by summing all asphaltic (AC) and portland cement (PC) concrete thicknesses which have been placed in the test section. Total thickness does not include granular base or subbase. The ratio is zero if original PC concrete pavement exists at the surface -(the PC concrete has not been overlaid).

Thickness of Asphaltic Concrete Base (Entry 7). Asphaltic concrete "base" consists of all AC which is between the newest AC overlay and the original PC concrete for composite pavements. Thickness listed is in inches. A value of zero is shown when no (AC) base is present.

Portland Cement Concrete Thickness (Entry 8). The thickness is shown in inches.

Subbase Thickness (Entry 9). The thickness of subbase is given in inches. Zero is shown if the pavement lies directly on the subgrade.

Subbase Type (Entry 10). For subbase type, the following code was used:

G = granular

BS = bituminous stabilized

N = none present

Line No. 5 - Subgrade Data

Three-inch shelby tubes were pushed into the subgrade through a six-inch core holes in each of the pavement test sections. From this sample, sieve analyses, Atterberg limit, dry unit weight, moisture content, and specific gravity tests were conducted to ascertain the following data shown in this line of the data base:

AASHTO Soil Classification (Entry 1).

AASHTO Soil Group Index (Entry 2).

Unified Soil Classification (Entry 3).

Dry Unit Weight (Entry 4).

In-place Moisture Content (Entry 5).

Estimated CBR (%) (Entry 6). See the "Thickness Design for Concrete Highway and Street Pavements", Portland Cement Association, 1984, p. 7. The two soil classifications were used to estimate the CBR values.

Liquid Limit (Entry 7).

Plastic Limit (Entry 8).

Plasticity Index (Entry 9).

Specific Gravity (Entry 10).

and Skid Measurements

Condition Rating (Entry 1). Pavement condition was quantified using the pavement maintenance management system (PAVER) developed by M.D. Shahin and S.D. Kohn for the U.S. Army Corps of Engineers and discussed in Technical Report M-294, "Pavement Maintenance Management for Roads and Parking Lots", USACE-CERL, October 1981.

Serviceability Measurement (Entry 2). The InDOT Research Center measures roughness of Indiana highway pavements on a three year cycle using the Portland Cement Association (PCA) Roadmeter. The roughness values obtained are converted to Present Serviceability Index (PSI) using a regression equation relating these roughness values to PSI.

Skid Number (Entry 3). The InDOT Research Center yearly quantifies skid characteristics of Indiana highway pavements using a skid trailer.

Line No. 7 - Number of Days of Testing

Deflection measurement were made during two testing periods - spring and summer/fall. Because of equipment malfunctions, not all test sections were tested by all NDT deflection testing devices on the same day. This line has one entry showing the total number of days in the combined spring and summer/fall testing sessions that deflection

testing was performed on a pavement test section. It can be useful to a programmer who must know the number of dates on which deflections were taken. (These dates and the deflection data follow this line in the data base.)

Line No. 8 - Testing Dates, Times,
Temperatures, and Devices Used

Date of Test (Entry 1).

Equipment Used (Entries 2 through 5). Four NDT devices were used during the pavement testing. The use of the Dynaflect, Road Rater 400 (RR400), Road Rater 2000 (RR2000), and Dynatest Falling Weight Deflectometer (FWD) at a test section on a particular day may be ascertained from the second, third, fourth, and fifth entries, respectively, on this data line. A "1" as an entry indicates that a device was used, and a "0" indicates that it was not. For example, the entry "1 0 1 0" as the second through fifth entries would show that the Dynaflect and the RR2000 were used on a test section on the date shown.

Beginning and Ending Times of Testing (Entries 6 and 7).

All times shown are in military time.

Pavement Surface Temperatures (Entries 8 through 10).

Pavement temperatures in degrees-Fahrenheit were measured

at different times throughout the deflection testing. A maximum of three measurements were made. A zero is placed in remaining entries if fewer than three temperature measurements were taken.

Air Temperature (Entry 11). A thermometer was placed in the shade away from the pavement at the test site to obtain the air temperature in degrees-Fahrenheit.

Five-day Average Air Temperature (Entry 12). The average temperature for the five days before the test day was calculated by adding the high and low temperatures for all five days and dividing by ten. This value was used in obtaining the temperature correction factor for the deflection values. Deflections were converted to equivalent deflections at 70 degrees-F. Temperature information was obtained from the climatological data published by the National Oceanic and Atmospheric Administration (NOAA).

Line No. 9 - First NDT Deflection Device

The name of the device for which deflection data is about to be listed is named.

Lines 10, etc. - Deflection Data

Raw, pre-temperature-corrected data obtained from each NDT

deflection testing device which was used on a given day is given. Unique amounts of data were recorded for each NDT device; thus each line has entries of different data types:

Dynalect - site no., location of loading site, load magnitude, frequency magnitude, and deflections at sensors 0, 1, 2, 3, and 4.

Road Raters 400 and 2000 - site no., load no., frequency no., location of loading site, load magnitude, frequency magnitude, and deflections at sensors 0, 1, 2, and 3.

Dynatest FWD - site number, load number, location of loading site, load magnitude, and deflections at sensors 0, 1, 2, 3, 4, 5, and 7.

More detailed descriptions of the data line entries follow.

Site Number. Each test section was tested at six locations, or sites, within the section. On some JRCF test sections, a seventh site was added at a joint. The sites are numbered consecutively in the order that testing was performed.

Load Number. Load imparted to the pavement may be varied by several of the devices. These loads are numbered consecutively from lowest to highest.

Frequency Number. When frequency of loading could be varied, the frequencies were numbered consecutively from low to high.

Location of Loading Site. On jointed concrete pavements, the test sites were generally located in the right wheel

path at mid-slab or at a joint. On bituminous and CRC pavements, the location of these sites was random. The following entries are made based upon location:

0 = not applicable

1 = adjacent to joint

2 = mid-slab

Load Magnitude. The load magnitude for the Dynaflect and Road Raters are listed in kips of force. Kilopascals (kPa) are the units for the FWD loading. The circular plate through which the FWD load is imparted has a diameter of 300mm.

Frequency Magnitude The frequency of the loading is shown in Hz.

Deflection at Sensor No. 0. This deflection sensor is located at the center of loading for each device. The remaining sensors are numbered according to their distance in feet from sensor no. 0 (or the load center). They radiate from the load center at one-foot intervals, except for sensor no. 7 which is two feet from sensor no. 5 for the FWD; there is no sensor no. 6. The deflection values shown for all sensors for the Dynaflect and Road Raters are in milli-inches, or mils. The FWD deflection values are in microns.

Deflection at Sensor No. 1.

Deflection at Sensor No. 2.

Deflection at Sensor No. 3.

Deflection at Sensor No. 4.

Deflection at Sensor No. 5.

Deflection at Sensor No. 7.

Once deflection information is completed for a given day, lines 8 and after are repeated for the next test date on that test section. When all deflection data has been listed for a test section, the process is repeated from line 1 for the next section.

CRC Pavement

"C1" 83 "SR" 63 5930 12.0 712 "S"
 "F. 4.0m. n. of US36 northerly"
 "F. CRISOS (4.5m. n. of US36) northerly (NB)"
 4 10093 77 9 3.7 0.30 0.0 8.5 4.0 "G"
 "A-6" 7 "CL" 130.2 11.3 6 34.5 16.9 17.6 2.75
 65 2.8 0

0.1
0.25

"03-31-86" 1 1 1 1 1030 1100 76 65 0 68 55
 "Dynalect"

1	0	1.0	8	0.46	0.41	0.35	0.32	0.25
2	0	1.0	8	0.58	0.53	0.47	0.44	0.35
3	0	1.0	8	0.74	0.68	0.64	0.61	0.53
4	0	1.0	8	0.81	0.75	0.70	0.67	0.59
5	0	1.0	8	0.68	0.62	0.56	0.53	0.46
6	0	1.0	8	0.53	0.48	0.42	0.38	0.31

"Road Rater 400"

1	1	2	0	0.64	25.7	0.21	0.06	0.14	0.38
1	2	2	0	1.25	25.5	0.46	0.39	0.33	1.78
1	3	2	0	1.89	25.5	0.88	1.05	0.67	1.58
2	1	2	0	0.60	25.0	0.21	0.15	0.14	0.10
2	2	2	0	1.22	25.0	0.47	0.33	0.34	0.24
2	3	2	0	1.83	25.0	0.86	0.64	0.73	0.49
3	1	2	0	0.59	24.9	0.21	0.17	0.15	0.11
3	2	2	0	1.23	25.0	0.76	0.41	0.35	0.26
3	3	2	0	1.83	25.0	0.94	0.72	0.67	0.50
4	1	2	0	0.60	25.0	0.22	0.10	1.54	0.14
4	2	2	0	1.21	25.0	2.49	0.14	0.35	0.27
4	3	2	0	1.81	25.0	0.90	0.55	0.65	0.55
5	1	2	0	0.60	24.9	0.20	0.09	0.82	0.06
5	2	2	0	1.22	25.0	2.45	0.34	1.56	0.24
5	3	2	0	1.83	25.0	0.83	0.70	0.59	0.45
6	1	1	0	0.57	14.8	0.23	0.20	0.17	0.13
6	2	1	0	1.20	14.9	0.52	0.51	0.40	0.34
6	1	2	0	0.61	25.0	0.18	0.17	0.13	0.08
6	2	2	0	1.24	25.1	0.41	0.45	0.30	0.21
6	3	2	0	1.86	25.1	0.77	0.98	0.56	0.51
6	1	3	0	0.56	35.1	0.15	0.12	0.08	0.05
6	2	3	0	1.20	35.1	0.36	0.33	0.24	0.17
6	3	3	0	1.77	35.1	0.89	0.77	0.62	0.50

"Road Rater 2000"

1	1	2	0	0.57	25.1	0.25	0.19	0.17	0.16
1	2	2	0	1.25	25.2	0.55	0.41	0.35	0.28
1	3	2	0	1.82	25.1	0.80	0.58	0.49	0.40
1	4	2	0	2.39	25.1	1.06	0.78	0.65	0.54
1	5	2	0	3.61	25.1	1.73	1.19	0.99	0.82
2	1	2	0	0.60	25.1	0.25	0.19	0.15	0.14
2	2	2	0	1.21	25.1	0.49	0.38	0.27	0.24
2	3	2	0	1.79	25.1	0.73	0.57	0.41	0.37
2	4	2	0	2.44	25.1	1.02	0.77	0.57	0.50
2	5	2	0	3.62	25.1	1.54	1.17	0.89	0.76
2	1	2	0	0.60	25.1	0.29	0.18	0.16	0.13
2	2	2	0	1.22	25.1	0.59	0.38	0.32	0.25
2	3	2	0	1.79	25.1	0.89	0.56	0.47	0.37
2	4	2	0	2.41	25.1	1.23	0.76	0.65	0.51
2	5	2	0	3.59	25.1	1.91	1.15	0.99	0.77
4	1	2	0	0.57	25.1	0.24	0.20	0.16	0.14
4	2	2	0	1.19	25.1	0.50	0.41	0.35	0.27
4	3	2	0	1.83	25.1	0.75	0.63	0.53	0.41
4	4	2	0	2.41	25.1	1.01	0.83	0.70	0.55
4	5	2	0	3.57	25.1	1.50	1.25	1.08	0.84
5	1	2	0	0.59	25.1	0.36	0.18	0.14	0.13
5	2	2	0	1.19	25.1	0.74	0.38	0.29	0.24
5	3	2	0	1.79	25.1	1.13	0.57	0.45	0.36
5	4	2	0	2.41	25.1	1.59	0.77	0.62	0.49
5	5	2	0	3.59	25.1	2.51	1.17	0.95	0.75
6	1	1	0	0.62	15.1	0.31	0.25	0.23	0.18
6	2	1	0	1.24	15.1	0.59	0.49	0.41	0.34
6	3	1	0	1.80	15.1	0.87	0.71	0.61	0.50
6	4	1	0	2.41	15.1	1.19	0.94	0.81	0.70
6	1	2	0	0.59	25.0	0.22	0.16	0.15	0.14

6	2	2	0	1.23	25.0	0.45	0.34	0.29	0.21
6	2	2	0	1.82	25.1	0.66	0.51	0.41	0.32
6	4	2	0	2.41	25.0	1.20	0.68	0.55	0.42
6	5	2	0	3.61	25.1	1.45	1.03	0.84	0.64
6	1	3	0	0.63	35.1	0.21	0.16	0.14	0.13
6	2	3	0	1.22	35.1	0.42	0.31	0.26	0.19
6	3	3	0	1.81	35.1	0.64	0.46	0.37	0.28
6	4	3	0	2.40	35.1	0.87	0.62	0.51	0.39
6	5	3	0	3.63	35.1	1.35	0.95	0.78	0.58

"Dynatest FWD"

1	2	0	440	84	68	59	49	35	0	0
1	4	0	910	173	147	123	102	79	0	0
2	2	0	439	86	77	66	54	44	0	0
2	4	0	914	184	163	135	113	97	0	0
3	2	0	433	80	72	61	49	41	0	0
3	4	0	906	167	144	123	103	84	0	0
4	2	0	418	86	77	63	51	41	0	0
4	4	0	899	177	158	132	108	87	0	0
5	2	0	417	88	71	61	46	40	0	0
5	4	0	905	183	152	128	102	84	0	0
6	1	0	205	39	29	26	16	16	0	0
6	2	0	413	73	64	53	41	34	0	0
6	3	0	642	119	102	82	65	51	0	0
6	4	0	904	166	139	113	91	70	0	0

"08-13-86" 1 1 1 1 1040 1110 94 96 0 78 63

"Dynalect"

1	0	1.0	8	0.47	0.37	0.31	0.24	0.17
2	0	1.0	8	0.63	0.51	0.41	0.34	0.26
3	0	1.0	8	0.66	0.60	0.52	0.46	0.38
4	0	1.0	8	0.74	0.66	0.56	0.49	0.41
5	0	1.0	8	0.65	0.58	0.48	0.42	0.34
6	0	1.0	8	0.51	0.45	0.36	0.29	0.23

"Road Rater 400"

1	1	2	0	0.58	25.1	0.27	0.16	0.11	0.15
1	2	2	0	1.23	25.1	0.64	0.24	0.70	0.36
1	3	2	0	1.83	25.1	0.97	0.89	0.75	0.60
2	1	2	0	0.60	25.1	0.28	0.23	0.13	0.12
2	2	2	0	1.22	25.1	0.65	0.58	0.47	0.34
2	3	2	0	1.85	25.2	1.02	0.90	0.74	0.55
3	1	2	0	0.59	25.1	0.25	0.29	0.19	0.13
3	2	2	0	1.23	25.1	0.62	0.67	0.44	0.32
3	3	2	0	1.83	25.1	0.95	0.97	0.72	0.55
4	1	2	0	0.59	25.1	0.31	0.27	0.22	0.16
4	2	2	0	1.23	25.1	0.74	0.65	0.51	0.37
4	3	2	0	1.85	25.1	1.13	1.00	0.82	0.61
5	1	2	0	0.58	25.1	0.25	0.21	0.17	0.12
5	2	2	0	1.20	25.1	0.63	0.60	0.44	0.31
5	3	2	0	1.85	25.2	0.99	0.89	0.70	0.53
6	1	1	0	0.59	14.9	0.29	0.26	0.22	0.16
6	2	1	0	1.23	14.9	0.61	0.57	0.46	0.37
6	1	2	0	0.60	25.0	0.24	0.19	0.14	0.09
6	2	2	0	1.23	25.1	0.58	0.57	0.38	0.29
6	3	2	0	1.82	25.1	0.88	0.76	0.57	0.40
6	1	3	0	0.60	35.3	0.23	0.18	0.12	0.08
6	2	3	0	1.23	35.3	0.62	0.53	0.38	0.26
6	3	3	0	1.78	35.3	1.18	0.99	0.72	0.51

"Road Rater 2000"

1	1	2	0	0.58	25.1	0.27	0.16	0.11	0.15
1	2	2	0	1.23	25.1	0.64	0.24	0.70	0.36
1	3	2	0	1.83	25.1	0.97	0.89	0.75	0.60
2	1	2	0	0.60	25.1	0.28	0.23	0.18	0.12
2	2	2	0	1.22	25.1	0.65	0.58	0.47	0.34
2	3	2	0	1.85	25.2	1.02	0.90	0.74	0.55
3	1	2	0	0.59	25.1	0.25	0.29	0.19	0.13
3	2	2	0	1.23	25.1	0.62	0.67	0.44	0.32
3	3	2	0	1.83	25.1	0.95	0.87	0.72	0.55
4	1	2	0	0.59	25.1	0.31	0.27	0.22	0.16
4	2	2	0	1.23	25.1	0.74	0.65	0.51	0.37
4	3	2	0	1.85	25.1	1.13	1.00	0.82	0.61
5	1	2	0	0.58	25.1	0.25	0.21	0.17	0.12

5	2	2	0	1.20	25.1	0.63	0.60	0.44	0.31
5	3	2	0	1.85	25.2	0.99	0.89	0.70	0.53
6	1	1	0	0.59	14.9	0.29	0.26	0.22	0.16
6	2	1	0	1.23	14.9	0.61	0.57	0.46	0.37
6	1	2	0	0.60	25.0	0.24	0.19	0.14	0.09
6	2	2	0	1.23	25.1	0.58	0.57	0.38	0.29
6	3	2	0	1.82	25.1	0.93	0.76	0.57	0.40
6	1	3	0	0.60	35.3	0.23	0.18	0.12	0.08
6	2	3	0	1.23	35.3	0.62	0.53	0.38	0.26
6	3	3	0	1.78	35.3	1.18	0.99	0.72	0.51

"Dynatest FWD"

1	2	0	402	106	79	63	47	37	31	14
1	4	0	850	231	171	136	103	79	63	36
2	2	0	400	106	89	72	54	40	0	0
2	4	0	847	233	189	151	119	99	0	0
3	2	0	385	96	86	65	50	37	35	26
3	4	0	845	215	173	138	109	84	70	46
4	2	0	396	118	95	71	54	38	0	0
4	4	0	843	259	202	154	116	89	0	0
5	2	0	396	124	91	69	53	40	34	13
5	4	0	841	266	193	146	112	85	69	40
6	1	0	0	0	0	0	0	0	0	0
6	2	0	398	106	84	58	44	35	0	0
6	3	0	615	164	126	91	68	52	0	0
6	4	0	846	227	172	124	93	70	0	0

"C2" 6 "I" 65 24020 30.0 7206 "6"
 "F. 0.5m. n. of SR47 to Boone/Clinton CL" 3.65
 "F. CR700N (1.1m. n. of SR47, betw. MP 47&48) northerly (N81)" 0.25
 7 8208 71 15 0.0 0.00 0.0 9.3 7.5 "6"
 "A-7-6" 14 "CL" 104.4 22.0 6 40.7 15.7 25.0 2.72
 70 2.8 0

3

"03-31-86" 1 1 1 1 1500 1530 96 0 0 82 53

"Dynalect"

1	0	1.0	8	0.36	0.32	0.36	0.21	0.15
2	0	1.0	8	0.52	0.47	0.55	0.32	0.23
3	0	1.0	8	0.41	0.37	0.25	0.26	0.20
4	0	1.0	8	0.44	0.40	0.27	0.27	0.20
5	0	1.0	8	0.48	0.43	0.29	0.29	0.22
6	0	1.0	8	0.44	0.39	0.27	0.26	0.20

"Road Rater 400"

1	1	2	0	0.59	25.0	0.27	0.62	0.52	0.18
1	2	2	0	1.25	25.1	0.51	0.46	0.41	0.31
1	3	2	0	1.85	25.1	0.92	0.88	0.74	2.75
2	1	2	0	0.59	25.1	0.35	0.27	0.51	0.22
2	2	2	0	1.22	25.1	0.71	0.89	0.97	0.48
2	3	2	0	1.85	25.1	1.34	1.23	1.16	2.35
3	1	2	0	0.61	25.1	0.28	0.20	0.19	0.57
3	2	2	0	1.23	25.1	0.55	0.57	0.43	0.34
3	3	2	0	1.86	25.1	1.00	0.93	0.72	0.71
4	1	2	0	0.60	25.0	0.34	0.29	0.27	0.19
4	2	2	0	1.22	25.1	0.71	0.65	0.60	0.57
4	3	2	0	1.83	25.1	1.33	1.35	1.82	2.96
5	1	2	0	0.61	25.1	0.37	0.31	1.14	0.21
5	2	2	0	1.24	25.1	0.73	0.69	0.62	0.49
5	3	2	0	1.85	25.1	1.33	3.97	1.17	4.77
6	1	1	0	0.60	15.0	0.26	0.30	0.92	0.16
6	2	1	0	1.19	15.0	0.60	0.80	1.07	0.40
6	1	2	0	0.61	25.1	0.29	0.63	0.71	0.16
6	2	2	0	1.24	25.1	0.53	0.61	0.53	0.31
6	3	2	0	1.85	25.2	0.90	0.77	0.73	0.61
6	1	3	0	0.57	34.9	0.23	0.39	0.18	0.16
6	2	3	0	1.17	34.9	0.42	0.39	0.35	0.40
6	3	3	0	1.90	34.9	0.79	1.23	0.60	0.75

"Road Rater 2000"

1	1	2	0	0.58	25.1	0.28	0.20	0.17	0.15
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1	2	2	0	1.17	25.1	0.58	0.42	0.35	0.28
1	3	2	0	1.80	25.1	0.90	0.64	0.55	0.44
1	4	2	0	2.41	25.1	1.22	0.87	0.72	0.60
1	5	2	0	3.62	25.0	1.94	1.36	1.15	0.95
2	1	2	0	0.60	25.1	0.38	0.31	0.28	0.23
2	2	2	0	1.18	25.1	0.78	0.64	0.56	0.47
2	3	2	0	1.81	25.1	1.20	1.01	0.90	0.75
2	4	2	0	2.41	25.1	1.65	1.38	1.24	1.03
2	5	2	0	3.56	25.1	2.62	2.13	1.93	1.61
3	1	2	0	0.60	25.1	0.31	0.24	0.22	0.17
3	2	2	0	1.19	25.1	0.61	0.48	0.42	0.34
3	3	2	0	1.83	25.1	0.96	0.74	0.66	0.53
3	4	2	0	2.43	25.1	1.30	1.02	0.89	0.72
3	5	2	0	3.60	25.1	2.02	1.56	1.37	1.13
4	1	2	0	0.59	25.1	0.39	0.31	0.27	0.22
4	2	2	0	1.23	25.1	0.83	0.64	0.56	0.48
4	3	2	0	1.81	25.1	1.27	0.97	0.85	0.73
4	4	2	0	2.42	25.1	1.68	1.30	1.13	0.99
4	5	2	0	3.57	25.1	2.63	1.97	1.74	1.49
5	1	2	0	0.63	25.1	0.35	0.30	0.26	0.23
5	2	2	0	1.22	25.1	0.73	0.61	0.53	0.45
5	3	2	0	1.84	25.0	1.10	0.92	0.83	0.70
5	4	2	0	2.41	25.1	1.47	1.23	1.11	0.95
5	5	2	0	3.60	25.1	2.23	1.84	1.65	1.38
6	1	1	0	0.64	14.8	0.38	0.25	0.22	0.18
6	2	1	0	1.22	14.9	0.69	0.49	0.44	0.36
6	3	1	0	1.80	14.9	1.00	0.77	0.68	0.56
6	4	1	0	2.38	15.0	1.37	1.06	0.93	0.75
6	5	1	0	3.57	14.9	1.83	1.65	1.43	1.16
6	1	2	0	0.61	25.1	0.25	0.21	0.19	0.16
6	2	2	0	1.18	25.2	0.49	0.42	0.37	0.30
6	3	2	0	1.85	25.2	0.78	0.66	0.58	0.46
6	4	2	0	2.41	25.1	1.00	0.98	0.77	0.62
6	5	2	0	3.61	25.2	1.56	1.35	1.19	0.95
6	1	3	0	0.62	35.1	0.21	0.19	0.16	0.14
6	2	3	0	1.23	35.1	0.41	0.36	0.29	0.23
6	3	3	0	1.77	35.1	0.61	0.53	0.43	0.33
6	4	3	0	2.41	35.1	0.82	0.71	0.60	0.46
6	5	3	0	3.60	35.1	1.28	1.12	0.95	0.46
"Dynatest FWD"									
1	2	0	423	67	62	60	42	40	0
1	4	0	884	150	137	116	95	74	0
2	2	0	419	97	90	79	64	51	0
2	4	0	886	211	195	170	141	113	0
3	2	0	411	72	68	61	50	41	0
3	4	0	901	163	154	138	116	96	0
4	2	0	411	80	77	64	55	39	0
4	4	0	906	177	163	144	117	94	0
5	2	0	413	83	78	67	54	43	0
5	4	0	902	179	166	147	119	97	0
6	1	0	195	33	34	23	22	14	0
6	2	0	409	71	68	57	45	36	0
6	3	0	638	113	105	90	72	56	0
6	4	0	889	160	147	123	101	80	0
"10-30-86"									
1	1	0	0	0845	0900	37	37	38	47
"Dynaflect"									
1	0	1.0	8	0.34	0.31	0.27	0.22	0.16	
2	0	1.0	8	0.73	0.64	0.52	0.42	0.31	
3	0	1.0	8	0.29	0.26	0.22	0.17	0.13	
4	0	1.0	8	0.44	0.41	0.36	0.29	0.23	
5	0	1.0	8	0.42	0.38	0.33	0.27	0.21	
6	0	1.0	8	0.44	0.40	0.34	0.27	0.21	
"Road Rater 400"									
1	1	2	0	0.59	25.0	0.27	0.62	0.52	0.12
1	2	2	0	1.25	25.1	0.51	0.46	0.41	0.31
1	3	2	0	1.85	25.1	0.92	0.88	0.74	2.75
2	1	2	0	0.59	25.1	0.35	0.27	0.51	0.22
2	2	2	0	1.22	25.1	0.71	0.89	0.97	0.48
2	3	2	0	1.85	25.1	1.34	1.23	1.16	2.35
3	1	2	0	0.61	25.1	0.28	0.20	0.19	0.57

3	2	2	0	1.23	25.1	0.55	0.57	0.43	0.24
3	3	2	0	1.86	25.1	1.00	0.93	0.72	0.71
4	1	2	0	0.60	25.0	0.34	0.29	0.27	0.19
4	2	2	0	1.22	25.1	0.71	0.65	0.60	0.57
4	3	2	0	1.83	25.1	1.33	1.35	1.82	2.36
5	1	2	0	0.61	25.1	0.37	0.31	1.14	0.21
5	2	2	0	1.24	25.1	0.73	0.69	0.62	0.49
5	3	2	0	1.85	25.1	1.33	3.97	1.17	4.77
6	1	1	0	0.60	15.0	0.26	0.30	0.92	0.16
6	2	1	0	1.19	15.0	0.60	0.80	1.07	0.40
6	1	2	0	0.61	25.1	0.29	0.63	0.71	0.16
6	2	2	0	1.24	25.1	0.53	0.61	0.53	0.31
6	3	2	0	1.85	25.2	0.90	0.77	0.73	0.61
6	1	3	0	0.57	34.9	0.23	0.39	0.18	0.16
6	2	3	0	1.17	34.8	0.42	0.39	0.35	0.40
6	3	3	0	1.80	34.9	0.79	1.23	0.60	0.75
"11-24-86" 0 0 0 1 0900 0930 25 25 25 29 38									
"Dynatest FWD"									
1	2	0	463	137	129	115	98	81	69
1	4	0	956	250	236	214	182	150	124
2	2	0	432	220	199	175	143	118	0
2	4	0	939	447	409	358	298	247	0
3	2	0	428	79	73	63	52	41	33
3	4	0	958	174	162	142	119	95	76
4	2	0	425	155	141	129	111	95	0
4	4	0	943	307	282	255	222	191	0
5	2	0	421	105	101	90	74	60	48
5	4	0	950	218	207	187	155	126	101
6	1	0	0	0	0	0	0	0	0
6	2	0	418	134	118	103	79	66	0
6	3	0	682	206	183	156	126	101	0
6	4	0	942	262	234	199	161	129	0

"F1"	52	"US"	31	16100	22.0	3542	"S"		
"F. SR18 northerly"				1.90					
"F. 0.25m. n. of/to CR1150S (1.0m. n. of SR18) (SB)"								0.25	
4	14724	85	1	5.1	0.38	0.0	8.4	6.0	"6"
"A-6"	16	"CL"		113.7	17.8	7	34.0	17.3	16.7 2.67
100	3.6	0							
2									
"04-02-86"	1	1	1	1	0900	0930	48	0	0 37 62
"Dynaflect"									
1	0	1.0	8	0.30	0.26	0.23	0.21	0.16	
2	0	1.0	8	0.34	0.31	0.22	0.24	0.12	
3	0	1.0	8	0.39	0.35	0.31	0.27	0.21	
4	0	1.0	8	0.33	0.29	0.25	0.22	0.17	
5	0	1.0	8	0.41	0.36	0.31	0.27	0.21	
6	0	1.0	8	0.42	0.35	0.29	0.24	0.18	
"Road Rater 400"									
1	1	2	0	0.60	25.2	0.22	0.74	0.17	0.13
1	2	2	0	1.26	25.3	0.49	0.41	0.38	0.31
1	3	2	0	1.86	25.3	0.83	0.86	0.68	0.67
2	1	2	0	0.60	25.3	0.29	0.54	0.30	0.21
2	2	2	0	1.25	25.2	0.67	0.63	0.59	0.49
2	3	2	0	1.89	25.2	1.16	0.78	2.90	0.77
3	1	2	0	0.58	25.1	0.28	0.26	0.23	0.31
3	2	2	0	1.24	25.2	0.63	0.68	0.54	0.88
3	3	2	0	1.85	25.2	1.06	3.47	3.46	2.79
4	1	2	0	0.62	25.1	0.26	0.28	1.51	0.34
4	2	2	0	1.28	25.2	0.56	0.62	0.83	0.48
4	3	2	0	1.86	25.2	0.90	0.96	2.07	0.68
5	1	2	0	0.58	25.1	0.20	0.24	1.45	0.20
5	2	2	0	1.26	25.2	0.49	0.48	1.20	0.43
5	3	2	0	1.86	25.2	0.86	0.71	2.22	0.63
6	1	1	0	0.59	15.1	0.32	0.28	0.37	0.22
6	2	1	0	1.23	15.2	0.67	0.62	0.79	0.48
6	1	2	0	0.59	25.3	0.24	0.30	1.16	0.27

6	2	2	0	1.25	25.3	0.53	0.61	0.74	0.93
6	3	2	0	1.83	25.4	0.94	0.73	3.29	1.71
6	1	3	0	0.59	35.2	0.17	0.11	0.29	0.07
6	1	3	0	0.59	35.2	0.19	0.11	0.28	0.07
6	2	3	0	1.22	35.2	0.40	0.33	0.70	0.22
6	3	3	0	1.86	35.2	0.78	1.89	11.96	1.56
"Road Rater 2000"									
1	1	2	0	0.59	25.0	0.21	0.19	0.19	0.16
1	2	2	0	1.22	25.0	0.43	0.39	0.36	0.31
1	3	2	0	1.79	25.0	0.66	0.58	0.54	0.47
1	4	2	0	2.39	25.0	0.85	0.78	0.72	0.63
1	5	2	0	3.60	25.0	1.34	1.20	1.12	0.98
2	1	2	0	0.62	25.0	0.32	0.28	0.27	0.23
2	2	2	0	1.22	25.0	0.63	0.58	0.55	0.48
2	3	2	0	1.82	25.0	0.93	0.86	0.81	0.71
2	4	2	0	2.42	25.0	1.26	1.15	1.08	0.96
2	5	2	0	3.57	24.7	1.93	1.74	1.67	1.46
3	1	2	0	0.59	24.9	0.32	0.28	0.26	0.23
3	2	2	0	1.20	24.9	0.66	0.59	0.54	0.46
3	3	2	0	1.82	24.9	1.01	0.90	0.83	0.71
3	4	2	0	2.41	24.9	1.36	1.21	1.12	0.96
3	5	2	0	3.60	24.9	2.04	1.81	1.66	1.43
4	1	2	0	0.61	24.9	0.29	0.26	0.23	0.19
4	2	2	0	1.22	24.9	0.58	0.50	0.46	0.37
4	3	2	0	1.79	24.9	0.86	0.74	0.67	0.57
4	4	2	0	2.41	24.9	1.17	1.01	0.93	0.77
4	5	2	0	3.63	24.9	1.81	1.55	1.40	1.19
5	1	2	0	0.61	24.9	0.23	0.21	0.20	0.16
5	2	2	0	1.21	25.1	0.48	0.42	0.39	0.33
5	3	2	0	1.81	25.1	0.70	0.63	0.58	0.50
5	4	2	0	2.43	25.1	0.96	0.85	0.78	0.67
5	5	2	0	3.62	25.1	1.48	1.29	1.18	1.02
6	1	1	0	0.59	14.9	0.28	0.26	0.23	0.20
6	2	1	0	1.22	14.9	0.61	0.55	0.48	0.40
6	3	1	0	1.77	14.9	0.93	0.82	0.75	0.62
6	4	1	0	2.42	14.9	1.28	1.15	1.05	0.83
6	5	1	0	3.60	14.9	1.90	1.73	1.55	1.22
6	1	2	0	0.60	25.1	0.25	0.22	0.20	0.16
6	2	2	0	1.19	25.1	0.51	0.45	0.41	0.34
6	3	2	0	1.81	25.1	0.78	0.68	0.60	0.50
6	4	2	0	2.37	25.1	1.04	0.91	0.83	0.68
6	5	2	0	3.63	25.0	1.60	1.41	1.27	1.07
6	1	3	0	0.62	35.1	0.19	0.17	0.15	0.13
6	2	3	0	1.22	35.0	0.36	0.30	0.26	0.21
6	3	3	0	1.80	35.1	0.55	0.44	0.39	0.30
6	4	3	0	2.41	35.1	0.73	0.60	0.52	0.41
6	5	3	0	3.61	35.1	-1.08	0.91	0.78	0.62
"Dynatest FWD"									
1	2	0	421	61	53	44	37	31	0
1	4	0	883	127	107	94	79	68	0
2	2	0	421	64	62	54	47	39	0
2	4	0	880	146	127	113	93	84	0
3	2	0	421	82	69	62	52	43	0
3	4	0	880	175	147	131	111	93	0
4	2	0	420	64	60	52	43	36	0
4	4	0	985	146	127	112	94	79	0
5	2	0	419	79	66	59	47	41	34
5	4	0	884	173	138	120	100	83	70
6	1	0	215	42	37	29	24	19	0
6	2	0	412	89	72	58	46	38	0
6	3	0	642	137	111	90	73	59	0
6	4	0	882	187	152	123	99	81	0
"08-25-86"									
1	1	0	1	0830	0855	63	76	79	70
"Dynaflect"									
1	0	1.0	8	0.25	0.22	0.20	0.17	0.13	
2	0	1.0	8	0.29	0.26	0.24	0.19	0.15	
3	0	1.0	8	0.35	0.31	0.28	0.23	0.19	
4	0	1.0	8	0.29	0.25	0.23	0.19	0.15	
5	0	1.0	8	0.35	0.30	0.28	0.23	0.19	
6	0	1.0	8	0.35	0.29	0.26	0.19	0.15	

"Road Rater 400"

1	1	2	0	0.61	25.1	0.24	0.19	2.96	0.15
1	2	2	0	1.20	25.1	0.48	0.44	2.46	0.35
1	3	2	0	1.81	25.1	0.81	0.78	2.17	2.46
2	1	2	0	0.60	25.1	0.29	0.26	0.22	0.20
2	2	2	0	1.21	25.1	0.56	0.60	0.32	0.46
2	3	2	0	1.80	25.2	1.07	1.07	0.58	0.83
3	1	2	0	0.59	25.0	0.32	0.29	0.27	0.24
3	2	2	0	1.21	25.0	0.73	0.68	0.65	0.55
3	3	2	0	1.79	25.0	1.20	1.14	1.07	0.95
4	1	2	0	0.59	25.0	0.24	0.50	0.21	0.15
4	2	2	0	1.20	25.0	0.55	0.85	0.49	0.40
4	3	2	0	1.80	25.0	0.93	0.90	0.94	0.74
5	1	2	0	0.59	25.0	0.26	0.21	0.19	0.14
5	2	2	0	1.20	25.0	0.58	0.52	0.47	0.41
5	3	2	0	1.81	25.0	0.94	0.86	0.78	0.67
6	1	1	0	0.60	15.0	0.26	0.21	0.13	0.32
6	2	1	0	1.21	15.1	0.61	0.51	0.43	0.43
6	1	2	0	0.59	25.1	0.25	0.20	0.17	0.08
6	2	2	0	1.19	25.0	0.57	0.47	0.42	0.22
6	3	2	0	1.82	25.1	1.01	0.95	0.45	0.51
6	1	3	0	0.60	35.0	0.18	0.16	0.04	0.07
6	2	3	0	1.20	35.0	0.41	0.36	0.18	0.21
6	3	3	0	1.80	35.0	0.82	0.80	0.68	0.41

"Dynatest FWD"

1	2	0	420	70	51	44	37	31	26	16
1	4	0	938	149	113	99	83	70	58	39
2	2	0	418	78	66	55	45	37	0	0
2	4	0	927	168	140	123	102	84	0	0
3	2	0	413	93	70	61	52	42	35	22
3	4	0	925	197	156	137	115	95	79	48
4	2	0	412	77	58	51	42	35	0	0
4	4	0	923	167	132	116	96	79	0	0
5	2	0	408	93	64	55	46	38	31	20
5	4	0	923	189	141	121	100	82	67	43
6	1	0	0	0	0	0	0	0	0	0
6	2	0	407	94	66	54	43	35	0	0
6	3	0	634	143	103	83	67	55	0	0
6	4	0	920	202	147	119	97	78	0	0

"F2" 52 "US" 31 15390 22.0 3385 "N"
 "F. 3.8m. n. of SR18 to 0.5m. n. of Head" 5.87
 "F. 2.0m. n. of SR218W southerly (SB)" 0.25
 4 14724 85 1 5.2 0.37 - 0.0 8.8 6.0 "G"
 "A-7-6" 17 "CL" 120.1 16.5 5 46.8 15.8 31.0 2.74
 92 3.9 0

2
 "04-02-86" 1 1 1 1 1015 1045 62 0 0 45 62

"Dynalect"

1	0	1.0	8	0.35	0.32	0.28	0.24	0.17
2	0	1.0	8	0.48	0.42	0.33	0.28	0.21
3	0	1.0	8	0.33	0.30	0.26	0.23	0.18
4	0	1.0	8	0.48	0.44	0.39	0.35	0.23
5	0	1.0	8	0.38	0.36	0.30	0.27	0.20
6	0	1.0	8	0.33	0.30	0.26	0.22	0.16

"Road Rater 400"

1	1	2	0	0.58	25.0	0.22	0.20	0.14	0.72
1	2	2	0	1.25	25.1	0.51	1.19	0.41	1.93
1	3	2	0	1.86	25.1	0.83	1.88	0.37	2.42
2	1	2	0	0.60	25.1	0.27	0.25	0.17	0.16
2	2	2	0	1.25	25.1	0.63	0.55	1.50	0.59
2	3	2	0	1.84	25.1	1.03	1.06	1.81	1.00
3	1	2	0	0.61	25.1	0.23	0.25	0.18	0.13
3	2	2	0	1.24	25.1	0.50	0.57	0.42	0.16
3	3	2	0	1.87	25.1	0.83	0.69	2.10	0.65
4	1	2	0	0.63	25.1	0.20	0.16	0.81	0.24
4	2	2	0	1.24	25.1	0.42	1.14	0.66	0.22

1	0	1.0	8	0.29	0.27	0.25	0.20	0.15
2	0	1.0	8	0.40	0.34	0.29	0.22	0.17
3	0	1.0	8	0.28	0.26	0.24	0.19	0.15
4	0	1.0	8	0.37	0.35	0.32	0.27	0.23
5	0	1.0	8	0.32	0.29	0.26	0.21	0.17
6	0	1.0	8	0.27	0.25	0.23	0.18	0.14
"Road Rater 400"								
1	1	2	0	0.61	25.2	0.24	0.21	0.19
1	2	2	0	1.22	25.1	0.53	0.52	0.48
1	3	2	0	1.81	25.1	0.84	0.81	0.75
2	1	2	0	0.60	25.1	0.28	0.21	0.17
2	2	2	0	1.22	25.1	0.62	0.48	0.33
2	3	2	0	1.79	25.1	0.96	0.72	0.73
3	1	2	0	0.59	25.1	0.23	0.21	0.19
3	2	2	0	1.21	25.1	0.52	0.48	0.43
3	3	2	0	1.78	25.1	0.82	0.76	0.69
4	1	2	0	0.60	25.1	0.17	0.12	0.12
4	2	2	0	1.20	25.1	0.36	0.20	0.28
4	3	2	0	1.80	25.1	0.58	1.30	0.45
5	1	2	0	0.59	25.1	0.21	0.19	0.11
5	2	2	0	1.22	25.1	0.49	0.44	0.25
5	3	2	0	1.80	25.2	0.78	0.80	0.34
6	1	1	0	0.60	15.1	0.16	0.31	0.14
6	2	1	0	1.19	15.2	0.38	0.51	0.32
6	1	2	0	0.61	25.1	0.25	0.96	0.18
6	2	2	0	1.21	25.1	0.53	1.17	0.46
6	3	2	0	1.79	25.1	0.84	0.60	0.73
6	1	3	0	0.61	35.2	0.19	0.17	0.15
6	2	3	0	1.20	34.9	0.49	0.45	0.41
6	3	3	0	1.80	35.0	0.84	1.98	1.60

"Dynatest FWD"

1	2	0	405	72	59	50	43	34	26	84
1	4	0	914	160	130	114	95	75	60	73
2	2	0	401	100	79	59	68	65	0	0
2	4	0	912	222	179	132	134	105	0	0
3	2	0	396	68	55	48	40	32	27	19
3	4	0	903	153	127	110	93	74	58	35
4	2	0	394	76	59	52	43	35	0	0
4	4	0	907	167	133	116	96	79	0	0
5	2	0	395	74	59	51	42	32	27	17
5	4	0	905	163	132	115	95	76	59	37
6	1	0	0	0	0	0	0	0	0	0
6	2	0	395	71	56	49	38	31	0	0
6	3	0	617	110	88	77	62	49	0	0
6	4	0	903	158	128	112	90	72	0	0

"G1" 49 "I" 465 33410 13.0 4343 "S"

"F. 62nd St. to s. of 96th St. - west leg" 4.06

"F. 79th St. (1.0m. n. of 71st St.) northerly -west leg (NE)" 0.25

7 7596 69 17 0.0 0.00 0.0 8.5 6.0 "G"

"A-4" 4 "CL" 125.3 13.0 8 21.3 13.1 8.2 2.65

73 2.8 0

3

"04-01-86" 1 1 1 1 0945 1015 69 73 0 66 55

"Dynalect"

1	0	1.0	8	0.52	0.47	0.42	0.33	0.25
2	0	1.0	8	0.45	0.41	0.36	0.28	0.21
3	0	1.0	8	0.53	0.48	0.40	0.30	0.21
4	0	1.0	8	0.49	0.45	0.38	0.28	0.19
5	0	1.0	8	0.50	0.45	0.38	0.30	0.22
6	0	1.0	8	0.50	0.46	0.40	0.31	0.24

"Road Rater 400"

1	1	2	0	0.60	25.1	0.45	0.41	0.37
1	2	2	0	1.22	25.1	0.91	0.83	0.78
1	3	2	0	1.84	25.1	1.51	1.44	1.32
2	1	2	0	0.59	25.1	0.33	1.05	0.30
2	2	2	0	1.26	25.2	0.72	0.61	0.50

3	3	2	0	1.86	25.2	1.16	1.09	0.99	2.02
3	1	2	0	0.60	25.1	0.38	0.54	0.29	0.19
3	3	2	0	1.26	25.1	0.64	1.61	0.64	1.27
3	3	2	0	1.88	25.2	1.40	1.55	1.08	2.99
4	1	2	0	0.61	25.1	0.34	0.23	0.60	1.03
4	2	2	0	1.25	25.1	0.68	0.19	1.68	0.53
4	3	2	0	1.84	25.1	1.09	0.41	1.94	0.92
5	1	2	0	0.61	25.1	0.33	0.32	1.02	0.18
5	2	2	0	1.23	25.1	0.61	0.81	2.23	0.35
5	3	2	0	1.85	25.2	1.01	0.95	0.74	0.63
6	1	1	0	0.62	15.0	0.28	0.33	0.44	0.18
6	2	1	0	1.22	15.0	0.64	0.77	1.04	0.45
6	1	2	0	0.62	25.1	0.35	1.43	0.29	0.19
6	2	2	0	1.24	25.1	0.62	1.64	1.65	0.38
6	3	2	0	1.85	25.1	1.01	2.88	0.84	0.69
6	1	3	0	0.58	35.0	0.23	0.20	0.16	0.24
6	2	3	0	1.19	35.0	0.55	0.41	0.43	0.33
6	3	3	0	1.79	35.0	1.03	1.10	1.09	0.88
"Road Rater 2000"									
1	1	2	0	0.58	25.1	0.46	0.39	0.34	0.31
1	2	2	0	1.23	25.1	1.01	0.86	0.76	0.66
1	3	2	0	1.77	25.1	1.48	1.26	1.07	0.97
1	4	2	0	2.41	25.1	2.05	1.67	1.51	1.30
1	5	2	0	3.60	25.1	2.78	2.50	2.27	1.98
2	1	2	0	0.60	25.1	0.34	0.31	0.27	0.30
2	2	2	0	1.22	25.1	0.70	0.61	0.55	0.38
2	3	2	0	1.84	25.1	1.05	0.94	0.82	0.66
2	4	2	0	2.40	25.1	1.40	1.26	1.12	0.96
2	5	2	0	3.59	25.0	2.18	1.94	1.74	1.50
3	1	2	0	0.59	25.1	0.38	0.29	0.25	0.20
3	2	2	0	1.18	25.1	0.81	0.63	0.56	0.43
3	3	2	0	1.78	25.0	1.23	0.96	0.82	0.66
3	4	2	0	2.39	25.1	1.69	1.31	1.12	0.91
3	5	2	0	3.60	25.1	2.65	2.09	1.78	1.44
4	1	2	0	0.61	25.1	0.41	0.30	0.25	0.19
4	2	2	0	1.23	25.1	0.83	0.60	0.51	0.40
4	3	2	0	1.78	25.0	1.25	0.91	0.77	0.60
4	4	2	0	2.39	25.0	1.71	1.26	1.05	0.84
4	5	2	0	3.57	25.0	2.66	1.95	1.65	1.30
5	1	2	0	0.59	25.1	0.29	0.28	0.21	0.18
5	2	2	0	1.19	25.1	0.61	0.58	0.42	0.34
5	3	2	0	1.78	25.1	0.91	0.86	0.64	0.52
5	4	2	0	2.41	25.0	1.23	1.19	0.89	0.70
5	5	2	0	3.58	25.1	1.91	1.60	1.36	1.08
6	1	1	0	0.60	15.0	0.35	0.28	0.26	0.19
6	2	1	0	1.22	15.0	0.75	0.60	0.54	0.36
6	3	1	0	1.82	15.0	1.19	0.91	0.83	0.67
6	4	1	0	2.39	15.0	1.63	1.32	1.11	0.88
6	5	1	0	3.58	15.0	2.63	1.98	1.73	1.45
6	1	2	0	0.60	25.2	0.33	0.25	0.21	0.17
6	2	2	0	1.21	25.1	0.69	0.54	0.45	0.36
6	3	2	0	1.79	25.1	1.05	0.83	0.70	0.55
6	4	2	0	2.41	25.1	1.45	1.10	0.95	0.75
6	5	2	0	3.59	25.1	2.33	1.71	1.47	1.16
6	1	3	0	0.63	35.2	0.33	0.25	0.21	0.17
6	2	3	0	1.19	35.1	0.67	0.50	0.42	0.32
6	3	3	0	1.81	35.1	1.07	0.75	0.64	0.50
6	4	3	0	2.43	35.2	1.58	1.04	0.91	0.70
6	5	3	0	3.59	35.1	1.88	1.64	1.40	1.05
"Dynatest FWD"									
1	2	0	423	105	100	96	75	64	0
1	4	0	915	227	214	193	165	134	0
2	2	0	422	86	82	71	59	46	0
2	4	0	432	190	179	159	130	104	0
3	2	0	418	94	88	75	56	44	0
3	4	0	919	205	189	161	124	96	0
4	2	0	418	92	87	75	59	44	0
4	4	0	923	208	195	169	130	102	0
5	2	0	415	85	80	67	54	41	0
5	4	0	904	191	175	147	119	93	0

6	1	0	200	40	39	36	27	22	0	0
6	2	0	414	90	86	75	60	48	0	0
6	3	0	550	144	135	116	97	74	0	0
6	4	0	925	202	182	163	129	107	0	0
"08-14-86"										
1	1	1	0	1000	1030	85	87	0	77	69

"Dynalect"

1	0	1.0	8	0.45	0.42	0.37	0.31	0.23
2	0	1.0	8	0.35	0.32	0.27	0.22	0.16
3	0	1.0	8	0.36	0.33	0.27	0.21	0.15
4	0	1.0	8	0.40	0.34	0.28	0.22	0.16
5	0	1.0	8	0.37	0.34	0.29	0.24	0.18
6	0	1.0	8	0.40	0.37	0.32	0.26	0.19

"Road Rater 400"

1	1	2	0	0.60	25.1	0.49	0.44	0.41	0.36
1	2	2	0	1.24	25.1	1.03	1.02	0.95	0.83
1	3	2	0	1.85	25.1	1.64	1.71	1.51	1.33
2	1	2	0	0.61	25.1	0.30	0.28	0.27	0.21
2	2	2	0	1.19	25.1	0.69	0.63	0.30	0.51
2	3	2	0	1.85	25.1	1.13	1.11	0.39	0.86
3	1	2	0	0.61	25.1	0.27	0.26	0.23	0.18
3	2	2	0	1.23	25.1	0.67	0.66	0.60	0.47
3	3	2	0	1.85	25.1	1.00	1.01	0.91	0.74
4	1	2	0	0.61	25.1	0.31	0.28	0.24	0.18
4	2	2	0	1.22	25.1	0.74	0.68	0.59	0.46
4	3	2	0	1.85	25.1	1.15	1.07	0.91	0.74
5	1	2	0	0.60	25.1	0.24	0.22	0.19	0.14
5	2	2	0	1.23	25.1	0.61	0.56	0.49	0.39
5	3	2	0	1.83	25.1	0.92	0.86	0.75	0.61
6	1	1	0	0.58	14.9	0.25	0.23	0.21	0.16
6	2	1	0	1.23	15.0	0.58	0.58	0.50	0.41
6	3	1	0	0.61	25.1	0.25	0.23	0.20	0.15
6	4	2	0	1.25	25.2	0.59	0.57	0.49	0.40
6	5	2	0	1.84	25.1	0.89	0.86	0.76	0.62
6	6	1	0	0.60	35.1	0.24	0.23	0.24	0.14
6	7	2	0	1.04	35.1	0.48	0.55	0.40	0.29
6	8	3	0	1.78	35.1	0.98	2.20	2.95	0.64

"Road Rater 2000"

1	1	2	0	0.60	25.1	0.51	0.42	0.37	0.30
1	2	2	0	1.19	25.1	1.00	0.83	0.75	0.64
1	3	2	0	1.78	25.1	1.53	1.25	1.13	0.96
1	4	2	0	2.42	25.1	2.16	1.75	1.58	1.33
1	5	2	0	3.58	25.2	3.34	2.71	2.46	2.07
2	1	2	0	0.57	25.1	0.58	0.26	0.22	0.13
2	2	2	0	1.23	25.0	1.22	0.57	0.48	0.39
2	3	2	0	1.80	25.1	1.86	0.83	0.73	0.58
2	4	2	0	2.40	25.0	2.52	1.12	0.99	0.80
2	5	2	0	3.58	25.1	4.26	1.78	1.53	1.25
3	1	2	0	0.59	25.1	0.42	0.23	0.20	0.17
3	2	2	0	1.18	25.1	0.84	0.46	0.41	0.34
3	3	2	0	1.80	25.1	1.32	0.71	0.63	0.51
3	4	2	0	2.40	25.1	1.83	0.98	0.86	0.70
3	5	2	0	3.64	25.1	2.90	1.55	1.35	1.11
4	1	2	0	0.60	25.2	0.31	0.24	0.21	0.16
4	2	2	0	1.24	25.2	0.67	0.51	0.45	0.35
4	3	2	0	1.80	25.2	1.02	0.79	0.69	0.54
4	4	2	0	2.42	25.3	1.39	1.07	0.92	0.73
4	5	2	0	3.59	25.0	2.10	1.67	1.46	1.13
5	1	2	0	0.60	25.2	0.46	0.28	0.20	0.16
5	2	2	0	1.24	25.2	0.94	0.45	0.33	0.31
5	3	2	0	1.76	25.1	1.37	0.67	0.57	0.46
5	4	2	0	2.42	25.0	1.90	0.91	0.77	0.62
5	5	2	0	3.61	25.1	3.00	1.40	1.22	0.96
6	1	1	0	0.60	15.2	0.39	0.35	0.28	0.23
6	2	1	0	1.18	15.2	0.73	0.53	0.47	0.38
6	3	1	0	1.78	15.2	1.11	0.82	0.71	0.56
6	4	1	0	2.38	15.2	1.57	1.12	0.96	0.75
6	5	1	0	3.62	15.1	2.34	1.60	1.42	1.06
6	6	2	0	0.63	25.0	0.35	0.32	0.23	0.18
6	7	2	0	1.21	25.1	0.63	0.45	0.38	0.30
6	8	2	0	1.81	25.1	0.99	0.70	0.59	0.48

6	4	2	0	2.41	25.1	1.33	0.93	0.79	0.61
6	5	2	0	3.63	25.1	2.08	1.45	1.22	0.94
6	1	3	0	0.59	35.2	0.33	0.20	0.16	0.12
6	2	3	0	1.21	35.2	0.64	0.39	0.32	0.24
6	3	3	0	1.81	35.2	0.98	0.61	0.50	0.36
6	4	3	0	2.40	35.0	1.33	0.82	0.65	0.49
6	5	3	0	3.62	35.0	2.17	1.29	1.04	0.77
"11-17-86"	0	0	0	1	1300	1322	37	38	39 43 29
"Dynatest FWD"									
1	2	0	400	90	86	78	63	49	40 19
1	4	0	805	176	168	154	127	93	74 41
2	2	0	405	73	70	66	50	39	0 0
2	4	0	812	142	138	129	100	78	0 0
3	2	0	405	76	75	61	43	30	23 17
3	4	0	812	153	151	113	88	65	47 26
4	2	0	401	88	83	70	49	37	0 0
4	4	0	812	177	168	137	102	75	0 0
5	2	0	401	76	70	62	49	36	29 16
5	4	0	812	152	141	121	97	74	57 33
6	1	0	0	0	0	0	0	0	0 0
6	2	0	400	80	73	64	49	39	0 0
6	3	0	612	120	111	99	79	60	0 0
6	4	0	809	156	144	129	104	79	0 0

"L1" 50 "US" 30 11660 27.5 3207 "N"
 "F. 5.15m. w. of SR331 to 0.53m. w. of SR331" 4.62
 "F. Gumwood Rd. (3m. w. of SR331 & 5.8m. e. of US31 easterly (EB))" 0.25
 4 13898 83 3 5.2 0.37 0.0 8.8 2.5 "G"
 "A-4" 2 "SC" 135.1 9.4 14 20.8 10.8 10.0 2.71
 86 3.4 0

2
 "04-11-86" 1 1 0 1 0830 0900 43 0 0 45 51

"Dynalect"

1	0	1.0	8	0.32	0.28	0.24	0.20	0.15
2	0	1.0	8	0.32	0.29	0.25	0.22	0.17
3	0	1.0	8	0.38	0.32	0.25	0.20	0.15
4	0	1.0	8	0.34	0.31	0.27	0.24	0.19
5	0	1.0	8	0.41	0.37	0.31	0.27	0.21
6	0	1.0	8	0.52	0.47	0.40	0.34	0.27

"Road Rater 400"

1	1	2	0	0.62	25.0	2.47	0.10	0.70	0.10
1	2	2	0	1.23	25.0	0.43	0.77	0.62	1.12
1	3	2	0	1.82	25.1	0.67	0.76	1.20	1.85
2	1	2	0	0.60	25.0	-0.18	0.12	0.59	0.12
2	2	2	0	1.24	25.0	0.44	1.44	1.17	0.30
2	3	2	0	1.81	25.1	0.66	1.60	1.16	0.44
3	1	2	0	0.59	25.0	0.31	0.15	0.33	0.12
3	2	2	0	1.24	25.1	0.64	1.02	1.13	0.32
3	3	2	0	1.83	25.1	1.03	0.94	0.86	0.53
4	1	2	0	0.59	25.0	0.23	0.21	0.28	0.28
4	3	2	0	1.83	25.1	0.79	1.01	1.17	0.52
5	1	2	0	0.61	25.0	0.23	0.52	0.47	0.11
5	2	2	0	1.23	25.1	0.49	1.95	1.32	0.29
5	3	2	0	1.83	25.1	0.77	0.99	1.41	0.49
6	1	1	0	0.62	15.1	0.27	0.20	0.16	0.15
6	2	1	0	1.24	15.2	0.58	0.39	0.34	0.28
6	1	2	0	0.61	25.2	0.26	0.13	0.70	0.12
6	2	2	0	1.23	25.1	0.52	1.35	0.30	1.49
6	3	2	0	1.84	25.2	0.83	0.59	1.24	0.52
6	1	3	0	0.60	35.2	0.21	0.13	0.14	0.28
6	2	3	0	1.22	35.2	0.47	0.40	0.35	0.61
6	3	3	0	1.83	35.3	0.87	0.52	0.65	1.45

"Dynatest FWD"

1	2	0	462	71	57	53	40	34	0 0
1	4	0	996	146	125	108	88	72	0 0
2	2	0	446	70	65	57	49	38	0 0
2	4	0	991	145	133	119	100	83	0 0

3	2	0	441	115	93	65	45	34	0	0
3	4	0	932	243	192	138	97	75	0	0
4	2	0	448	61	58	50	42	34	0	0
4	4	0	996	140	124	107	89	73	0	0
5	2	0	440	88	84	71	57	47	36	21
5	4	0	984	196	175	149	120	98	78	47
6	1	0	211	57	48	39	32	25	0	0
6	2	0	436	125	105	89	71	57	0	0
6	3	0	711	196	165	138	114	90	0	0
6	4	0	973	269	226	190	157	124	0	0

"09-03-86" 1 1 0 1 1055 1117 104 104 99 78 58

"Dynalect"

1	0	1.0	8	0.34	0.29	0.25	0.20	0.15
2	0	1.0	8	0.33	0.30	0.26	0.20	0.15
3	0	1.0	8	0.41	0.33	0.25	0.19	0.14
4	0	1.0	8	0.35	0.32	0.27	0.22	0.17
5	0	1.0	8	0.38	0.36	0.30	0.24	0.19
6	0	1.0	8	0.47	0.42	0.35	0.28	0.23

"Road Rater 400"

1	1	2	0	0.61	25.0	0.30	0.20	0.16	1.31
1	2	2	0	1.25	25.0	0.67	0.56	0.44	0.35
1	3	2	0	1.87	25.1	1.10	0.82	0.70	0.55
2	1	2	0	0.59	25.0	0.28	0.22	0.20	0.15
2	2	2	0	1.23	25.1	0.62	0.54	0.49	0.36
2	3	2	0	1.81	25.1	1.03	0.92	0.83	0.63
3	1	2	0	0.60	25.0	0.39	0.27	0.23	0.15
3	2	2	0	1.22	25.1	0.94	0.92	0.59	0.42
3	3	2	0	1.80	25.1	1.54	1.20	0.93	0.65
4	1	2	0	0.60	25.1	0.24	0.16	0.13	0.09
4	2	2	0	1.24	25.1	0.54	0.41	0.35	0.49
4	3	2	0	1.81	25.1	0.81	0.64	0.52	0.40
5	1	2	0	0.59	25.0	0.25	0.22	0.20	0.14
5	2	2	0	1.25	25.0	0.62	0.57	0.51	0.42
5	3	2	0	1.83	25.0	0.67	0.87	0.77	0.64
6	1	1	0	0.63	15.3	0.33	0.32	0.30	0.53
6	2	1	0	1.25	15.3	0.80	0.78	0.74	1.12
6	1	2	0	0.60	24.9	0.31	0.30	0.29	0.50
6	2	2	0	1.23	24.9	0.77	0.77	0.71	0.58
6	3	2	0	1.78	24.9	1.53	1.86	0.58	2.50
6	1	3	0	0.59	35.2	0.29	0.27	0.19	0.40
6	2	3	0	1.13	35.2	1.92	1.25	2.01	2.77

"Dynatest FWD"

1	2	0	393	94	57	45	37	29	22	16
1	4	0	904	196	130	106	87	68	56	34
2	2	0	393	79	61	54	43	34	0	0
2	4	0	899	175	140	121	100	80	0	0
3	2	0	390	121	86	55	38	27	21	12
3	4	0	896	262	194	129	91	67	52	29
4	2	0	392	83	61	51	39	32	0	0
4	4	0	897	183	141	116	92	71	0	0
5	2	0	388	98	70	59	46	37	29	18
5	4	0	894	212	162	136	108	85	66	40
6	1	0	0	0	0	0	0	0	0	0
6	2	0	387	120	88	74	57	44	0	0
6	3	0	604	187	140	119	92	73	0	0
6	4	0	887	266	202	170	135	103	0	0

"L2" 50 "US" 30 12080 27.5 3322 "N"

"F. SR331 to Marshall/Kosciusko CL" 3.65

"F. Beech Rd. (1.1a. w. of Marshall/Kosciusko CL) easterly (EB)" 0.25

4 7842 68 18 0.0 0.00 0.0 9.1 2.5 "B"

"A-6" 8 "CL" 117.9 16.3 3 30.2 15.9 14.3 2.55

71 2.4 0

1

"04-11-86" 1 1 0 1 0930 1000 46 0 0 48 51

"Dynalect"

1	0	1.0	8	0.45	0.42	0.36	0.32	0.25
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2	0	1.0	8	0.56	0.52	0.46	0.41	0.34
3	0	1.0	8	0.57	0.53	0.45	0.38	0.29
4	0	1.0	8	0.52	0.47	0.40	0.35	0.27
5	0	1.0	8	0.50	0.45	0.38	0.32	0.25
6	0	1.0	8	0.58	0.52	0.44	0.37	0.28
"Road Rater 400"								
1	1	2	0	0.59	24.8	0.21	0.28	0.13
1	2	2	0	1.21	25.1	0.46	0.56	0.33
1	3	2	0	1.83	25.1	0.72	0.66	0.54
2	1	2	0	0.60	25.0	0.28	0.19	0.21
2	2	2	0	1.22	25.1	0.58	0.76	0.46
2	3	2	0	1.82	25.1	0.86	0.72	0.72
3	1	2	0	0.60	25.1	0.33	0.33	1.68
3	2	2	0	1.24	25.1	0.66	0.50	0.47
3	3	2	0	1.82	25.1	0.97	1.10	2.85
4	1	2	0	0.60	25.1	0.29	0.27	1.04
4	2	2	0	1.27	25.1	0.58	0.78	0.38
4	3	2	0	2.39	28.8	0.87	0.99	0.67
5	1	2	0	0.61	25.1	0.31	0.61	0.96
5	2	2	0	1.23	25.1	0.56	1.20	2.11
5	3	2	0	1.83	25.1	0.85	0.78	0.87
6	1	1	0	0.65	15.3	0.38	0.35	0.31
6	2	1	0	1.21	15.0	0.75	0.71	0.62
6	1	2	0	0.61	25.2	0.31	0.27	0.22
6	2	2	0	1.24	25.2	0.61	0.58	0.45
6	3	2	0	1.83	25.2	1.01	0.99	0.80
6	1	3	0	0.59	35.0	0.27	0.91	2.48
6	2	3	0	1.18	34.9	0.62	1.59	3.41
6	3	3	0	1.84	35.0	1.27	3.57	3.20
"Dynatest FWD"								
1	2	0	447	81	76	64	52	43
1	4	0	981	174	160	139	113	92
2	2	0	443	97	91	82	67	58
2	4	0	980	201	189	170	146	123
3	2	0	437	106	102	90	69	55
3	4	0	976	226	215	186	148	117
4	2	0	444	88	89	75	61	46
4	4	0	978	207	187	159	129	100
5	2	0	439	86	85	70	59	46
5	4	0	968	198	182	157	126	101
6	1	0	212	57	54	41	34	24
6	2	0	432	114	107	91	72	55
6	3	0	687	178	165	141	114	87
6	4	0	970	244	224	192	156	120
"L3" 46 "I" 94 34670 27.5 9534 "N"								
"F. Porter/LaPorte CL to 0.4m. e. of US421" 2.36								
"F. 1.3m. w. of US421 bridges westerly (WB)" 0.25								
7	8476	70	16	0.0	0.00	0.0	9.1	6.0
"A-6" 10 "CL" 118.2 17.9 6 31.6 15.4 16.2 2.74								
73	3.4	0						
"04-16-86" 1 1 1 1 1040 1110 41 0 0 38 46								
"Dynaflect"								
1	0	1.0	8	0.61	0.53	0.47	0.43	0.33
2	0	1.0	8	0.50	0.44	0.39	0.36	0.27
3	0	1.0	8	0.58	0.51	0.44	0.40	0.29
4	0	1.0	8	0.50	0.44	0.38	0.34	0.24
5	0	1.0	8	0.51	0.44	0.35	0.30	0.20
6	0	1.0	8	0.48	0.42	0.36	0.33	0.23
"Road Rater 400"								
1	1	2	0	0.63	25.4	0.40	0.34	0.29
1	2	2	0	1.24	25.3	0.81	0.78	0.65
1	3	2	0	1.86	25.4	1.30	1.21	3.11
2	1	2	0	0.59	25.0	0.25	0.21	0.17
2	2	2	0	1.21	25.0	0.60	0.47	0.41
2	3	2	0	1.83	25.0	1.03	0.79	0.70

3	1	2	0	0.60	25.0	0.45	0.70	0.65	0.22
3	2	2	0	1.21	25.0	0.97	0.96	4.49	0.55
3	3	2	0	1.82	25.1	1.56	1.36	1.17	0.96
4	2	2	0	1.23	25.1	0.54	0.41	1.16	0.32
4	3	2	0	1.84	25.0	0.87	0.62	1.95	0.61
4	3	2	0	1.81	25.1	0.85	0.63	2.07	0.58
5	1	2	0	0.60	24.9	0.28	0.21	0.16	0.10
5	2	2	0	1.22	25.0	0.63	0.57	0.51	0.35
5	3	2	0	1.83	25.0	1.00	1.08	1.06	0.59
6	1	1	0	0.62	15.3	0.32	0.35	0.62	0.16
6	2	1	0	1.21	15.2	0.65	0.68	1.12	0.41
6	1	2	0	0.64	25.5	0.31	0.49	1.01	0.14
6	2	2	0	1.23	25.2	0.64	0.75	2.95	0.37
6	3	2	0	1.83	25.1	0.93	0.79	0.90	0.57
6	1	3	0	0.57	35.1	0.19	0.10	0.10	0.04
6	2	3	0	1.17	34.5	0.44	0.38	0.31	0.29
6	3	3	0	1.83	35.5	0.85	0.72	0.64	0.50
"Road Rater 2000"									
1	1	2	0	0.60	25.0	0.42	0.27	0.25	0.21
1	2	2	0	1.19	25.0	0.93	0.58	0.53	0.45
1	3	2	0	1.81	25.0	1.47	0.92	0.84	0.73
1	4	2	0	2.39	25.0	1.52	1.26	1.16	1.00
1	5	2	0	3.56	25.0	2.40	2.00	1.88	1.60
2	1	2	0	0.59	25.0	0.21	0.22	0.19	0.15
2	2	2	0	1.18	25.0	0.44	0.49	0.43	0.33
2	3	2	0	1.81	25.0	0.66	0.76	0.67	0.55
2	4	2	0	2.36	25.0	0.86	1.02	0.89	0.73
2	5	2	0	3.61	25.0	1.28	1.60	1.41	1.14
3	1	2	0	0.62	25.0	0.25	0.29	0.27	0.23
3	2	2	0	1.21	25.0	0.55	0.63	0.59	0.51
3	3	2	0	1.78	25.0	0.89	0.97	0.90	0.79
3	4	2	0	2.41	25.0	1.30	1.38	1.30	1.16
3	5	2	0	3.64	25.0	2.11	2.20	2.08	1.87
4	1	2	0	0.56	25.0	0.25	0.23	0.21	0.17
4	2	2	0	1.24	25.0	0.64	0.59	0.52	0.40
4	3	2	0	1.80	25.0	0.97	0.89	0.76	0.60
4	4	2	0	2.41	25.0	1.33	1.19	1.03	0.80
4	5	2	0	3.60	25.0	2.01	1.85	1.61	1.25
5	1	2	0	0.63	25.0	0.23	0.26	0.28	0.16
5	2	2	0	1.19	25.0	0.49	0.53	0.51	0.35
5	3	2	0	1.85	25.0	0.71	0.77	0.64	0.50
5	4	2	0	2.37	25.0	1.09	1.12	0.93	0.73
5	5	2	0	3.61	25.0	1.60	1.79	1.41	1.17
6	1	1	0	0.60	15.0	0.28	0.30	0.27	0.21
6	2	1	0	1.20	15.0	0.53	0.62	0.57	0.47
6	3	1	0	1.85	15.0	0.78	0.93	0.90	0.71
6	4	1	0	2.36	15.0	1.03	1.33	1.21	0.99
6	5	1	0	3.54	15.0	1.42	2.00	1.89	1.64
6	1	2	0	0.58	25.1	0.18	0.24	0.21	0.16
6	2	2	0	1.16	25.1	0.39	0.48	0.44	0.35
6	3	2	0	1.81	25.1	0.62	0.78	0.72	0.57
6	4	2	0	2.40	25.1	0.83	1.05	0.99	0.79
6	5	2	0	3.61	25.1	1.24	1.69	1.57	1.26
6	1	3	0	0.63	35.1	0.12	0.20	0.18	0.15
6	2	3	0	1.22	35.1	0.26	0.41	0.38	0.30
6	3	3	0	1.80	35.2	0.38	0.62	0.57	0.44
6	4	3	0	2.42	35.0	0.55	0.84	0.77	0.61
6	5	3	0	3.59	35.0	0.47	1.29	1.21	0.93
"Dynatest FWD"									
1	2	0	462	119	112	94	88	65	0
1	4	0	972	229	209	186	160	134	0
2	2	0	448	86	80	72	61	50	0
2	4	0	966	182	168	150	123	105	0
3	2	0	445	123	119	105	87	67	0
3	4	0	958	266	242	218	181	139	0
4	2	0	447	88	84	77	64	50	0
4	4	0	963	200	181	164	136	108	0
5	2	0	440	105	90	76	55	45	24
5	4	0	952	234	201	160	121	94	48
6	1	0	219	47	43	37	32	24	0

6	2	0	442	100	90	78	57	52	0	0
6	3	0	695	158	140	123	104	82	0	0
6	4	0	953	213	187	167	140	112	0	0

"09-04-86" 1 1 0 1 1250 1315 94 98 98 79 63

"Dynaflect"

1	0	1.0	8	0.42	0.38	0.36	0.30	0.25
2	0	1.0	8	0.42	0.39	0.37	0.31	0.25
3	0	1.0	8	0.47	0.43	0.39	0.32	0.27
4	0	1.0	8	0.41	0.37	0.35	0.29	0.24
5	0	1.0	8	0.48	0.46	0.44	0.37	0.31
6	0	1.0	8	0.42	0.39	0.37	0.30	0.25

"Road Rater 400"

1	1	2	0	0.60	25.0	0.25	0.21	-0.19	0.15
1	2	2	0	1.23	25.1	0.55	1.96	6.42	0.35
1	3	2	0	1.86	25.1	0.91	0.85	0.77	0.63
2	2	2	0	1.24	25.1	0.51	0.73	0.48	0.40
2	3	2	0	1.81	25.1	0.90	0.87	0.75	0.65
3	1	2	0	0.60	25.0	0.31	0.27	0.24	0.18
3	2	2	0	1.22	25.1	0.73	2.92	0.59	0.47
3	3	2	0	1.85	25.1	1.16	1.07	0.94	1.58
4	1	2	0	0.58	25.1	0.24	0.22	0.19	0.12
4	2	2	0	1.23	25.1	0.57	0.55	0.49	0.41
4	3	2	0	1.93	25.1	0.88	0.84	0.75	0.62
5	1	2	0	0.61	25.1	0.48	1.31	0.25	0.19
5	2	2	0	1.23	25.1	0.96	0.42	0.55	0.42
5	3	2	0	1.78	25.1	1.03	0.98	0.90	0.76
6	1	1	0	0.60	15.1	0.27	0.25	0.24	0.19
6	2	1	0	1.22	15.1	0.60	0.56	0.52	0.42
6	1	2	0	0.60	25.0	0.24	0.21	0.19	0.15
6	2	2	0	1.20	25.0	0.55	0.54	0.46	0.38
6	3	2	0	1.90	25.0	0.78	0.79	0.70	0.59
6	1	3	0	0.59	34.9	0.18	0.15	0.11	0.08
6	1	3	0	0.72	34.9	0.85	0.81	0.71	0.55

"Dynatest FWD"

1	2	0	389	72	66	58	48	40	32	18
1	4	0	900	164	152	135	114	94	79	48
2	2	0	382	72	67	60	50	42	0	0
2	4	0	894	166	154	136	115	96	0	0
3	2	0	377	90	85	72	59	49	36	27
3	4	0	886	207	192	166	139	113	94	56
4	2	0	360	73	69	60	48	41	0	0
4	4	0	883	169	158	137	115	96	0	0
5	2	0	379	87	83	74	63	52	43	27
5	4	0	884	197	188	165	144	117	97	55
6	1	0	0	0	0	0	0	0	0	0
6	2	0	380	70	66	58	48	39	0	0
6	3	0	604	116	111	93	81	65	0	0
6	4	0	887	168	156	137	115	94	0	0

"L4" 45 "1" 65 29260 27.8 8134 "N"

"F. 0.6m. s. of SR53 to 0.4m. n. of US30" 6.51

"F. s. of MP252 southerly (SB)" 0.25

4 13465 82 4 4.9 0.34 0.0 9.5 6.0 "G"

" 0 " 0.0 0.0 0 0.0 0.0 0.0 0.0 0.00

73 3.4 0

2

"04-16-86" 1 1 1 1 1300 1330 47 0 0 42 46

"Dynaflect"

1	0	1.0	8	0.35	0.32	0.28	0.26	0.19
2	0	1.0	8	0.32	0.29	0.25	0.24	0.18
3	0	1.0	8	0.42	0.39	0.35	0.33	0.25
4	0	1.0	8	0.40	0.37	0.33	0.32	0.27
5	0	1.0	8	0.34	0.31	0.27	0.26	0.20
6	0	1.0	8	0.31	0.29	0.26	0.24	0.19

"Road Rater 400"

1	1	2	0	0.62	25.3	0.15	0.06	0.10	0.46
1	2	2	0	1.28	25.4	0.40	0.77	0.30	0.74

1	3	2	0	1.86	25.4	0.62	1.03	0.49	1.26
2	1	2	0	0.60	25.1	0.13	0.10	0.12	0.04
2	2	2	0	1.22	25.1	0.32	0.26	0.18	0.15
2	3	2	0	1.88	25.4	0.52	0.31	0.36	0.23
3	1	2	0	0.60	25.1	0.19	0.19	0.10	0.03
3	2	2	0	1.25	25.2	0.44	0.47	0.32	0.14
3	3	2	0	1.87	25.3	0.73	0.60	0.82	0.22
4	1	2	0	0.61	25.1	0.15	0.08	0.11	0.06
4	2	2	0	1.22	25.1	0.37	0.19	0.28	0.19
4	3	2	0	1.85	25.2	0.58	1.35	0.46	0.35
5	1	2	0	0.64	25.1	0.18	0.27	0.58	0.57
5	2	2	0	1.21	25.1	0.37	1.13	1.14	1.01
5	3	2	0	1.82	25.1	0.60	1.38	1.25	0.42
6	1	1	0	0.65	15.4	0.22	0.19	0.40	0.13
6	2	1	0	1.25	15.4	0.48	0.45	0.61	0.33
6	1	2	0	0.63	25.6	0.17	0.75	0.15	0.12
6	2	2	0	1.26	25.5	0.37	1.08	0.57	0.41
6	3	2	0	1.83	25.3	0.62	1.62	0.53	2.41
6	1	3	0	0.58	35.1	0.17	0.07	0.10	0.31
6	2	3	0	1.20	35.1	0.44	0.26	0.35	0.51
6	3	3	0	1.76	35.1	0.82	0.60	0.58	0.93
"Road Rater 2000"									
1	1	2	0	0.56	25.0	0.17	0.15	0.15	0.12
1	2	2	0	1.13	25.0	0.37	0.32	0.29	0.24
1	3	2	0	1.80	25.0	0.57	0.48	0.44	0.37
1	4	2	0	2.42	25.0	0.78	0.65	0.60	0.51
1	5	2	0	3.59	25.0	1.29	1.01	0.94	0.79
2	1	2	0	0.64	25.0	0.16	0.19	0.17	0.15
2	2	2	0	1.21	25.0	0.29	0.36	0.32	0.25
2	3	2	0	1.80	25.0	0.43	0.55	0.48	0.38
2	4	2	0	2.39	25.0	0.59	0.75	0.66	0.53
2	5	2	0	3.62	24.9	0.91	1.17	1.03	0.84
3	1	2	0	0.61	25.0	0.37	0.20	0.19	0.17
3	2	2	0	1.20	25.0	0.75	0.44	0.40	0.34
3	3	2	0	1.80	25.0	1.17	0.68	0.63	0.53
3	4	2	0	2.42	25.0	1.57	0.91	0.85	0.74
3	5	2	0	3.61	25.0	2.49	1.43	1.36	1.17
4	1	2	0	0.63	25.0	0.18	0.18	0.15	0.12
4	2	2	0	1.25	25.0	0.34	0.33	0.29	0.24
4	3	2	0	1.80	24.9	0.46	0.49	0.43	0.36
4	4	2	0	2.41	25.0	0.60	0.68	0.59	0.49
4	5	2	0	3.58	25.0	1.15	1.07	0.93	0.76
5	1	2	0	0.60	24.9	0.12	0.17	0.18	0.14
5	2	2	0	1.19	25.0	0.25	0.35	0.34	0.28
5	3	2	0	1.80	25.0	0.34	0.53	0.52	0.43
5	4	2	0	2.43	24.8	0.46	0.73	0.69	0.59
5	5	2	0	3.57	25.1	0.67	1.10	0.99	0.90
6	1	1	0	0.60	15.0	0.25	0.21	0.19	0.16
6	2	1	0	1.19	15.1	0.53	0.42	0.33	0.35
6	3	1	0	1.81	15.0	0.88	0.68	0.54	0.55
6	4	1	0	2.40	15.0	1.14	0.93	0.64	0.73
6	5	1	0	3.52	15.0	1.59	1.39	1.44	1.07
6	1	2	0	0.62	25.1	0.21	0.17	0.15	0.14
6	2	2	0	1.18	25.1	0.40	0.34	0.25	0.26
6	3	2	0	1.81	25.1	0.62	0.53	0.43	0.42
6	4	2	0	2.43	25.1	0.85	0.72	0.59	0.57
6	5	2	0	3.60	25.1	1.35	1.10	0.84	0.87
6	1	3	0	0.64	35.1	0.16	0.13	0.11	0.11
6	2	3	0	1.26	35.0	0.34	0.26	0.22	0.19
6	3	3	0	1.83	35.1	0.49	0.38	0.32	0.29
6	4	3	0	2.42	35.1	0.66	0.51	0.43	0.39
6	5	3	0	3.62	35.1	1.02	0.79	0.66	0.60
"Dynatest FWD"									
1	2	0	439	68	58	50	44	36	0
1	4	0	939	137	118	105	89	73	0
2	2	0	433	61	52	47	41	34	0
2	4	0	950	126	108	97	84	70	0
3	2	0	437	79	69	61	53	45	0
3	4	0	931	156	136	121	105	89	0
4	2	0	438	72	56	52	45	39	0

4	4	0	927	143	114	106	92	79	0	0
5	2	0	445	66	56	53	44	38	33	21
5	4	0	942	139	117	107	94	78	67	43
6	1	0	185	25	22	19	16	15	0	0
6	2	0	441	59	53	49	42	36	0	0
6	3	0	697	95	82	76	65	59	0	0
6	4	0	944	127	110	100	88	76	0	0

"09-04-86" 1 1 0 1 1403 1428 114 117 116 82 63

"Dynaflect"

1	0	1.0	8	0.59	0.54	0.50	0.41	0.32
2	0	1.0	8	0.32	0.31	0.29	0.24	0.20
3	0	1.0	8	0.42	0.40	0.38	0.31	0.26
4	0	1.0	8	0.39	0.37	0.35	0.30	0.25
5	0	1.0	8	0.32	0.29	0.27	0.23	0.19
6	0	1.0	8	0.31	0.32	0.28	0.23	0.20

"Road Rater 400"

1	1	2	0	0.54	25.2	0.34	0.43	0.25	0.19
1	2	2	0	1.23	25.2	1.06	1.74	3.70	1.30
1	3	2	0	1.88	25.3	2.22	8.95	6.31	1.54
2	1	2	0	0.62	25.2	0.17	0.14	0.15	0.11
2	2	2	0	1.23	25.2	0.52	1.70	0.41	0.33
2	3	2	0	1.88	25.2	0.96	8.85	6.98	1.51
3	1	2	0	0.59	25.2	0.23	0.22	0.21	0.17
3	2	2	0	1.22	25.2	0.68	3.00	1.12	0.54
3	3	2	0	1.89	25.2	1.47	7.61	5.43	1.18
4	1	2	0	0.62	25.2	0.21	0.16	0.15	0.11
4	2	2	0	1.19	25.2	0.68	0.56	0.49	0.39
4	3	2	0	1.68	25.3	1.20	1.04	0.93	0.70
5	1	2	0	0.60	25.2	0.20	0.16	0.15	0.11
5	2	2	0	1.29	25.2	0.56	3.54	2.14	0.45
5	3	2	0	1.86	25.2	1.00	0.94	4.33	0.73
6	1	1	0	0.59	14.9	0.23	0.28	0.26	0.17
6	2	1	0	1.24	15.0	0.54	0.51	0.58	0.42
6	1	2	0	0.62	25.1	0.20	0.44	0.57	0.14
6	2	2	0	1.21	25.1	0.45	0.91	0.87	0.36
6	3	2	0	1.83	25.1	0.69	1.30	0.65	0.56
6	1	3	0	0.57	35.3	0.12	0.10	0.10	0.07
6	2	3	0	1.01	35.2	0.28	0.26	0.22	0.17
6	2	3	0	1.30	35.3	0.43	0.38	0.35	0.28
6	3	3	0	1.67	35.2	0.61	3.56	0.89	0.53

"Dynatest FWD"

1	2	0	386	127	114	99	82	63	46	22
1	4	0	893	263	236	205	167	128	96	48
2	2	0	377	47	50	45	38	30	0	0
2	4	0	886	108	111	101	84	69	0	0
3	2	0	374	76	69	62	53	44	34	21
3	4	0	882	162	149	134	115	94	74	45
4	2	0	375	75	55	50	42	37	0	0
4	4	0	885	152	123	111	96	80	0	0
5	2	0	374	69	51	44	38	29	25	17
5	4	0	884	146	115	102	86	70	60	41
6	1	0	0	0	0	0	0	0	0	0
6	2	0	370	58	51	47	38	34	0	0
6	3	0	595	91	81	75	63	52	0	0
6	4	0	883	129	118	108	93	79	0	0

"S1" 41 "I" 65 26500 30.0 7950 "S"

"F. 0.5m. n. of Whiteland Rd. northerly" 2.01

"F. 1.7m. n. of Whiteland Rd. (betw. MP 96&97) northerly (NB)" 0.25

4 14249 84 2 5.3 0.37 0.0 9.1 6.0 "S"

"A-6" 7 "CL" 109.8 18.7 8 26.8 15.0 11.8 2.70

67 3.6 0

2

"03-25-86" 1 1 0 1 0915 0945 69 0 0 55 33

"Dynaflect"

1	0	1.0	8	0.34	0.26	0.22	0.20	0.14
2	0	1.0	8	0.36	0.29	0.25	0.23	0.17

3	0	1.0	8	0.36	0.29	0.26	0.24	0.21	
4	0	1.0	8	0.39	0.33	0.30	0.28	0.21	
5	0	1.0	8	0.33	0.27	0.24	0.23	0.16	
6	0	1.0	8	0.33	0.27	0.23	0.22	0.16	
"Road Rater 400"									
1	1	2	0	0.62	25.3	0.17	0.11	0.09	0.05
1	2	2	0	1.26	25.3	0.35	0.27	0.47	0.26
1	3	2	0	1.89	25.3	0.68	1.18	1.61	0.36
1	3	2	0	1.84	25.3	0.68	0.97	1.79	0.35
2	1	2	0	0.62	25.3	0.23	0.26	0.29	0.23
2	2	2	0	1.24	25.3	0.50	0.55	1.53	0.50
2	3	2	0	1.84	25.3	0.99	2.27	0.91	0.76
3	1	2	0	0.61	25.3	0.19	0.12	0.28	0.14
3	2	2	0	1.25	25.3	0.39	0.33	0.84	0.30
3	3	2	0	1.85	25.3	0.77	2.00	1.30	0.55
4	1	2	0	0.63	25.3	0.16	0.13	0.63	0.23
4	2	2	0	1.27	25.3	0.37	0.54	1.34	0.58
4	3	2	0	1.83	25.3	0.68	1.87	0.86	0.46
5	1	2	0	0.63	25.3	0.23	0.15	1.45	0.24
5	2	2	0	1.26	25.3	0.51	1.37	2.07	1.19
5	3	2	0	1.84	25.3	0.96	2.68	2.11	0.78
6	1	1	0	0.63	15.1	0.18	0.17	0.16	0.29
6	2	1	0	1.24	15.2	0.40	0.35	0.33	0.45
6	1	2	0	0.62	25.1	0.23	0.18	0.19	0.07
6	2	2	0	1.23	25.1	0.48	0.43	0.38	0.17
6	3	2	0	1.84	25.2	0.97	1.57	0.92	0.94
6	1	3	0	0.59	34.9	0.18	0.14	0.12	0.06
6	2	3	0	1.17	34.9	0.39	0.34	0.32	0.17
6	3	3	0	1.82	35.1	1.08	1.00	1.36	1.35
"Dynatest FWD"									
1	2	0	452	62	48	40	31	24	0
1	4	0	967	131	105	87	69	53	0
2	2	0	442	64	56	51	42	35	0
2	4	0	943	134	122	109	91	75	0
3	2	0	434	63	58	51	45	36	0
3	4	0	942	131	119	108	93	73	0
4	2	0	432	65	57	51	43	37	0
4	4	0	941	138	123	110	94	79	0
5	2	0	432	66	59	53	47	40	0
5	4	0	937	134	121	111	98	84	0
6	1	0	221	38	35	30	26	21	0
6	2	0	432	73	69	63	53	46	0
6	3	0	679	120	107	98	83	70	0
6	4	0	945	165	147	135	115	98	0
"08-11-86" 1 1 1 1 0920 0955 85 87 91 75 72									
"Dynalect"									
1	0	1.0	8	0.29	0.26	0.23	0.18	0.13	
2	0	1.0	8	0.30	0.27	0.25	0.20	0.15	
3	0	1.0	8	0.30	0.29	0.26	0.22	0.17	
4	0	1.0	8	0.31	0.29	0.27	0.22	0.18	
5	0	1.0	8	0.27	0.25	0.23	0.19	0.15	
6	0	1.0	8	0.26	0.24	0.22	0.17	0.13	
"Road Rater 400"									
1	1	2	0	0.61	24.8	0.17	0.14	0.10	0.10
1	2	2	0	1.20	24.9	0.39	0.28	0.21	0.22
1	3	2	0	1.81	24.9	0.62	0.38	0.38	0.38
2	1	2	0	0.60	24.8	0.26	0.24	0.22	0.18
2	2	2	0	1.20	24.9	0.62	0.60	0.55	0.47
2	3	2	0	1.78	24.9	1.04	1.01	0.96	0.82
3	1	2	0	0.58	24.8	0.19	0.13	0.17	0.14
3	2	2	0	1.19	24.9	0.45	0.24	0.41	0.35
3	3	2	0	1.81	24.9	0.74	0.25	0.68	0.58
4	1	2	0	0.59	24.9	0.19	0.15	0.16	0.13
4	2	2	0	1.20	24.9	0.43	0.39	0.37	0.31
4	3	2	0	1.81	24.9	0.69	0.49	0.62	0.53
5	1	2	0	0.60	24.8	0.29	0.34	0.25	0.16
5	2	2	0	1.20	24.9	0.65	2.20	0.57	1.37
5	3	2	0	1.82	24.9	1.11	2.02	1.00	2.55
6	1	1	0	0.60	15.0	0.18	0.16	0.14	0.11
6	2	1	0	1.23	15.0	0.41	0.36	0.31	0.25

6	1	2	0	0.61	25.0	0.23	0.18	0.17	0.14
6	2	2	0	1.23	25.1	0.49	0.57	0.37	0.30
6	3	2	0	1.85	25.1	0.84	1.43	0.67	0.69
6	1	3	0	0.59	35.0	0.20	0.17	0.15	0.12
6	2	3	0	1.17	35.0	0.50	0.44	0.25	0.33
6	3	3	0	1.79	35.0	1.06	0.68	1.48	0.77
"Road Rater 2000"									
1	1	2	0	0.58	25.0	0.21	0.16	0.16	0.14
1	2	2	0	1.22	25.0	0.45	0.35	0.29	0.23
1	3	2	0	1.84	25.0	0.65	0.52	0.47	0.36
1	4	2	0	2.41	25.0	0.84	0.70	0.64	0.49
1	5	2	0	3.62	25.0	1.23	1.10	1.00	0.77
2	1	2	0	0.61	25.1	0.32	0.30	0.23	0.23
2	2	2	0	1.21	25.0	0.62	0.56	0.48	0.44
2	3	2	0	1.78	25.0	0.92	0.85	0.74	0.66
2	4	2	0	2.41	25.1	1.29	1.20	1.05	0.93
2	5	2	0	3.60	25.0	2.00	1.86	1.63	1.46
3	1	2	0	0.63	25.0	0.31	0.25	0.22	0.19
3	2	2	0	1.20	25.0	0.60	0.47	0.43	0.37
3	3	2	0	1.80	25.0	0.91	0.72	0.66	0.56
3	4	2	0	2.43	25.0	1.24	1.00	0.93	0.78
3	5	2	0	3.62	25.0	1.93	1.59	1.48	1.24
4	1	2	0	0.58	25.0	0.26	0.19	0.13	0.15
4	2	2	0	1.21	25.0	0.57	0.44	0.39	0.31
4	3	2	0	1.82	25.0	0.80	0.65	0.59	0.47
4	4	2	0	2.39	25.1	1.06	0.89	0.79	0.65
4	5	2	0	3.58	25.0	1.56	1.40	1.27	1.05
5	1	2	0	0.61	25.0	0.39	0.29	0.26	0.22
5	2	2	0	1.21	25.0	0.80	0.59	0.55	0.47
5	3	2	0	1.79	25.0	1.17	0.89	0.81	0.71
5	4	2	0	2.42	25.1	1.60	1.19	1.12	0.99
5	5	2	0	3.57	25.1	2.51	1.83	1.73	1.50
6	1	1	0	0.60	15.1	0.29	0.20	0.18	0.15
6	2	1	0	1.23	15.0	0.51	0.41	0.38	0.31
6	3	1	0	1.81	15.0	0.90	0.67	0.62	0.52
6	4	1	0	2.40	15.1	1.25	0.92	0.86	0.75
6	5	1	0	3.64	15.0	1.89	1.53	1.44	1.11
6	1	2	0	0.61	25.2	0.28	0.23	0.22	0.17
6	2	2	0	1.19	25.2	0.59	0.49	0.45	0.38
6	3	2	0	1.82	25.2	0.91	0.73	0.66	0.56
6	4	2	0	2.41	25.2	1.26	1.03	0.94	0.78
6	5	2	0	3.59	25.2	2.03	1.61	1.48	1.24
6	1	3	0	0.64	35.0	0.34	0.25	0.24	0.20
6	2	3	0	1.21	35.1	0.71	0.53	0.49	0.41
6	3	3	0	1.93	35.1	1.09	0.83	0.77	0.65
6	4	3	0	2.41	35.1	1.50	1.14	1.06	0.90
6	5	3	0	3.61	35.0	2.37	1.80	1.68	1.43

"Dynatest FWD"

1	2	0	400	83	55	46	37	29	21	18
1	4	0	853	170	120	99	79	60	47	24
2	2	0	403	89	65	57	47	39	0	0
2	4	0	948	181	138	123	104	85	0	0
3	2	0	400	78	62	57	49	38	34	20
3	4	0	948	164	132	118	103	83	70	40
4	2	0	397	081	60	54	46	38	0	0
4	4	0	843	161	127	116	98	82	0	0
5	2	0	391	74	59	54	45	39	33	21
5	4	0	841	156	124	113	98	82	69	43
6	1	0	0	0	0	0	0	0	0	0
6	2	0	395	76	60	54	44	36	0	0
6	3	0	611	120	94	84	71	57	0	0
6	4	0	340	165	130	117	99	81	0	0

"S2" 41 "I" 65 26500 30.0 7950 "S"
 "F. 2.5m. n. of to 3.9m. n. of Whiteland Rd." 1.38
 "F. CR750N (betw. MP 97&98) northerly (NB)" 0.25
 4 14249 84 2 4.6 0.34 0.0 9.0 6.0 "G"

"A-6" 4 "CL" 124.8 14.2 8 27.5 14.7 12.8 2.57
97 3.5 0

"03-25-86" 1 1 0 1 1000 1030 67 0 0 23 33
"Dynalect"

1	0	1.0	8	0.38	0.30	0.26	0.24	0.16
2	0	1.0	8	0.32	0.25	0.22	0.21	0.14
3	0	1.0	8	0.34	0.27	0.24	0.23	0.16
4	0	1.0	8	0.32	0.25	0.22	0.20	0.13
5	0	1.0	8	0.36	0.29	0.25	0.23	0.16
6	0	1.0	8	0.30	0.23	0.19	0.18	0.11

"Road Rater 400"

1	1	2	0	0.60	25.0	0.25	0.22	0.61	0.27
1	2	2	0	1.22	25.0	0.57	0.64	1.67	0.59
1	3	2	0	1.85	25.1	1.15	1.72	0.89	2.30
2	1	2	0	0.58	25.0	0.19	0.12	0.63	0.37
2	2	2	0	1.25	25.1	0.49	0.73	2.06	0.93
2	3	2	0	1.93	25.0	0.91	1.61	0.62	0.65
3	1	2	0	0.59	25.0	0.24	1.15	0.66	1.12
3	2	2	0	1.24	25.1	0.59	2.17	0.51	0.42
3	3	2	0	1.83	25.1	1.11	1.12	0.93	0.87
4	1	2	0	0.60	25.0	0.20	0.27	1.85	0.68
4	2	2	0	1.23	25.1	0.44	0.38	0.39	1.40
4	3	2	0	1.85	25.1	0.85	0.78	1.39	0.67
5	1	2	0	0.57	25.0	0.32	0.31	0.12	0.21
5	2	2	0	1.23	25.1	0.77	0.70	0.57	0.52
6	3	2	0	1.85	25.1	1.50	3.12	1.69	4.75
6	1	1	0	0.60	15.2	0.14	0.11	0.14	0.07
6	2	1	0	1.25	15.3	0.32	0.27	0.13	0.08
6	1	2	0	0.62	25.3	0.16	0.11	0.25	0.19
6	2	2	0	1.25	25.3	0.35	0.33	1.11	0.21
6	3	2	0	1.88	25.3	0.70	1.84	1.47	0.47
6	1	3	0	0.59	35.2	0.15	0.09	0.10	0.07
6	2	3	0	1.20	35.1	0.32	0.26	0.29	0.20
6	3	3	0	1.86	35.1	0.97	1.81	4.34	12.02

"Dynatest FWD"

1	2	0	434	70	58	53	42	36	0	0
1	4	0	929	153	129	112	95	77	0	0
2	2	0	433	58	49	46	38	32	0	0
2	4	0	929	125	110	97	83	70	0	0
3	2	0	428	63	58	53	45	38	0	0
3	4	0	927	130	121	110	95	81	0	0
4	2	0	424	59	54	47	39	32	0	0
4	4	0	929	124	113	101	86	70	0	0
5	2	0	424	72	64	58	48	41	0	0
5	4	0	927	150	133	120	103	85	0	0
6	1	0	216	30	24	23	18	15	0	0
6	2	0	421	59	51	44	37	30	0	0
6	3	0	664	93	80	71	60	47	0	0
6	4	0	920	129	112	99	81	67	0	0

"08-11-86" 1 1 1 1 1000 1030 90 92 100 80 72

"Dynalect"

1	0	1.0	8	0.30	0.27	0.24	0.20	0.15
2	0	1.0	8	0.23	0.21	0.20	0.16	0.12
3	0	1.0	8	0.28	0.26	0.24	0.20	0.15
4	0	1.0	8	0.24	0.22	0.20	0.16	0.11
5	0	1.0	8	0.27	0.25	0.23	0.19	0.14
6	0	1.0	8	0.21	0.19	0.17	0.13	0.09

"Road Rater 400"

1	1	2	0	0.61	25.2	0.34	0.30	0.32	0.24
1	2	2	0	1.25	25.3	0.76	0.70	0.63	0.58
1	3	2	0	1.90	25.3	1.25	1.17	1.11	0.99
2	1	2	0	0.61	25.2	0.21	0.18	0.17	0.14
2	2	2	0	1.24	25.3	0.53	0.49	0.46	0.40
2	3	2	0	1.86	25.2	0.86	0.81	0.76	0.66
3	1	2	0	0.60	25.2	0.29	0.28	0.25	0.07
3	2	2	0	1.23	25.2	0.67	0.69	0.58	0.24
3	3	2	0	1.89	25.3	1.20	1.50	1.10	2.04
4	1	2	0	0.59	25.2	0.20	0.15	0.16	0.13
4	2	2	0	1.22	25.3	0.42	0.80	0.36	0.26

4	3	2	0	1.33	25.3	0.73	1.07	0.68	1.03
5	1	2	0	0.61	25.2	0.37	0.33	0.29	0.25
5	3	2	0	1.25	25.3	0.37	0.31	0.74	0.66
5	3	2	0	1.87	25.3	1.40	1.34	1.24	1.10
6	1	1	0	0.62	15.4	0.13	0.13	0.12	0.08
6	2	1	0	1.26	15.4	0.34	0.29	0.25	0.07
6	1	2	0	0.59	24.9	0.16	0.13	0.12	0.08
6	2	2	0	1.22	25.0	0.33	0.40	0.47	0.20
6	3	2	0	1.80	25.0	0.57	0.55	1.56	0.38
6	1	3	0	0.57	34.9	0.08	0.07	0.09	0.07
6	2	3	0	1.16	35.0	0.55	2.43	0.57	0.49
"Road Rater 2000"									
1	1	2	0	0.61	25.2	0.39	0.32	0.31	0.27
1	2	2	0	1.22	25.2	0.79	0.65	0.63	0.55
1	3	2	0	1.83	25.1	1.18	0.97	0.92	0.80
1	4	2	0	2.40	25.1	1.61	1.31	1.25	1.09
1	5	2	0	3.59	25.2	2.46	2.02	1.92	1.57
2	1	2	0	0.59	25.1	0.31	0.20	0.13	0.15
2	2	2	0	1.19	25.2	0.62	0.43	0.38	0.32
2	3	2	0	1.77	25.1	0.97	0.64	0.59	0.50
2	4	2	0	2.39	25.2	1.16	0.85	0.78	0.66
2	5	2	0	3.64	25.1	1.83	1.35	1.22	1.05
3	1	2	0	0.59	25.2	0.37	0.31	0.30	0.26
3	2	2	0	1.19	25.1	0.74	0.61	0.58	0.50
3	3	2	0	1.78	25.1	1.10	0.93	0.87	0.77
3	4	2	0	2.44	25.1	1.59	1.29	1.23	1.07
3	5	2	0	3.60	25.2	2.36	1.91	1.82	1.60
4	1	2	0	0.60	25.2	0.27	0.18	0.20	0.13
4	2	2	0	1.23	25.2	0.57	0.38	0.38	0.27
4	3	2	0	1.83	25.1	0.87	0.57	0.50	0.41
4	4	2	0	2.42	25.1	1.10	0.77	0.67	0.55
4	5	2	0	3.60	25.2	1.61	1.16	1.06	0.85
5	1	2	0	0.59	25.2	0.41	0.31	0.30	0.27
5	2	2	0	1.19	25.1	0.83	0.64	0.58	0.53
5	3	2	0	1.80	25.2	1.29	1.00	0.92	0.84
5	4	2	0	2.40	25.1	1.74	1.33	1.24	1.13
5	5	2	0	3.60	25.1	2.70	2.04	1.91	1.71
6	1	1	0	0.58	15.2	0.19	0.15	0.13	0.13
6	2	1	0	1.22	15.2	0.35	0.27	0.24	0.18
6	3	1	0	1.80	15.2	0.55	0.42	0.37	0.29
6	4	1	0	2.39	15.2	0.70	0.57	0.50	0.41
6	5	1	0	3.58	15.2	1.04	0.93	0.77	0.61
6	1	2	0	0.57	25.1	0.18	0.15	0.14	0.14
6	2	2	0	1.20	25.1	0.37	0.29	0.25	0.19
6	3	2	0	1.84	25.1	0.57	0.45	0.39	0.30
6	4	2	0	2.42	25.2	0.76	0.59	0.51	0.39
6	5	2	0	3.62	25.2	1.11	0.90	0.77	0.59
6	1	3	0	0.63	35.2	0.22	0.16	0.15	0.14
6	2	3	0	1.22	35.2	0.43	0.32	0.27	0.22
6	3	3	0	1.80	35.2	0.65	0.47	0.40	0.32
6	4	3	0	2.43	35.2	0.88	0.63	0.55	0.43
6	5	3	0	3.63	35.2	1.33	0.98	0.84	0.66
"Dynatest FWD"									
1	2	0	398	83	64	53	46	36	29
1	4	0	354	168	130	116	96	79	63
2	2	0	397	64	49	43	37	30	0
2	4	0	842	133	100	91	76	64	0
3	2	0	395	70	58	53	45	38	35
3	4	0	843	147	120	109	96	81	66
4	2	0	393	60	50	45	38	30	0
4	4	0	838	137	111	99	83	67	0
5	2	0	392	72	55	52	42	35	30
5	4	0	840	151	121	107	91	75	61
6	1	0	0	0	0	0	0	0	0
6	2	0	394	60	41	34	26	22	0
6	3	0	608	91	65	54	45	35	0
6	4	0	839	124	89	76	63	50	0

"S3" 41 "I" 65 38000 30.0 11400 "5"
 "F. Greenwood Rd. northerly" 0.44
 "Betw. the end of Greenwood Rd. bridge to on-ramp merge point (NB)" 0.15
 4 10229 76 10 4.6 0.34 0.0 9.0 6.0 "6"
 "A-6" 6 "CL" 122.2 13.5 7 25.2 14.3 10.9 2.70
 81 3.0 0
 2
 "03-25-86" 1 1 1 1 1100 1130 73 0 0 68 33
 "Dynalect"
 1 0 1.0 8 0.38 0.32 0.28 0.25 0.17
 2 0 1.0 8 0.33 0.27 0.23 0.21 0.13
 3 0 1.0 8 0.44 0.36 0.30 0.27 0.23
 4 0 1.0 8 0.39 0.33 0.29 0.26 0.19
 5 0 1.0 8 0.32 0.26 0.22 0.20 0.13
 6 0 1.0 8 0.33 0.27 0.23 0.20 0.13
 "Road Rater 400"
 1 1 2 0 0.65 25.1 0.22 0.19 0.18 0.13
 1 2 2 0 1.23 25.2 0.44 0.41 0.38 0.32
 1 3 2 0 1.85 25.2 0.92 0.89 0.81 0.68
 2 1 2 0 0.60 25.1 0.22 0.20 0.13 0.13
 2 2 2 0 1.24 25.2 0.48 0.47 0.33 0.33
 2 3 2 0 1.85 25.2 0.95 1.07 0.51 0.72
 3 1 2 0 0.61 25.1 0.26 0.19 1.19 0.06
 3 2 2 0 1.23 25.2 0.54 1.60 1.38 1.54
 3 3 2 0 1.84 25.2 1.04 1.28 1.27 0.62
 4 1 2 0 0.60 25.1 0.20 0.23 0.13 0.31
 4 2 2 0 1.21 25.2 0.45 1.41 0.35 0.73
 4 3 2 0 1.85 25.2 0.91 0.93 0.75 0.62
 5 1 2 0 0.60 25.1 0.20 0.54 0.13 0.67
 5 2 2 0 1.22 25.2 0.42 1.67 0.33 0.61
 5 3 2 0 1.87 25.2 0.83 0.62 0.67 0.54
 6 1 1 0 0.63 15.4 0.17 0.15 0.23 1.38
 6 2 1 0 1.27 15.5 0.39 0.33 0.70 1.81
 6 1 2 0 0.59 25.0 0.20 0.16 0.14 0.11
 6 2 2 0 1.21 25.0 0.41 0.39 0.30 0.26
 6 3 2 0 1.83 25.1 0.93 0.74 0.63 0.57
 6 1 3 0 0.57 35.1 0.15 0.12 0.10 0.07
 6 2 3 0 1.22 35.1 0.38 0.33 0.29 0.22
 6 3 3 0 1.80 35.2 1.05 0.99 0.84 0.70
 "Road Rater 2000"
 1 1 2 0 0.56 25.2 0.10 0.18 0.19 0.19
 1 2 2 0 1.25 25.1 0.15 0.33 0.42 0.36
 1 3 2 0 1.78 25.0 0.13 0.50 0.59 0.51
 1 4 2 0 2.42 25.0 0.09 0.68 0.78 0.70
 2 1 2 0 0.58 25.1 0.09 0.15 0.18 0.16
 2 2 2 0 1.21 25.0 -0.15 0.34 0.37 0.31
 2 3 2 0 1.82 25.1 0.12 0.52 0.56 0.47
 2 4 2 0 2.38 25.0 0.08 0.68 0.73 0.65
 3 1 2 0 0.58 25.0 0.05 0.12 0.22 0.13
 3 2 2 0 1.17 25.0 0.12 0.27 0.52 0.27
 3 3 2 0 1.77 25.0 0.14 0.41 0.70 0.44
 3 4 2 0 2.40 25.0 0.12 0.59 0.89 0.63
 4 1 2 0 0.59 25.1 0.08 0.27 0.19 0.17
 4 2 2 0 1.19 25.0 0.15 0.56 0.39 0.34
 4 3 2 0 1.77 25.0 0.15 0.85 0.58 0.52
 4 4 2 0 2.43 24.9 0.10 1.19 0.90 0.72
 5 1 2 0 0.60 25.0 0.08 0.38 0.19 0.17
 5 2 2 0 1.22 25.0 0.11 0.78 0.38 0.34
 5 3 2 0 1.84 25.1 0.14 1.21 0.63 0.55
 5 4 2 0 2.41 25.0 0.12 1.67 0.32 0.72
 6 1 1 0 0.60 15.1 0.13 0.31 0.20 0.17
 6 2 1 0 1.23 15.1 0.17 0.60 0.38 0.34
 6 3 1 0 1.79 15.1 0.18 0.97 0.57 0.48
 6 4 1 0 2.37 15.1 0.16 1.38 0.76 0.66
 6 1 2 0 0.56 25.0 0.08 0.29 0.18 0.15
 6 2 2 0 1.23 25.0 0.12 0.63 0.37 0.31
 6 3 2 0 1.80 25.0 0.10 0.96 0.55 0.48
 6 4 2 0 2.44 25.0 0.11 1.36 0.74 0.65
 6 1 3 0 0.63 35.1 0.08 0.29 0.18 0.14

6	2	3	0	1.22	35.2	0.12	0.57	0.37	0.28
6	3	3	0	1.82	35.0	0.12	0.87	0.53	0.41
6	4	3	0	2.43	35.1	0.13	1.19	0.72	0.57
"Dynatest FWD"									
1	2	0	425	72	66	58	50	39	0
1	4	0	916	153	140	128	108	88	0
2	2	0	421	65	57	52	41	34	0
2	4	0	920	139	123	110	93	76	0
3	2	0	419	73	63	55	43	34	0
3	4	0	914	156	137	116	91	72	0
4	2	0	419	64	59	51	43	35	0
4	4	0	913	133	121	108	90	74	0
5	2	0	422	61	55	50	40	32	0
5	4	0	917	133	120	107	90	72	0
6	1	0	210	29	26	23	19	15	0
6	2	0	417	60	54	49	40	32	0
6	3	0	657	93	85	76	64	51	0
6	4	0	917	130	117	108	89	72	0
"08-11-86" 1 1 1 1 1040 1120 102 92 88 75 72									
"Dynalect"									
1	0	1.0	8	0.32	0.31	0.28	0.22	0.17	
2	0	1.0	8	0.27	0.25	0.23	0.18	0.13	
3	0	1.0	8	0.36	0.33	0.29	0.23	0.17	
4	0	1.0	8	0.30	0.29	0.26	0.21	0.16	
5	0	1.0	8	0.22	0.21	0.18	0.14	0.10	
6	0	1.0	8	0.23	0.21	0.19	0.15	0.11	
"Road Rater 400"									
1	1	2	0	0.58	24.6	0.23	0.18	0.21	0.16
1	2	2	0	1.18	24.6	0.53	0.41	0.48	0.41
1	3	2	0	1.76	24.6	1.00	1.23	0.76	0.79
2	1	2	0	0.58	24.6	0.18	0.15	0.13	0.11
2	2	2	0	1.16	24.6	0.45	0.38	0.32	0.32
2	3	2	0	1.76	24.6	0.79	0.54	0.37	0.61
3	1	2	0	0.55	24.5	0.21	0.21	0.15	0.13
3	2	2	0	1.23	25.1	0.52	0.50	0.42	0.34
3	3	2	0	1.80	25.1	0.85	0.81	0.73	0.58
4	1	2	0	0.61	25.1	0.22	0.20	0.19	0.15
4	2	2	0	1.22	25.1	0.53	0.62	0.49	0.41
4	3	2	0	1.83	25.1	0.84	0.80	0.78	0.64
5	1	2	0	0.59	25.0	0.16	0.14	0.13	0.10
5	2	2	0	1.25	25.1	0.40	0.38	0.34	0.28
5	3	2	0	1.83	25.1	0.65	0.63	0.57	0.47
6	1	1	0	0.58	14.9	0.15	0.14	0.13	0.09
6	2	1	0	1.14	14.9	0.33	0.30	0.29	0.21
6	1	2	0	0.60	25.0	0.16	0.14	0.13	0.10
6	2	2	0	1.22	25.1	0.41	0.39	0.35	0.28
6	3	2	0	1.85	25.1	0.68	0.64	0.59	0.48
6	1	3	0	0.59	35.1	0.18	0.15	0.13	0.10
6	2	3	0	1.22	35.1	0.49	0.46	0.41	0.34
6	3	3	0	1.78	35.1	0.91	0.81	0.73	0.61
"Road Rater 2000"									
1	1	2	0	0.60	25.1	0.35	0.21	0.16	0.16
1	2	2	0	1.24	25.1	0.75	0.43	0.33	0.31
1	3	2	0	1.81	25.1	1.11	0.66	0.56	0.47
1	4	2	0	2.42	25.1	1.47	0.88	0.75	0.65
1	5	2	0	3.62	25.1	2.31	1.36	1.18	1.00
2	1	2	0	0.64	25.1	0.26	0.20	0.18	0.15
2	2	2	0	1.20	25.1	0.50	0.39	0.35	0.29
2	3	2	0	1.81	25.1	0.78	0.62	0.56	0.46
2	4	2	0	2.41	25.1	1.07	0.85	0.77	0.65
2	5	2	0	3.56	25.1	1.68	1.34	1.22	1.01
3	1	2	0	0.58	25.1	0.21	0.18	0.14	0.14
3	2	2	0	1.20	25.1	0.44	0.38	0.27	0.27
3	3	2	0	1.78	25.1	0.67	0.56	0.44	0.41
3	4	2	0	2.39	25.1	0.94	0.76	0.64	0.57
3	5	2	0	3.56	25.1	1.46	1.20	1.05	0.91
4	1	2	0	0.61	25.1	0.34	0.21	0.12	0.17
4	2	2	0	1.21	25.1	0.67	0.42	0.25	0.33
4	3	2	0	1.82	25.1	1.03	0.63	0.44	0.50
4	4	2	0	2.40	25.1	1.38	0.84	0.66	0.66

4	5	2	0	3.62	25.1	2.16	1.29	1.13	1.02
5	1	2	0	0.58	25.1	0.37	0.16	0.14	0.14
5	2	2	0	1.20	25.1	0.81	0.33	0.25	0.22
5	3	2	0	1.82	25.1	1.25	0.50	0.40	0.34
5	4	2	0	2.42	25.1	1.71	0.67	0.53	0.45
5	5	2	0	3.64	25.1	2.55	1.03	0.88	0.71
6	1	1	0	0.60	15.1	0.23	0.16	0.15	0.13
6	2	1	0	1.21	15.1	0.41	0.32	0.27	0.23
6	3	1	0	1.83	15.1	0.56	0.49	0.47	0.35
6	4	1	0	2.37	15.0	0.86	0.70	0.62	0.49
6	5	1	0	3.56	15.1	1.84	1.22	1.11	0.92
6	1	2	0	0.58	25.1	0.24	0.18	0.16	0.14
6	2	2	0	1.18	25.0	0.50	0.37	0.33	0.27
6	3	2	0	1.80	25.0	0.80	0.56	0.50	0.41
6	4	2	0	2.42	25.0	1.12	0.78	0.69	0.56
6	5	2	0	3.61	25.0	1.72	1.19	1.08	0.87
6	1	3	0	0.61	35.1	0.28	0.19	0.16	0.16
6	2	3	0	1.24	35.1	0.55	0.39	0.34	0.28
6	3	3	0	1.82	35.1	0.82	0.57	0.51	0.42
6	4	3	0	2.43	35.1	1.13	0.78	0.70	0.57
6	5	3	0	3.63	35.1	1.77	1.22	1.09	0.91

"Dynatest FWD"

1	2	0	396	70	64	58	50	39	30	21
1	4	0	844	154	134	120	101	79	64	35
2	2	0	395	63	50	46	38	30	0	0
2	4	0	840	139	109	101	83	68	0	0
3	2	0	403	74	60	50	44	33	26	17
3	4	0	839	163	128	109	88	68	55	27
4	2	0	395	67	54	49	42	34	0	0
4	4	0	838	140	112	101	83	71	0	0
5	2	0	401	57	43	37	30	24	20	07
5	4	0	835	122	92	81	67	53	41	29
6	1	0	0	0	0	0	0	0	0	0
6	2	0	401	62	44	18	32	11	0	0
6	3	0	609	94	70	28	49	17	0	0
6	4	0	835	127	96	41	67	24	0	0

"S4" 53 "SR" 37 10500 11.0 1155 "S"

"F. 6.4m. n. of Lawrence/Monroe CL to SR45" 4.81

"F. Rockport Rd. (2.2m. s. of SR45) southerly (SB)" 0.25

7 8783 73 13 0.0 0.00 0.0 8.1 4.0 "BS"

"A-7-6" 20 "CH" 88.3 20.8 3 58.0 21.3 36.2 2.54

70 4.5 0

2

"03-26-86" 1 1 0 1 0915 0945 66 0 0 64 37

"Dynalect"

1	0	1.0	8	0.47	0.39	0.34	0.29	0.20
2	0	1.0	8	0.59	0.50	0.43	0.38	0.27
3	0	1.0	8	0.61	0.51	0.45	0.39	0.30
4	0	1.0	8	0.70	0.60	0.54	0.47	0.35
5	0	1.0	8	0.51	0.42	0.38	0.33	0.25
6	0	1.0	8	0.58	0.49	0.42	0.35	0.29

"Road Rater 400"

1	1	2	0	0.60	25.0	0.42	0.44	0.34	0.50
1	2	2	0	1.22	25.0	0.91	0.88	0.77	1.57
1	3	2	0	1.83	25.0	1.75	1.64	1.54	3.03
2	1	2	0	0.62	25.0	0.35	0.44	0.23	0.74
2	2	2	0	1.23	25.0	0.74	0.67	0.58	2.49
2	3	2	0	1.82	25.0	1.43	1.32	1.14	9.88
3	1	2	0	0.60	25.0	0.35	0.32	1.50	1.79
3	2	2	0	1.23	25.1	0.72	0.70	1.72	2.49
3	3	2	0	1.83	25.1	1.43	1.38	1.18	2.73
4	1	2	0	0.59	25.0	0.35	0.49	1.15	1.21
4	2	2	0	1.22	25.0	0.75	0.81	0.61	2.27
4	3	2	0	1.82	25.0	1.43	1.07	1.21	2.32
5	1	2	0	0.58	25.0	0.25	0.23	0.18	0.15
5	2	2	0	1.24	25.0	0.54	1.21	0.34	1.80

5	3	2	0	1.78	25.0	1.00	0.94	0.83	6.60
6	1	1	0	0.61	14.9	0.29	0.23	0.21	0.90
6	2	1	0	1.21	14.9	0.68	0.70	0.53	0.51
6	1	2	0	0.59	25.0	0.28	0.23	0.22	1.20
6	2	2	0	1.23	25.1	0.62	0.57	0.50	1.97
6	3	2	0	1.84	25.1	1.19	1.12	0.99	6.53
6	1	3	0	0.59	35.1	0.19	0.16	0.13	0.23
6	2	3	0	1.19	35.1	0.43	0.40	0.33	0.45
6	3	3	0	1.84	35.1	1.16	0.83	1.37	1.87
"Dynatest FWD"									
1	2	0	446	85	80	68	55	45	0
1	4	0	940	183	172	148	123	98	0
2	2	0	436	93	87	75	65	49	0
2	4	0	931	201	188	163	134	107	0
3	2	0	434	91	86	75	63	49	0
3	4	0	954	201	188	162	136	107	0
4	2	0	0	0	0	0	0	0	0
4	4	0	0	0	0	0	0	0	0
5	2	0	0	0	0	0	0	0	0
5	4	0	0	0	0	0	0	0	0
6	1	0	0	0	0	0	0	0	0
6	2	0	0	0	0	0	0	0	0
6	3	0	0	0	0	0	0	0	0
6	4	0	0	0	0	0	0	0	0
"08-12-86" 1 1 1 1 0830 0900 73 74 76 69 71									
"Dynalect"									
1	0	1.0	8	0.41	0.38	0.33	0.27	0.21	
2	0	1.0	8	0.50	0.45	0.40	0.33	0.26	
3	0	1.0	8	0.50	0.46	0.41	0.34	0.27	
4	0	1.0	8	0.58	0.54	0.48	0.41	0.34	
5	0	1.0	8	0.45	0.42	0.37	0.31	0.25	
6	0	1.0	8	0.51	0.48	0.41	0.34	0.27	
"Road Rater 400"									
1	1	2	0	0.60	24.8	0.48	0.45	0.42	0.36
1	2	2	0	1.23	24.8	1.03	1.00	0.94	0.85
1	3	2	0	1.80	24.8	2.38	3.25	2.06	3.53
2	1	2	0	0.61	25.1	1.27	0.35	0.32	0.25
2	2	2	0	1.19	24.8	1.26	0.71	0.65	0.53
2	3	2	0	1.80	24.9	1.46	1.54	1.27	1.04
3	1	2	0	0.61	25.1	0.37	0.64	0.29	1.80
3	2	2	0	1.25	25.2	0.79	0.94	0.66	1.54
3	3	2	0	1.83	25.2	1.45	1.56	1.23	2.78
4	1	2	0	0.58	24.2	0.36	1.12	1.59	1.27
4	2	2	0	1.20	24.9	0.85	0.71	1.68	0.61
4	3	2	0	1.79	24.9	1.31	2.08	3.62	0.98
5	1	2	0	0.59	24.9	0.29	0.62	0.22	3.12
5	2	2	0	1.22	24.9	0.69	0.64	0.57	1.38
5	3	2	0	1.81	24.9	1.12	1.08	0.96	2.41
6	1	1	0	0.59	15.0	0.32	0.28	0.25	0.49
6	2	1	0	1.23	15.1	0.82	0.75	0.67	1.79
6	1	2	0	0.61	25.0	0.37	0.33	0.30	0.32
6	2	2	0	1.23	25.1	0.75	0.73	0.64	0.54
6	3	2	0	1.83	25.1	1.28	1.26	1.15	0.99
6	1	3	0	0.58	35.0	0.30	0.29	0.16	0.18
6	2	3	0	1.18	35.0	0.82	1.46	0.42	0.49
6	3	3	0	1.78	35.1	1.38	3.08	1.18	0.81
"Road Rater 2000"									
1	1	2	0	0.59	25.0	0.55	0.47	0.43	0.38
1	2	2	0	1.17	25.0	1.09	0.96	0.87	0.75
1	3	2	0	1.77	25.0	1.69	1.44	1.35	1.17
1	4	2	0	2.38	25.0	2.29	1.98	1.83	1.58
1	5	2	0	3.61	25.0	3.51	3.03	2.79	2.43
2	1	2	0	0.60	25.0	0.47	0.33	0.29	0.24
2	2	2	0	1.18	25.0	0.96	0.66	0.59	0.47
2	3	2	0	1.79	25.0	1.46	1.01	0.89	0.71
2	4	2	0	2.36	25.0	2.01	1.37	1.23	0.98
2	5	2	0	3.59	25.0	3.22	2.14	1.89	1.51
3	1	2	0	0.61	25.0	0.40	0.33	0.29	0.24
3	2	2	0	1.19	25.0	0.82	0.67	0.60	0.49
3	3	2	0	1.79	25.0	1.26	1.02	0.91	0.75

3	4	2	0	2.40	25.0	1.69	1.37	1.22	1.01
3	5	2	0	3.58	25.0	2.63	2.09	1.87	1.53
4	1	2	0	0.61	25.0	0.43	0.36	0.33	0.28
4	2	2	0	1.20	25.0	0.90	0.75	0.67	0.54
4	3	2	0	1.81	25.0	1.35	1.14	1.03	0.84
4	4	2	0	2.41	25.0	1.83	1.53	1.37	1.11
4	5	2	0	3.61	25.0	2.83	2.36	2.12	1.73
5	1	2	0	0.60	25.0	0.32	0.24	0.21	0.17
5	2	2	0	1.21	25.0	0.67	0.52	0.45	0.35
5	3	2	0	1.81	25.0	1.04	0.77	0.67	0.53
5	4	2	0	2.42	25.0	1.44	1.06	0.93	0.74
5	5	2	0	3.59	25.0	2.20	1.57	1.38	1.08
6	1	1	0	0.61	15.1	0.44	0.36	0.30	0.26
6	2	1	0	1.23	15.1	0.88	0.71	0.65	0.53
6	3	1	0	1.84	15.1	1.41	1.09	1.00	0.79
6	4	1	0	2.39	15.1	1.90	1.51	1.33	1.08
6	5	1	0	3.58	15.1	3.04	2.26	2.04	1.75
6	1	2	0	0.60	25.1	0.40	0.31	0.25	0.23
6	2	2	0	1.21	25.1	0.86	0.63	0.58	0.48
6	3	2	0	1.79	25.1	1.29	1.01	0.87	0.73
6	4	2	0	2.39	25.1	1.75	1.36	1.22	0.99
6	5	2	0	3.58	25.1	2.74	2.09	1.86	1.52
6	1	3	0	0.62	35.2	0.33	0.24	0.21	0.17
6	2	3	0	1.21	35.0	0.71	0.48	0.41	0.32
6	3	3	0	1.84	35.0	1.09	0.74	0.63	0.50
6	4	3	0	2.41	34.9	1.45	0.99	0.84	0.66
6	5	3	0	3.61	35.0	2.23	1.50	1.30	1.02

"Dynatest FWD"

1	2	0	413	93	89	76	65	45	43	24
1	4	0	875	192	181	156	132	106	87	50
2	2	0	408	99	94	80	67	54	0	0
2	4	0	874	207	193	167	138	111	0	0
3	2	0	407	99	91	79	66	55	43	27
3	4	0	866	205	189	165	143	113	37	32
4	2	0	403	106	99	87	74	59	0	0
4	4	0	861	222	207	182	152	125	0	0
5	2	0	400	85	81	70	59	49	39	22
5	4	0	856	181	170	147	125	104	79	46
6	1	0	0	0	0	0	0	0	0	0
6	2	0	403	92	90	78	64	51	0	0
6	3	0	622	144	137	119	99	81	0	0
6	4	0	957	196	186	163	135	108	0	0

"S17" 49 "SR" 37 20600 11.0 2266 "S"
 "F. Johnson/Marion CL northerly" 4.06
 "F. Santa Rd. (2.0m. s. of 1465) southerly (SB)" 0.25
 7 3815 73 13 0.0 0.00 0.0 8.0 10.0 "G"
 "A-2-6" 1 "SC" 121.1 12.0 15 32.9 12.7 20.2 2.71
 69 4.5 0

2
 "10-30-86" 1 1 0 0 1155 1205 43 47 32 53 55

"Dynaflect"

1	0	1.0	8	0.33	0.29	0.25	0.19	0.14
2	0	1.0	8	0.32	0.28	0.24	0.19	0.14
3	0	1.0	8	0.41	0.32	0.28	0.19	0.14
4	0	1.0	8	0.40	0.37	0.29	0.21	0.15
5	0	1.0	8	0.30	0.27	0.23	0.18	0.12
6	0	1.0	8	0.27	0.24	0.20	0.16	0.12

"Road Rater 400"

1	1	2	0	0.61	25.2	0.24	0.22	0.18	1.30
1	2	2	0	1.23	25.2	0.57	0.54	0.46	0.79
1	3	2	0	1.83	25.3	1.12	0.87	0.75	2.98
2	1	2	0	0.60	25.2	0.22	0.20	0.17	0.13
2	2	2	0	1.22	25.3	0.55	0.51	0.45	0.36
2	3	2	0	1.84	25.3	0.90	0.86	0.75	0.61
3	1	2	0	0.61	25.2	0.32	0.24	0.19	0.80
3	2	2	0	1.22	25.3	0.70	0.55	0.44	1.09

3	3	2	0	1.84	25.3	1.12	0.92	0.74	3.09					
4	1	2	0	0.61	25.2	0.33	0.27	0.22	1.63					
4	2	2	0	1.22	25.3	0.82	0.76	0.65	1.87					
4	3	2	0	1.85	25.3	1.20	1.09	0.91	1.51					
5	1	2	0	0.60	25.2	0.24	0.19	0.16	0.11					
5	2	2	0	1.23	25.3	0.54	0.48	0.40	0.31					
5	3	2	0	1.84	25.3	0.86	0.78	1.47	0.53					
6	1	1	0	0.63	15.1	0.21	0.18	0.16	0.11					
6	2	1	0	1.22	15.2	0.44	0.39	0.32	0.25					
6	1	2	0	0.61	25.2	0.24	0.19	0.16	0.12					
6	2	2	0	1.29	25.3	0.52	0.48	0.41	0.32					
6	3	2	0	1.86	25.3	0.92	0.74	0.62	0.48					
6	1	3	0	0.60	35.3	0.19	0.15	0.12	0.08					
6	2	3	0	1.20	35.2	0.41	0.37	0.31	0.24					
6	3	3	0	1.80	35.3	0.89	0.81	0.69	0.54					
"11-18-86"				0	0	0	1	0858	0925	30	35	37	45	32
"Dynatest FWD"														
1	2	0	409	67	57	50	36	28	22	13				
1	4	0	923	144	127	107	82	64	50	31				
2	2	0	398	66	57	49	37	28	0	0				
2	4	0	917	141	125	104	81	63	0	0				
3	2	0	400	96	95	71	52	36	24	11				
3	4	0	909	202	201	149	109	76	53	31				
4	2	0	398	101	85	70	47	30	0	0				
4	4	0	904	218	186	153	104	67	0	0				
5	2	0	404	68	63	53	43	33	25	14				
5	4	0	906	144	132	110	91	71	54	33				
6	1	0	0	0	0	0	0	0	0	0				
6	2	0	403	60	54	44	35	27	0	0				
6	3	0	639	95	85	73	57	45	0	0				
6	4	0	902	127	115	97	77	61	0	0				

JRC Pavement

"C3" 61 "US" 41 3040 12.0 365 "S"
 "F. SR163 to s. Rockville C/L" 9.97
 "F. CR150W (8.9m. n. of SR163) northerly (SB)" 0.25
 2 15106 85 1 1.9 0.14 5.3 6.8 0.0 "N"
 "A-4" 7 "CL" 91.1 28.0 9 29.0 19.2 9.8 2.66
 88 3.2 0

"03-31-86" 1 1 1 1 1210 1240 101 0 0 75 60
 "Dynalect"

1	2	1.0	8	1.22	1.06	0.92	0.71	0.56
2	2	1.0	8	1.07	0.94	0.83	0.67	0.55
3	2	1.0	8	1.07	0.93	0.85	0.68	0.57
4	2	1.0	8	1.02	0.90	0.80	0.61	0.48
5	2	1.0	8	1.05	0.90	0.78	0.61	0.50
6	2	1.0	8	1.30	1.12	0.97	0.76	0.61

"Road Rater 400"

1	1	2	2	0.61	25.1	0.68	0.47	0.40	0.24
1	2	2	2	1.23	25.1	1.51	1.06	0.89	0.46
1	3	2	2	1.85	25.1	3.23	2.91	1.93	1.43
2	1	2	2	0.61	25.1	0.53	0.36	0.42	0.21
2	2	2	2	1.24	25.1	1.23	0.94	1.69	0.30
2	3	2	2	1.85	25.1	2.40	2.37	0.97	2.36
3	1	2	2	0.60	25.1	0.56	0.36	1.16	0.40
3	2	2	2	1.22	25.1	1.31	1.29	2.10	0.72
3	3	2	2	1.84	25.2	2.85	2.84	1.66	1.33
4	1	2	2	0.61	25.1	0.47	0.38	0.34	0.17
4	2	2	2	1.24	25.1	1.11	0.85	0.78	0.36
4	3	2	2	1.85	25.2	2.22	2.71	1.51	1.10
5	1	2	2	0.61	25.1	0.45	0.25	1.30	0.26
5	2	2	2	1.23	25.1	0.99	1.90	0.66	0.60
5	3	2	2	1.85	25.1	1.96	2.35	2.04	1.18
6	1	1	2	0.60	15.0	0.68	0.42	0.36	0.37
6	2	1	2	1.23	15.1	1.55	1.12	0.52	0.86
6	1	2	2	0.61	25.1	0.48	0.73	1.04	0.24
6	2	2	2	1.23	25.1	1.11	1.59	0.76	0.55
6	3	2	2	1.85	25.2	2.25	2.54	1.46	1.11
6	1	3	2	0.58	35.1	0.39	0.22	0.22	0.39
6	2	3	2	1.21	35.2	0.91	0.48	0.54	0.84
6	3	3	2	1.88	35.2	2.59	4.62	11.96	8.28

"Road Rater 2000"

1	1	2	2	0.61	25.1	0.66	0.46	0.39	0.29
1	2	2	2	1.23	25.1	1.47	1.02	0.81	0.61
1	3	2	2	1.79	25.1	2.28	1.56	1.23	0.93
1	4	2	2	2.37	25.1	3.14	2.13	1.70	1.26
1	5	2	2	3.57	25.1	5.23	3.50	2.85	2.02
2	1	2	2	0.61	25.1	0.55	0.43	0.30	0.32
2	2	2	2	1.21	25.1	1.14	0.86	0.57	0.63
2	3	2	2	1.82	25.1	1.85	1.32	0.98	0.96
2	4	2	2	2.42	25.2	2.58	1.82	1.40	1.31
2	5	2	2	3.57	25.0	4.21	2.87	2.46	2.06
3	1	2	2	0.60	25.0	0.55	0.41	0.37	0.30
3	2	2	2	1.21	25.0	1.16	0.91	0.79	0.66
3	3	2	2	1.77	25.0	1.84	1.37	1.19	0.99
3	4	2	2	2.43	25.0	2.57	1.89	1.62	1.34
3	5	2	2	3.61	25.0	4.09	2.95	2.51	2.09
4	1	2	2	0.60	25.0	0.48	0.40	0.34	0.26
4	2	2	2	1.22	25.0	0.99	0.84	0.72	0.58
4	3	2	2	1.81	25.0	1.48	1.29	1.09	0.85
4	4	2	2	2.41	25.0	2.07	1.75	1.49	1.15
4	5	2	2	3.61	25.0	3.32	2.79	2.37	1.81
5	1	2	2	0.63	25.0	0.43	0.35	0.28	0.24
5	2	2	2	1.21	25.0	0.87	0.71	0.59	0.49
5	3	2	2	1.81	25.0	1.35	1.11	0.95	0.78
5	4	2	2	2.41	25.0	1.84	1.51	1.26	1.05
5	5	2	2	3.58	25.0	2.89	2.35	2.03	1.62
6	1	1	2	0.58	14.8	0.84	0.67	0.57	0.50
6	2	1	2	1.21	14.9	1.69	1.42	1.23	1.03
6	3	1	2	1.82	14.9	2.91	2.24	1.87	1.53
6	4	1	2	2.41	15.0	3.98	3.04	2.61	2.06
6	5	1	2	3.56	15.0	6.71	4.90	4.10	3.20

6	1	2	2	0.63	25.1	0.63	0.45	0.37	0.31
6	2	2	2	1.23	25.2	1.33	0.95	0.76	0.59
6	3	2	2	1.78	25.0	2.06	1.44	1.15	0.91
6	4	2	2	2.39	25.0	2.86	1.99	1.56	1.23
6	5	2	2	3.62	25.0	4.92	3.23	2.46	1.90
6	1	3	2	0.64	35.1	0.57	0.36	0.27	0.21
6	2	3	2	1.23	35.1	1.16	0.73	0.55	0.40
6	3	3	2	1.82	35.1	1.84	1.15	0.86	0.63
6	4	3	2	2.42	35.1	2.59	1.61	1.19	0.87
6	5	3	2	3.63	35.1	4.34	2.63	1.87	1.33
"Dynatest FWD"									
1	2	2	407	298	208	168	139	107	0
1	4	2	887	597	443	354	296	241	0
2	2	2	414	255	183	150	122	99	0
2	4	2	883	517	386	302	260	206	0
3	2	2	411	258	176	144	124	102	0
3	4	2	882	519	369	305	261	224	0
4	2	2	408	198	157	128	104	85	0
4	4	2	883	418	335	273	228	183	0
5	2	2	406	197	143	124	96	82	0
5	4	2	882	419	323	263	220	177	0
6	1	2	195	115	79	68	46	42	0
6	2	2	406	259	197	150	119	95	0
6	3	2	628	389	300	232	184	147	0
6	4	2	980	536	416	317	254	204	0
"08-13-86"									
1	1	1	1	1	1250	1320	106	109	0
"Dynalect"									
1	2	1.0	8	0.82	0.72	0.62	0.52	0.41	
2	2	1.0	8	0.81	0.72	0.62	0.53	0.42	
3	2	1.0	8	0.76	0.69	0.59	0.52	0.43	
4	2	1.0	8	0.72	0.66	0.56	0.47	0.36	
5	2	1.0	8	0.76	0.68	0.57	0.49	0.39	
6	2	1.0	8	0.93	0.83	0.68	0.60	0.48	
"Road Rater 400"									
1	1	2	2	0.60	24.9	0.65	0.58	0.40	0.44
1	2	2	2	1.23	25.0	1.47	1.38	0.75	1.01
1	3	2	2	1.83	25.0	2.33	2.39	1.38	1.56
2	1	2	2	0.60	24.9	0.54	0.46	0.42	0.35
2	2	2	2	1.20	25.0	1.19	1.02	0.94	0.79
2	3	2	2	1.80	25.0	1.81	1.58	1.44	1.23
3	1	2	2	0.60	25.0	0.57	0.44	0.41	0.34
3	2	2	2	1.24	24.9	1.40	1.02	1.00	0.84
3	3	2	2	1.81	25.0	2.15	1.80	1.49	1.24
4	1	2	2	0.59	24.9	0.54	0.46	0.40	0.32
4	2	2	2	1.20	25.0	1.26	1.10	0.94	0.78
4	3	2	2	1.81	25.0	1.93	1.71	1.44	1.20
5	1	2	2	0.60	24.9	0.49	0.44	0.39	0.33
5	2	2	2	1.21	24.9	1.15	1.03	0.93	0.79
5	3	2	2	1.85	25.0	1.82	1.61	1.44	1.23
6	1	1	2	0.58	14.9	0.67	0.60	0.54	0.45
6	2	1	2	1.21	15.0	1.43	1.30	1.18	1.00
6	1	2	2	0.61	25.0	0.53	0.46	0.42	0.35
6	3	2	2	1.80	25.0	1.95	1.68	1.48	1.26
6	1	3	2	0.60	35.1	0.42	0.34	0.29	0.23
6	2	3	2	1.16	34.8	1.09	0.90	0.75	0.60
6	3	3	2	1.75	34.9	1.82	1.52	1.26	1.02
"Road Rater 2000"									
1	1	2	2	0.59	24.9	0.76	0.54	0.51	0.35
1	2	2	2	1.19	24.9	1.61	1.11	1.05	0.72
1	3	2	2	1.80	24.9	2.59	1.75	1.62	1.13
1	4	2	2	2.41	24.9	3.69	2.42	2.16	1.54
1	5	2	2	3.59	24.9	6.07	3.79	3.26	2.37
2	1	2	2	0.60	24.9	0.61	0.47	0.43	0.36
2	2	2	2	1.19	24.9	1.21	0.94	0.85	0.70
2	3	2	2	1.77	24.9	1.86	1.44	1.28	1.07
2	4	2	2	2.41	24.9	2.58	1.98	1.77	1.46
2	5	2	2	3.60	24.9	4.02	3.05	2.73	2.26
3	1	2	2	0.59	24.9	0.57	0.41	0.38	0.31
3	2	2	2	1.19	24.9	1.16	0.84	0.76	0.62
3	3	2	2	1.81	24.9	1.86	1.35	1.19	0.98

3	4	2	2	2.42	24.9	2.57	1.33	1.63	1.32
3	5	2	2	3.59	24.9	4.06	2.85	2.49	2.02
4	1	2	2	0.60	24.9	0.57	0.33	0.34	0.23
4	2	2	2	1.22	25.0	1.24	0.81	0.72	0.59
4	3	2	2	1.79	24.9	1.83	1.23	1.08	0.87
4	4	2	2	2.40	24.9	2.63	1.66	1.48	1.21
4	5	2	2	3.60	24.9	4.29	2.59	2.27	1.85
5	1	2	2	0.58	24.9	0.55	0.38	0.34	0.23
5	2	2	2	1.17	24.9	1.20	0.82	0.72	0.57
5	3	2	2	1.79	25.0	1.92	1.30	1.12	0.93
5	4	2	2	2.42	24.9	2.73	1.81	1.56	1.27
5	5	2	2	3.59	25.0	4.36	2.77	2.42	1.96
6	1	1	2	0.60	15.0	0.82	0.63	0.56	0.46
6	2	1	2	1.17	15.0	1.78	1.28	1.14	0.97
6	3	1	2	1.82	15.0	2.68	2.03	1.79	1.42
6	4	1	2	2.37	15.0	3.79	2.83	2.47	2.00
6	5	1	2	3.63	15.0	5.89	4.58	3.83	3.02
6	1	2	2	0.58	25.0	0.57	0.43	0.39	0.31
6	2	2	2	1.21	25.0	1.28	0.94	0.80	0.63
6	3	2	2	1.81	25.0	2.01	1.48	1.25	1.01
6	4	2	2	2.43	25.0	2.77	2.03	1.73	1.37
6	5	2	2	3.57	25.0	4.37	3.13	2.66	2.08
6	1	3	2	0.64	35.0	0.54	0.34	0.29	0.21
6	2	3	2	1.22	35.1	1.05	0.69	0.57	0.42
6	3	3	2	1.82	35.1	1.56	1.06	0.86	0.64
6	4	3	2	2.41	35.0	2.14	1.46	1.17	0.87
6	5	3	2	3.62	35.0	3.60	2.31	1.84	1.33

"Dynatest FWD"

1	2	2	388	273	181	153	121	100	81	46
1	4	2	838	541	379	313	263	214	173	96
2	2	2	387	236	158	133	111	88	0	0
2	4	2	836	465	334	275	224	186	0	0
3	2	2	386	234	157	131	108	90	75	48
3	4	2	834	464	326	268	226	190	160	96
4	2	2	384	207	143	121	97	81	0	0
4	4	2	832	415	298	250	204	168	0	0
5	2	2	386	230	149	124	100	81	67	39
5	4	2	825	445	311	255	213	172	141	84
6	1	2	0	0	0	0	0	0	0	0
6	2	2	383	249	178	141	113	89	0	0
6	3	2	597	375	275	217	173	139	0	0
6	4	2	824	504	372	292	232	190	0	0

"C4" 63 "SR" 63 7580 12.0 910 "S"
 "F. 1.9m. n. of US36 northerly" 2.43
 "F. CR300S (3.2m. n. of US36) northerly (NB)" 0.25
 2 11629 79 7 3.7 0.31 0.0 8.2 7.5 "S"
 "A-7-6" 20 "CH" 97.8 25.2 3 61.1 20.4 40.7 2.71
 41 2.8 0

2
 "03-31-86" 1 1 1 1 0940 1010 68 0 0 60 55

"Dynalect"

1	2	1.0	8	0.80	0.74	0.66	0.60	0.48
2	2	1.0	8	1.14	1.07	0.99	0.93	0.77
3	2	1.0	8	1.17	1.08	0.98	0.90	0.74
4	2	1.0	8	1.03	0.96	0.88	0.81	0.66
5	2	1.0	8	0.87	0.82	0.76	0.71	0.57
6	1	1.0	8	1.58	1.30	1.07	0.91	0.70
7	2	1.0	8	0.98	0.91	0.84	0.78	0.64

"Road Rater 400"

1	1	2	2	0.60	24.9	0.50	0.48	0.40	0.41
1	2	2	2	1.23	25.0	1.11	1.05	2.14	0.74
1	3	2	2	1.82	25.0	1.95	1.91	1.88	1.65
2	1	2	2	0.59	24.9	0.61	0.64	1.22	0.31
2	2	2	2	1.22	24.9	1.39	1.62	1.12	1.22
2	3	2	2	1.87	25.0	2.74	2.70	2.68	2.45
3	1	2	2	0.60	24.9	0.55	0.56	0.52	0.35

3	2	2	2	1.20	24.9	1.23	1.22	1.19	0.38
3	3	2	2	1.82	25.0	2.32	2.62	1.90	2.11
4	1	2	2	0.58	24.9	0.51	0.48	0.51	0.36
4	2	2	2	1.22	25.0	1.14	1.08	1.03	0.95
4	3	2	2	1.86	25.0	2.24	2.27	2.30	2.72
5	1	2	2	0.60	24.9	0.46	0.43	0.45	0.40
5	2	2	2	1.23	25.0	1.00	0.77	0.96	0.35
5	3	2	2	1.84	25.0	1.90	2.70	1.82	2.71
6	1	2	1	0.59	24.9	1.06	0.80	1.04	0.26
6	2	2	1	1.22	24.9	2.43	2.05	1.74	1.75
6	3	2	1	1.82	25.0	4.90	4.28	2.31	2.69
7	1	1	2	0.61	15.0	0.59	0.50	0.27	0.50
7	2	1	2	1.21	15.1	1.38	1.18	0.43	1.04
7	1	2	2	0.60	25.1	0.56	0.52	0.17	0.34
7	2	2	2	1.24	25.1	1.31	1.13	1.66	0.84
7	3	2	2	1.84	25.1	2.46	2.92	2.71	3.12
7	1	3	2	0.58	35.0	0.34	0.32	0.21	0.25
7	2	3	2	1.18	34.9	0.78	0.74	0.41	0.60
7	3	3	2	1.85	35.0	2.42	2.37	2.19	2.48
"Road Rater 2000"									
1	1	2	2	0.60	25.0	0.52	0.48	0.48	0.42
1	2	2	2	1.24	25.1	1.13	1.05	1.00	0.92
1	3	2	2	1.81	25.1	1.72	1.56	1.48	1.40
1	4	2	2	2.38	25.1	2.30	2.11	1.97	1.87
1	5	2	2	3.63	25.1	3.53	3.22	3.00	2.85
2	1	2	2	0.58	25.1	0.63	0.56	0.51	0.46
2	2	2	2	1.22	25.1	1.36	1.25	1.20	1.11
2	3	2	2	1.81	25.1	2.14	1.93	1.83	1.67
2	4	2	2	2.41	25.1	2.93	2.66	2.52	2.31
2	5	2	2	3.61	25.1	4.53	4.11	3.93	3.56
3	1	2	2	0.59	25.2	0.66	0.62	0.54	0.52
3	2	2	2	1.22	25.2	1.41	1.34	1.25	1.14
3	3	2	2	1.82	25.0	2.21	2.08	1.92	1.74
3	4	2	2	2.42	24.9	2.99	2.82	2.63	2.38
3	5	2	2	3.57	25.0	4.62	4.38	4.08	3.71
4	1	2	2	0.60	24.9	0.81	0.70	0.62	0.52
4	2	2	2	1.20	24.9	1.74	1.50	1.36	1.14
4	3	2	2	1.82	24.9	2.72	2.36	2.12	1.84
4	4	2	2	2.43	24.9	3.74	3.30	2.97	2.56
4	5	2	2	3.61	24.9	5.78	5.09	4.63	4.04
5	1	2	2	0.57	24.9	0.57	0.50	0.49	0.42
5	2	2	2	1.25	24.9	1.29	1.15	1.08	0.99
5	3	2	2	1.79	24.9	1.91	1.72	1.60	1.46
5	4	2	2	2.41	24.9	2.59	2.33	2.17	1.98
5	5	2	2	3.61	24.9	3.95	3.54	3.00	3.03
6	1	1	2	0.62	15.2	0.75	0.64	0.66	0.55
6	2	1	2	1.20	15.0	1.55	1.38	1.36	1.15
6	3	1	2	1.79	14.9	2.46	2.23	2.12	1.80
6	4	1	2	2.43	14.9	3.51	3.17	3.14	2.73
6	5	1	2	3.57	14.9	5.57	5.11	4.93	4.31
6	1	2	2	0.58	25.2	0.58	0.51	0.46	0.43
6	2	2	2	1.20	24.9	1.22	1.11	0.99	0.92
6	3	2	2	1.82	24.9	1.88	1.72	1.54	1.45
6	4	2	2	2.43	25.0	2.54	2.29	2.07	1.92
6	5	2	2	3.61	25.0	3.84	3.45	3.24	2.92
6	1	3	2	0.64	35.1	0.39	0.35	0.31	0.29
6	2	3	2	1.25	35.1	0.79	0.74	0.67	0.61
6	3	3	2	1.82	35.2	1.25	1.12	1.04	0.93
6	4	3	2	2.42	35.1	1.78	1.59	1.46	1.30
6	5	3	2	3.61	35.1	2.95	2.52	2.31	2.09
7	1	2	1	0.58	25.0	0.64	0.59	0.47	0.34
7	2	2	1	1.20	25.0	1.44	1.38	0.95	0.77
7	3	2	1	1.82	25.0	2.30	2.13	1.43	1.21
7	4	2	1	2.40	25.0	3.08	2.88	1.94	1.65
7	5	2	1	3.61	25.0	4.90	4.35	3.17	2.61
"Dynatest FWD"									
1	2	2	442	165	156	145	121	105	0
1	4	2	910	344	318	293	256	218	0
2	2	2	434	236	229	210	193	166	0
2	4	2	918	459	430	398	357	312	0

3	2	2	421	229	216	201	180	154	0	0				
3	4	2	923	447	421	392	346	303	0	0				
4	2	2	428	249	235	214	184	164	0	0				
4	4	2	919	484	458	415	370	315	0	0				
5	2	2	433	174	166	156	138	121	0	0				
5	4	2	910	348	331	311	278	245	0	0				
6	2	1	428	334	275	238	191	162	0	0				
6	4	1	908	635	524	454	370	308	0	0				
7	1	2	219	102	93	86	73	64	0	0				
7	2	2	424	193	181	166	145	123	0	0				
7	3	2	650	288	270	251	218	188	0	0				
7	4	2	918	387	367	332	295	248	0	0				
"08-13-86"			1	1	1	1	1.0	8	1030	86	91	91	74	66
"Dynaflect"														
1	2	1.0	8	0.58	0.50	0.43	0.37	0.30						
2	2	1.0	8	0.67	0.64	0.55	0.49	0.38						
3	2	1.0	8	0.57	0.54	0.47	0.41	0.32						
4	2	1.0	8	0.63	0.59	0.51	0.44	0.35						
5	2	1.0	8	0.51	0.49	0.45	0.39	0.31						
6	1	1.0	8	0.88	0.74	0.59	0.47	0.35						
7	2	1.0	8	0.61	0.59	0.52	0.46	0.36						
"Road Rater 400"														
1	1	2	2	0.60	25.0	0.53	0.22	0.62	0.44					
1	2	2	2	1.22	25.1	1.19	0.81	1.78	1.00					
1	3	2	2	1.82	25.1	1.91	1.90	1.81	1.63					
2	1	2	2	0.59	25.0	0.65	0.63	0.61	0.54					
2	2	2	2	1.19	25.0	1.52	1.50	1.45	1.32					
2	3	2	2	1.84	25.1	2.46	2.47	2.42	2.24					
3	1	2	2	0.60	25.0	0.65	0.62	0.57	0.50					
3	2	2	2	1.23	25.1	1.51	1.50	1.45	1.30					
3	3	2	2	1.85	25.1	2.40	2.35	2.23	2.01					
4	1	2	2	0.59	25.0	0.57	0.57	0.55	0.48					
4	2	2	2	1.22	25.1	1.35	1.40	1.37	1.27					
4	3	2	2	1.86	25.1	2.22	2.27	2.27	2.08					
5	1	2	2	0.58	25.0	0.46	0.44	0.43	0.39					
5	2	2	2	1.23	25.1	1.13	1.12	1.10	1.00					
5	3	2	2	1.83	25.1	1.74	1.73	1.72	1.57					
6	1	2	1	0.58	24.9	1.04	0.83	0.78	2.71					
6	2	2	1	1.19	24.9	2.66	1.84	1.42	3.16					
6	3	2	1	1.83	25.0	4.22	3.21	1.23	2.70					
7	1	1	2	0.58	14.9	0.45	0.54	0.42	0.35					
7	2	1	2	1.17	15.0	1.03	1.06	0.94	0.81					
7	1	2	2	0.59	25.0	0.52	0.41	0.47	0.41					
7	2	2	2	1.21	25.0	1.25	1.28	1.14	2.24					
7	3	2	2	1.85	25.1	2.05	2.61	1.92	1.73					
7	1	3	2	0.58	34.9	0.34	1.19	0.49	0.26					
7	2	3	2	1.13	34.9	0.75	1.05	0.54	0.64					
7	3	3	2	1.86	35.0	1.09	1.81	0.91	1.20					
"Road Rater 2000"														
1	1	2	2	0.58	25.0	0.65	0.54	0.53	0.49					
1	2	2	2	1.20	25.0	1.45	1.22	1.16	1.02					
1	3	2	2	1.81	25.0	2.28	1.90	1.78	1.60					
1	4	2	2	2.43	25.0	3.13	2.58	2.45	2.19					
1	5	2	2	3.63	25.0	4.74	3.95	3.75	3.36					
2	1	2	2	0.60	25.0	0.72	0.55	0.51	0.52					
2	2	2	2	1.22	25.0	1.59	1.29	1.24	1.19					
2	3	2	2	1.80	25.0	2.40	2.09	1.84	1.82					
2	4	2	2	2.40	25.0	3.29	2.95	2.59	2.52					
2	5	2	2	3.62	25.0	5.07	4.58	4.13	3.93					
3	1	2	2	0.63	25.0	0.80	0.67	0.63	0.57					
3	2	2	2	1.17	25.0	1.55	1.34	1.25	1.14					
3	3	2	2	1.81	25.0	2.49	2.15	2.02	1.81					
3	4	2	2	2.41	25.0	3.41	2.92	2.75	2.46					
3	5	2	2	3.63	25.0	5.33	4.61	4.32	3.82					
4	1	2	2	0.62	25.0	0.69	0.58	0.45	0.44					
4	2	2	2	1.22	25.0	1.47	1.23	1.08	0.97					
4	3	2	2	1.78	25.0	2.24	1.93	1.67	1.50					
4	4	2	2	2.43	25.0	3.22	2.75	2.36	2.14					
4	5	2	2	3.62	25.0	4.84	4.29	3.73	3.41					
5	1	2	2	0.59	25.0	0.62	0.49	0.47	0.41					

5	2	2	2	1.22	25.0	1.29	1.03	0.98	0.85
5	3	2	2	1.78	25.0	1.95	1.58	1.52	1.33
5	4	2	2	2.42	25.0	2.69	2.19	2.10	1.85
5	5	2	2	3.60	25.0	4.16	3.53	3.21	2.82
6	1	1	2	0.63	15.1	0.53	0.50	0.47	0.40
6	2	1	2	1.21	15.1	1.25	1.10	0.97	0.87
6	3	1	2	1.78	15.1	2.05	1.65	1.61	1.39
6	4	1	2	2.39	15.1	2.81	2.41	2.19	1.94
6	5	1	2	3.57	15.1	4.45	3.88	3.46	3.17
6	1	2	2	0.59	25.1	0.63	0.55	0.39	0.45
6	2	2	2	1.20	25.1	1.33	1.14	0.94	0.94
6	3	2	2	1.81	25.1	1.98	1.69	1.37	1.41
6	4	2	2	2.44	25.1	2.64	2.30	1.93	1.90
6	5	2	2	3.60	25.1	3.98	3.47	3.04	2.88
6	1	3	2	0.61	35.1	0.37	0.29	0.25	0.25
6	2	3	2	1.24	35.1	0.77	0.63	0.53	0.52
6	3	3	2	1.83	35.1	1.13	0.94	0.75	0.77
6	4	3	2	2.44	35.1	1.52	1.26	0.90	1.03
6	5	3	2	3.58	35.1	2.41	1.92	1.51	1.57
7	1	2	1	0.63	25.1	0.71	0.59	0.42	0.42
7	2	2	1	1.21	25.1	1.49	1.19	0.91	0.82
7	3	2	1	1.84	25.1	2.42	1.86	1.47	1.30
7	4	2	1	2.43	25.1	3.35	2.61	2.09	1.80
7	5	2	1	3.63	25.1	5.27	4.10	3.29	2.86

"Dynatest FWD"

1	2	2	409	158	139	128	108	92	74	43
1	4	2	857	323	290	260	227	192	156	79
2	2	2	403	235	202	179	165	133	0	0
2	4	2	847	448	386	351	312	263	0	0
3	2	2	399	191	170	156	134	115	94	52
3	4	2	843	383	344	314	277	233	192	110
4	2	2	401	188	177	161	138	115	0	0
4	4	2	847	377	350	319	278	234	0	0
5	2	2	397	157	148	140	121	103	85	51
5	4	2	842	323	302	282	247	212	175	108
6	2	1	392	296	231	186	155	120	0	0
6	4	1	834	568	445	369	304	244	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	394	156	144	135	115	100	0	0
7	3	2	611	238	220	204	176	150	0	0
7	4	2	840	320	295	272	236	201	0	0

"C5" 11 "I" 70 19350 34.0 6579 "S"

"F. Vigo/Clay CL to 0.4m. e. of SR59" 6.56

"F. 1.0m. w. of SR59 westerly (W8)" 0.25

2 13724 84 2 4.2 0.30 0.0 9.7 6.0 "6"

"A-6" 12 "CL" 106.0 21.6 6 37.2 15.6 21.6 2.67

33 3.6 0

2

"03-27-86" 1 1 0 1 1000 1030 51 0 0 40 44

"Dynalect"

1	2	1.0	8	0.47	0.39	0.35	0.33	0.25
2	2	1.0	8	0.48	0.43	0.39	0.36	0.28
3	2	1.0	8	0.49	0.42	0.39	0.38	0.31
4	1	1.0	8	0.51	0.51	0.46	0.43	0.32
5	2	1.0	8	0.54	0.49	0.45	0.41	0.33
6	2	1.0	8	0.68	0.58	0.52	0.48	0.39
7	2	1.0	8	0.53	0.46	0.43	0.41	0.34

"Road Rater 400"

1	1	2	2	0.62	25.1	0.10	0.11	0.32	0.03
1	2	2	2	1.23	25.1	0.25	0.28	0.48	0.20
1	3	2	2	1.83	25.1	0.45	1.14	0.43	1.35
2	1	2	2	0.60	25.1	0.12	0.09	0.38	0.08
2	2	2	2	1.24	25.1	0.28	0.25	1.80	0.21
2	3	2	2	1.81	25.1	0.50	0.45	0.64	2.16
3	1	2	2	0.60	25.1	0.22	0.14	0.13	0.18
3	2	2	2	1.22	25.1	0.49	1.54	0.34	0.25

3	3	2	2	1.86	25.1	0.88	1.06	0.65	0.66
4	1	2	1	0.59	25.1	0.24	0.33	0.46	0.11
4	2	2	1	1.22	25.1	0.55	1.95	0.85	0.29
4	3	2	1	1.31	25.1	0.94	0.31	0.69	0.51
5	1	2	2	0.60	25.1	0.17	0.68	0.55	0.32
5	2	2	2	1.23	25.1	0.31	1.36	0.25	1.47
5	3	2	2	1.83	25.1	0.53	1.76	0.46	7.13
6	1	2	2	0.61	25.1	0.22	0.20	0.30	0.20
6	2	2	2	1.24	25.1	0.51	0.43	0.56	0.42
6	3	2	2	1.83	25.1	0.98	0.87	1.77	0.56
7	1	1	2	0.60	15.1	0.25	0.25	0.20	0.12
7	2	1	2	1.25	15.2	0.56	0.57	0.49	0.33
7	1	2	2	0.59	24.9	0.16	0.14	0.11	0.06
7	2	2	2	1.23	25.0	0.39	0.34	0.30	0.11
7	3	2	2	1.79	25.0	2.49	1.27	0.59	1.37
7	1	3	2	0.57	35.1	0.12	0.09	0.07	0.05
7	2	3	2	1.17	35.0	0.30	0.25	0.21	0.21
7	3	3	2	1.86	35.1	0.91	0.72	0.68	0.55
"Dynatest FWD"									
1	2	2	468	60	59	52	45	38	0
1	4	2	957	123	120	106	92	78	0
2	2	2	462	71	67	63	53	43	0
2	4	2	961	142	136	127	108	91	0
3	2	2	455	102	92	88	76	68	0
3	4	2	958	210	191	179	158	140	0
4	2	1	451	105	93	77	67	53	0
4	4	1	954	218	192	164	138	113	0
5	2	2	446	69	67	65	48	41	0
5	4	2	951	146	141	136	102	84	0
6	2	2	456	110	96	88	71	65	0
6	4	2	954	223	197	173	151	127	0
7	1	2	233	50	37	34	28	24	0
7	2	2	446	94	78	70	62	52	0
7	3	2	693	145	121	111	97	84	0
7	4	2	950	191	161	148	129	112	0
"08-12-86"									
1	1	1	1	1	1330	1400	108	110	115
81	69								
"Dynaflect"									
1	2	1.0	8	0.49	0.44	0.38	0.32	0.25	
2	2	1.0	8	0.50	0.49	0.40	0.35	0.28	
3	2	1.0	8	0.45	0.43	0.39	0.36	0.29	
4	1	1.0	8	0.49	0.46	0.42	0.38	0.32	
5	2	1.0	8	0.56	0.53	0.46	0.40	0.32	
6	2	1.0	8	0.66	0.59	0.49	0.42	0.33	
7	2	1.0	8	0.45	0.44	0.40	0.36	0.30	
"Road Rater 400"									
1	1	2	2	0.61	25.0	0.17	0.09	0.08	0.14
1	2	2	2	1.25	25.1	0.38	0.22	0.24	0.33
1	3	2	2	1.82	25.1	0.57	0.56	0.59	0.52
2	1	2	2	0.59	25.0	0.17	0.15	0.15	0.12
2	2	2	2	1.22	25.1	0.38	0.37	0.35	0.30
2	3	2	2	1.86	25.1	0.60	0.58	0.56	0.50
3	1	2	2	0.60	25.0	0.18	0.16	0.15	0.11
3	2	2	2	1.22	25.1	0.42	0.39	0.36	0.29
3	3	2	2	1.85	25.1	0.67	0.65	0.60	0.50
4	1	2	1	0.61	25.1	0.19	0.16	0.15	0.08
4	2	2	1	1.23	25.1	0.40	0.39	0.37	0.32
4	3	2	1	1.83	25.1	0.63	0.64	0.63	0.63
5	1	2	2	0.60	25.0	0.16	0.14	0.13	0.10
5	2	2	2	1.23	25.1	0.37	0.36	0.33	0.27
5	3	2	2	1.84	25.1	0.60	0.59	0.55	0.48
6	1	2	2	0.61	25.1	0.26	0.19	0.16	0.11
6	2	2	2	1.22	25.1	0.61	0.48	0.41	0.31
6	3	2	2	1.82	25.1	0.92	0.70	0.61	0.48
7	1	1	2	0.61	15.1	0.26	0.24	0.27	0.20
7	2	1	2	1.22	15.2	0.55	0.50	0.54	0.44
7	1	2	2	0.61	25.0	0.17	0.14	0.14	0.11
7	2	2	2	1.23	25.1	0.40	0.36	0.33	0.28
7	3	2	2	1.82	25.1	0.61	0.55	0.62	0.46
7	1	3	2	0.59	35.1	0.16	0.39	0.35	0.08
7	2	3	2	1.19	35.1	0.40	0.36	0.55	0.21

7	3	3	2	1.80	35.2	0.62	0.86	0.45	0.35
"Road Rater 2000"									
1	1	2	2	0.59	24.9	0.25	0.20	0.12	0.14
1	2	2	2	1.21	24.8	0.51	0.42	0.24	0.28
1	3	2	2	1.77	24.9	0.74	0.62	0.40	0.42
1	4	2	2	2.41	24.9	1.03	0.84	0.59	0.57
1	5	2	2	3.62	24.9	1.63	1.27	0.97	0.86
2	1	2	2	0.59	24.9	0.30	0.17	0.17	0.15
2	2	2	2	1.22	24.9	0.62	0.35	0.33	0.28
2	3	2	2	1.83	24.9	0.96	0.55	0.49	0.41
2	4	2	2	2.44	24.9	1.29	0.74	0.66	0.55
2	5	2	2	3.57	24.9	1.75	1.11	1.00	0.84
3	1	2	2	0.59	24.9	0.31	0.19	0.18	0.16
3	2	2	2	1.21	24.9	0.68	0.39	0.37	0.29
3	3	2	2	1.80	24.9	1.06	0.63	0.59	0.45
3	4	2	2	2.40	24.9	1.50	0.82	0.77	0.60
3	5	2	2	3.62	24.9	2.41	1.37	1.31	0.98
4	1	2	1	0.60	24.9	0.25	0.18	0.15	0.14
4	2	2	1	1.20	24.9	0.51	0.38	0.32	0.26
4	3	2	1	1.78	24.9	0.77	0.56	0.50	0.38
4	4	2	1	2.42	24.9	1.07	0.77	0.71	0.52
4	5	2	1	3.60	24.9	1.67	1.22	1.16	0.83
5	1	2	2	0.57	24.9	0.31	0.17	0.18	0.17
5	2	2	2	1.23	24.9	0.63	0.32	0.28	0.23
5	3	2	2	1.82	24.9	0.71	0.48	0.43	0.34
5	4	2	2	2.41	24.9	0.92	0.64	0.56	0.45
5	5	2	2	3.59	24.9	1.35	0.97	0.86	0.70
6	1	2	2	0.58	24.9	0.23	0.18	0.16	0.13
6	2	2	2	1.20	24.9	0.45	0.39	0.32	0.25
6	3	2	2	1.81	24.9	0.69	0.60	0.50	0.38
6	4	2	2	2.44	24.9	0.96	0.81	0.69	0.51
6	5	2	2	3.57	24.9	1.47	1.26	1.04	0.78
7	1	1	2	0.61	15.1	0.58	0.28	0.26	0.24
7	2	1	2	1.20	15.1	1.07	0.57	0.52	0.47
7	3	1	2	1.77	15.1	1.71	0.80	0.75	0.68
7	4	1	2	2.37	15.1	2.47	1.09	1.01	0.92
7	5	1	2	3.57	15.1	4.53	1.72	1.55	1.36
7	1	2	2	0.61	24.7	0.38	0.17	0.16	0.16
7	2	2	2	1.20	25.1	0.78	0.34	0.29	0.24
7	3	2	2	1.81	25.1	1.30	0.51	0.45	0.37
7	4	2	2	2.42	25.1	1.80	0.67	0.59	0.48
7	5	2	2	3.63	25.1	3.05	1.04	0.91	0.75
7	1	3	2	0.63	34.9	0.36	0.15	0.14	0.13
7	2	3	2	1.23	34.9	0.75	0.28	0.23	0.18
7	3	3	2	1.77	34.8	1.17	0.42	0.35	0.27
7	4	3	2	2.39	34.8	1.65	0.54	0.46	0.35
7	5	3	2	3.62	34.9	2.80	0.83	0.69	0.53
"Dynatest FWD"									
1	2	2	393	99	70	64	52	44	37
1	4	2	840	203	147	136	111	92	77
2	2	2	392	94	73	72	55	45	0
2	4	2	835	196	157	153	119	97	0
3	2	2	386	84	78	66	57	45	41
3	4	2	830	191	162	145	128	104	88
4	2	1	389	117	88	77	59	51	0
4	4	1	825	243	188	162	131	106	0
5	2	2	388	65	59	57	48	41	0
5	4	2	824	148	121	118	96	84	0
6	2	2	382	114	74	64	49	42	35
6	4	2	822	229	155	132	105	85	68
7	1	2	0	0	0	0	0	0	0
7	2	2	382	114	59	56	50	41	0
7	3	2	595	148	92	87	76	63	0
7	4	2	819	187	124	117	103	85	0

"C6" 84 "US" 41 27000 11.5 3105 "S"
 "F. 0.5m. n. of Honey Creek to s. Terre Haute C/L" 1.88

"F. 0.5m. n. of Honey Creek (2.3m. s. of 170) northerly (NB)"

0.25

5 3239 51 35 0.0 0.00 0.0 7.1 14.0 "5"

"A-4" 5 "ML-CL" 110.2 18.0 10 22.5 16.4 5.1 2.69

43 1.7 0

3

"03-27-86" 1 1 0 1 1150 1220 61 0 0 44 44

"Dynaflect"

1 2 1.0 8 0.85 0.77 0.69 0.62 0.50

2 2 1.0 8 0.99 0.86 0.73 0.61 0.44

3 2 1.0 8 0.66 0.57 0.48 0.43 0.32

4 2 1.0 8 0.74 0.64 0.55 0.47 0.36

5 2 1.0 8 0.72 0.62 0.53 0.46 0.35

6 2 1.0 8 0.75 0.66 0.57 0.49 0.37

"Road Rater 400"

1 1 2 2 0.60 25.1 0.44 0.41 0.35 0.30

1 2 2 2 1.23 25.1 0.79 1.30 0.62 0.47

1 3 2 2 1.88 25.1 1.57 1.50 1.26 2.11

2 1 2 2 0.61 25.1 0.56 0.86 0.81 0.32

2 2 2 2 1.22 25.1 0.98 1.11 1.52 0.56

2 3 2 2 1.84 25.1 2.17 1.92 1.52 2.86

3 1 2 2 0.60 25.0 0.31 0.72 0.45 0.16

3 2 2 2 1.23 25.1 0.63 1.36 0.47 0.36

3 3 2 2 1.83 25.1 1.20 1.01 0.91 0.69

4 1 2 2 0.59 25.0 0.30 1.82 1.28 1.72

4 2 2 2 1.23 25.1 0.70 1.06 0.88 1.23

4 3 2 2 1.83 25.1 1.36 1.27 0.97 1.37

5 1 2 2 0.61 25.1 0.32 0.38 1.39 0.14

5 2 2 2 1.23 25.1 0.67 0.55 0.44 0.32

5 3 2 2 1.83 25.1 1.28 1.07 0.87 0.65

6 1 1 2 0.63 15.1 0.29 0.29 0.17 0.17

6 1 1 2 0.60 15.1 0.29 0.24 0.18 0.20

6 2 1 2 1.22 15.1 0.63 0.58 0.44 0.38

6 1 2 2 0.60 25.1 0.30 0.29 0.21 0.40

6 2 2 2 1.24 25.1 0.65 1.23 0.53 1.64

6 3 2 2 1.88 25.1 1.24 0.83 3.59 2.16

6 1 3 2 0.58 35.0 0.25 0.19 0.16 0.12

6 2 3 2 1.18 35.0 0.55 0.46 0.40 0.32

6 3 3 2 1.71 35.0 1.29 1.59 1.10 1.05

"Dynatest FWD"

1 2 2 440 133 124 109 91 72 0 0

1 4 2 941 278 264 228 192 154 0 0

2 2 2 450 171 158 136 108 83 0 0

2 4 2 934 332 308 263 207 164 0 0

3 2 2 450 117 109 90 72 55 0 0

3 4 2 933 246 229 192 155 121 0 0

4 2 2 445 130 117 102 76 60 0 0

4 4 2 934 274 251 212 168 131 0 0

5 2 2 439 124 113 97 77 58 0 0

5 4 2 931 262 244 206 167 131 0 0

6 1 2 209 61 53 51 35 32 0 0

6 2 2 442 130 121 104 83 67 0 0

6 3 2 677 200 186 161 129 104 0 0

6 4 2 934 277 256 221 179 143 0 0

"10-30-86" 1 1 0 0 1445 1455 60 60 62 53 54

"Dynaflect"

1 2 1.0 8 0.61 0.57 0.48 0.43 0.35

2 2 1.0 8 0.75 0.69 0.58 0.50 0.39

3 2 1.0 8 0.59 0.53 0.44 0.37 0.29

4 2 1.0 8 0.67 0.60 0.50 0.42 0.33

5 2 1.0 8 0.61 0.55 0.46 0.39 0.30

6 2 1.0 8 0.63 0.57 0.48 0.40 0.30

"Road Rater 400"

1 1 2 2 0.60 25.0 0.39 0.36 0.31 0.24

1 2 2 2 1.26 25.1 1.14 1.13 1.04 0.89

1 3 2 2 1.83 25.0 1.44 1.40 1.21 1.00

2 1 2 2 0.62 24.9 0.58 0.58 0.53 0.44

2 2 2 2 1.20 25.0 1.07 1.03 0.90 0.73

2 3 2 2 1.81 25.0 1.65 1.60 1.41 1.14

3 1 2 2 0.59 24.9 0.36 0.33 0.27 0.20

3 3 2 2 1.76 25.0 1.32 1.25 1.04 0.80

4	1	2	2	0.60	25.0	0.48	0.46	0.43	0.36
4	2	2	2	1.20	25.0	1.08	1.13	1.03	0.95
4	3	2	2	1.78	25.0	1.17	1.46	1.21	0.96
5	1	2	2	0.59	25.0	0.36	0.34	0.29	0.22
5	2	2	2	1.18	25.0	0.90	0.86	0.75	0.63
5	3	2	2	1.81	25.0	1.36	1.32	1.13	0.90
6	1	1	2	0.62	15.0	0.49	0.48	0.47	0.84
6	2	1	2	1.21	15.0	1.01	0.93	0.85	1.02
6	1	2	2	0.60	25.1	0.45	0.44	0.37	0.30
6	2	2	2	1.22	25.1	1.16	1.17	1.03	0.85
6	3	2	2	1.75	24.7	1.57	1.57	1.41	1.51
6	1	3	2	0.62	35.4	0.97	1.03	1.64	1.44
6	2	3	2	1.20	35.2	1.53	1.55	4.73	7.88
6	3	3	2	1.84	35.3	1.96	2.31	1.55	12.47

"11-24-86" 0 0 0 1 1345 1415 45 43 44 41 37

"Dynatest FWD"

1	2	2	416	116	103	89	73	59	45	25
1	4	2	914	251	227	193	165	132	99	57
2	2	2	421	119	107	90	73	56	0	0
2	4	2	907	249	225	191	158	123	0	0
3	2	2	421	107	94	81	63	50	39	22
3	4	2	894	234	210	177	144	112	86	53
4	2	2	425	120	106	88	70	54	0	0
4	4	2	889	258	230	192	158	122	0	0
5	2	2	399	108	97	80	66	51	38	22
5	4	2	882	246	221	181	154	115	90	55
6	1	2	0	0	0	0	0	0	0	0
6	2	2	266	112	100	87	71	57	0	0
6	3	2	636	187	169	144	119	93	0	0
6	4	2	870	254	232	196	162	126	0	0

"C7" 84 "US" 41 27000 11.5 3105 "S"
 "F. 200' s. of Honey Creek northerly" 0.50
 "F. 0.2m. n. of Honey Creek (2.6m. s. of 170) northerly (NB)" 0.25
 2 8996 72 14 1.9 0.17 2.3 6.8 0.0 "N"
 "A-4" 8 "CL" 97.5 22.3 8 27.7 18.7 9.0 2.68
 69 2.4 0

3

"03-27-86" 1 1 0 1 1125 1155 55 0 0 42 44

"Dynaflect"

1	2	1.0	8	0.73	0.63	0.55	0.49	0.38
2	2	1.0	8	0.89	0.80	0.71	0.53	0.37
3	2	1.0	8	0.65	0.56	0.49	0.44	0.34
4	2	1.0	8	0.67	0.59	0.52	0.47	0.37
5	2	1.0	8	0.59	0.50	0.43	0.38	0.29
6	2	1.0	8	0.64	0.57	0.51	0.47	0.38

"Road Rater 400"

1	1	2	2	0.60	25.2	0.41	0.36	1.36	0.21
1	2	2	2	1.26	25.2	0.87	0.75	1.81	0.44
1	3	2	2	1.89	25.2	1.70	1.24	1.61	1.08
2	1	2	2	0.61	25.2	0.54	0.85	1.22	0.30
2	2	2	2	1.25	25.2	1.11	1.40	0.83	0.69
2	3	2	2	1.86	25.2	2.12	1.83	1.72	2.07
3	1	2	2	0.61	25.2	0.35	0.26	0.81	0.12
3	2	2	2	1.24	25.2	0.78	0.72	0.96	0.86
3	3	2	2	1.88	25.3	1.50	1.63	1.16	6.17
4	1	2	2	0.63	25.2	0.42	0.38	0.41	0.27
4	2	2	2	1.24	25.2	0.87	0.71	1.11	0.49
4	3	2	2	1.86	25.2	1.11	1.73	2.71	2.67
5	1	2	2	0.60	25.0	0.39	0.31	1.41	0.77
5	2	2	2	1.21	25.0	0.84	0.59	1.89	1.05
5	3	2	2	1.83	25.0	1.79	4.87	5.36	3.42
6	1	1	2	0.63	15.2	0.38	0.33	0.29	0.19
6	2	1	2	1.25	15.3	0.85	0.74	0.32	0.45
6	1	2	2	0.59	25.0	0.37	0.32	0.17	0.21
6	2	2	2	1.21	25.0	0.79	0.71	0.93	0.40
6	3	2	2	1.83	25.1	1.58	1.43	1.20	1.60

6	1	3	2	0.58	35.1	0.36	0.31	0.27	0.11
6	2	3	2	1.17	35.2	0.80	0.72	0.62	0.40
6	3	3	2	1.82	35.2	2.43	2.28	1.71	1.56

"Dynatest FWD"

1	2	2	450	136	118	98	78	58	0	0
1	4	2	935	295	254	217	172	132	0	0
2	2	2	445	187	149	126	98	77	0	0
2	4	2	942	396	332	288	225	180	0	0
3	2	2	448	109	88	71	57	44	0	0
3	4	2	948	233	191	159	126	97	0	0
4	2	2	438	120	95	79	58	44	0	0
4	4	2	946	256	210	178	134	105	0	0
5	2	2	448	119	91	73	54	41	0	0
5	4	2	945	249	195	162	123	94	0	0
6	1	2	212	46	41	35	29	23	0	0
6	2	2	449	110	96	88	70	61	0	0
6	3	2	685	169	151	135	112	93	0	0
6	4	2	943	233	208	189	156	131	0	0

"10-30-86"	1	1	0	0	1435	1443	64	69	63	53	54
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"Dynalect"

1	2	1.0	8	0.53	0.48	0.41	0.34	0.28
2	2	1.0	8	0.61	0.56	0.48	0.39	0.28
3	2	1.0	8	0.48	0.44	0.37	0.32	0.27
4	2	1.0	8	0.53	0.49	0.41	0.35	0.29
5	2	1.0	8	0.45	0.41	0.34	0.29	0.23
6	2	1.0	8	0.48	0.45	0.40	0.35	0.29

"Road Rater 400"

1	1	2	2	0.60	24.9	0.34	0.30	0.25	0.18
1	2	2	2	1.17	24.9	0.71	0.64	0.54	0.41
1	3	2	2	1.78	25.0	1.08	1.01	0.84	0.64
2	1	2	2	0.59	24.9	0.37	0.37	0.32	0.21
2	2	2	2	1.22	25.0	0.92	0.92	0.85	0.58
2	3	2	2	1.79	25.0	1.43	1.45	1.32	0.92
3	1	2	2	0.58	24.9	0.24	0.20	0.17	0.12
3	2	2	2	1.19	24.9	0.62	0.57	0.49	0.39
3	3	2	2	1.79	25.0	0.91	0.82	0.68	0.53
4	1	2	2	0.59	24.9	0.31	0.29	0.26	0.17
4	3	2	2	1.79	25.0	1.02	0.97	0.81	0.64
5	1	2	2	0.59	24.9	0.25	0.20	0.17	0.12
5	2	2	2	1.21	25.0	0.58	0.52	0.44	0.32
5	3	2	2	1.80	25.0	0.90	0.81	1.31	0.53
6	1	1	2	0.65	15.1	0.33	0.33	0.32	3.28
6	2	1	2	1.22	15.1	0.58	0.56	0.50	3.72
6	1	2	2	0.61	24.9	0.27	0.25	0.22	0.17
6	2	2	2	1.19	24.9	0.64	0.63	0.60	0.56
6	3	2	2	1.80	25.0	0.97	0.93	0.83	2.36
6	1	3	2	0.60	35.1	0.26	0.24	0.21	0.45
6	2	3	2	1.14	35.1	0.61	0.58	0.51	8.56
6	3	3	2	1.81	35.1	1.17	1.14	6.88	6.51

"11-24-86"	0	0	0	1	1318	1340	40	46	42	45	36
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"Dynatest FWD"

1	2	2	417	99	82	68	54	40	30	16
1	4	2	927	224	186	159	124	93	69	38
2	2	2	408	116	95	83	68	52	0	0
2	4	2	924	260	224	193	161	125	0	0
3	2	2	413	79	66	54	44	32	26	16
3	4	2	926	178	149	124	98	74	56	34
4	2	2	415	88	71	54	46	32	0	0
4	4	2	926	193	157	132	106	81	0	0
5	2	2	424	81	64	48	42	26	22	14
5	4	2	927	184	146	119	94	71	58	37
6	1	2	0	0	0	0	0	0	0	0
6	2	2	425	89	77	67	59	50	0	0
6	3	2	645	152	132	118	102	86	0	0
6	4	2	908	207	181	164	141	119	0	0

"F3"	17	"US"	6	3540	25.0	885	"N"
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"F. e. Butler C/L to the Indiana/Ohio State Line" 3.04
 "F. CR75 (1.3m. e. of Butler C/L) easterly (EB)" 0.25
 2 10470 83 3 1.5 0.10 5.3 7.8 3.5 "6"
 "A-7-6" 16 "CL" 97.9 25.9 5 48.5 24.1 24.4 2.66
 51 2.6 0

2
 "04-07-86" 1 1 0 1 1345 1415 90 0 0 68 50

"Dynaflect"
 1 2 1.0 8 0.64 0.54 0.45 0.38 0.28
 2 2 1.0 8 0.64 0.58 0.51 0.43 0.33
 3 2 1.0 8 0.67 0.56 0.46 0.38 0.28
 4 2 1.0 8 0.72 0.65 0.56 0.48 0.37
 5 2 1.0 8 0.58 0.49 0.39 0.31 0.21
 6 2 1.0 8 0.71 0.63 0.55 0.47 0.36

"Road Rater 400"
 1 1 2 2 0.60 24.8 0.50 0.29 0.38 0.42
 1 2 2 2 1.23 25.0 1.02 1.67 0.78 1.20
 1 3 2 2 1.81 25.0 1.81 2.32 1.40 1.72
 2 1 2 2 0.60 25.0 0.60 0.72 0.45 1.37
 2 2 2 2 1.22 25.0 1.25 1.73 1.00 2.58
 2 3 2 2 1.81 25.0 2.12 1.86 1.71 3.22
 3 1 2 2 0.60 25.0 0.62 0.61 1.55 0.31
 3 3 2 2 1.80 25.0 2.21 1.48 1.38 1.14
 4 1 2 2 0.60 25.0 0.65 0.31 0.50 0.42
 4 2 2 2 1.23 25.0 1.40 0.58 1.11 0.95
 4 3 2 2 1.79 25.0 2.30 1.45 2.42 1.49
 5 1 2 2 0.60 25.0 0.55 0.33 0.31 0.73
 5 2 2 2 1.23 25.0 1.16 1.21 0.67 1.59
 5 3 2 2 1.82 25.0 1.99 1.24 1.17 2.03
 6 1 1 2 0.52 14.0 0.42 0.27 0.17 0.23
 6 2 1 2 1.27 15.4 1.16 1.12 1.48 0.72
 6 1 2 2 0.59 24.9 0.58 0.52 1.17 0.37
 6 2 2 2 1.22 25.0 1.30 1.12 1.64 0.92
 6 3 2 2 1.83 25.1 2.15 1.64 1.89 1.49
 6 1 3 2 0.60 35.0 0.39 0.33 0.29 0.36
 6 2 3 2 1.20 35.0 0.86 0.75 0.67 0.93
 6 3 3 2 1.81 35.0 1.80 1.47 1.34 1.14

"Dynatest FWD"
 1 2 2 431 206 127 100 81 65 0 0
 1 4 2 896 424 276 222 184 148 0 0
 2 2 2 416 197 127 110 94 75 0 0
 2 4 2 893 425 282 242 208 174 0 0
 3 2 2 408 225 145 112 92 72 0 0
 3 4 2 888 462 309 248 205 167 0 0
 4 2 2 414 214 138 119 103 84 0 0
 4 4 2 897 464 299 262 226 188 0 0
 5 2 2 405 188 115 93 72 56 43 21
 5 4 2 888 416 265 214 169 132 98 44
 6 1 2 202 94 70 54 48 37 0 0
 6 2 2 401 210 141 113 101 79 0 0
 6 3 2 633 322 218 182 157 132 0 0
 6 4 2 895 437 301 256 222 187 0 0

"08-27-86" 1 1 0 1 1420 1450 85 82 90 67 67

"Dynaflect"
 1 2 1.0 8 0.52 0.47 0.39 0.31 0.24
 2 2 1.0 8 0.55 0.47 0.40 0.33 0.26
 3 2 1.0 8 0.58 0.47 0.37 0.29 0.21
 4 2 1.0 8 0.58 0.51 0.44 0.37 0.29
 5 2 1.0 8 0.50 0.40 0.31 0.23 0.16
 6 2 1.0 8 0.67 0.51 0.44 0.38 0.29

"Road Rater 400"
 1 1 2 2 0.60 25.2 0.45 0.38 0.33 0.22
 1 2 2 2 1.21 25.0 0.99 0.84 0.75 0.56
 1 3 2 2 1.79 25.0 1.66 1.58 1.30 0.96
 2 1 2 2 0.60 25.0 0.45 2.16 0.34 0.26
 2 2 2 2 1.19 25.0 0.97 0.82 0.76 0.85
 2 3 2 2 1.81 25.0 1.66 1.41 1.29 1.21
 3 1 2 2 0.59 25.0 0.50 0.38 0.61 0.22
 3 2 2 2 1.20 25.0 1.13 0.90 0.68 0.56
 3 3 2 2 1.79 25.0 1.94 1.55 0.92 0.96

4	1	2	2	0.59	25.0	0.50	0.41	0.45	0.34
4	2	2	2	1.19	25.0	1.07	0.94	0.92	0.75
4	3	2	2	1.30	25.0	1.78	1.56	1.47	1.30
5	1	2	2	0.59	25.0	0.38	0.21	0.18	0.16
5	2	2	2	1.20	25.0	0.86	0.48	0.52	0.40
5	3	2	2	1.82	25.1	1.45	0.95	0.90	0.71
6	1	1	2	0.59	15.0	0.29	0.34	0.27	0.22
6	2	1	2	1.20	15.1	0.79	0.82	0.67	0.55
6	1	2	2	0.59	25.1	0.44	0.40	0.37	0.30
6	2	2	2	1.19	25.1	0.95	1.84	0.82	0.68
6	3	2	2	1.81	25.1	1.58	1.44	1.35	1.14
6	1	3	2	0.60	35.1	0.33	0.27	0.25	0.19
6	2	3	2	1.19	35.0	0.76	0.67	0.63	0.51
6	3	3	2	1.79	35.0	1.44	1.31	1.22	1.01

"Dynatest FWD"

1	2	2	405	184	124	96	78	63	45	27
1	4	2	920	403	282	227	187	151	122	70
2	2	2	400	173	107	95	78	65	0	0
2	4	2	913	379	255	225	192	157	0	0
3	2	2	401	197	119	95	77	61	48	28
3	4	2	916	414	277	227	185	149	118	63
4	2	2	400	202	117	106	89	75	0	0
4	4	2	913	422	272	241	206	173	0	0
5	2	2	394	157	100	78	63	46	34	17
5	4	2	905	358	242	192	153	118	90	43
6	1	2	0	0	0	0	0	0	0	0
6	2	2	395	215	130	109	90	73	0	0
6	3	2	621	308	205	172	144	116	0	0
6	4	2	907	433	293	250	211	172	0	0

"F4" 20 "SR" 19 8880 27.0 2398 "N"

"F. n. Elkhart C/L to Indiana/Michigan State Line" 3.96

"F. Indiana/Michigan State Line southerly (S8)" 0.25

2 8660 71 15 1.0 0.09 2.5 8.0 3.5 "G"

"A-1-b" 0 "SM" 117.2 14.3 38 20.8 0.0 0.0 2.66

26 4.3 0

3

"04-09-86" 1 0 1 0 1400 1430 51 0 0 40 56 .

"Dynaflect"

1	2	1.0	8	0.93	0.81	0.96	0.57	0.43
2	2	1.0	8	0.74	0.68	0.81	0.51	0.39
3	2	1.0	8	0.85	0.76	0.88	0.56	0.43
4	2	1.0	8	0.78	0.71	0.83	0.53	0.41
5	2	1.0	8	0.86	0.74	0.84	0.51	0.38
6	2	1.0	8	0.78	0.71	0.86	0.54	0.42

"Road Rater 2000"

1	1	2	2	0.61	25.0	0.42	0.35	0.33	0.27
1	2	2	2	1.22	24.9	0.86	0.73	0.67	0.57
1	3	2	2	1.81	24.9	1.32	1.12	1.04	0.87
1	4	2	2	2.39	24.9	1.77	1.51	1.40	1.17
1	5	2	2	3.61	24.9	2.82	2.42	2.23	1.87
2	1	2	2	0.59	25.0	0.44	0.37	0.35	0.28
2	2	2	2	1.20	25.0	0.94	0.82	0.75	0.60
2	3	2	2	1.80	25.0	1.46	1.28	1.16	0.95
2	4	2	2	2.39	25.0	2.03	1.79	1.61	1.33
2	5	2	2	3.56	25.0	3.30	2.84	2.55	2.13
3	1	2	2	0.61	25.0	0.54	0.49	0.44	0.37
3	2	2	2	1.19	25.0	1.09	0.99	0.92	0.78
3	3	2	2	1.78	25.0	1.76	1.58	1.45	1.23
3	4	2	2	2.44	25.0	2.55	2.29	2.10	1.79
3	5	2	2	3.58	25.0	4.03	3.67	3.35	2.89
4	1	2	2	0.58	25.0	0.48	0.39	0.37	0.30
4	2	2	2	1.19	25.0	1.02	0.87	0.80	0.69
4	3	2	2	1.79	25.0	1.62	1.39	1.26	1.10
4	4	2	2	2.42	25.0	2.30	1.97	1.82	1.57
4	5	2	2	3.59	25.0	3.70	3.19	2.92	2.55
5	1	2	2	0.59	25.0	0.63	0.44	0.32	0.29

5	2	2	2	1.20	25.0	1.35	0.93	0.71	0.61
5	3	2	2	1.78	25.0	2.05	1.44	1.10	0.95
5	4	2	2	2.40	25.0	2.84	2.00	1.54	1.31
5	5	2	2	3.59	25.0	3.91	3.01	2.46	1.91
6	1	1	2	0.61	15.0	0.57	0.51	0.48	0.41
6	2	1	2	1.18	14.9	1.30	1.18	1.07	0.94
6	3	1	2	1.82	15.0	2.02	1.92	1.79	1.45
6	4	1	2	2.42	15.0	2.95	2.76	2.46	2.19
6	5	1	2	3.61	15.0	4.73	4.26	4.03	3.38
6	1	2	2	0.59	25.0	0.57	0.47	0.44	0.36
6	2	2	2	1.19	25.0	1.22	1.01	0.92	0.76
6	3	2	2	1.76	25.0	1.86	1.55	1.43	1.20
6	4	2	2	2.44	25.0	2.64	2.19	2.01	1.59
6	5	2	2	3.57	25.0	4.05	3.40	3.12	2.65
6	1	3	2	0.62	35.0	0.55	0.45	0.41	0.35
6	2	3	2	1.21	35.0	1.17	0.96	0.85	0.72
6	3	3	2	1.80	35.0	1.31	1.44	1.31	1.11
6	4	3	2	2.40	35.0	2.46	1.96	1.79	1.52
6	5	3	2	3.60	35.0	3.62	3.04	2.79	2.34
"04-45-86"				0	0	0	1	1230	1300
				94	0	0	0	81	45

"Dynatest FWD"

1	2	2	383	181	138	117	93	73	0	0
1	4	2	840	352	280	238	193	151	0	0
2	2	2	381	132	110	100	81	65	0	0
2	4	2	833	267	230	205	169	135	0	0
3	2	2	377	130	105	90	76	57	0	0
3	4	2	831	264	220	191	157	123	0	0
4	2	2	382	138	109	92	74	59	0	0
4	4	2	830	285	228	196	161	127	0	0
5	2	2	375	184	136	101	82	63	50	30
5	4	2	828	355	276	211	172	134	106	62
6	1	2	177	56	48	44	35	28	0	0
6	2	2	378	122	107	95	81	64	0	0
6	3	2	598	189	168	148	126	101	0	0
6	4	2	830	255	226	201	169	137	0	0
"08-29-86"				1	1	0	1	1020	1045	75
				79	81	62	64			

"Dynaflect"

1	2	1.0	8	0.60	0.56	0.50	0.41	0.33
2	2	1.0	8	0.51	0.48	0.43	0.36	0.28
3	2	1.0	8	0.49	0.46	0.41	0.34	0.27
4	2	1.0	8	0.51	0.48	0.42	0.36	0.29
5	2	1.0	8	0.60	0.56	0.49	0.42	0.34
6	2	1.0	8	0.58	0.54	0.47	0.39	0.31

"Road Rater 400"

1	1	2	2	0.59	25.0	0.39	0.87	0.31	0.24
1	2	2	2	1.21	25.0	0.82	0.62	0.68	0.55
1	3	2	2	1.81	25.1	1.95	2.37	2.22	1.35
2	1	2	2	0.58	25.0	0.27	0.33	0.30	0.16
2	2	2	2	1.19	25.0	0.61	0.37	0.39	0.42
2	3	2	2	1.80	25.1	1.53	12.64	4.43	1.13
3	1	2	2	0.61	25.0	0.40	0.37	1.03	0.26
3	2	2	2	1.19	25.0	0.86	0.84	3.81	0.60
3	3	2	2	1.80	25.1	1.94	4.91	2.56	1.39
4	1	2	2	0.58	25.0	0.32	0.67	0.27	0.22
4	2	2	2	1.21	25.0	0.72	1.18	0.62	0.51
4	3	2	2	1.83	25.1	1.78	1.73	2.34	2.50
5	1	2	2	0.58	25.0	0.55	0.55	0.37	0.56
5	2	2	2	1.20	25.0	0.98	1.49	0.94	1.91
5	3	2	2	1.78	25.1	2.01	4.93	4.22	1.23
6	1	1	2	0.61	15.1	0.35	0.31	0.13	1.24
6	2	1	2	1.21	15.1	0.94	0.91	0.99	1.02
6	1	2	2	0.59	25.1	0.41	0.38	0.34	0.74
6	2	2	2	1.22	25.1	0.91	0.86	0.75	3.86
6	3	2	2	1.78	25.1	1.86	0.90	1.63	1.32
6	1	3	2	0.60	35.1	0.35	1.87	0.61	0.23
6	2	3	2	1.20	35.1	0.83	2.80	1.21	0.56
6	2	3	2	1.39	35.1	1.79	2.01	9.63	0.00

2	2	2	407	134	111	102	80	65	0	0
2	4	2	927	293	258	221	181	145	0	0
3	2	2	406	197	141	128	100	82	63	35
3	4	2	915	393	310	264	214	175	131	77
4	2	2	408	150	125	108	90	71	0	0
4	4	2	915	320	268	234	193	152	0	0
5	2	2	406	191	145	112	88	71	54	30
5	4	2	914	383	304	241	190	152	117	69
6	1	2	0	0	0	0	0	0	0	0
6	2	2	408	137	122	105	86	69	0	0
6	3	2	628	211	186	162	133	108	0	0
6	4	2	914	297	264	232	190	155	0	0

"F5" 35 "US" 224 3150 27.5 866 "N"
 "F. 0.28m. e. of SR5 to 2.0m. w. of 169" 4.32
 "F. CR200E (3.3m. w. of 169 & 3.6m. e. of SR5) easterly (E5)" 0.25
 2 10561 77 9 1.1 0.07 5.3 7.5 1.5 "6"
 "A-2-6" 0 "SC" 130.9 9.1 13 25.0 14.2 10.8 2.70
 29 4.2 0

2
 "04-08-86" 1 1 1 1 1345 1415 73 0 0 60 55
 "Dynaflect"

1	2	1.0	8	0.98	0.73	0.54	0.40	0.27
2	2	1.0	8	1.50	1.10	0.63	0.36	0.20
3	2	1.0	8	0.93	0.73	0.52	0.39	0.26
4	2	1.0	8	0.82	0.65	0.45	0.34	0.23
5	2	1.0	8	0.99	0.78	0.56	0.43	0.29
6	1	1.0	8	0.97	0.75	0.50	0.35	0.22
7	2	1.0	8	1.09	0.83	0.55	0.38	0.23

"Road Rater 400"

1	1	2	2	0.60	25.0	0.71	0.40	0.41	0.28
1	2	2	2	1.21	25.0	1.49	1.34	0.43	0.62
1	3	2	2	1.81	25.0	2.57	2.33	0.63	1.08
2	1	2	2	0.60	25.0	1.29	0.97	0.61	0.47
2	2	2	2	1.22	25.0	2.81	2.01	1.20	1.00
2	3	2	2	1.83	25.1	5.29	5.55	2.85	1.78
3	1	2	2	0.60	25.0	0.58	0.34	0.34	0.19
3	2	2	2	1.21	25.0	1.28	1.27	0.79	0.57
3	3	2	2	1.83	25.1	2.15	2.69	1.36	2.00
4	1	2	2	0.61	25.0	0.69	0.48	0.32	0.28
4	2	2	2	1.24	25.1	1.46	0.92	0.86	0.65
4	3	2	2	1.84	25.1	2.49	2.33	1.43	1.61
5	1	2	2	0.60	24.9	0.77	0.66	0.52	0.63
5	2	2	2	1.21	25.0	1.64	1.98	1.13	1.43
5	3	2	2	1.83	25.1	2.87	3.11	1.99	2.12
6	1	2	1	0.61	25.0	0.98	1.02	0.55	0.34
6	2	2	1	1.23	25.1	2.10	2.84	1.18	1.43
6	3	2	1	1.81	25.0	3.78	3.13	2.05	1.37
7	1	1	2	0.57	14.4	0.61	0.48	0.33	0.18
7	2	1	2	1.27	15.4	1.61	1.24	0.73	1.10
7	1	2	2	0.60	25.1	0.84	0.67	0.48	0.24

"Road Rater 2000"

1	1	2	2	0.61	25.1	0.51	0.36	0.27	0.21
1	2	2	2	1.18	25.1	1.33	0.93	0.70	0.53
1	3	2	2	1.77	25.1	2.10	1.49	1.11	0.85
1	4	2	2	2.38	25.0	2.98	2.08	1.55	1.18
1	5	2	2	3.61	25.1	4.99	3.45	2.53	1.92
2	1	2	2	0.59	25.0	1.13	0.73	0.50	0.34
2	2	2	2	1.17	25.1	2.78	1.80	1.16	0.81
2	3	2	2	1.77	25.1	4.43	2.92	1.84	1.25
2	4	2	2	2.41	25.1	7.12	4.68	2.95	1.93
2	5	2	2	3.61	25.1	15.72	9.07	6.06	3.61
3	1	2	2	0.61	25.0	0.50	0.39	0.29	0.24
3	2	2	2	1.21	25.1	1.27	0.97	0.76	0.61
3	3	2	2	1.78	25.1	1.95	1.51	1.13	0.94
3	4	2	2	2.44	25.1	2.80	2.17	1.65	1.31
3	5	2	2	3.58	25.1	4.69	3.50	2.58	2.14

4	1	2	2	0.55	25.0	0.51	0.38	0.33	0.26
4	2	2	2	1.15	25.1	1.26	0.89	0.76	0.62
4	3	2	2	1.83	25.1	2.08	1.41	1.23	0.99
4	4	2	2	2.45	25.0	2.93	1.99	1.72	1.41
4	5	2	2	3.63	25.1	4.58	3.15	2.69	2.17
5	1	2	2	0.62	25.1	0.53	0.37	0.37	0.21
5	2	2	2	1.16	25.0	1.71	1.27	0.96	0.72
5	3	2	2	1.79	25.1	2.97	2.15	1.52	1.20
5	4	2	2	2.39	25.1	4.15	2.99	2.12	1.66
5	5	2	2	3.56	25.1	6.08	4.81	3.55	2.75
6	1	1	2	0.59	15.2	0.47	0.37	0.35	0.21
6	2	1	2	1.17	15.2	1.15	0.92	0.82	0.50
6	3	1	2	1.83	15.2	2.14	1.62	1.40	0.80
6	4	1	2	2.44	15.2	3.19	2.31	1.98	1.20
6	5	1	2	3.55	15.2	4.80	3.61	2.82	1.92
6	1	2	2	0.60	25.1	0.65	0.48	0.47	0.27
6	2	2	2	1.23	25.1	1.52	1.15	0.86	0.62
6	3	2	2	1.78	25.1	2.40	1.62	1.28	0.95
6	4	2	2	2.39	25.1	3.37	2.56	1.80	1.33
6	5	2	2	3.65	25.1	5.65	4.31	3.18	2.20
6	1	3	2	0.58	35.2	0.74	0.53	0.45	0.31
6	2	3	2	1.17	35.3	1.72	1.28	1.02	0.75
6	3	3	2	1.81	35.1	2.77	2.09	1.64	1.18
6	4	3	2	2.43	35.0	4.06	3.00	2.40	1.70
6	5	3	2	3.60	35.0	6.67	5.03	4.00	2.90
7	1	2	1	0.58	25.0	0.43	0.29	0.30	0.19
7	2	2	1	1.20	25.0	1.07	0.71	0.67	0.43
7	3	2	1	1.82	24.9	1.73	1.12	0.95	0.67
7	4	2	1	2.42	25.0	2.39	1.52	1.26	0.90
7	5	2	1	3.57	25.0	3.93	2.44	1.95	1.45
"Dynatest FWD"									
1	2	2	417	275	201	137	92	65	0
1	4	2	932	545	420	292	203	142	0
2	2	2	403	584	408	253	144	79	0
2	4	2	913	1145	848	545	328	191	0
3	2	2	414	234	177	124	89	64	0
3	4	2	932	459	361	261	195	142	0
4	2	2	417	227	158	112	80	58	0
4	4	2	928	453	341	248	181	130	0
5	2	2	415	277	216	157	118	79	58
5	4	2	916	570	455	348	261	189	130
6	2	1	422	377	265	168	106	67	0
6	4	1	911	737	543	379	248	166	0
7	1	2	187	166	119	0	44	0	0
7	2	2	414	376	274	0	113	0	0
7	3	2	653	544	405	0	181	0	0
7	4	2	914	731	551	0	255	0	0
"08-28-86" 1 1 0 1 1410 1445 83 83 83 63 69									
"Dynaflect"									
1	2	1.0	8	0.70	0.58	0.43	0.31	0.21	
2	2	1.0	8	1.08	0.74	0.43	0.28	0.15	
3	2	1.0	8	0.72	0.57	0.42	0.31	0.21	
4	2	1.0	8	0.61	0.49	0.36	0.27	0.18	
5	2	1.0	8	0.72	0.60	0.43	0.31	0.20	
6	1	1.0	8	0.83	0.61	0.37	0.23	0.14	
7	2	1.0	8	0.75	0.62	0.41	0.28	0.15	
"Road Rater 400"									
1	1	2	2	0.58	25.0	0.59	0.66	0.33	0.24
1	2	2	2	1.18	25.1	1.22	0.96	0.76	0.57
1	3	2	2	1.81	25.1	2.12	1.79	1.29	1.00
2	1	2	2	0.59	25.0	1.03	0.32	0.50	0.56
2	2	2	2	1.20	25.1	2.57	1.57	1.25	2.25
2	3	2	2	1.80	25.1	4.74	3.74	2.37	1.31
3	1	2	2	0.59	25.0	0.53	0.49	2.79	0.27
3	2	2	2	1.22	25.1	1.15	0.92	1.80	0.70
3	3	2	2	1.80	25.1	1.93	1.90	1.35	1.18
4	1	2	2	0.58	24.9	0.57	1.26	0.35	0.25
4	2	2	2	1.18	25.1	1.31	1.13	0.82	0.62
4	3	2	2	1.79	25.2	2.20	1.93	1.39	1.06
5	1	2	2	0.58	25.0	0.52	0.34	0.35	0.26

5	2	2	2	1.22	25.0	1.20	1.08	0.37	0.62
5	3	2	2	1.81	25.0	2.03	1.79	1.45	5.13
6	1	2	1	0.60	25.0	0.70	0.58	0.40	0.24
6	2	2	1	1.22	25.0	1.65	1.41	0.99	0.65
6	3	2	1	1.79	25.0	2.80	2.44	1.67	1.14
7	1	1	2	0.60	15.0	0.45	0.48	0.29	0.17
7	2	1	2	1.19	15.0	1.12	1.09	0.71	0.49
7	1	2	2	0.58	24.9	0.59	0.34	0.35	0.22
7	2	2	2	1.22	25.1	1.39	1.21	0.85	0.58
7	3	2	2	1.78	25.0	2.29	1.76	1.43	1.02
7	1	3	2	0.59	35.0	0.65	1.51	0.57	0.29
7	2	3	2	1.21	35.0	1.64	3.34	1.32	0.77
7	3	3	2	1.80	34.9	3.34	5.37	2.34	1.51

"Dynatest FWD"

1	2	2	401	234	163	109	74	53	37	23
1	4	2	921	500	370	255	179	126	92	50
2	2	2	390	432	290	178	100	58	0	0
2	4	2	862	918	666	415	254	147	0	0
3	2	2	396	202	141	98	72	52	38	19
3	4	2	914	410	305	223	166	122	88	44
4	2	2	393	197	135	95	67	48	0	0
4	4	2	910	415	309	227	164	118	0	0
5	2	2	391	207	153	111	82	58	40	18
5	4	2	908	466	362	272	202	147	101	42
6	2	1	388	277	188	124	77	48	0	0
6	4	1	904	601	437	302	193	123	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	388	272	196	127	81	49	0	0
7	3	2	615	408	300	204	132	83	0	0
7	4	2	903	571	427	299	197	128	0	0

"F5m" 35 "US" 224 3150 27.5 866 "N"
 "F. 0.28m. e. of SR5 to 2.0m. w. of 169" 4.32
 "F. CR200E (3.3m. w. of 169 & 3.6m. e. of SR5) easterly (EB)" 0.25
 2 10561 77 9 1.1 0.07 5.3 7.5 1.5 "B"
 "A-2-6" 0 "SC" 130.9 9.1 13 25.0 14.2 10.3 2.70
 29 4.2 0

1
 "04-08-86" 1 1 1 0 1345 1415 73 0 0 60 55
 "Dynaflect"

1	2	1.0	8	0.73	0.60	0.45	0.36	0.26
2	2	1.0	8	1.15	0.93	0.64	0.46	0.29
3	2	1.0	8	0.73	0.62	0.47	0.37	0.26
4	2	1.0	8	0.66	0.55	0.41	0.32	0.22
5	2	1.0	8	0.79	0.69	0.57	0.49	0.37
6	1	1.0	8	0.93	0.75	0.52	0.38	0.24
7	2	1.0	8	0.73	0.61	0.45	0.34	0.23

"Road Rater 400"

1	1	2	2	0.61	25.0	0.49	0.41	0.29	0.22
1	2	2	2	1.21	25.0	1.07	1.13	0.64	0.51
1	3	2	2	1.81	25.1	1.77	2.12	1.08	0.86
2	1	2	2	0.60	25.0	0.96	0.87	0.42	0.42
2	2	2	2	1.24	25.1	2.17	2.18	0.94	1.02
2	3	2	2	1.84	25.1	3.86	3.51	1.73	1.32
3	1	2	2	0.60	25.0	0.55	0.40	0.32	0.23
3	2	2	2	1.22	25.0	1.20	1.24	0.73	0.58
3	3	2	2	1.83	25.1	2.00	2.15	1.21	1.68
4	1	2	2	0.58	24.4	0.61	0.60	0.32	0.20
4	2	2	2	1.23	25.1	1.40	1.35	0.77	0.46
4	3	2	2	1.84	25.2	2.30	2.33	1.22	1.21
5	1	2	2	0.60	25.1	0.73	0.62	0.51	0.51
5	2	2	2	1.25	25.1	1.60	1.84	1.15	0.86
5	3	2	2	1.82	25.1	2.62	1.30	1.40	1.49
6	1	2	1	0.60	25.1	0.71	1.43	0.45	0.32
6	2	2	1	1.23	25.1	1.51	1.14	0.94	0.69
6	3	2	1	1.83	25.2	2.54	0.95	1.55	1.17
7	1	1	2	0.60	15.0	0.51	0.39	0.31	0.20

7	2	1	2	1.18	15.0	1.12	0.85	0.61	0.47
7	1	2	2	0.60	25.1	0.63	0.50	0.25	0.26
7	2	2	2	1.23	25.1	1.32	1.41	1.19	0.72
7	3	2	2	1.81	25.1	2.19	0.63	1.46	1.01
7	1	3	2	0.60	35.0	0.60	0.52	0.35	0.27
7	2	3	2	1.19	35.0	1.32	1.17	0.79	0.65
7	3	3	2	1.81	35.1	2.64	1.77	1.63	1.34
"Road Rater 2000"									
1	1	2	2	0.59	24.9	0.49	0.31	0.31	0.22
1	2	2	2	1.21	25.0	1.09	0.71	0.59	0.48
1	3	2	2	1.84	24.9	1.71	1.12	0.89	0.74
1	4	2	2	2.42	24.9	2.34	1.53	1.20	1.02
1	5	2	2	3.57	24.9	3.72	2.40	1.84	1.57
2	1	2	2	0.57	24.9	0.77	0.55	0.41	0.31
2	2	2	2	1.18	25.0	2.04	1.46	1.17	0.92
2	3	2	2	1.83	25.0	3.48	2.48	1.90	1.33
2	4	2	2	2.37	25.0	4.85	3.49	2.62	1.84
2	5	2	2	3.64	25.0	8.40	6.03	4.58	3.18
3	1	2	2	0.63	25.0	0.54	0.37	0.40	0.24
3	2	2	2	1.23	24.9	1.20	0.81	0.64	0.52
3	3	2	2	1.80	24.9	1.88	1.28	0.99	0.84
3	4	2	2	2.43	24.9	2.60	1.75	1.35	1.15
3	5	2	2	3.57	25.0	4.21	2.84	2.14	1.81
4	1	2	2	0.64	25.0	0.51	0.35	0.31	0.25
4	2	2	2	1.18	24.9	1.21	0.83	0.72	0.58
4	3	2	2	1.81	25.0	1.88	1.27	1.14	0.92
4	4	2	2	2.45	25.0	2.61	1.81	1.60	1.27
4	5	2	2	3.56	24.9	4.04	2.77	2.42	1.95
5	1	2	2	0.60	25.0	0.68	0.49	0.49	0.34
5	2	2	2	1.17	25.0	1.54	1.13	0.98	0.80
5	3	2	2	1.78	25.0	2.50	1.80	1.44	1.22
5	4	2	2	2.44	25.0	3.40	2.48	1.93	1.67
5	5	2	2	3.58	25.0	5.38	3.87	3.07	2.62
6	1	1	2	0.64	15.1	0.63	0.36	0.36	0.24
6	2	1	2	1.19	15.1	1.28	0.77	0.64	0.49
6	3	1	2	1.83	15.1	2.17	1.28	1.08	0.83
6	4	1	2	2.45	15.1	3.07	1.90	1.58	1.21
6	5	1	2	3.51	15.1	6.62	3.30	2.57	1.94
6	1	2	2	0.62	25.1	0.62	0.40	0.33	0.26
6	2	2	2	1.21	25.1	1.34	0.90	0.75	0.57
6	3	2	2	1.80	25.1	2.16	1.47	1.24	0.95
6	4	2	2	2.44	25.2	3.03	2.03	1.69	1.28
6	5	2	2	3.56	25.1	4.78	3.17	2.67	2.02
6	1	3	2	0.58	35.2	0.62	0.44	0.38	0.29
6	2	3	2	1.22	35.2	1.44	1.04	0.90	0.70
6	3	3	2	1.82	35.2	2.19	1.59	1.37	1.08
6	4	3	2	2.42	35.2	3.12	2.25	1.97	1.52
6	5	3	2	3.59	35.2	4.71	3.44	3.09	2.43
7	1	2	1	0.56	25.1	0.48	0.35	0.26	0.18
7	2	2	1	1.25	25.1	1.13	0.83	0.61	0.41
7	3	2	1	1.83	25.1	1.81	1.30	0.94	0.63
7	4	2	1	2.44	25.1	2.56	1.84	1.32	0.88
7	5	2	1	3.58	25.1	4.06	2.93	2.01	1.35

"F6" 57 "SR" 3 6480 22.0 1426 "N"
 "F. Noble/Dekalb CL northerly" 5.86
 "F. 0.15m. s. of CR1005 (3.5m. n. of SR205) southerly (NB)" 0.25
 2 10359 76 10 1.0 0.08 4.4 7.3 0.0 "N"
 "A-6" 10 "CL" 122.3 13.3 6 28.6 13.2 15.4 2.73
 72 4.2 0
 2
 "04-07-86" 1 1 1 1 1040 1110 53 68 0 50 47
 "Dynalect"
 1 2 1.0 8 1.05 0.85 0.65 0.50 0.36
 2 2 1.0 8 0.88 0.70 0.55 0.43 0.31
 3 2 1.0 8 0.56 0.50 0.40 0.31 0.23
 4 2 1.0 8 0.72 0.62 0.49 0.37 0.24

5	2	1.0	8	0.83	0.68	0.53	0.39	0.26	
6	2	1.0	8	0.74	0.67	0.57	0.47	0.37	
"Road Rater 400"									
1	1	2	2	0.60	23.0	0.88	0.80	0.60	0.60
1	1	2	2	1.17	24.4	1.16	1.68	2.07	2.82
1	1	3	2	1.70	24.3	1.85	1.00	2.43	1.12
2	1	2	2	0.57	24.3	0.78	1.92	0.61	0.44
2	2	2	2	1.15	24.3	1.58	1.01	1.11	0.95
2	3	2	2	1.72	24.4	2.05	2.26	2.43	1.58
3	1	2	2	0.83	29.2	0.54	0.72	0.34	0.24
3	2	2	2	1.14	24.2	1.00	1.29	0.69	0.53
3	3	2	2	1.69	24.1	1.69	1.22	1.14	0.92
4	1	2	2	0.58	24.6	0.64	1.49	1.49	0.34
4	2	2	2	1.19	24.7	1.24	0.48	2.22	0.63
4	3	2	2	1.77	24.7	2.15	2.54	1.35	1.12
5	1	2	2	0.57	24.6	0.64	1.52	0.38	0.25
5	2	2	2	1.19	24.7	1.23	0.76	0.71	0.53
5	3	2	2	1.76	24.7	2.15	2.46	1.29	0.93
6	1	1	1	0.46	13.1	0.39	0.26	0.41	0.16
6	1	2	2	0.59	24.9	0.53	1.61	0.40	0.30
6	2	2	2	1.19	24.9	1.05	2.20	0.80	0.67
6	3	2	2	1.80	24.9	1.75	1.71	1.43	1.17
6	1	3	2	0.56	33.8	3.38	0.30	0.27	0.77
6	2	3	2	1.11	33.8	0.95	0.77	0.63	1.02
6	3	3	2	1.69	33.8	1.54	2.70	5.50	1.08
"Road Rater 2000"									
1	1	2	2	0.66	25.2	0.73	0.51	0.44	0.33
1	1	2	2	1.22	25.2	1.79	1.26	1.08	0.31
1	1	3	2	1.82	25.2	2.69	1.91	1.61	1.23
1	1	4	2	2.43	25.2	3.85	2.70	2.22	1.73
1	1	5	2	3.64	25.2	6.18	4.30	3.19	2.71
2	1	2	2	0.57	25.1	0.50	0.34	0.25	0.22
2	2	2	2	1.17	25.1	1.11	0.78	0.57	0.50
2	3	2	2	1.79	25.2	1.72	1.18	0.88	0.77
2	4	2	2	2.44	25.1	2.41	1.65	1.24	1.07
2	5	2	2	3.64	25.1	3.84	2.65	2.00	1.57
3	1	2	2	0.60	25.1	0.50	0.32	0.27	0.20
3	2	2	2	1.26	25.1	1.27	0.79	0.66	0.49
3	3	2	2	1.84	25.1	1.94	1.21	1.01	0.77
3	4	2	2	2.39	25.1	2.63	1.64	1.35	1.03
3	5	2	2	3.61	25.1	4.26	2.64	2.20	1.64
4	1	2	2	0.61	25.1	0.42	0.32	0.28	0.20
4	2	2	2	1.17	25.2	0.83	0.62	0.49	0.41
4	3	2	2	1.80	25.2	1.46	0.98	0.77	0.64
4	4	2	2	2.41	25.1	2.07	1.35	1.08	0.89
4	5	2	2	3.60	25.2	3.45	2.21	1.81	1.46
5	1	2	2	0.63	25.2	0.57	0.33	0.33	0.25
5	2	2	2	1.17	25.1	1.13	0.75	0.63	0.49
5	3	2	2	1.75	25.1	1.77	1.18	1.00	0.77
5	4	2	2	2.41	25.1	2.50	1.63	1.38	1.06
5	5	2	2	3.61	25.2	3.97	2.58	2.20	1.71
6	1	1	2	0.62	15.0	0.48	0.37	0.35	0.27
6	2	1	2	1.21	14.9	1.01	0.79	0.67	0.57
6	3	1	2	1.81	15.1	1.59	1.19	1.08	0.86
6	4	1	2	2.40	15.0	2.26	1.72	1.45	1.22
6	5	1	2	3.59	15.1	3.48	2.56	2.28	1.97
6	1	2	2	0.56	25.0	0.43	0.33	0.30	0.24
6	2	2	2	1.21	25.0	0.96	0.76	0.66	0.54
6	3	2	2	1.81	25.0	1.50	1.17	1.03	0.84
6	4	2	2	2.38	25.1	2.01	1.56	1.38	1.12
6	5	2	2	3.57	25.0	3.23	2.46	2.16	1.76
6	1	3	2	0.62	35.0	0.38	0.27	0.24	0.19
6	2	3	2	1.24	34.9	0.75	0.55	0.48	0.38
6	3	3	2	1.81	35.0	1.15	0.85	0.73	0.58
6	4	3	2	2.42	35.0	1.56	1.13	0.99	0.79
6	5	3	2	3.62	34.9	2.49	1.76	1.51	1.21
"Dv nate test FWD"									
1	2	2	441	272	208	155	120	92	0
1	4	2	912	521	390	314	239	192	0
2	2	2	434	212	162	122	94	72	0

2	4	2	913	430	328	251	196	153	0	0
3	2	2	438	173	135	110	83	60	0	0
3	4	2	908	364	283	233	178	137	0	0
4	2	2	430	186	148	120	94	68	0	0
4	4	2	912	402	313	260	205	153	0	0
5	2	2	429	207	164	127	95	66	44	12
5	4	2	908	455	357	282	217	154	102	34
6	1	2	203	73	59	50	37	29	0	0
6	2	2	419	158	124	105	84	65	0	0
6	3	2	650	244	196	168	138	106	0	0
6	4	2	909	338	269	232	192	148	0	0

"08-27-86" 1 1 0 1 0950 1020 64 69 73 64 69

"Dynaflect"

1	2	1.0	8	0.67	0.55	0.42	0.32	0.24
2	2	1.0	8	0.59	0.47	0.36	0.28	0.21
3	2	1.0	8	0.46	0.39	0.31	0.23	0.17
4	2	1.0	8	0.42	0.38	0.31	0.23	0.16
5	2	1.0	8	0.50	0.43	0.34	0.25	0.17
6	2	1.0	8	0.56	0.50	0.42	0.34	0.27

"Road Rater 400"

1	1	2	2	0.59	25.0	0.65	0.51	0.43	0.21
1	2	2	2	1.22	25.0	1.50	1.16	0.96	0.62
1	3	2	2	1.82	25.1	2.70	2.12	1.74	2.29
2	1	2	2	0.59	25.0	0.53	0.47	0.64	0.30
2	2	2	2	1.20	25.0	1.25	0.98	0.63	0.61
2	3	2	2	1.80	25.1	2.12	1.68	1.44	1.04
3	1	2	2	0.59	25.0	0.36	0.20	0.26	0.19
3	2	2	2	1.20	25.0	0.76	0.69	0.57	0.45
3	3	2	2	1.81	25.1	1.33	0.99	0.95	0.83
4	1	2	2	0.59	25.0	0.38	0.51	0.63	0.19
4	2	2	2	1.21	25.0	0.74	0.62	0.90	0.41
4	3	2	2	1.82	25.1	1.31	1.14	1.33	0.75
5	1	2	2	0.59	25.0	0.53	0.38	0.60	0.23
5	2	2	2	1.20	25.0	1.06	0.63	0.68	0.49
5	3	2	2	1.83	25.1	1.99	2.88	5.68	9.83
6	1	1	2	0.60	15.1	0.50	0.37	0.31	0.10
6	2	1	2	1.21	15.2	1.13	0.84	0.98	1.69
6	1	2	2	0.60	25.0	0.49	0.38	0.85	0.14
6	2	2	2	1.21	25.0	1.08	0.86	0.74	0.68
6	3	2	2	1.80	25.1	1.93	1.68	4.03	19.37
6	1	3	2	0.60	35.1	0.39	0.28	0.33	0.39
6	2	3	2	1.20	35.0	0.87	0.68	0.53	0.65
6	3	3	2	1.80	35.0	1.83	1.73	6.69	8.48

"Dynatest FWD"

1	2	2	408	214	147	110	86	65	49	25
1	4	2	933	421	305	239	187	145	111	57
2	2	2	402	200	134	100	78	60	0	0
2	4	2	926	399	288	221	174	135	0	0
3	2	2	403	130	102	85	66	51	38	18
3	4	2	928	292	233	198	153	121	90	44
4	2	2	400	133	103	83	62	44	0	0
4	4	2	920	301	241	199	152	111	0	0
5	2	2	399	191	137	100	71	49	32	12
5	4	2	916	416	317	236	174	124	80	27
6	1	2	0	0	0	0	0	0	0	0
6	2	2	399	175	130	106	85	67	0	0
6	3	2	625	262	204	166	136	107	0	0
6	4	2	916	370	292	241	197	156	0	0

"F7" 20 "US" 33 13880 27.0 3748 "N"
 "F. w. Goshen C/L to se. Elkhart C/L" 2.90
 "F. turnout 0.4m. n. of Goshen C/L northerly 2 turnouts (N8)" 0.35
 2 8806 73 13 4.5 0.39 0.0 7.0 11.0 "6"
 "A-1-b" 0 "SM" 132.9 9.2 23 0.0 0.0 0.0 2.67
 43 2.9 0

3

"04-09-86" 1 1 1 0 1100 1130 43 0 0 40 56

"Dynalect"

1	2	1.0	8	0.51	0.42	0.33	0.26	0.19
2	2	1.0	8	0.50	0.44	0.36	0.29	0.21
3	2	1.0	8	0.48	0.42	0.35	0.28	0.21
4	2	1.0	8	0.49	0.43	0.35	0.29	0.21
5	2	1.0	8	0.48	0.42	0.34	0.28	0.21
6	2	1.0	8	0.69	0.61	0.51	0.42	0.33

"Road Rater 400"

1	1	2	2	0.61	24.9	0.40	0.48	0.88	0.87
1	2	2	2	1.20	24.9	0.80	2.20	0.45	0.36
1	3	2	2	1.80	25.0	1.27	1.89	1.70	0.67
2	1	2	2	0.60	25.0	0.33	0.22	0.92	0.16
2	2	2	2	1.23	25.0	0.71	1.98	0.63	0.43
2	3	2	2	1.81	25.0	1.11	2.08	1.79	0.95
3	1	2	2	0.60	25.0	0.32	0.40	0.92	0.15
3	2	2	2	1.24	25.0	0.71	0.97	1.01	0.43
3	3	2	2	1.81	25.0	1.13	1.68	0.91	0.73
4	1	2	2	0.60	25.0	0.37	1.27	0.78	0.22
4	2	2	2	1.24	25.0	0.77	0.75	2.49	0.48
4	3	2	2	1.83	25.1	1.23	0.84	2.85	0.85
5	1	2	2	0.59	25.0	0.33	0.11	0.47	0.19
5	2	2	2	1.24	25.1	0.76	2.01	0.43	0.43
5	3	2	2	1.84	25.1	1.23	1.22	3.10	0.87
6	1	1	2	0.61	14.9	0.55	0.49	0.47	0.37
6	2	1	2	1.22	15.1	1.18	0.97	0.53	0.31
6	1	2	2	0.60	24.9	0.47	0.41	0.56	0.15
6	2	2	2	1.24	25.1	1.00	2.63	0.55	1.61
6	3	2	2	1.85	25.2	1.59	1.44	2.71	2.62
6	1	3	2	0.60	35.0	0.40	0.36	0.29	0.31
6	2	3	2	1.21	35.0	0.89	0.82	0.69	0.75
6	3	3	2	1.80	35.0	1.71	1.82	1.38	1.30

"Road Rater 2000"

1	1	2	2	0.57	25.0	0.28	0.24	0.24	0.15
1	2	2	2	1.22	25.0	0.60	0.53	0.47	0.33
1	3	2	2	1.80	25.0	0.92	0.82	0.71	0.52
1	4	2	2	2.41	24.9	1.23	1.14	0.97	0.73
1	5	2	2	3.56	25.0	1.80	1.80	1.49	1.14
2	1	2	2	0.59	25.0	0.31	0.25	0.19	0.17
2	2	2	2	1.20	25.0	0.66	0.53	0.40	0.34
2	3	2	2	1.77	25.0	0.98	0.81	0.64	0.53
2	4	2	2	2.38	25.0	1.31	1.10	0.94	0.74
2	5	2	2	3.60	25.0	1.77	1.75	1.39	1.15
3	1	2	2	0.59	25.0	0.32	0.26	0.27	0.19
3	2	2	2	1.16	25.0	0.64	0.56	0.55	0.39
3	3	2	2	1.80	25.0	1.02	0.90	0.92	0.62
3	4	2	2	2.42	25.0	1.40	1.24	1.11	0.97
3	5	2	2	3.58	25.0	2.10	1.94	1.78	1.33
4	1	2	2	0.60	24.9	0.22	0.29	0.25	0.19
4	2	2	2	1.18	25.0	0.50	0.60	0.51	0.40
4	3	2	2	1.79	25.0	0.78	0.95	0.80	0.63
4	4	2	2	2.41	25.0	1.08	1.32	1.08	0.88
4	5	2	2	3.55	25.0	2.11	2.09	1.70	1.41
5	1	2	2	0.59	25.0	0.29	0.28	0.22	0.19
5	2	2	2	1.21	25.0	0.63	0.61	0.49	0.43
5	3	2	2	1.80	25.0	0.98	0.94	0.77	0.68
5	4	2	2	2.42	25.0	1.39	1.32	1.08	0.93
5	5	2	2	3.60	25.0	2.04	2.08	1.61	1.49
6	1	1	2	0.59	15.1	0.65	0.51	0.43	0.34
6	2	1	2	1.20	15.1	1.44	1.06	0.93	0.75
6	3	1	2	1.79	15.1	2.39	1.72	1.45	1.14
6	4	1	2	2.42	15.1	3.52	2.40	2.04	1.66
6	5	1	2	3.55	15.1	5.30	3.87	3.19	2.52
6	1	2	2	0.62	25.0	0.58	0.41	0.34	0.25
6	2	2	2	1.18	25.0	1.17	0.83	0.69	0.53
6	3	2	2	1.77	25.1	1.79	1.25	1.03	0.80
6	4	2	2	2.41	25.0	2.49	1.71	1.43	1.11
6	5	2	2	3.63	25.0	4.01	2.68	2.20	1.71
6	1	3	2	0.63	35.1	0.47	0.33	0.25	0.19
6	2	3	2	1.22	35.1	1.03	0.67	0.54	0.39
6	3	3	2	1.77	35.1	1.60	1.02	0.82	0.59

6	4	3	2	2.40	35.2	2.19	1.42	1.12	0.81
6	5	3	2	3.62	35.0	3.60	2.26	1.77	1.27
"04-25-86"	0	0	0	1	1010	1040	85	0	74 45
"Dynatest FWD"									
1	2	2	398	143	107	76	58	41	0 0
1	4	2	846	291	224	162	122	88	0 0
2	2	2	393	125	104	84	63	47	0 0
2	4	2	848	260	214	172	132	99	0 0
3	2	2	393	126	102	80	62	48	0 0
3	4	2	843	255	209	167	130	99	0 0
4	2	2	392	121	100	84	62	47	0 0
4	4	2	843	247	209	173	131	100	0 0
5	2	2	390	120	101	79	62	46	37 18
5	4	2	846	247	207	169	130	99	76 43
6	1	2	179	73	53	44	30	25	0 0
6	2	2	388	161	128	104	79	63	0 0
6	3	2	610	246	196	159	125	96	0 0
6	4	2	838	325	262	211	165	127	0 0
"09-20-86"	1	1	0	1	1450	1515	112	110	111 83 58
"Dynalect"									
1	2	1.0	8	0.54	0.43	0.34	0.24	0.17	
2	2	1.0	8	0.48	0.40	0.31	0.22	0.16	
3	2	1.0	8	0.65	0.49	0.35	0.25	0.17	
4	2	1.0	8	0.51	0.43	0.33	0.24	0.18	
5	2	1.0	8	0.53	0.47	0.39	0.31	0.24	
6	2	1.0	8	0.83	0.76	0.65	0.53	0.41	
"Road Rater 400"									
1	1	2	2	0.61	25.1	0.51	0.41	0.29	0.18
1	2	2	2	1.23	25.1	1.19	1.00	0.71	0.48
1	3	2	2	1.84	25.1	2.11	2.99	1.21	3.55
2	1	2	2	0.61	25.1	0.46	0.38	0.30	0.18
2	2	2	2	1.20	25.1	1.04	0.93	0.74	0.65
2	3	2	2	1.84	25.2	1.69	1.55	1.25	0.92
3	1	2	2	0.59	25.1	0.45	0.37	0.29	1.36
3	2	2	2	1.23	25.1	1.09	0.95	0.76	0.56
3	3	2	2	1.84	25.1	1.81	1.53	1.21	0.91
4	1	2	2	0.61	25.1	0.42	0.37	0.28	0.19
4	2	2	2	1.21	25.1	0.96	0.91	0.72	0.53
4	3	2	2	1.81	25.1	1.56	1.42	1.19	0.90
5	1	2	2	0.60	25.1	0.44	0.40	0.32	0.24
5	2	2	2	1.25	25.1	1.17	1.10	0.92	0.73
5	3	2	2	1.80	25.1	1.87	1.75	1.47	1.19
6	1	1	2	0.59	14.8	0.60	0.55	0.46	0.37
6	2	1	2	1.19	14.9	1.44	1.33	1.07	0.86
6	1	2	2	0.63	25.1	0.58	0.51	0.41	0.32
6	2	2	2	1.23	25.1	1.34	1.19	0.93	0.74
6	3	2	2	1.84	25.2	2.16	2.87	1.44	1.13
6	1	3	2	0.59	35.1	0.33	0.40	0.29	0.21
6	2	3	2	1.20	35.1	2.67	2.04	1.03	0.79
"Dynatest FWD"									
1	2	2	386	191	123	82	55	37	25 18
1	4	2	890	410	274	186	122	85	70 39
2	2	2	383	166	113	86	60	42	0 0
2	4	2	889	361	251	193	136	96	0 0
3	2	2	380	168	113	85	59	43	32 19
3	4	2	886	362	253	188	135	97	73 47
4	2	2	383	149	107	84	60	42	0 0
4	4	2	887	321	240	187	135	98	0 0
5	2	2	378	178	115	87	65	46	37 26
5	4	2	881	360	248	191	141	104	80 50
6	1	2	0	0	0	0	0	0	0 0
6	2	2	377	215	134	101	71	51	0 0
6	3	2	597	324	209	157	111	82	0 0
6	4	2	883	453	297	222	156	116	0 0

"FB" 20 "SR" 15 6460 27.0 1744 "N"
 "F. 6.07m. n. of Elkhart/Kosciusko CL to Goshen C/L" 3.50

"F. CR29 (6.2m. n. of Elkhart/Kosciusko CL) northerly (N2)" 0.25
 2 13411 82 4 2.3 0.23 0.0 9.3 2.4 "6"
 "A-1-b" 0 "SW-SM" 92.8 8.7 40 0.0 0.0 0.0 2.70
 59 2.8 0

3
 "04-09-86" 1 1 1 0 0945 1015 43 0 0 38 56

"Dynalect"

1	2	1.0	8	0.48	0.43	0.35	0.30	0.20
2	2	1.0	8	0.45	0.44	0.40	0.38	0.33
3	2	1.0	8	0.44	0.40	0.35	0.32	0.25
4	2	1.0	8	0.44	0.42	0.37	0.33	0.26
5	2	1.0	8	0.48	0.47	0.42	0.39	0.32
6	2	1.0	8	0.40	0.37	0.31	0.28	0.22

"Road Rater 400"

1	1	2	2	0.59	24.9	0.26	0.24	0.34	0.13
1	2	2	2	1.22	25.1	0.61	1.21	2.62	0.35
1	3	2	2	1.83	25.1	0.94	1.15	2.21	2.37
2	1	2	2	0.60	25.1	0.24	0.14	0.22	0.22
2	2	2	2	1.23	25.1	0.52	0.37	0.51	0.51
2	3	2	2	1.83	25.1	0.86	0.61	0.86	0.38
3	1	2	2	0.60	25.0	0.25	0.53	0.23	0.21
3	2	2	2	1.24	25.1	0.56	2.32	0.54	0.42
3	3	2	2	1.83	25.1	0.88	0.88	0.94	2.38
4	1	2	2	0.61	25.1	0.29	0.22	0.21	0.17
4	2	2	2	1.23	25.1	0.59	1.00	0.45	0.30
4	3	2	2	1.83	25.1	0.90	1.16	0.71	1.55
5	1	2	2	0.61	25.1	0.37	0.63	1.22	0.55
5	2	2	2	1.23	25.1	0.76	2.49	0.65	1.36
5	3	2	2	1.84	25.1	1.17	2.02	1.01	2.43
6	1	1	2	0.62	15.1	0.18	0.46	2.11	0.11
6	2	1	2	1.21	15.1	0.39	0.84	1.49	0.25
6	1	2	2	0.60	24.9	0.21	1.79	0.89	0.10
6	2	2	2	1.24	25.0	0.58	0.79	0.31	0.24
6	3	2	2	1.80	25.0	0.54	0.54	0.50	0.41
6	1	3	2	0.60	35.1	0.25	0.12	0.32	0.79
6	2	3	2	1.20	35.1	0.57	0.33	0.42	1.02
6	3	3	2	1.83	35.2	0.87	0.62	1.41	1.97

"Road Rater 2000"

1	1	2	2	0.62	24.8	0.28	0.24	0.33	0.17
1	2	2	2	1.18	25.0	0.57	0.48	0.49	0.33
1	3	2	2	1.82	24.9	0.87	0.73	0.68	0.51
1	4	2	2	2.43	25.0	1.19	1.02	0.91	0.71
1	5	2	2	3.60	25.0	1.79	1.56	1.35	1.11
2	1	2	2	0.60	25.0	0.25	0.19	0.18	0.15
2	2	2	2	1.23	24.9	0.55	0.44	0.38	0.30
2	3	2	2	1.76	24.9	0.82	0.65	0.57	0.46
2	4	2	2	2.43	25.0	1.15	0.94	0.81	0.65
2	5	2	2	3.61	25.0	1.74	1.47	1.29	1.05
3	1	2	2	0.61	25.0	0.29	0.24	0.22	0.17
3	2	2	2	1.16	24.9	0.57	0.50	0.43	0.36
3	3	2	2	1.78	24.9	0.93	0.80	0.70	0.58
3	4	2	2	2.44	11.9	1.32	1.12	1.01	0.82
3	4	2	2	2.40	24.9	1.29	1.10	1.00	0.83
3	5	2	2	3.59	25.0	2.08	1.82	1.67	1.35
4	1	2	2	0.62	24.9	0.19	0.21	0.18	0.16
4	2	2	2	1.19	24.9	0.43	0.42	0.36	0.28
4	3	2	2	1.78	24.9	0.67	0.66	0.55	0.44
4	4	2	2	2.39	24.9	0.93	0.93	0.81	0.62
4	5	2	2	3.58	25.0	1.43	1.47	1.28	1.00
5	1	2	2	0.59	24.9	0.21	0.24	0.19	0.17
5	2	2	2	1.20	24.9	0.49	0.53	0.43	0.37
5	3	2	2	1.82	24.9	0.80	0.85	0.69	0.59
5	4	2	2	2.38	24.9	1.14	1.19	0.98	0.84
5	5	2	2	3.59	24.9	1.87	1.93	1.62	1.38
6	1	1	2	0.57	15.1	0.33	0.19	0.18	0.14
6	2	1	2	1.22	15.1	0.65	0.39	0.38	0.30
6	3	1	2	1.77	15.0	1.05	0.65	0.60	0.45
6	4	1	2	2.39	15.1	1.41	0.93	0.90	0.65
6	5	1	2	3.57	15.1	1.15	1.89	1.27	0.98
6	1	2	2	0.58	25.0	0.20	0.25	0.14	0.14

6	2	2	2	1.21	25.1	0.44	0.45	0.29	0.26					
6	3	2	2	1.82	25.0	0.67	0.70	0.47	0.43					
6	4	2	2	2.41	25.1	0.92	0.93	0.66	0.56					
6	5	2	2	3.58	25.1	1.42	1.35	1.07	0.83					
6	1	3	2	0.60	35.1	0.20	0.23	0.14	0.13					
6	2	3	2	1.24	35.1	0.42	0.50	0.29	0.24					
6	3	3	2	1.80	35.1	0.61	0.72	0.44	0.36					
6	4	3	2	2.41	35.1	0.86	0.99	0.60	0.50					
6	5	3	2	3.62	35.1	1.31	1.54	0.97	0.80					
"04-25-86"				0	0	0	1	0900	0930	78	0	0	69	45
"Dynatest FWD"														
1	2	2	404	73	69	57	45	36	0	0				
1	4	2	856	153	145	119	96	76	0	0				
2	2	2	399	68	59	55	48	39	0	0				
2	4	2	849	139	125	115	98	83	0	0				
3	2	2	395	77	69	56	47	36	0	0				
3	4	2	848	162	142	119	96	76	0	0				
4	2	2	392	112	107	97	82	66	0	0				
4	4	2	844	221	211	192	164	132	0	0				
5	2	2	388	132	126	117	103	85	75	39				
5	4	2	842	254	243	226	196	162	129	64				
6	1	2	185	42	37	29	24	17	0	0				
6	2	2	391	89	78	65	53	41	0	0				
6	3	2	615	137	120	102	82	64	0	0				
6	4	2	842	183	159	136	110	87	0	0				
"08-29-86"				1	1	0	1	0845	0910	42	46	50	51	70
"Dynalect"														
1	2	1.0	8	0.35	0.33	0.30	0.24	0.20						
2	2	1.0	8	0.34	0.33	0.31	0.27	0.23						
3	2	1.0	8	0.32	0.30	0.26	0.21	0.17						
4	2	1.0	8	0.33	0.32	0.30	0.25	0.21						
5	2	1.0	8	0.36	0.35	0.33	0.29	0.24						
6	2	1.0	8	0.30	0.28	0.26	0.21	0.17						
"Road Rater 400"														
1	1	2	2	0.59	25.0	0.22	1.12	1.16	0.14					
1	2	2	2	1.21	25.1	0.47	1.11	1.71	0.34					
1	3	2	2	1.80	25.1	0.90	1.40	0.60	0.56					
2	1	2	2	0.58	25.0	0.22	0.88	0.23	0.22					
2	2	2	2	1.22	25.1	0.49	0.56	0.52	0.50					
2	3	2	2	1.79	25.1	0.83	0.60	0.89	0.90					
3	1	2	2	0.59	25.0	0.18	0.78	2.46	0.14					
3	2	2	2	1.20	25.1	0.39	0.69	4.53	0.33					
4	3	2	2	1.78	25.1	0.71	1.72	2.43	0.62					
4	1	2	2	0.58	25.0	0.24	0.63	0.19	0.14					
4	2	2	2	1.19	25.1	0.47	0.73	0.42	0.35					
4	3	2	2	1.78	25.0	0.86	1.60	0.74	0.61					
5	1	2	2	0.59	25.0	0.21	0.19	1.83	0.14					
5	2	2	2	1.22	25.0	0.49	0.46	0.38	0.32					
5	3	2	2	1.81	25.0	0.84	0.79	0.69	1.74					
6	1	1	2	0.58	14.9	0.17	0.34	0.86	0.11					
6	2	1	2	1.18	15.0	0.40	1.18	3.52	0.28					
6	1	2	2	0.59	25.1	0.19	2.00	2.07	0.12					
6	2	2	2	1.20	25.1	0.42	1.31	1.16	0.30					
6	3	2	2	1.78	25.1	0.69	2.00	1.73	0.48					
6	1	3	2	0.60	35.0	0.17	1.82	0.13	0.08					
6	2	3	2	0.94	35.1	0.83	0.57	0.49	1.60					
6	2	3	2	1.20	35.0	0.42	2.28	0.34	0.25					
"Dynatest FWD"														
1	2	2	439	87	83	69	58	47	39	24				
1	4	2	979	190	180	153	128	103	84	57				
2	2	2	438	76	71	65	59	54	0	0				
2	4	2	969	165	152	142	127	116	0	0				
3	2	2	432	78	65	57	45	36	32	27				
3	4	2	966	173	146	123	102	81	66	56				
4	2	2	429	86	81	74	62	50	0	0				
4	4	2	957	190	180	164	136	112	0	0				
5	2	2	426	93	98	81	71	58	48	25				
5	4	2	951	198	186	171	149	125	104	58				
6	1	2	0	0	0	0	0	0	0	0				
6	2	2	426	77	66	56	45	36	0	0				

6	3	2	655	120	103	89	71	58	0	0
6	4	2	947	169	145	124	102	82	0	0

"F9" 17 " 1" 69 14420 31.3 4513 "N"
 "F. 3.9m. n. of Allen/Dekalb CL to 10.9m. s. of Dekalb/Steuben CL" 3.29
 "F. 2.0m. n. of CR11-A (Garrett exit) northerly (NB)" 0.25
 2 11298 78 8 4.3 0.29 0.0 10.3 7.0 "G"
 "A-6" 2 "SC" 113.1 19.5 10 36.9 19.4 17.5 2.71
 79 2.8 0

2
 "04-07-86" 1 1 1 1 1150 1220 81 0 0 50 50
 "Dynalect"

1	2	1.0	8	0.45	0.42	0.38	0.35	0.28
2	2	1.0	8	0.27	0.25	0.22	0.20	0.15
3	2	1.0	8	0.44	0.43	0.38	0.32	0.24
4	2	1.0	8	0.38	0.36	0.33	0.30	0.24
5	2	1.0	8	0.42	0.38	0.34	0.30	0.24
6	1	1.0	8	0.36	0.32	0.29	0.26	0.21
7	2	1.0	8	0.39	0.36	0.31	0.28	0.22

"Road Rater 400"

1	1	2	2	0.58	24.5	0.33	0.38	0.23	0.13
1	2	2	2	1.15	24.6	0.57	0.55	0.45	0.28
1	3	2	2	1.77	24.7	0.92	0.83	0.76	0.70
2	1	2	2	0.57	24.6	0.21	0.78	1.08	0.15
2	2	2	2	1.23	25.3	0.44	1.52	1.85	0.35
2	3	2	2	1.83	25.3	0.73	0.91	0.67	0.68
3	1	2	2	0.62	25.3	0.34	0.41	1.05	0.20
3	2	2	2	1.25	25.3	0.73	0.48	1.37	0.45
3	3	2	2	1.84	25.3	1.21	0.83	0.70	0.81
4	1	2	2	0.61	25.2	0.25	0.23	0.34	0.15
4	2	2	2	1.22	25.3	0.57	0.51	0.55	0.50
4	3	2	2	1.85	25.3	0.92	0.71	0.82	0.66
5	1	2	2	0.62	25.3	0.30	0.24	0.22	0.20
5	2	2	2	1.22	25.3	0.62	0.49	0.50	0.45
5	3	2	2	1.86	25.3	1.03	1.04	0.89	0.79
6	1	1	2	0.63	15.2	0.24	0.11	0.20	0.13
6	2	1	2	1.24	15.2	0.55	0.39	0.44	0.36
6	1	2	2	0.76	28.5	0.33	0.25	0.25	0.37
6	2	2	2	1.23	25.3	0.69	1.42	0.59	3.17
6	3	2	2	1.87	25.3	1.15	1.82	0.91	2.16
6	1	3	2	0.58	34.6	0.22	0.19	0.17	0.35
6	2	3	2	1.20	35.0	0.52	0.46	0.43	0.66
6	3	3	2	1.81	35.0	0.98	0.90	0.84	0.82

"Road Rater 2000"

1	1	2	2	0.59	25.0	0.36	0.23	0.21	0.18
1	2	2	2	1.19	25.0	0.75	0.48	0.45	0.41
1	3	2	2	1.80	25.0	1.14	0.74	0.70	0.56
1	4	2	2	2.43	25.0	1.52	1.00	0.91	0.71
1	5	2	2	3.60	25.0	2.42	1.56	1.43	1.13
2	1	2	2	0.58	25.1	0.33	0.18	0.17	0.14
2	2	2	2	1.21	25.0	0.69	0.36	0.32	0.33
2	3	2	2	1.75	25.0	0.99	0.53	0.48	0.46
2	4	2	2	2.40	25.0	1.39	0.74	0.67	0.45
2	5	2	2	3.63	25.1	2.22	1.16	1.02	0.72
3	1	2	2	0.62	25.0	0.34	0.24	0.23	0.18
3	2	2	2	1.22	25.0	0.70	0.48	0.46	0.36
3	3	2	2	1.81	25.1	1.09	0.73	0.72	0.56
3	4	2	2	2.45	25.0	1.43	1.00	0.96	0.75
3	5	2	2	3.61	25.0	2.32	1.56	1.51	1.21
4	1	2	2	0.60	25.1	0.26	0.21	0.21	0.17
4	2	2	2	1.20	25.1	0.51	0.44	0.40	0.35
4	3	2	2	1.81	25.1	0.80	0.65	0.60	0.53
4	4	2	2	2.41	25.1	1.06	0.88	0.80	0.73
4	5	2	2	3.63	25.1	1.64	1.35	1.20	1.12
5	1	2	2	0.58	25.1	0.36	0.27	0.26	0.25
5	2	2	2	1.15	25.1	0.72	0.56	0.54	0.45
5	4	2	2	1.75	25.1	1.14	0.90	0.87	0.71

5	4	2	2	2.40	25.1	1.59	1.24	1.20	0.97
5	5	2	2	3.62	25.1	2.46	1.98	1.76	1.59
6	1	1	2	0.54	14.9	0.29	0.29	0.24	0.25
6	2	1	2	1.25	14.8	0.52	0.57	0.48	0.47
6	3	1	2	1.79	14.9	0.87	0.92	0.74	0.77
6	4	1	2	2.36	14.9	1.27	1.24	1.09	0.95
6	1	2	2	0.56	25.1	0.35	0.32	0.23	0.34
6	2	2	2	1.20	25.0	0.85	0.70	0.51	0.73
6	3	2	2	1.80	25.0	1.34	1.08	0.81	1.23
6	4	2	2	2.43	25.0	1.90	1.52	1.12	1.83
6	5	2	2	3.60	25.0	3.18	1.82	1.75	2.59
6	1	3	2	0.62	35.2	0.35	0.26	0.29	0.16
6	2	3	2	1.22	35.1	0.73	0.52	0.54	0.30
6	3	3	2	1.81	35.2	1.11	0.82	0.81	0.47
6	4	3	2	2.43	35.1	1.54	1.07	1.06	0.64
6	5	3	2	3.62	35.2	2.63	1.45	1.70	0.98
7	1	2	1	0.60	25.0	0.32	0.19	0.18	0.22
7	2	2	1	1.16	24.9	0.61	0.38	0.35	0.27
7	3	2	1	1.84	24.9	0.99	0.59	0.54	0.38
7	4	2	1	2.39	24.9	1.32	0.80	0.71	0.51
7	5	2	1	3.60	25.0	2.11	1.22	1.11	0.83
"Dynatest FWD"									
1	2	2	418	100	93	85	75	64	0
1	4	2	936	206	190	176	155	132	0
2	2	2	416	64	57	54	46	40	0
2	4	2	928	148	131	122	106	95	0
3	2	2	421	97	93	89	74	63	0
3	4	2	904	209	197	187	159	135	0
4	2	2	420	86	80	75	66	57	0
4	4	2	714	188	164	159	136	121	0
5	2	2	421	102	98	89	77	64	53
5	4	2	895	225	200	179	160	132	112
6	2	1	423	74	67	61	51	44	0
6	4	1	894	166	144	130	113	97	0
7	1	2	209	38	36	30	26	21	0
7	2	2	415	80	73	65	53	46	0
7	3	2	644	126	115	104	86	74	0
7	4	2	896	176	156	142	125	101	0
"08-27-86" 1 1 0 1 1255 1323 77 85 82 66 72									
"Dynaflect"									
1	2	1.0	8	0.31	0.27	0.25	0.21	0.17	
2	2	1.0	8	0.21	0.19	0.17	0.14	0.11	
3	2	1.0	8	0.31	0.28	0.25	0.21	0.17	
4	2	1.0	8	0.31	0.28	0.26	0.22	0.18	
5	2	1.0	8	0.34	0.28	0.25	0.21	0.17	
6	1	1.0	8	0.34	0.28	0.24	0.19	0.15	
7	2	1.0	8	0.30	0.26	0.24	0.20	0.16	
"Road Rater 400"									
1	1	2	2	0.58	25.1	0.23	0.41	0.19	0.15
1	2	2	2	1.19	25.1	0.47	1.43	0.39	0.34
1	3	2	2	1.81	25.1	0.81	0.86	0.73	0.63
2	1	2	2	0.60	25.1	0.16	0.16	0.14	0.11
2	2	2	2	1.22	25.1	0.35	0.27	0.32	0.27
2	3	2	2	1.78	25.1	0.58	0.40	0.54	0.47
3	1	2	2	0.58	25.1	0.21	0.20	0.19	0.15
3	2	2	2	1.21	25.1	0.47	0.46	0.40	0.34
3	3	2	2	1.79	25.1	0.78	0.76	0.73	0.61
4	1	2	2	0.61	25.1	0.23	0.08	0.09	0.16
4	2	2	2	1.21	25.1	0.52	0.13	0.41	0.42
4	3	2	2	1.78	25.1	0.85	0.31	0.52	0.70
5	1	2	2	0.59	25.0	0.22	0.21	0.17	0.13
5	2	2	2	1.19	25.1	0.46	0.42	0.37	0.31
5	3	2	2	1.80	25.1	0.78	0.72	0.66	0.55
6	1	2	1	0.59	25.1	0.19	0.18	0.17	0.14
6	2	2	1	1.21	25.1	0.46	0.44	0.42	0.36
6	3	2	1	1.82	25.1	0.78	0.76	0.72	0.63
7	1	1	2	0.60	15.0	0.15	0.13	0.11	0.08
7	2	1	2	1.19	15.0	0.35	0.31	0.27	0.23
7	1	2	2	0.60	25.0	0.19	0.16	0.15	0.11
7	2	2	2	1.19	25.0	0.40	0.36	0.31	0.28

7	3	2	2	1.79	25.0	0.69	0.62	0.56	1.26
7	1	3	2	0.59	35.0	0.17	0.13	0.11	0.97
7	2	3	2	1.20	35.0	0.37	0.32	0.29	0.37
7	3	3	2	1.79	35.0	0.74	0.69	0.61	0.52

"Dynatest FWD"

1	2	2	405	70	67	61	51	42	31	18
1	4	2	920	154	147	135	115	97	80	44
2	2	2	408	54	47	44	37	33	0	0
2	4	2	922	125	112	104	89	76	0	0
3	2	2	409	81	72	69	54	46	36	19
3	4	2	926	183	166	156	131	106	84	45
4	2	2	402	72	62	60	51	43	0	0
4	4	2	916	161	146	134	117	100	0	0
5	2	2	404	80	69	61	53	44	36	23
5	4	2	918	176	153	137	117	99	81	48
6	2	1	395	65	59	51	46	36	0	0
6	4	1	902	153	137	125	103	87	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	401	70	62	54	46	37	0	0
7	3	2	626	110	97	86	73	59	0	0
7	4	2	912	159	137	124	103	88	0	0

"F10" 92 "US" 30 13209 25.0 3302 "N"
 "F. Kosciusko/Whitley CL to SR5" 1.39
 "F. Kosciusko/Whitley CL (3.0m. e. of SR13) easterly (EB)" 0.25
 2 10483 76 10 3.6 0.29 2.0 7.0 11.0 "6"
 "A-6" 7 "CL" 115.3 18.7 5 31.4 12.0 19.4 2.71
 42 2.6 0

2
 "04-03-86" 1 1 1 1 0950 0920 50 0 0 45 60
 "Dynalect"

1	2	1.0	8	0.54	0.47	0.50	0.31	0.23
2	2	1.0	8	0.52	0.43	0.44	0.26	0.17
3	2	1.0	8	0.57	0.52	0.59	0.39	0.30
4	2	1.0	8	0.62	0.53	0.59	0.37	0.27
5	2	1.0	8	0.55	0.48	0.53	0.33	0.24
6	1	1.0	8	0.60	0.48	0.51	0.31	0.22
7	2	1.0	8	0.72	0.62	0.53	0.43	0.32

"Road Rater 400"

1	1	2	2	0.62	25.2	0.45	0.31	0.34	0.21
1	2	2	2	1.25	25.2	0.98	0.87	0.74	0.53
1	3	2	2	1.86	25.2	1.63	1.94	0.89	1.07
2	1	2	2	0.61	25.2	0.48	0.32	0.83	0.13
2	2	2	2	1.23	25.2	1.05	1.19	0.79	0.79
2	3	2	2	1.85	25.2	1.79	1.69	1.20	1.07
3	1	2	2	0.60	25.2	0.41	0.24	0.34	0.30
3	2	2	2	1.25	25.2	0.91	0.81	0.79	0.70
3	3	2	2	1.88	25.2	1.53	1.26	1.35	1.24
4	1	2	2	0.61	25.2	0.55	0.73	0.76	0.40
4	2	2	2	1.25	25.2	1.25	1.16	0.89	0.95
4	3	2	2	1.87	25.2	2.08	1.89	1.65	1.61
5	1	2	2	0.61	25.2	0.46	0.37	0.36	0.31
5	2	2	2	1.25	25.2	1.02	0.51	0.31	0.70
5	3	2	2	1.87	25.2	1.71	3.60	1.39	1.20
6	1	2	1	0.61	25.2	0.37	0.24	0.15	0.22
6	2	2	1	1.26	25.2	1.08	0.58	0.61	0.39
6	3	2	1	1.84	25.2	1.91	2.11	1.10	0.84
7	1	1	2	0.62	15.1	0.63	0.52	0.49	0.41
7	2	1	2	1.22	15.1	1.37	1.13	1.11	1.03
7	1	2	2	0.60	25.0	0.57	0.46	0.26	0.23
7	2	2	2	1.24	25.1	1.25	1.06	1.45	0.36
7	3	2	2	1.84	25.1	2.24	1.84	1.35	2.16
7	1	3	2	0.58	35.1	0.41	0.33	0.29	0.35
7	2	3	2	1.18	35.1	0.93	0.79	0.69	0.75
7	3	3	2	1.81	35.2	2.07	1.79	1.54	1.49

"Road Rater 2000"

1	1	2	2	0.60	25.0	0.44	0.36	0.39	0.25
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1	2	2	2	1.19	25.0	0.93	0.73	0.69	0.52
1	3	2	2	1.80	25.1	1.48	1.16	1.01	0.84
1	4	2	2	2.42	25.0	2.04	1.61	1.39	1.15
1	5	2	2	3.63	25.0	3.42	2.62	2.24	1.86
2	1	2	2	0.60	25.0	0.35	0.29	0.24	0.20
2	2	2	2	1.21	25.0	0.76	0.61	0.52	0.43
2	3	2	2	1.79	25.0	1.19	0.96	0.82	0.69
2	4	2	2	2.39	25.0	1.64	1.35	1.11	0.98
2	5	2	2	3.60	25.0	2.66	2.14	1.84	1.60
3	1	2	2	0.58	25.0	0.43	0.34	0.35	0.22
3	2	2	2	1.22	25.0	0.96	0.78	0.81	0.51
3	3	2	2	1.83	25.0	1.53	1.18	1.09	0.77
3	4	2	2	2.38	25.0	2.08	1.59	1.39	1.05
3	5	2	2	3.59	25.0	3.50	2.61	2.16	1.71
4	1	2	2	0.59	25.0	0.56	0.49	0.43	0.38
4	2	2	2	1.22	25.0	1.25	1.07	0.92	0.85
4	3	2	2	1.81	25.1	1.95	1.67	1.45	1.31
4	4	2	2	2.40	25.0	2.67	2.30	1.98	1.82
4	5	2	2	3.57	25.0	4.26	3.58	3.23	2.90
5	1	2	2	0.58	25.0	0.47	0.40	0.39	0.31
5	2	2	2	1.23	25.0	1.06	0.90	0.79	0.71
5	3	2	2	1.79	25.0	1.64	1.37	1.24	1.08
5	4	2	2	2.40	25.0	2.26	1.89	1.67	1.47
5	5	2	2	3.61	25.0	3.60	2.94	2.61	2.30
6	1	1	2	0.60	15.1	0.56	0.48	0.46	0.33
6	2	1	2	1.19	15.1	1.20	0.96	0.94	0.72
6	3	1	2	1.85	15.1	1.81	1.58	1.44	1.12
6	4	1	2	2.43	15.1	2.67	2.22	2.06	1.62
6	5	1	2	3.57	15.0	4.29	3.64	3.03	2.52
6	1	2	2	0.62	25.0	0.50	0.42	0.34	0.28
6	2	2	2	1.23	25.0	1.10	0.92	0.77	0.63
6	3	2	2	1.80	25.0	1.63	1.35	1.11	0.94
6	4	2	2	2.37	25.0	2.27	1.87	1.55	1.31
6	5	2	2	3.59	25.0	3.77	3.01	2.49	2.12
6	1	3	2	0.60	35.1	0.39	0.29	0.23	0.19
6	2	3	2	1.20	35.2	0.85	0.63	0.50	0.40
6	3	3	2	1.80	35.1	1.33	1.00	0.79	0.63
6	4	3	2	2.40	35.1	1.86	1.39	1.11	0.89
6	5	3	2	3.60	35.1	3.02	2.28	1.83	1.47
7	1	2	1	0.61	25.0	0.43	0.44	0.38	0.28
7	2	2	1	1.18	25.0	0.86	0.85	0.80	0.56
7	3	2	1	1.82	25.0	1.38	1.32	1.23	0.88
7	4	2	1	2.40	25.0	1.88	1.76	1.57	1.20
7	5	2	1	3.61	25.0	3.06	2.68	2.46	1.87
"Dynatest FWD"									
1	2	2	435	135	119	99	79	61	0
1	4	2	911	290	251	220	178	139	0
2	2	2	436	146	109	85	63	47	0
2	4	2	931	302	237	186	141	108	0
3	2	2	435	149	128	113	97	80	0
3	4	2	929	309	270	243	206	173	0
4	2	2	435	174	134	114	94	76	0
4	4	2	919	350	278	242	200	163	0
5	2	2	424	132	117	99	83	65	53
5	4	2	921	292	251	214	181	146	113
6	2	2	432	158	111	84	63	49	0
6	4	2	914	325	237	178	138	108	0
7	1	2	214	72	67	55	46	36	0
7	2	2	420	170	141	116	99	76	0
7	3	2	657	260	219	186	153	124	0
7	4	2	912	352	291	248	208	166	0
"08-26-86"									
1	1	0	1	1350	1420	76	76	78	76
"Dynaflect"									
1	2	1.0	8	0.41	0.34	0.29	0.22	0.16	
2	2	1.0	8	0.36	0.28	0.23	0.17	0.12	
3	2	1.0	8	0.45	0.39	0.35	0.29	0.23	
4	2	1.0	8	0.48	0.41	0.36	0.29	0.22	
5	2	1.0	8	0.45	0.38	0.33	0.26	0.19	
6	1	1.0	8	0.53	0.42	0.34	0.25	0.19	
7	2	1.0	8	0.64	0.54	0.47	0.39	0.30	

"Road Rater 400"

1	1	2	2	0.60	25.0	0.38	0.40	0.24	0.19
1	2	2	2	1.19	25.0	1.27	0.64	0.54	0.95
1	3	2	2	1.81	25.1	1.94	1.02	0.97	0.79
2	1	2	2	0.61	25.0	0.26	0.95	0.14	0.11
2	2	2	2	1.21	25.0	0.48	0.30	0.39	0.29
2	3	2	2	1.79	25.1	0.34	2.03	0.62	0.52
3	1	2	2	0.58	25.0	0.35	0.34	0.31	0.26
3	2	2	2	1.21	25.0	0.81	0.72	0.73	0.64
3	3	2	2	1.81	25.1	1.33	1.25	1.20	1.05
4	1	2	2	0.58	25.0	0.45	0.32	0.36	0.29
4	2	2	2	1.22	25.0	1.04	0.84	0.83	0.70
4	3	2	2	1.79	25.1	1.64	1.33	1.33	1.14
5	1	2	2	0.60	25.0	0.44	0.15	0.39	0.28
5	2	2	2	1.19	25.0	0.97	0.88	0.85	0.64
5	3	2	2	1.80	25.0	1.65	2.21	1.36	1.08
6	1	2	1	0.59	25.0	0.39	0.34	0.21	0.15
6	2	2	1	1.20	25.1	0.91	0.89	0.68	0.36
6	3	2	1	1.78	25.1	1.59	1.07	0.82	0.48
7	1	1	2	0.59	15.0	0.45	0.36	0.32	0.25
7	2	1	2	1.20	15.0	1.04	0.78	0.71	0.50
7	1	2	2	0.59	25.0	0.43	0.39	0.23	0.23
7	2	2	2	1.20	25.1	0.97	1.16	0.65	0.52
7	3	2	2	1.79	25.1	1.64	1.59	1.07	0.89
7	1	3	2	0.60	35.1	0.31	0.25	0.17	0.12
7	2	3	2	1.20	35.1	0.74	0.44	0.44	0.33
7	3	3	2	1.78	35.1	1.70	1.30	1.02	0.77

"Dynatest FWD"

1	2	2	400	143	86	72	57	42	31	13
1	4	2	911	286	201	171	137	104	77	35
2	2	2	395	116	73	58	42	29	0	0
2	4	2	909	247	170	136	102	74	0	0
3	2	2	395	119	96	85	72	58	46	24
3	4	2	913	260	222	196	170	135	108	53
4	2	2	393	152	105	90	74	58	0	0
4	4	2	900	309	237	205	171	136	0	0
5	2	2	392	158	97	82	65	52	40	19
5	4	2	899	313	223	190	157	122	94	49
6	2	1	391	165	94	74	56	45	0	0
6	4	1	899	327	212	168	132	103	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	386	188	126	108	87	69	0	0
7	3	2	612	274	198	171	139	110	0	0
7	4	2	896	373	280	245	201	159	0	0

"F11" 20 "US" 20 6030 27.0 1628 "N"
 "F. 10.6m. e. of St. Joseph/Elkhart CL to SR15" 3.72
 "F. 1.25m. w. of SR15 easterly (W8)" 0.25
 2 10528 76 10 2.8 0.20 4.4 7.0 2.4 "G"
 "A-2-4" 0 "SM" 120.8 10.3 30 0.0 0.0 0.0 2.65
 51 4.3 0

3
 "04-09-86" 1 1 1 0 1505 1535 42 0 0 40 56

"Dynalect"

1	2	1.0	8	0.67	0.62	0.78	0.50	0.41
2	2	1.0	8	0.44	0.40	0.38	0.32	0.25
3	2	1.0	8	0.52	0.48	0.45	0.40	0.33
4	2	1.0	8	0.37	0.34	0.31	0.27	0.21
5	2	1.0	8	0.38	0.36	0.33	0.29	0.23
6	2	1.0	8	0.68	0.66	0.64	0.59	0.52

"Road Rater 400"

1	1	2	2	0.60	25.0	0.40	0.25	1.29	1.12
1	2	2	2	1.22	25.0	0.87	2.59	1.38	3.43
1	3	2	2	1.82	25.1	1.38	2.93	1.22	4.06
2	1	2	2	0.62	25.0	0.29	0.94	0.22	0.16
2	2	2	2	1.23	25.1	0.55	1.94	0.46	0.45
2	3	2	2	1.84	25.1	0.99	1.18	0.76	0.65

3	1	2	2	0.61	25.0	0.36	0.87	0.86	0.25
3	2	2	2	1.26	25.0	0.77	1.80	0.88	0.59
3	3	2	2	1.82	25.1	1.13	1.52	1.12	0.99
4	1	2	2	0.60	25.0	0.26	1.00	1.46	0.15
4	2	2	2	1.24	25.1	0.96	0.45	2.89	0.96
4	3	2	2	1.83	25.1	0.57	1.48	0.75	0.66
5	1	2	2	0.61	25.0	0.28	1.42	2.06	0.19
5	2	2	2	1.25	25.0	0.52	2.01	0.48	1.51
5	3	2	2	1.83	25.1	0.72	1.99	0.80	0.72
6	1	1	2	0.69	15.5	0.56	0.55	2.84	0.53
6	2	1	2	1.29	15.6	1.15	1.05	1.22	1.95
6	1	2	2	0.60	25.0	0.50	1.90	0.60	0.45
6	2	2	2	1.21	25.0	1.02	1.66	1.07	1.96
6	3	2	2	1.84	25.1	1.78	2.14	1.88	2.37
6	1	3	2	0.61	35.3	0.56	0.36	0.81	0.83
6	2	3	2	1.22	35.3	0.93	0.27	1.23	1.42
6	3	3	2	1.80	34.9	1.70	1.20	2.17	1.65
"Road Rater 2000"									
1	1	2	2	0.57	25.0	0.32	0.28	0.25	0.21
1	2	2	2	1.16	25.0	0.69	0.59	0.49	0.45
1	3	2	2	1.85	25.0	1.04	0.87	0.75	0.69
1	4	2	2	2.43	25.0	1.41	1.20	1.01	0.76
1	5	2	2	3.63	25.0	2.16	1.86	1.55	1.46
2	1	2	2	0.61	25.0	0.36	0.22	0.19	0.18
2	2	2	2	1.21	25.0	0.79	0.51	0.43	0.38
2	3	2	2	1.78	25.0	1.15	0.76	0.65	0.58
2	4	2	2	2.43	25.1	1.56	1.01	0.86	0.77
2	5	2	2	3.57	25.0	2.55	1.60	1.36	1.23
3	1	2	2	0.60	24.9	0.35	0.30	0.30	0.23
3	2	2	2	1.22	25.0	0.71	0.57	0.55	0.45
3	3	2	2	1.84	25.0	1.12	0.97	0.85	0.77
3	4	2	2	2.40	25.0	1.55	1.31	1.13	1.05
3	5	2	2	3.55	25.0	2.46	2.06	1.80	1.63
4	1	2	2	0.60	25.0	0.23	0.20	0.18	0.14
4	2	2	2	1.23	25.0	0.51	0.45	0.38	0.33
4	3	2	2	1.79	25.0	0.85	0.72	0.61	0.53
4	4	2	2	2.43	25.0	1.12	0.96	0.83	0.74
4	5	2	2	3.56	25.0	1.76	1.48	1.29	1.14
5	1	2	2	0.57	25.0	0.25	0.22	0.23	0.18
5	2	2	2	1.18	25.0	0.53	0.46	0.49	0.37
5	3	2	2	1.82	25.0	0.83	0.74	0.76	0.59
5	4	2	2	2.42	25.0	1.15	1.00	1.10	0.81
5	5	2	2	3.57	25.1	1.76	1.55	1.57	1.28
6	1	1	2	0.61	15.1	0.55	0.39	0.36	0.30
6	2	1	2	1.17	15.0	1.23	0.85	0.79	0.66
6	3	1	2	1.80	15.0	1.86	1.33	1.26	1.05
6	4	1	2	2.45	15.1	2.53	1.96	1.64	1.47
6	5	1	2	3.54	15.0	4.05	3.38	2.95	2.44
6	1	2	2	0.60	25.1	0.44	0.39	0.38	0.30
6	2	2	2	1.22	25.1	0.96	0.83	0.80	0.67
6	3	2	2	1.81	25.2	1.46	1.28	1.24	1.03
6	4	2	2	2.38	25.1	2.09	1.82	1.79	1.49
6	5	2	2	3.56	25.1	3.20	2.79	2.64	2.33
6	1	3	2	0.60	35.0	0.37	0.31	0.26	0.23
6	2	3	2	1.23	35.0	0.82	0.70	0.56	0.50
6	3	3	2	1.78	35.1	1.22	1.02	0.85	0.71
6	4	3	2	2.42	35.0	1.69	1.41	1.19	0.98
6	5	3	2	3.57	35.0	2.60	2.11	1.87	1.49
"04-25-86"									
				0	0	0	1	1350	1420
								98	0
								0	84
								45	
"Dynatest FWD"									
1	2	2	2	382	211	154	138	115	89
1	4	2	2	832	427	325	293	244	192
2	2	2	2	377	122	82	76	64	51
2	4	2	2	823	241	181	167	139	117
3	2	2	2	376	148	112	99	87	72
3	4	2	2	828	313	246	220	194	163
4	2	2	2	376	114	81	73	59	48
4	4	2	2	830	237	174	157	131	106
5	2	2	2	374	113	82	73	63	50
5	4	2	2	829	233	176	160	137	110
								39	20
								87	46

6	1	2	179	70	53	50	41	33	0	0
6	2	2	373	161	121	113	76	79	0	0
6	3	2	599	248	191	176	151	124	0	0
6	4	2	327	328	253	235	201	166	0	0
"08-29-86"	1	1	0	1	1140	1202	88	86	90	63

"Dynaflect"

1	2	1.0	8	0.70	0.65	0.58	0.48	0.38
2	2	1.0	8	0.54	0.50	0.44	0.36	0.29
3	2	1.0	8	0.61	0.57	0.49	0.41	0.33
4	2	1.0	8	0.39	0.36	0.32	0.26	0.20
5	2	1.0	8	0.43	0.40	0.35	0.28	0.23
6	2	1.0	8	0.65	0.63	0.57	0.52	0.42

"Road Rater 400"

1	1	2	2	0.59	25.0	0.35	0.32	0.29	0.20
1	2	2	2	1.22	25.1	0.80	0.75	0.68	1.51
1	3	2	2	1.79	25.1	1.24	1.18	1.09	1.84
2	1	2	2	0.58	25.1	0.29	0.88	0.22	0.36
2	2	2	2	1.23	25.1	0.66	0.67	0.54	0.44
2	3	2	2	1.79	25.1	1.07	0.38	0.66	0.74
3	1	2	2	0.59	25.1	0.35	1.72	0.27	0.20
3	2	2	2	1.22	25.0	0.76	2.34	0.66	0.61
3	3	2	2	1.79	25.0	1.28	1.97	1.14	0.97
4	1	2	2	0.58	25.0	0.26	0.63	0.21	0.15
4	2	2	2	1.18	25.0	0.59	0.58	0.50	0.40
4	3	2	2	1.79	25.0	1.02	0.54	0.83	0.75
5	1	2	2	0.59	25.0	0.25	0.91	0.20	0.17
5	2	2	2	1.21	25.0	0.59	0.52	0.50	0.42
5	3	2	2	1.79	25.0	0.95	0.88	0.81	0.69
6	1	1	2	0.58	15.0	0.34	0.32	0.31	0.23
6	2	1	2	1.20	15.0	0.83	0.80	0.78	0.70
6	1	2	2	0.59	25.1	0.37	0.35	0.34	0.25
6	2	2	2	1.23	25.0	0.85	0.82	0.80	0.71
6	3	2	2	1.81	25.0	1.51	1.46	1.43	1.30
6	1	3	2	0.60	35.0	0.30	0.25	0.27	0.27
6	2	3	2	1.19	35.0	0.66	0.61	0.58	0.51
6	2	3	2	1.36	35.0	2.38	11.24	12.85	13.41

"Dynatest FWD"

1	2	2	404	170	139	125	106	88	71	38
1	4	2	917	375	314	287	246	206	169	91
2	2	2	405	136	119	105	87	69	0	0
2	4	2	906	302	254	232	189	157	0	0
3	2	2	401	173	140	121	103	83	68	46
3	4	2	909	378	308	269	227	191	158	104
4	2	2	402	111	91	80	65	53	0	0
4	4	2	910	251	205	179	150	121	0	0
5	2	2	399	115	97	85	71	57	46	24
5	4	2	909	257	216	192	161	132	104	57
6	1	2	0	0	0	0	0	0	0	0
6	2	2	394	204	163	151	138	125	0	0
6	3	2	617	309	250	231	212	193	0	0
6	4	2	901	427	349	319	291	267	0	0

"F12" 92 "US" 30 12186 25.0 3047 "N"
 "F. 4.32m. w. of/to Columbia City C/L" 4.32
 "F. Lincoln Way (6.3m. e. of SR5) easterly (EB)" 0.25
 2 10112 76 10 3.2 0.26 0.0 9.1 3.5 "G"
 "A-6" 11 "CL" 122.1 15.1 6 30.5 14.2 16.3 2.83
 57 2.7 0

"04-03-86" 1 1 1 1 1000 1030 53 0 0 48 50
 "Dynaflect"

1	2	1.0	8	0.38	0.36	0.30	0.26	0.20
2	2	1.0	8	0.31	0.28	0.24	0.21	0.16
3	2	1.0	8	0.35	0.32	0.28	0.24	0.18
4	2	1.0	8	0.46	0.43	0.37	0.32	0.25
5	2	1.0	8	0.39	0.36	0.31	0.28	0.21
6	1	1.0	8	0.41	0.35	0.28	0.23	0.17

7		2		1.0		9		0.34		0.31		0.27		0.24		0.18	
Road		Rater		400"													
1	1	2	2	2	2	0.62	25.1	0.32	0.29	0.25	0.53						
1	1	2	2	2	2	1.22	25.1	0.54	0.59	0.51	0.76						
1	1	3	2	2	2	1.85	25.1	1.00	2.01	0.84	0.69						
2	1	2	2	2	2	0.61	25.1	0.22	0.17	0.19	0.15						
2	2	2	2	2	2	1.22	25.1	0.47	0.36	0.39	0.32						
2	2	3	2	2	2	1.86	25.1	0.75	0.70	0.63	0.55						
3	1	2	2	2	2	0.60	25.1	0.26	0.20	0.37	0.16						
3	2	2	2	2	2	1.23	25.1	0.55	0.52	0.52	0.36						
3	3	2	2	2	2	1.84	25.1	0.89	1.00	0.80	0.66						
4	1	2	2	2	2	0.60	25.1	0.30	0.37	0.25	0.20						
4	2	2	2	2	2	1.23	25.1	0.66	0.59	0.57	0.47						
4	3	2	2	2	2	1.85	25.1	1.07	1.27	0.93	0.81						
5	1	2	2	2	2	0.60	25.1	0.23	0.21	0.47	0.13						
5	2	2	2	2	2	1.23	25.1	0.51	0.52	0.98	0.33						
5	3	2	2	2	2	1.84	25.1	0.81	0.82	0.91	0.55						
6	1	2	2	2	1	0.60	25.1	0.35	0.23	0.23	0.18						
6	2	2	2	2	1	1.24	25.1	0.76	0.53	1.37	0.45						
6	3	2	2	2	1	1.83	25.1	1.25	1.22	1.62	0.76						
7	1	1	2	2	2	0.58	15.3	0.21	0.15	0.34	0.20						
7	2	1	2	2	2	1.26	15.4	0.54	0.53	1.20	1.93						
7	1	2	2	2	2	0.60	25.1	0.28	0.62	0.55	0.16						
7	2	2	2	2	2	1.22	25.1	0.60	1.16	0.51	0.44						
7	3	2	2	2	2	1.85	25.1	0.98	0.71	0.84	0.73						
7	1	3	2	2	2	0.58	35.1	0.23	0.19	0.17	0.35						
7	2	3	2	2	2	1.20	35.1	0.51	0.48	0.91	0.61						
7	3	3	2	2	2	1.82	35.2	0.98	0.94	0.86	0.37						
Road		Rater		2000"													
1	1	2	2	2	2	0.59	25.1	0.40	0.25	0.19	0.17						
1	1	2	2	2	2	1.21	25.1	0.83	0.54	0.42	0.33						
1	1	3	2	2	2	1.80	25.1	1.29	0.81	0.62	0.52						
1	1	4	2	2	2	2.39	24.6	1.79	1.11	0.85	0.71						
1	1	4	2	2	2	2.41	25.0	1.78	1.11	0.87	0.71						
1	1	5	2	2	2	3.58	25.0	2.94	1.69	1.33	1.12						
2	1	2	2	2	2	0.58	25.0	0.22	0.18	0.16	0.13						
2	2	2	2	2	2	1.19	25.1	0.48	0.39	0.34	0.27						
2	2	3	2	2	2	1.78	25.1	0.74	0.59	0.52	0.43						
2	2	4	2	2	2	2.40	25.0	0.99	0.81	0.72	0.58						
2	2	5	2	2	2	3.61	25.0	1.47	1.28	1.13	0.93						
3	1	2	2	2	2	0.60	25.1	0.25	0.22	0.20	0.16						
3	2	2	2	2	2	1.23	25.0	0.54	0.46	0.42	0.35						
3	3	2	2	2	2	1.80	25.0	0.82	0.70	0.65	0.55						
3	4	2	2	2	2	2.40	25.0	1.11	0.98	0.90	0.75						
3	5	2	2	2	2	3.60	25.1	1.71	1.52	1.39	1.19						
4	1	2	2	2	2	0.60	25.1	0.33	0.26	0.26	0.20						
4	2	2	2	2	2	1.23	25.1	0.66	0.54	0.46	0.42						
4	3	2	2	2	2	1.79	25.0	0.99	0.81	0.68	0.64						
4	4	2	2	2	2	2.41	25.1	1.35	1.11	0.95	0.88						
4	5	2	2	2	2	3.58	25.1	2.17	1.73	1.75	1.39						
5	1	2	2	2	2	0.57	25.1	0.14	0.21	0.20	0.15						
5	2	2	2	2	2	1.17	25.1	0.29	0.44	0.38	0.31						
5	3	2	2	2	2	1.82	25.1	0.43	0.69	0.59	0.49						
5	4	2	2	2	2	2.42	25.1	0.56	0.93	0.82	0.67						
5	5	2	2	2	2	3.59	25.1	1.52	1.43	1.28	1.03						
6	1	1	2	2	2	0.62	15.0	0.26	0.21	0.21	0.15						
6	2	1	2	2	2	1.18	14.9	0.55	0.40	0.44	0.33						
6	3	1	2	2	2	1.77	15.0	0.86	0.67	0.68	0.52						
6	4	1	2	2	2	2.38	15.0	1.16	0.94	0.89	0.70						
6	5	1	2	2	2	3.58	15.0	1.63	1.49	1.29	1.05						
6	1	2	2	2	2	0.59	25.1	0.27	0.22	0.25	0.17						
6	2	2	2	2	2	1.21	25.1	0.57	0.46	0.52	0.35						
6	3	2	2	2	2	1.82	25.1	0.88	0.72	0.78	0.55						
6	4	2	2	2	2	2.43	25.1	1.19	0.97	0.98	0.74						
6	5	2	2	2	2	3.61	25.1	1.84	1.48	1.31	1.13						
6	1	3	2	2	2	0.61	35.1	0.28	0.22	0.19	0.16						
6	2	3	2	2	2	1.24	35.1	0.55	0.43	0.39	0.32						
6	3	3	2	2	2	1.81	35.1	0.82	0.64	0.57	0.48						
6	4	3	2	2	2	2.43	35.1	1.12	0.88	0.78	0.65						
6	5	3	2	2	2	3.62	35.2	1.73	1.35	1.21	1.01						

7	1	2	1	0.59	25.1	0.42	0.31	0.23	0.19
7	2	2	1	1.21	25.1	0.90	0.67	0.49	0.43
7	3	2	1	1.84	25.1	1.47	1.06	0.82	0.57
7	4	2	1	2.40	25.1	1.97	1.42	1.11	0.89
7	5	2	1	3.58	25.1	3.26	2.25	1.73	1.43

"Dynatest FWD"

1	2	2	448	95	87	78	62	51	0	0
1	4	2	912	201	186	164	135	110	0	0
2	2	2	427	70	70	64	51	43	0	0
2	4	2	914	169	152	135	117	94	0	0
3	2	2	432	84	79	71	57	47	0	0
3	4	2	909	186	170	151	134	104	0	0
4	2	2	426	93	88	77	66	51	0	0
4	4	2	906	202	187	164	137	112	0	0
5	2	2	425	80	75	68	53	46	37	18
5	4	2	901	180	162	148	128	105	96	43
6	2	1	422	96	85	69	57	42	0	0
6	4	1	909	225	187	150	121	93	0	0
7	1	2	200	35	33	38	24	19	0	0
7	2	2	414	79	74	64	56	47	0	0
7	3	2	651	126	114	106	86	73	0	0
7	4	2	907	175	159	146	120	104	0	0

"08-26-86" 1 1 0 1 1440 1515 79 81 84 78 68

"Dynaflect"

1	2	1.0	8	0.31	0.29	0.26	0.21	0.16
2	2	1.0	8	0.27	0.26	0.23	0.18	0.14
3	2	1.0	8	0.30	0.28	0.25	0.20	0.15
4	2	1.0	8	0.37	0.35	0.31	0.26	0.20
5	2	1.0	8	0.34	0.32	0.29	0.24	0.19
6	1	1.0	8	0.35	0.31	0.26	0.21	0.15
7	2	1.0	8	0.33	0.29	0.26	0.21	0.16

"Road Rater 400"

1	1	2	2	0.59	25.1	0.26	0.23	0.21	0.15
1	2	2	2	1.19	25.0	0.51	0.46	0.42	0.33
1	3	2	2	1.78	25.0	0.88	0.84	0.76	0.62
2	1	2	2	0.59	25.0	0.18	0.14	0.14	0.11
2	2	2	2	1.19	25.0	0.41	0.23	0.32	0.25
2	3	2	2	1.80	25.0	0.71	0.81	0.58	0.45
3	1	2	2	0.58	25.0	0.22	1.09	0.46	0.14
3	2	2	2	1.20	25.0	0.48	0.43	0.38	0.31
3	3	2	2	1.82	25.1	0.59	0.75	0.66	0.55
4	1	2	2	0.60	25.0	0.26	0.24	0.19	0.14
4	2	2	2	1.21	25.0	0.52	0.47	0.42	0.35
4	3	2	2	1.78	25.1	0.90	0.32	0.73	0.62
5	1	2	2	0.58	25.0	0.20	0.18	0.16	0.12
5	2	2	2	1.18	25.0	0.49	0.46	0.40	0.32
5	3	2	2	1.79	25.0	0.81	0.80	0.71	0.59
6	1	2	1	0.58	25.0	0.25	0.21	0.15	0.14
6	2	2	1	1.20	25.0	0.59	0.53	0.41	0.37
6	3	2	1	1.82	25.1	1.03	0.92	0.90	0.84
7	1	1	2	0.61	15.0	0.19	0.15	0.14	0.10
7	2	1	2	1.19	15.1	0.44	0.39	0.35	0.29
7	1	2	2	0.59	25.0	0.23	0.20	0.18	0.13
7	2	2	2	1.21	25.0	0.50	0.58	0.40	0.34
7	3	2	2	1.82	25.0	0.92	1.52	0.76	0.64
7	1	3	2	0.60	35.1	0.20	0.13	0.14	0.29
7	2	3	2	1.19	35.0	0.45	0.23	0.38	0.53
7	3	3	2	1.81	35.1	0.94	2.20	0.79	4.20

"Dynatest FWD"

1	2	2	397	76	71	61	52	41	32	16
1	4	2	913	179	164	147	123	99	79	41
2	2	2	392	78	66	60	49	39	0	0
2	4	2	903	174	151	132	110	88	0	0
3	2	2	391	73	65	56	47	37	29	14
3	4	2	905	167	149	131	107	87	63	37
4	2	2	389	78	71	63	56	44	0	0
4	4	2	903	175	159	142	111	98	0	0
5	2	2	388	74	68	60	50	42	35	16
5	4	2	903	173	158	140	121	97	78	45
6	2	1	388	84	69	63	48	38	0	0

6	4	1	902	193	159	140	111	88	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	390	77	69	63	50	42	0	0
7	3	2	609	123	109	97	81	67	0	0
7	4	2	902	179	159	143	121	99	0	0

"G2" 18 "1" 69 14400 31.3 4507 "S"
 "F. Delaware/Grant CL to Madison/Delaware CL" 20.55
 "F. Delaware/Madison CL (betw. MP 31&32) northerly (N8)" 0.25
 2 13279 83 3 4.2 0.30 0.0 10.0 4.0 "G"
 "A-6" 8 "CL" 105.4 20.6 6 29.8 16.1 13.7 2.67
 63 3.6 0

3
 "04-01-86" 1 1 0 1 1345 1415 82 0 0 70 54
 "Dynalect"

1	2	1.0	8	0.38	0.37	0.33	0.28	0.22
2	2	1.0	8	0.44	0.40	0.34	0.30	0.22
3	2	1.0	8	0.35	0.33	0.28	0.25	0.20
4	2	1.0	8	0.48	0.41	0.33	0.27	0.19
5	2	1.0	8	0.33	0.32	0.27	0.22	0.17
6	2	1.0	8	0.38	0.34	0.28	0.25	0.20

"Road Rater 400"

1	1	2	2	0.59	24.9	0.25	0.30	0.30	0.18
1	2	2	2	1.22	24.9	0.55	1.14	0.47	0.41
1	3	2	2	1.83	25.0	0.89	1.70	0.77	0.70
2	1	2	2	0.60	25.0	0.25	0.19	0.17	0.12
2	2	2	2	1.22	25.0	0.54	0.73	0.76	0.33
2	3	2	2	1.83	25.0	0.89	1.36	1.36	0.52
3	1	2	2	0.60	25.0	0.24	0.22	0.17	0.43
3	2	2	2	1.22	25.0	0.52	0.37	0.39	0.63
3	3	2	2	1.83	25.0	0.86	1.77	0.68	1.87
4	1	2	2	0.60	25.0	0.34	0.27	0.25	0.82
4	2	2	2	1.22	25.0	0.76	0.73	0.58	1.57
4	3	2	2	1.83	25.1	1.26	1.17	1.02	2.38
5	1	2	2	0.60	25.0	0.20	0.18	0.15	0.26
5	2	2	2	1.23	25.0	0.43	0.37	0.35	0.49
5	3	2	2	1.84	25.0	0.69	0.91	0.58	1.58
6	1	1	2	0.60	14.9	0.23	0.21	0.19	0.14
6	2	1	2	1.22	15.0	0.50	0.47	0.43	0.46
6	1	2	2	0.61	25.2	0.29	0.25	0.25	0.41
6	2	2	2	1.24	25.2	0.64	1.05	0.57	1.58
6	3	2	2	1.87	25.2	1.05	1.64	0.98	1.67
6	1	3	2	0.57	35.1	0.20	0.19	0.22	0.25
6	2	3	2	1.20	35.1	0.45	0.46	0.54	0.46
6	3	3	2	1.77	35.1	0.83	0.85	0.92	0.74

"Dynatest FWD"

1	2	2	398	80	67	62	51	41	0	0
1	4	2	881	160	141	133	112	91	0	0
2	2	2	402	87	70	64	50	42	0	0
2	4	2	882	186	154	135	109	89	0	0
3	2	2	399	67	61	55	45	39	0	0
3	4	2	876	144	133	120	104	85	0	0
4	2	2	397	104	80	68	52	41	0	0
4	4	2	875	215	176	147	116	91	0	0
5	2	2	393	63	59	54	44	33	0	0
5	4	2	876	140	132	122	100	79	0	0
6	1	2	186	35	32	24	23	16	0	0
6	2	2	396	83	66	60	48	39	0	0
6	3	2	624	127	107	93	77	62	0	0
6	4	2	873	175	146	128	109	86	0	0

"08-14-86" 1 1 1 0 1404 1434 114 110 0 86 68

"Dynalect"

1	2	1.0	8	0.36	0.35	0.30	0.25	0.19
2	2	1.0	8	0.34	0.32	0.29	0.26	0.21
3	2	1.0	8	0.29	0.27	0.24	0.20	0.16
4	2	1.0	8	0.38	0.34	0.28	0.23	0.17
5	2	1.0	8	0.26	0.25	0.22	0.18	0.13

2	2	2	392	70	60	53	42	34	0	0
2	4	2	304	136	117	101	81	67	0	0
3	2	2	390	53	48	43	38	32	28	18
3	4	2	801	104	94	84	73	63	56	37
4	2	2	386	75	64	53	43	34	0	0
4	4	2	786	147	125	105	85	69	0	0
5	2	2	385	45	44	40	34	27	22	15
5	4	2	782	90	88	82	69	56	46	27
5	1	2	0	0	0	0	0	0	0	0
6	2	2	382	88	75	63	50	43	0	0
6	3	2	581	132	114	94	77	64	0	0
6	4	2	780	169	145	121	98	81	0	0

"63" 30 "SR" 67 9000 15.0 1350 "S"
 "F. SR234 to Hancock/Madison CL (except Fortville)" 4.95
 "F. CR500W (1.2m. e. of SR234) easterly to East Dr. (NB)" 0.25
 2 10530 76 10 1.0 0.08 4.4 7.0 4.5 "G"
 "A-7-6" 15 "CL" 104.7 20.7 6 46.8 19.4 27.4 2.57
 37 2.5 0

3
 "04-01-88" 1 1 1 1 1125 1155 83 0 0 72 53
 "Dynaflect"

1	2	1.0	8	0.56	0.52	0.44	0.38	0.29
2	2	1.0	8	0.60	0.55	0.47	0.39	0.30
3	2	1.0	8	0.67	0.62	0.53	0.44	0.33
4	2	1.0	8	0.69	0.63	0.55	0.48	0.37
5	2	1.0	8	0.59	0.55	0.48	0.41	0.32
6	1	1.0	8	0.57	0.50	0.42	0.33	0.25
7	2	1.0	8	0.71	0.66	0.57	0.47	0.34

"Road Rater 400"

1	1	2	2	0.60	24.9	0.52	0.44	0.44	0.50
1	2	2	2	1.25	25.2	1.11	1.04	0.98	0.86
1	3	2	2	1.89	25.3	1.84	1.76	1.59	1.04
2	1	2	2	0.62	25.2	0.60	0.76	1.28	0.44
2	2	2	2	1.24	25.2	1.28	1.60	1.06	0.94
2	3	2	2	1.85	25.2	2.08	2.54	1.70	1.53
3	1	2	2	0.61	25.2	0.40	0.34	0.32	0.33
3	2	2	2	1.24	25.2	0.87	0.59	0.69	0.69
3	3	2	2	1.86	25.3	1.43	1.23	1.17	0.99
4	1	2	2	0.62	25.2	0.57	0.59	0.48	0.41
4	2	2	2	1.25	25.3	1.23	2.05	1.04	0.89
4	3	2	2	1.89	25.3	2.00	3.29	1.72	1.49
5	1	2	2	0.62	25.2	0.51	0.33	0.43	0.23
5	2	2	2	1.26	25.3	1.02	1.31	0.69	1.19
5	3	2	2	1.86	25.3	1.74	1.97	0.31	1.74
6	1	2	1	0.61	25.2	0.44	0.37	0.32	0.26
6	2	2	1	1.25	25.2	0.99	1.22	0.71	0.59
6	3	2	1	1.89	25.2	1.66	2.62	1.19	0.99
7	1	1	2	0.60	15.0	0.48	0.42	0.37	0.29
7	2	1	2	1.22	15.1	1.03	0.89	0.90	0.63
7	1	2	2	0.62	25.3	0.58	0.47	0.44	0.36
7	2	2	2	1.24	25.3	1.22	1.32	0.96	0.79
7	3	2	2	1.89	25.3	2.01	3.79	1.56	1.23
7	1	3	2	0.59	35.1	3.51	0.23	0.26	0.24
7	2	3	2	1.20	35.1	0.80	0.55	0.60	0.56
7	3	3	2	1.79	35.1	1.53	1.04	1.16	1.00

"Road Rater 2000"

1	1	2	2	0.57	25.0	0.60	0.46	0.40	0.35
1	2	2	2	1.20	24.9	1.28	0.96	0.86	0.72
1	3	2	2	1.80	24.9	1.94	1.45	1.30	1.10
1	4	2	2	2.42	24.9	2.68	1.99	1.78	1.50
1	5	2	2	3.59	25.0	4.17	3.05	2.75	2.30
2	1	2	2	0.61	25.0	0.68	0.55	0.51	0.44
2	2	2	2	1.18	25.0	1.35	1.13	1.03	0.88
2	3	2	2	1.79	25.0	2.06	1.70	1.55	1.34
2	4	2	2	2.38	25.0	2.75	2.25	2.08	1.78
2	5	2	2	3.61	25.1	4.28	3.40	3.16	2.73

3	1	2	2	0.58	25.0	0.41	0.37	0.32	0.30
3	2	2	2	1.24	25.1	0.88	0.77	0.64	0.61
3	3	2	2	1.81	25.0	1.30	1.15	0.97	0.93
3	4	2	2	2.43	25.0	1.76	1.54	1.30	1.24
3	5	2	2	3.59	25.0	2.68	2.31	1.93	1.87
4	1	2	2	0.63	25.0	0.74	0.54	0.50	0.41
4	2	2	2	1.20	25.0	1.49	1.06	0.92	0.81
4	3	2	2	1.81	25.0	2.26	1.56	1.37	1.20
4	4	2	2	2.43	25.0	3.05	2.10	1.85	1.62
4	5	2	2	3.56	25.0	4.78	3.13	2.77	2.40
5	1	2	2	0.58	25.0	0.43	0.38	0.33	0.28
5	2	2	2	1.22	25.0	0.92	0.77	0.61	0.59
5	3	2	2	1.77	25.0	1.37	1.16	0.94	0.89
5	4	2	2	2.39	25.0	1.88	1.57	1.30	1.21
5	5	2	2	3.59	25.0	2.97	2.44	2.11	1.88
6	1	1	2	0.60	15.0	0.53	0.42	0.37	0.32
6	2	1	2	1.23	15.1	1.06	0.86	0.80	0.68
6	3	1	2	1.79	15.1	1.64	1.32	1.18	0.96
6	4	1	2	2.39	15.1	2.32	1.85	1.66	1.41
6	5	1	2	3.61	15.1	3.49	2.79	2.61	1.99
6	1	2	2	0.58	25.0	0.56	0.44	0.40	0.32
6	2	2	2	1.19	25.0	1.16	0.99	0.87	0.69
6	3	2	2	1.83	25.0	1.80	1.49	1.34	1.03
6	4	2	2	2.45	25.0	2.47	2.01	1.82	1.43
6	5	2	2	3.63	25.0	3.78	3.05	2.78	2.18
6	1	3	2	0.62	35.0	0.43	0.32	0.29	0.21
6	2	3	2	1.21	35.1	0.84	0.63	0.56	0.41
6	3	3	2	1.80	35.0	1.27	0.95	0.84	0.62
6	4	3	2	2.41	35.0	1.72	1.29	1.13	0.85
6	5	3	2	3.62	35.1	2.67	1.97	1.73	1.29
7	1	2	1	0.58	25.1	0.60	0.36	0.32	0.29
7	2	2	1	1.21	25.1	1.35	0.81	0.69	0.56
7	3	2	1	1.81	25.1	2.00	1.18	1.04	0.85
7	4	2	1	2.40	25.1	2.78	1.62	1.40	1.13
7	5	2	1	3.62	25.1	4.41	2.50	2.15	1.73
"Dynatest FWD"									
1	2	2	405	133	103	94	79	63	0
1	4	2	888	282	230	204	175	142	0
2	2	2	404	143	102	84	72	58	0
2	4	2	883	295	223	187	158	124	0
3	2	2	411	150	107	95	76	60	0
3	4	2	894	303	229	200	165	126	0
4	2	2	399	144	121	111	93	75	0
4	4	2	885	317	270	240	207	168	0
5	2	2	399	140	101	90	77	63	0
5	4	2	883	296	223	200	169	139	0
6	2	1	401	143	92	77	60	46	0
6	4	1	891	285	196	164	132	99	0
7	1	2	195	82	58	49	41	31	0
7	2	2	411	158	121	104	84	65	0
7	3	2	630	243	188	163	132	102	0
7	4	2	880	339	262	230	188	144	0
"08-14-86" 1 1 1 0 1230 1305 111 114 0 85 69									
"Dynalect"									
1	2	1.0	8	0.46	0.42	0.38	0.30	0.23	
2	2	1.0	8	0.52	0.48	0.42	0.34	0.26	
3	2	1.0	8	0.52	0.48	0.41	0.34	0.26	
4	2	1.0	8	0.57	0.54	0.47	0.41	0.33	
5	2	1.0	8	0.50	0.48	0.42	0.36	0.28	
6	1	1.0	8	0.48	0.43	0.35	0.28	0.20	
7	2	1.0	8	0.57	0.54	0.45	0.37	0.28	
"Road Rater 400"									
1	1	2	2	0.60	25.0	0.41	0.39	0.34	0.29
1	2	2	2	1.24	25.1	1.01	0.97	0.89	0.75
1	3	2	2	1.82	25.1	1.49	1.41	1.31	1.15
2	1	2	2	0.60	25.0	0.68	0.44	0.56	0.43
2	2	2	2	1.22	25.1	1.51	1.10	1.31	1.11
2	3	2	2	1.84	25.1	2.24	1.98	2.21	1.68
3	1	2	2	0.60	25.0	0.45	0.41	0.39	0.34
3	2	2	2	1.24	25.1	0.99	0.91	0.88	0.79

3	3	2	2	1.82	25.1	1.44	1.32	1.28	1.14
4	1	2	2	0.59	25.0	0.66	0.60	0.58	0.51
4	2	2	2	1.22	25.1	1.51	1.38	1.33	1.20
4	3	2	2	1.84	25.1	2.20	2.05	1.97	1.79
5	1	2	2	0.60	25.1	0.60	0.55	0.43	0.36
5	2	2	2	1.24	25.1	1.44	1.34	1.07	0.92
5	3	2	2	1.85	25.1	2.19	2.10	1.65	1.41
6	1	2	1	0.60	25.0	0.53	0.43	0.38	0.31
6	2	2	1	1.22	25.1	1.22	1.02	0.92	0.77
6	3	2	1	1.82	25.1	1.74	1.46	1.38	1.18
7	1	1	2	0.62	15.1	0.37	0.35	0.35	0.28
7	2	1	2	1.22	15.2	0.78	0.78	0.76	0.66
7	1	2	2	0.60	25.0	0.51	0.45	0.44	0.37
7	2	2	2	1.23	25.0	1.21	1.09	1.06	0.70
7	3	2	2	1.83	25.0	1.78	1.61	1.59	1.38
7	1	3	2	0.60	35.2	0.39	0.34	0.32	0.25
7	2	3	2	1.20	35.2	1.08	0.96	0.92	0.75
7	3	3	2	1.83	35.3	1.59	1.40	1.36	1.09
"Road Rater 2000"									
1	1	2	2	0.61	25.1	0.55	0.40	0.35	0.27
1	2	2	2	1.22	25.1	1.12	0.83	0.73	0.58
1	3	2	2	1.81	25.0	1.68	1.20	1.07	0.86
1	4	2	2	2.41	25.0	2.32	1.65	1.45	1.20
1	5	2	2	3.57	25.1	3.65	2.53	2.23	1.81
2	1	2	2	0.61	25.0	0.68	0.54	0.48	0.42
2	2	2	2	1.19	25.0	1.36	1.11	1.00	0.86
2	3	2	2	1.83	25.1	2.15	1.68	1.55	1.32
2	4	2	2	2.41	25.0	2.89	2.25	2.08	1.80
2	5	2	2	3.57	25.0	4.38	3.34	3.08	2.64
3	1	2	2	0.60	25.0	0.46	0.38	0.34	0.30
3	2	2	2	1.21	25.0	0.92	0.74	0.67	0.53
3	3	2	2	1.82	25.0	1.42	1.13	1.04	0.93
3	4	2	2	2.42	25.1	1.92	1.51	1.37	1.22
3	5	2	2	3.63	25.1	2.98	2.25	2.03	1.81
4	1	2	2	0.59	25.0	0.75	0.52	0.49	0.40
4	2	2	2	1.18	25.1	1.56	1.10	1.00	0.84
4	3	2	2	1.80	25.0	2.56	1.65	1.49	1.26
4	4	2	2	2.46	25.0	3.56	2.26	2.04	1.72
4	4	2	2	2.42	25.1	3.52	2.24	2.04	1.71
4	5	2	2	3.56	25.1	5.44	3.32	2.98	2.53
5	1	2	2	0.58	25.1	0.50	0.36	0.31	0.27
5	2	2	2	1.20	25.1	1.04	0.76	0.65	0.55
5	3	2	2	1.77	25.1	1.55	1.16	0.98	0.82
5	4	2	2	2.39	25.1	2.23	1.61	1.41	1.18
5	5	2	2	3.60	25.1	3.72	2.40	2.15	1.77
6	1	1	2	0.60	15.1	0.50	0.37	0.38	0.27
6	2	1	2	1.22	15.1	1.03	0.78	0.71	0.53
6	3	1	2	1.78	15.1	1.65	1.18	1.12	0.84
6	4	1	2	2.41	15.1	2.24	1.69	1.37	1.14
6	5	1	2	3.62	15.1	3.59	2.70	2.41	1.84
6	1	2	2	0.59	25.0	0.60	0.46	0.35	0.33
6	2	2	2	1.23	25.1	1.26	0.96	0.73	0.65
6	3	2	2	1.78	25.1	1.87	1.43	1.17	1.07
6	4	2	2	2.39	25.0	2.54	1.95	1.65	1.44
6	5	2	2	3.57	25.0	3.98	3.01	2.59	2.18
6	1	3	2	0.64	35.0	0.45	0.32	0.31	0.23
6	2	3	2	1.24	35.1	0.91	0.65	0.60	0.44
6	3	3	2	1.83	35.0	1.38	0.99	0.89	0.66
6	4	3	2	2.41	35.0	1.89	1.32	1.19	0.98
6	5	3	2	3.61	35.0	2.91	2.01	1.69	1.34
7	1	2	1	0.62	25.1	0.53	0.39	0.35	0.28
7	2	2	1	1.17	25.1	1.04	0.75	0.66	0.54
7	3	2	1	1.33	25.1	1.64	1.19	1.05	0.86
7	4	2	1	2.44	25.1	2.27	1.61	1.41	1.14
7	5	2	1	3.60	25.0	3.45	2.40	2.08	1.69
"11-17-85"									
"Dynatest FWD"									
1	2	2	397	97	81	71	56	48	37
1	4	2	796	189	161	141	117	96	75
2	2	2	394	115	89	73	59	46	0

2	4	2	796	223	176	145	116	92	0	0
3	2	2	398	108	80	72	58	47	37	24
3	4	2	794	201	159	136	111	88	68	41
4	2	2	392	120	89	77	64	51	0	0
4	4	2	792	225	172	149	124	99	0	0
5	2	2	390	113	82	70	58	47	37	19
5	4	2	792	215	165	141	118	95	75	41
6	2	1	382	121	86	68	54	41	0	0
6	4	1	783	223	163	130	104	79	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	384	115	87	75	60	45	0	0
7	3	2	593	166	129	108	89	69	0	0
7	4	2	785	216	168	143	115	90	0	0

"L5" 71 "US" 20 5434 20.0 1087 "N"

"F. New Carlisle C/L to US31" 7.90

"F. Rose Rd. (2.6m. w. of concrete pvt. w. of US31) easterly (EB)" 0.25

2 12850 81 5 1.8 0.14 4.5 7.0 0.0 "N"

"A-2-4" 0 "SM" 102.9 11.1 28 0.0 0.0 0.0 2.55

56 4.4 0

2

"04-10-86" 1 1 1 1 1150 1220 64 0 0 40 51

"Dynalect"

1	2	1.0	8	0.75	0.65	0.52	0.40	0.29
2	2	1.0	8	0.95	0.80	0.60	0.44	0.31
3	2	1.0	8	0.95	0.75	0.55	0.40	0.29
4	2	1.0	8	0.96	0.78	0.60	0.43	0.32
5	2	1.0	8	0.80	0.69	0.57	0.45	0.33
6	1	1.0	8	0.90	0.77	0.60	0.46	0.33
7	2	1.0	8	0.82	0.72	0.58	0.46	0.34

"Road Rater 400"

1	1	2	2	0.61	24.9	0.53	1.89	1.76	0.30
1	2	2	2	1.23	25.0	1.05	0.56	2.56	0.60
1	3	2	2	1.82	25.0	2.09	1.91	1.33	1.04
2	1	2	2	0.58	25.2	0.67	0.48	0.75	0.25
2	2	2	2	1.23	25.2	1.54	3.37	0.75	0.46
2	3	2	2	1.87	25.3	2.75	4.72	1.57	2.50
3	1	2	2	0.60	25.2	0.71	0.49	0.19	0.28
3	2	2	2	1.26	25.3	1.61	2.86	0.92	0.63
3	3	2	2	1.84	25.3	2.65	2.12	1.54	1.05
4	1	2	2	0.62	25.2	0.73	0.56	0.31	0.27
4	3	2	2	1.85	25.3	2.64	3.06	0.80	0.98
5	1	2	2	0.61	25.2	0.58	0.66	0.72	0.25
5	2	2	2	1.24	25.2	1.20	2.98	0.44	0.56
5	3	2	2	1.87	25.3	1.95	1.52	1.31	0.94
6	1	2	1	0.61	25.2	0.63	0.43	0.65	0.26
6	2	2	1	1.26	25.2	1.37	2.29	0.53	0.60
6	3	2	1	1.86	25.3	2.23	1.42	2.21	2.38
7	1	1	2	0.62	15.1	0.52	0.43	0.38	0.28
7	2	1	2	1.23	15.2	1.11	0.96	0.74	0.60
7	1	2	2	0.61	25.2	0.54	0.36	0.18	0.25
7	2	2	2	1.25	25.2	1.15	1.25	0.69	0.60
7	3	2	2	1.86	25.3	1.85	1.33	1.35	2.02
7	1	3	2	0.60	35.1	0.46	0.38	0.30	0.25
7	2	3	2	1.21	35.1	1.01	0.89	0.72	0.55
7	3	3	2	1.81	35.1	2.07	1.78	1.21	1.16

"Road Rater 2000"

1	1	2	2	0.61	25.0	0.56	0.38	0.29	0.23
1	2	2	2	1.24	25.0	1.25	0.87	0.68	0.52
1	3	2	2	1.80	25.0	1.92	1.35	1.06	0.80
1	4	2	2	2.37	25.0	2.66	1.86	1.43	1.11
1	5	2	2	3.61	25.0	4.38	3.12	2.39	1.81
2	1	2	2	0.58	25.0	0.59	0.44	0.33	0.23
2	2	2	2	1.19	25.0	1.36	1.05	0.75	0.52
2	3	2	2	1.81	24.9	2.22	1.70	1.23	0.83
2	4	2	2	2.37	25.0	3.12	2.41	1.71	1.15
2	5	2	2	3.58	25.0	5.36	4.19	2.88	1.39

3	1	2	2	0.58	25.0	0.56	0.39	0.29	0.21
3	2	2	2	1.17	25.0	1.30	0.93	0.67	0.48
3	3	2	2	1.82	25.0	2.18	1.58	1.13	0.80
3	4	2	2	2.42	25.0	3.15	2.23	1.59	1.12
3	5	2	2	3.59	25.0	5.66	3.95	2.72	1.85
4	1	2	2	0.60	21.8	0.55	0.43	0.34	0.25
4	1	2	2	0.59	24.9	0.54	0.41	0.32	0.24
4	2	2	2	1.20	25.0	1.25	0.99	0.71	0.54
4	3	2	2	1.80	25.0	2.04	1.58	1.12	0.85
4	4	2	2	2.37	24.9	2.90	2.27	1.60	1.19
4	5	2	2	3.61	25.0	5.09	3.92	2.75	1.99
5	1	2	2	0.62	25.0	0.59	0.43	0.43	0.27
5	2	2	2	1.22	25.0	1.31	0.97	0.84	0.41
5	3	2	2	1.80	25.0	2.08	1.56	1.20	0.66
5	4	2	2	2.43	25.0	3.04	2.24	1.64	0.97
5	5	2	2	3.60	24.9	5.20	3.74	2.56	1.78
6	1	1	2	0.58	15.1	0.49	0.42	0.38	0.29
6	2	1	2	1.24	15.2	1.17	0.93	0.74	0.66
6	3	1	2	1.82	15.2	1.99	1.50	1.18	1.04
6	4	1	2	2.43	15.1	2.91	2.13	1.67	1.42
6	5	1	2	3.56	15.2	4.63	3.67	2.93	2.31
6	1	2	2	0.60	25.2	0.48	0.37	0.31	0.24
6	2	2	2	1.20	25.2	1.01	0.82	0.66	0.49
6	3	2	2	1.80	25.2	1.59	1.28	1.06	0.79
6	4	2	2	2.39	25.2	2.21	1.75	1.45	1.07
6	5	2	2	3.60	25.2	3.76	2.87	2.36	1.75
6	1	3	2	0.60	35.2	0.45	0.36	0.29	0.22
6	2	3	2	1.19	35.2	1.05	0.81	0.68	0.50
6	3	3	2	1.82	35.2	1.61	1.27	1.05	0.78
6	4	3	2	2.38	35.3	2.21	1.71	1.45	1.07
6	5	3	2	3.59	35.2	3.67	2.79	2.32	1.73
7	1	2	1	0.59	25.0	0.88	0.47	0.30	0.21
7	2	2	1	1.21	25.1	1.97	1.11	0.65	0.46
7	3	2	1	1.78	25.0	3.16	1.71	1.03	0.72
7	4	2	1	2.40	25.1	4.60	2.42	1.44	1.00
7	5	2	1	3.63	25.0	8.77	4.06	2.37	1.64
"Dynatest FWD"									
1	2	2	432	189	159	124	94	67	0
1	4	2	940	387	327	261	200	147	0
2	2	2	416	353	251	171	112	71	0
2	4	2	924	651	492	345	230	153	0
3	2	2	414	341	248	155	105	69	0
3	4	2	917	660	480	322	219	148	0
4	2	2	425	339	245	166	102	71	0
4	4	2	930	676	491	332	217	151	0
5	2	2	427	195	174	137	104	75	52
5	4	2	936	423	351	283	216	158	113
6	2	1	435	244	211	166	117	84	0
6	4	1	937	524	421	327	238	170	0
7	1	2	214	94	87	74	49	38	0
7	2	2	422	228	198	147	115	79	0
7	3	2	670	352	295	231	174	125	0
7	4	2	933	477	396	311	235	170	0
"09-02-86" 1 1 0 1 1010 1037 92 93 95 76 59									
"Dynaflect"									
1	2	1.0	8	0.66	0.55	0.44	0.33	0.23	
2	2	1.0	8	0.81	0.65	0.48	0.35	0.25	
3	2	1.0	8	0.87	0.67	0.49	0.35	0.26	
4	2	1.0	8	0.81	0.65	0.49	0.36	0.27	
5	2	1.0	8	0.77	0.65	0.51	0.39	0.29	
6	1	1.0	8	0.80	0.67	0.52	0.39	0.29	
7	2	1.0	8	0.75	0.64	0.50	0.38	0.28	
"Road Rater 400"									
1	1	2	2	0.60	25.0	0.51	0.92	0.35	0.24
1	2	2	2	1.21	25.1	1.22	1.40	0.91	0.67
1	3	2	2	1.87	25.1	2.54	2.28	1.86	1.38
2	1	2	2	0.60	25.0	0.66	0.90	0.41	0.27
2	2	2	2	1.37	25.0	2.48	2.79	1.59	1.09
2	3	2	2	1.80	25.1	2.85	2.90	2.03	1.41
3	1	2	2	0.59	25.0	0.67	0.56	0.39	0.26

3	2	2	2	1.22	25.1	1.79	1.66	1.17	0.81
3	3	2	2	1.88	25.1	4.44	5.96	2.42	1.84
4	1	2	2	0.59	25.0	0.61	0.17	0.41	0.30
4	2	2	2	1.20	25.0	1.81	1.43	1.25	0.91
4	3	2	2	1.91	25.1	3.29	3.11	2.27	1.73
5	1	2	2	0.60	25.0	0.52	0.36	0.36	0.24
5	2	2	2	1.20	25.0	1.71	1.21	0.90	0.71
5	3	2	2	1.87	25.1	2.98	5.63	5.01	1.73
6	1	1	1	0.62	14.9	0.99	0.50	0.39	0.29
6	2	1	1	1.23	15.0	1.45	1.36	1.07	0.82
6	1	2	1	0.59	25.1	0.47	0.49	0.38	0.28
6	2	2	1	1.23	25.1	1.56	1.65	1.30	0.97
6	3	2	1	1.82	25.1	2.68	1.61	1.61	1.50
6	1	3	1	0.57	34.9	0.62	0.43	0.33	0.24
6	2	3	1	1.24	34.9	1.79	1.85	1.51	1.09
7	1	2	2	0.60	24.9	0.65	0.79	0.21	0.24
7	2	2	2	1.21	25.0	1.84	0.98	1.07	0.73
7	3	2	2	1.80	25.0	3.07	1.88	1.77	1.20

"Dynatest FWD"

1	2	2	401	217	163	117	80	56	41	24
1	4	2	904	472	364	267	193	132	95	52
2	2	2	397	285	195	132	83	58	0	0
2	4	2	900	594	427	296	197	134	0	0
3	2	2	392	313	217	136	91	61	45	28
3	4	2	895	644	461	309	206	142	102	63
4	2	2	394	273	198	132	85	57	0	0
4	4	2	895	590	440	298	196	135	0	0
5	2	2	395	211	164	122	88	60	41	24
5	4	2	900	463	363	278	200	143	103	60
6	2	1	394	217	168	127	86	62	0	0
6	4	1	896	471	371	281	199	143	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	391	190	157	118	88	61	0	0
7	3	2	611	294	243	188	136	99	0	0
7	4	2	894	419	347	270	200	143	0	0

"L6" 71 "SR" 23 3200 20.0 640 "N"
 "F. 0.5m. n. of No. Liberty C/L northeasterly" 4.70
 "F. New Road (n. of No. Liberty) northerly (SR)" 0.25
 2 14821 85 1 1.2 0.10 3.6 7.1 0.0 "N"
 "A-3" 0 "SP-SM" 106.5 7.4 25 0.0 0.0 0.0 0.0 2.65
 63 4.3 0

2
 "04-10-86" 1 1 1 1 1340 1410 84 0 0 45 51
 "Dynaflect"

1	2	1.0	8	0.62	0.57	0.50	0.44	0.36
2	2	1.0	8	0.85	0.74	0.62	0.53	0.42
3	2	1.0	8	0.81	0.73	0.63	0.55	0.45
4	2	1.0	8	0.80	0.72	0.62	0.54	0.43
5	2	1.0	8	0.86	0.72	0.60	0.49	0.38
6	2	1.0	8	0.87	0.79	0.69	0.60	0.49

"Road Rater 400"

1	1	2	2	0.61	25.2	0.32	0.33	0.22	0.22
1	2	2	2	1.22	25.2	0.70	0.69	0.49	0.50
1	3	2	2	1.83	25.2	1.11	1.70	0.75	0.33
2	1	2	2	0.61	25.2	0.48	0.40	0.59	0.26
2	2	2	2	1.24	25.2	1.05	0.95	1.14	0.54
2	3	2	2	1.82	25.2	1.67	1.49	1.26	0.71
3	1	2	2	0.61	25.2	0.34	0.30	0.26	0.18
3	2	2	2	1.26	25.2	0.76	0.80	0.64	0.44
3	3	2	2	1.85	25.2	1.17	1.34	1.83	0.73
4	1	2	2	0.61	25.2	0.41	0.32	0.18	0.22
4	2	2	2	1.26	25.2	0.89	0.87	0.69	0.51
4	3	2	2	1.84	25.2	1.35	1.19	1.77	0.85
5	1	2	2	0.59	25.2	0.42	0.47	0.79	0.23
5	2	2	2	1.25	25.2	0.97	1.63	0.37	1.04
5	3	2	2	1.85	25.2	1.56	0.49	1.54	0.92

6	1	1	2	0.62	15.0	0.45	0.33	0.40	0.36
6	2	1	2	1.20	15.1	0.96	0.85	0.87	0.79
6	1	2	2	0.61	25.0	0.44	0.38	0.56	0.13
6	2	2	2	1.23	25.0	1.00	0.90	0.78	0.30
6	3	2	2	1.82	25.1	1.56	1.47	0.73	0.56
6	1	3	2	0.59	35.1	0.37	0.30	0.27	0.12
6	2	3	2	1.20	35.1	0.83	0.73	0.64	0.30
6	3	3	2	1.84	35.2	1.62	1.55	1.17	0.71
"Road Rater 2000"									
1	1	2	2	0.62	25.1	0.35	0.29	0.26	0.15
1	2	2	2	1.21	25.1	0.72	0.62	0.56	0.47
1	3	2	2	1.82	25.1	1.08	0.93	0.83	0.69
1	4	2	2	2.39	25.1	1.48	1.27	1.16	0.95
1	5	2	2	3.59	25.1	2.37	1.97	1.79	1.49
2	1	2	2	0.62	25.1	0.52	0.42	0.34	0.28
2	2	2	2	1.20	25.1	1.03	0.83	0.69	0.54
2	3	2	2	1.75	25.1	1.54	1.27	1.07	0.91
2	4	2	2	2.40	25.1	2.16	1.76	1.48	1.28
2	5	2	2	3.57	25.1	3.45	2.74	2.33	1.96
3	1	2	2	0.63	25.1	0.41	0.33	0.28	0.25
3	2	2	2	1.24	25.1	0.80	0.65	0.57	0.41
3	3	2	2	1.81	25.1	1.23	1.03	0.89	0.71
3	4	2	2	2.42	25.1	1.68	1.40	1.23	1.02
3	5	2	2	3.61	25.1	2.66	2.22	1.90	1.61
4	1	2	2	0.60	25.1	0.39	0.34	0.26	0.17
4	2	2	2	1.16	25.1	0.77	0.65	0.57	0.35
4	3	2	2	1.77	25.1	1.16	1.00	0.89	0.52
4	4	2	2	2.40	25.1	1.63	1.40	1.24	0.84
4	5	2	2	3.62	25.1	2.60	2.18	1.94	1.47
5	1	2	2	0.62	25.1	0.43	0.36	0.32	0.21
5	2	2	2	1.22	25.1	0.89	0.78	0.66	0.37
5	3	2	2	1.83	25.1	1.37	1.21	1.06	0.74
5	4	2	2	2.40	25.1	1.84	1.61	1.40	1.06
5	5	2	2	3.59	25.1	2.91	2.52	2.17	1.76
6	1	1	2	0.60	15.1	0.47	0.40	0.39	0.37
6	2	1	2	1.23	15.0	1.00	0.86	0.85	0.82
6	3	1	2	1.76	15.1	1.66	1.33	1.30	1.27
6	4	1	2	2.43	15.0	2.28	1.97	1.89	1.63
6	5	1	2	3.64	15.1	3.79	3.08	2.83	2.01
6	1	2	2	0.58	25.0	0.41	0.35	0.29	0.24
6	2	2	2	1.17	25.0	0.89	0.74	0.62	0.51
6	3	2	2	1.78	25.0	1.47	1.19	1.04	0.85
6	4	2	2	2.40	25.0	2.06	1.68	1.47	1.21
6	5	2	2	3.63	25.0	3.32	2.76	2.34	1.92
6	1	3	2	0.64	35.1	0.43	0.33	0.26	0.19
6	2	3	2	1.21	35.1	0.90	0.69	0.57	0.43
6	3	3	2	1.82	35.1	1.43	1.09	0.92	0.69
6	4	3	2	2.42	35.1	1.98	1.55	1.30	0.99
6	5	3	2	3.64	35.1	3.28	2.53	2.14	1.70
"Dynatest FWD"									
1	2	2	446	136	115	105	86	72	0
1	4	2	965	282	241	213	182	153	0
2	2	2	431	190	164	129	107	84	0
2	4	2	954	396	329	266	220	174	0
3	2	2	430	167	140	122	98	81	0
3	4	2	952	346	285	250	206	167	0
4	2	2	430	172	157	127	112	84	0
4	4	2	949	368	314	268	227	182	0
5	2	2	433	191	156	125	98	78	58
5	4	2	942	399	313	250	199	158	121
6	1	2	219	86	71	68	51	45	0
6	2	2	427	171	146	131	107	89	0
6	3	2	669	263	222	194	164	133	0
6	4	2	954	357	301	263	223	181	0
"09-02-86"									
1	1	0	1	1140	1202	108	109	110	82
"Dynaflect"									
1	2	1.0	8	0.48	0.45	0.40	0.34	0.28	
2	2	1.0	8	0.74	0.64	0.55	0.45	0.35	
3	2	1.0	8	0.66	0.60	0.53	0.44	0.35	
4	2	1.0	8	0.62	0.57	0.49	0.41	0.31	

5	2	1.0	8	0.69	0.60	0.51	0.41	0.31
6	2	1.0	8	0.73	0.67	0.58	0.48	0.36
"Road Rater 400"								
1	1	2	2	0.61	25.0	0.42	0.80	1.22
1	2	2	2	1.21	25.0	1.03	0.83	0.88
1	3	2	2	1.78	25.0	1.73	1.62	1.49
2	1	2	2	0.59	24.9	0.59	0.50	0.42
2	2	2	2	1.21	25.0	1.35	1.19	0.99
2	3	2	2	1.31	25.0	2.15	1.90	1.60
3	1	2	2	0.60	24.9	0.36	0.32	0.28
3	2	2	2	1.24	25.0	0.83	0.78	0.69
3	3	2	2	1.80	25.0	1.28	1.19	1.06
4	1	2	2	0.59	24.9	0.40	0.37	0.34
4	2	2	2	1.22	25.0	0.89	0.86	0.79
4	3	2	2	1.82	25.0	1.35	1.32	1.21
5	1	2	2	0.58	24.9	0.56	0.48	0.41
5	2	2	2	1.23	25.0	1.44	1.28	1.08
5	3	2	2	1.81	25.0	2.33	5.10	1.59
6	1	1	2	0.61	15.3	0.48	0.52	0.43
6	2	1	2	1.24	15.4	1.19	1.05	1.05
6	1	2	2	0.61	24.9	0.47	0.45	0.40
6	2	2	2	1.24	25.0	1.18	0.98	1.04
6	3	2	2	1.79	25.0	1.80	1.74	1.60
6	1	3	2	0.58	35.2	0.42	0.82	0.25
6	2	3	2	1.16	35.2	1.27	2.14	1.19
6	3	3	2	1.90	35.2	2.49	2.41	2.16

"Dynatest FWD"

1	2	2	392	148	116	103	86	72	60	35
1	4	2	899	320	260	228	195	162	133	90
2	2	2	393	178	145	121	99	79	0	0
2	4	2	895	379	316	263	215	171	0	0
3	2	2	390	179	140	117	98	78	60	40
3	4	2	894	378	312	263	220	176	139	77
4	2	2	390	170	138	120	99	78	0	0
4	4	2	899	368	307	269	221	177	0	0
5	2	2	388	193	148	122	99	76	59	33
5	4	2	886	397	316	263	213	170	133	75
6	1	2	0	0	0	0	0	0	0	0
6	2	2	386	182	141	123	100	79	0	0
6	3	2	604	270	215	188	155	122	0	0
6	4	2	889	380	305	264	218	173	0	0

"L7" 71 "US" 20 11884 20.0 2377 "N"
 "F. 5.07m. w. of/to St. Joseph/Elkhart CL" 5.07
 "F. Birch Rd. easterly to Beech Rd. (1.0m. w. of SR219) (WB)" 0.25
 2 7744 68 18 2.3 0.24 0.0 7.3 0.0 "N"
 "A-2-4" 0 "SM" 112.0 8.7 38 0.0 0.0 0.0 2.65
 0.0 2.6 0

1
 "04-10-86" 1 1 1 1 0945 1015 43 49 0 37 48
 "Dynaflect"

1	2	1.0	8	0.64	0.59	0.54	0.49	0.40
2	2	1.0	8	0.64	0.60	0.54	0.51	0.42
3	2	1.0	8	0.53	0.49	0.44	0.40	0.33
4	2	1.0	8	0.60	0.56	0.53	0.48	0.40
5	2	1.0	8	0.60	0.55	0.49	0.44	0.36
6	2	1.0	8	0.67	0.63	0.57	0.52	0.43
"Road Rater 400"								
1	1	2	2	0.60	25.1	0.37	0.34	0.31
1	2	2	2	1.23	25.1	0.81	0.74	0.67
1	3	2	2	1.83	25.1	1.22	1.46	1.05
2	1	2	2	0.61	25.1	0.42	0.40	1.17
2	2	2	2	1.24	25.1	0.86	0.83	2.77
2	3	2	2	1.83	25.1	1.45	1.44	1.24
3	1	2	2	0.61	25.1	0.34	0.93	1.95
3	2	2	2	1.26	25.1	0.70	1.57	0.55
3	3	2	2	1.84	25.1	1.14	1.06	0.93

4	1	2	2	0.62	25.1	0.44	0.37	0.60	0.23
4	2	2	2	1.24	25.1	0.91	1.49	0.86	0.57
4	3	2	2	1.82	25.1	1.43	1.47	1.26	1.08
5	1	2	2	0.60	25.1	0.39	0.58	1.03	0.94
5	2	2	2	1.24	25.1	0.86	1.56	0.72	2.02
5	3	2	2	1.83	25.1	1.36	1.25	1.17	2.59
6	1	1	2	0.53	14.2	0.39	0.34	0.25	0.28
6	2	1	2	1.23	15.3	0.98	0.86	0.22	1.06
6	1	2	2	0.61	25.2	0.43	0.76	0.86	0.64
6	2	2	2	1.26	25.3	0.99	2.16	0.27	1.41
6	3	2	2	1.86	25.3	1.58	2.10	1.34	1.98
6	1	3	2	0.60	35.3	0.35	0.29	0.27	0.36
6	2	3	2	1.22	35.4	0.77	0.67	0.63	0.69
6	3	3	2	1.84	35.4	1.48	1.35	1.23	0.99
"Road Rater 2000"									
1	1	2	2	0.59	25.0	0.39	0.32	0.28	0.23
1	2	2	2	1.23	25.0	0.87	0.74	0.58	0.54
1	3	2	2	1.82	25.0	1.37	1.16	0.95	0.85
1	4	2	2	2.40	25.0	1.88	1.58	1.32	1.16
1	5	2	2	3.61	25.0	3.02	2.53	2.17	1.86
2	1	2	2	0.58	25.0	0.38	0.32	0.30	0.25
2	2	2	2	1.18	25.0	0.84	0.71	0.66	0.57
2	3	2	2	1.78	24.9	1.32	1.13	1.06	0.89
2	4	2	2	2.40	25.0	1.84	1.58	1.46	1.25
2	5	2	2	3.59	25.0	2.95	2.52	2.35	2.02
3	1	2	2	0.61	25.0	0.30	0.26	0.24	0.20
3	2	2	2	1.21	25.0	0.64	0.56	0.50	0.42
3	3	2	2	1.80	25.0	0.96	0.83	0.75	0.64
3	4	2	2	2.44	25.0	1.31	1.16	1.04	0.88
3	5	2	2	3.57	25.1	2.02	1.77	1.64	1.36
4	1	2	2	0.59	25.0	0.37	0.32	0.27	0.25
4	2	2	2	1.16	25.0	0.76	0.67	0.56	0.50
4	3	2	2	1.80	25.0	1.22	1.06	0.89	0.80
4	4	2	2	2.39	25.0	1.66	1.44	1.23	1.11
4	5	2	2	3.62	25.0	2.61	2.30	2.02	1.77
5	1	2	2	0.58	25.0	0.44	0.30	0.28	0.23
5	2	2	2	1.18	18.5	0.94	0.67	0.60	0.50
5	3	2	2	1.17	25.0	0.92	0.65	0.58	0.48
5	4	2	2	1.83	25.0	1.53	1.07	0.97	0.80
5	5	2	2	2.43	25.0	2.11	1.46	1.33	1.09
5	5	2	2	3.57	25.0	3.61	2.41	2.19	1.80
6	1	1	2	0.62	15.0	0.09	0.07	0.05	0.03
6	2	1	2	1.26	14.9	0.64	0.54	0.53	0.44
6	3	1	2	1.81	14.9	1.45	1.21	1.16	0.98
6	4	1	2	2.45	15.0	2.01	1.73	1.61	1.38
6	1	2	2	0.57	25.0	0.34	0.30	0.32	0.23
6	2	2	2	1.16	25.1	0.85	0.75	0.69	0.57
6	3	2	2	1.81	25.0	1.45	1.26	1.14	1.00
6	4	2	2	2.43	25.0	2.02	1.74	1.57	1.40
6	5	2	2	3.58	25.1	3.28	2.73	2.40	2.19
6	1	3	2	0.61	35.1	0.38	0.30	0.28	0.23
6	2	3	2	1.20	35.1	0.75	0.63	0.56	0.48
6	3	3	2	1.78	35.0	1.16	0.96	0.84	0.75
6	4	3	2	2.41	35.1	1.67	1.35	1.21	1.07
6	5	3	2	3.66	35.0	2.68	2.14	1.91	1.72
"Dynatest FWD"									
1	2	2	454	159	138	122	104	88	0
1	4	2	961	325	282	249	216	182	0
2	2	2	441	170	143	145	127	106	0
2	4	2	970	332	285	284	244	212	0
3	2	2	446	119	103	93	79	68	0
3	4	2	952	247	221	198	172	146	0
4	2	2	440	169	145	131	115	102	0
4	4	2	968	328	286	267	231	209	0
5	2	2	432	170	144	126	109	91	74
5	4	2	959	337	286	254	222	185	150
6	1	2	230	94	85	75	65	53	0
6	2	2	428	182	165	146	125	107	0
6	3	2	693	273	248	225	190	166	0
6	4	2	954	366	330	300	259	222	0

"L7" 71 "US" 20 11884 20.0 2377 "N"
 "F. 5.07m. w. of/to St. Joseph/Elkhart CL" 5.07
 "F. Birch Rd. easterly to Beech Rd. (1.0m. w. of SR219) (WB)" 0.25
 2 16034 86 0 2.8 0.23 2.3 7.3 0.0 "N"
 "A-2-4" 0 "SM" 112.0 8.7 38 0.0 0.0 0.0 2.65
 100 4.5 0

1
 "09-02-86" 1 1 0 1 1328 1345 122 116 114 82 58

"Dynaflect"

1	2	1.0	8	0.00	0.00	0.00	0.00	0.00
2	2	1.0	8	0.63	0.59	0.54	0.47	0.40
3	2	1.0	8	0.00	0.00	0.00	0.00	0.00
4	2	1.0	8	0.00	0.00	0.00	0.00	0.00
5	2	1.0	8	0.77	0.70	0.61	0.49	0.38
6	2	1.0	8	0.70	0.65	0.57	0.47	0.38

"Road Rater 400"

1	1	2	2	0.60	24.9	0.49	0.42	0.40	0.33
1	2	2	2	1.26	25.0	1.17	1.04	1.00	0.85
1	3	2	2	1.80	25.0	1.84	1.66	1.62	1.43
2	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	1	2	2	0.60	24.9	0.69	0.56	0.53	1.74
5	2	2	2	1.23	25.0	1.60	1.37	1.29	2.35
5	3	2	2	1.80	25.0	2.47	2.24	2.12	1.79
6	1	1	2	0.59	14.9	0.54	0.90	0.48	0.39
6	2	1	2	1.21	14.9	1.33	1.38	1.14	0.97
6	1	2	2	0.61	25.1	0.61	0.54	0.49	0.41
6	2	2	2	1.25	25.1	1.46	1.63	1.22	1.05
6	3	2	2	1.81	25.1	2.49	2.12	2.00	2.37
6	1	3	2	0.60	35.4	0.47	0.38	0.36	0.55
6	2	3	2	1.30	35.4	1.37	1.17	1.09	1.09

"Dynatest FWD"

1	2	2	0	0	0	0	0	0	0
1	4	2	0	0	0	0	0	0	0
2	2	2	387	193	141	130	110	94	75
2	4	2	896	403	311	285	248	206	167
3	2	2	0	0	0	0	0	0	0
3	4	2	0	0	0	0	0	0	0
4	2	2	0	0	0	0	0	0	0
4	4	2	0	0	0	0	0	0	0
5	2	2	387	238	191	161	140	101	73
5	4	2	894	472	379	332	277	210	151
6	1	2	0	0	0	0	0	0	0
6	2	2	385	198	154	148	116	102	75
6	3	2	603	295	239	221	182	152	118
6	4	2	891	411	338	307	258	212	168

"L8" 75 "US" 30 10760 16.5 1775 "N"
 "F. LaPorte/Starke CL easterly" 3.73
 "F. CR50E (0.5m. e. of LaPorte/Starke CL) easterly (EB)" 0.25
 5 4401 59 27 0.0 0.00 0.0 9.4 0.0 "N"
 "A-3" 0 "SP-SM" 111.0 13.6 25 0.0 0.0 0.0 2.65
 40 1.9 0

2
 "04-17-86" 1 1 1 1 1125 1155 64 0 0 55 44
 "Dynaflect"

1	2	1.0	8	0.75	0.70	0.66	0.58	0.49
2	2	1.0	8	0.66	0.60	0.56	0.50	0.42
3	2	1.0	8	0.82	0.76	0.71	0.62	0.56
4	2	1.0	8	0.77	0.71	0.67	0.59	0.49
5	2	1.0	8	0.85	0.79	0.72	0.63	0.52
6	1	1.0	8	1.21	1.11	1.04	0.90	0.77
7	2	1.0	8	1.18	1.07	0.98	0.82	0.66
"Road Rater 400"								
1	1	2	2	0.60	24.4	0.64	0.91	0.57
1	2	2	2	1.22	24.9	1.23	1.24	1.19
1	3	2	2	1.79	24.9	1.83	0.90	1.71
2	1	2	2	0.60	24.9	0.48	0.83	0.37
2	2	2	2	1.23	25.2	1.07	0.59	0.83
2	3	2	2	1.83	25.0	1.51	1.07	1.32
3	1	2	2	0.58	24.9	0.51	0.66	0.47
3	2	2	2	1.26	25.2	1.23	1.14	1.02
3	3	2	2	1.86	25.2	1.77	1.66	1.57
4	1	2	2	0.59	24.9	0.51	1.01	0.53
4	2	2	2	1.22	25.0	1.04	0.80	0.96
4	3	2	2	1.82	25.0	1.71	1.03	1.64
5	1	2	2	0.60	24.8	0.64	0.51	0.50
5	2	2	2	1.22	25.0	1.24	1.18	1.83
5	3	2	2	1.79	25.0	1.97	1.89	1.83
6	1	2	1	0.58	24.9	0.81	0.70	0.59
6	2	2	1	1.21	25.0	1.79	1.65	1.50
6	3	2	1	1.81	25.0	3.17	2.92	2.65
7	1	1	2	0.60	14.8	0.68	0.63	1.09
7	2	1	2	1.17	14.9	1.55	1.42	2.41
7	1	2	2	0.61	25.0	0.81	0.72	0.67
7	2	2	2	1.22	24.9	1.75	1.62	2.60
7	3	2	2	1.78	24.9	2.92	2.76	3.06
7	1	3	2	0.57	34.7	0.96	0.90	0.81
7	2	3	2	1.19	35.0	2.54	2.45	2.27
7	3	3	2	1.79	35.2	5.47	5.55	3.66
"Road Rater 2000"								
1	1	2	2	0.60	25.0	0.40	0.31	0.27
1	2	2	2	1.17	25.0	0.88	0.70	0.60
1	3	2	2	1.81	25.0	1.39	1.10	0.95
1	4	2	2	2.41	25.0	1.91	1.51	1.32
1	5	2	2	3.61	25.1	3.04	2.44	2.12
2	1	2	2	0.57	25.1	0.25	0.27	0.23
2	2	2	2	1.19	25.0	0.54	0.58	0.52
2	3	2	2	1.82	25.0	0.85	0.94	0.86
2	4	2	2	2.43	25.1	1.16	1.29	1.15
2	5	2	2	3.59	25.1	1.73	2.08	1.81
3	1	2	2	0.65	25.1	0.26	0.31	0.28
3	2	2	2	1.19	25.0	0.53	0.63	0.55
3	3	2	2	1.78	25.1	0.81	1.01	0.91
3	4	2	2	2.39	25.0	1.22	1.46	1.30
3	5	2	2	3.60	25.1	2.02	2.34	2.08
4	1	2	2	0.58	25.0	0.46	0.24	0.21
4	2	2	2	1.20	25.1	1.07	0.57	0.51
4	3	2	2	1.82	25.1	1.69	0.91	0.81
4	4	2	2	2.40	25.0	2.35	1.28	1.12
4	5	2	2	3.59	25.1	3.99	2.21	1.99
5	1	2	2	0.65	25.0	0.39	0.33	0.27
5	2	2	2	1.22	25.1	0.77	0.73	0.60
5	3	2	2	1.86	25.1	1.26	1.28	1.08
5	4	2	2	2.38	25.0	1.81	1.79	1.50
5	5	2	2	3.67	25.1	2.89	2.98	2.63
6	1	1	2	0.67	15.2	0.59	0.49	0.45
6	2	1	2	1.24	15.2	1.20	1.12	1.04
6	3	1	2	1.77	15.2	1.99	1.81	1.64
6	4	1	2	2.37	15.2	2.81	2.58	2.38
6	5	1	2	3.53	15.1	4.24	4.28	3.75
6	1	2	2	0.60	25.0	0.64	0.55	0.51
6	2	2	2	1.18	25.0	1.38	1.20	1.09
6	3	2	2	1.80	25.0	2.24	1.97	1.80
6	4	2	2	2.39	25.1	3.10	2.69	2.46
6	5	2	2	3.62	25.0	4.90	4.29	3.92

6	1	3	2	0.61	35.1	0.93	0.78	0.73	0.61
6	2	3	2	1.22	35.0	2.14	1.78	1.64	1.41
6	3	3	2	1.81	35.0	3.50	2.94	2.71	2.32
6	4	3	2	2.43	35.0	4.84	4.07	3.84	3.23
6	5	3	2	3.64	35.0	0.00	5.67	5.03	4.73
7	1	2	1	0.61	25.2	0.43	0.34	0.30	0.25
7	2	2	1	1.16	25.2	0.93	0.74	0.64	0.53
7	3	2	1	1.77	25.1	1.56	1.23	1.07	0.89
7	4	2	1	2.42	25.2	2.17	1.75	1.52	1.27
7	5	2	1	3.62	25.1	3.13	2.94	2.56	2.10
"Dynatest FWD"									
1	2	2	2	416	126	119	111	96	89
1	4	2	2	890	240	227	209	183	162
2	2	2	2	420	124	114	104	92	76
2	4	2	2	886	237	219	201	175	146
3	2	2	2	417	143	133	128	107	99
3	4	2	2	883	257	244	223	194	169
4	2	2	2	417	113	115	103	94	81
4	4	2	2	882	224	212	187	163	141
5	2	2	2	407	144	144	136	115	106
5	4	2	2	881	275	254	228	202	175
6	2	1	2	407	196	176	151	135	115
6	4	1	2	879	364	319	281	246	209
7	1	2	2	192	101	99	87	76	61
7	2	2	2	406	212	194	180	151	126
7	3	2	2	640	307	282	256	217	179
7	4	2	2	872	384	351	319	269	217
"09-03-86"									
1	1	0	1	0850	0915	75	80	78	78
"Dynaflect"									
1	2	1.0	8	0.39	0.36	0.32	0.26	0.21	
2	2	1.0	8	0.37	0.34	0.31	0.25	0.21	
3	2	1.0	8	0.41	0.38	0.33	0.28	0.23	
4	2	1.0	8	0.45	0.42	0.37	0.31	0.28	
5	2	1.0	8	0.44	0.40	0.35	0.28	0.24	
6	1	1.0	8	0.86	0.67	0.49	0.33	0.25	
7	2	1.0	8	0.44	0.42	0.38	0.32	0.27	
"Road Rater 400"									
1	1	2	2	0.51	25.0	0.24	0.21	0.19	0.15
1	2	2	2	1.29	25.0	0.72	0.70	0.60	0.50
1	3	2	2	1.79	25.0	1.11	1.08	1.75	0.81
2	1	2	2	0.59	25.0	0.24	0.22	0.19	1.50
2	2	2	2	1.20	25.0	0.56	0.52	0.46	0.38
2	3	2	2	1.81	25.0	0.93	0.90	0.81	0.69
3	1	2	2	0.58	25.0	0.22	0.20	0.69	0.13
3	2	2	2	1.26	25.0	0.57	0.55	2.68	0.41
3	3	2	2	1.79	25.0	0.90	0.90	0.81	0.38
4	1	2	2	0.61	25.0	0.25	0.23	0.20	0.15
4	2	2	2	1.17	25.0	0.61	0.59	0.52	0.44
4	3	2	2	1.83	25.0	1.10	1.09	0.98	0.89
5	1	2	2	0.60	25.0	0.22	0.25	1.31	0.13
5	2	2	2	1.22	25.0	0.58	1.64	4.15	0.40
5	3	2	2	1.76	25.0	1.13	0.86	0.76	2.18
6	1	2	1	0.60	25.0	0.49	0.38	0.27	1.45
6	2	2	1	1.21	25.0	1.15	0.94	0.71	2.09
6	3	2	1	1.80	25.0	1.89	1.99	1.23	2.16
7	1	1	2	0.62	15.1	0.24	0.21	1.86	1.37
7	2	1	2	1.24	15.1	0.57	0.54	4.56	4.66
7	1	2	2	0.60	25.0	0.23	0.42	0.17	0.14
7	2	2	2	1.25	25.0	0.61	1.19	0.49	0.40
7	3	2	2	1.83	25.1	1.27	1.58	1.79	2.83
7	1	3	2	0.57	34.9	0.20	0.19	0.34	0.43
7	2	3	2	1.25	34.9	0.82	0.74	2.16	2.11
"Dynatest FWD"									
1	2	2	2	402	99	91	80	63	53
1	4	2	2	921	209	191	167	135	111
2	2	2	2	400	81	74	67	52	44
2	4	2	2	916	176	163	144	119	96
3	2	2	2	398	89	83	72	59	47
3	4	2	2	912	191	178	154	128	104
4	2	2	2	396	98	92	79	68	51

4	4	2	913	203	187	166	138	115	0	0
5	2	2	395	85	80	68	59	43	36	31
5	4	2	916	183	171	147	122	97	76	43
6	2	1	392	180	140	111	74	54	0	0
6	4	1	909	332	265	206	147	104	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	393	90	95	68	59	44	0	0
7	3	2	613	139	125	108	87	68	0	0
7	4	2	910	197	180	153	124	99	0	0

"L9" 50 "US" 30 14360 27.5 3949 "N"
 "F. Starke/Marshall CL easterly" 4.69
 "F. Union Rd. (1.15m. e. of Starke/Marshall CL) easterly (EB)" 0.30
 2 13899 84 2 5.9 0.39 0.0 9.4 0.0 "N"
 "A-2-4" 0 "SP-SM" 107.2 15.4 32 0.0 0.0 0.0 2.65
 82 3.3 0

2
 "04-10-86" 1 1 1 1 1515 1545 78 0 0 53 55
 "Dynaflect"

1	2	1.0	8	0.42	0.36	0.29	0.23	0.15
2	2	1.0	8	0.49	0.37	0.30	0.26	0.21
3	2	1.0	8	0.52	0.47	0.37	0.31	0.25
4	2	1.0	8	0.58	0.49	0.38	0.30	0.22
5	2	1.0	8	0.34	0.32	0.28	0.24	0.18
6	1	1.0	8	0.36	0.31	0.25	0.22	0.16
7	2	1.0	8	0.34	0.32	0.28	0.24	0.18

"Road Rater 400"

1	1	2	2	0.60	25.2	0.30	0.23	0.14	0.08
1	2	2	2	1.23	25.2	0.63	0.49	0.32	0.21
1	3	2	2	1.83	25.2	0.98	1.48	0.53	0.65
2	1	2	2	0.61	25.2	0.26	0.21	0.19	0.16
2	2	2	2	1.23	25.2	0.57	0.46	0.43	0.33
2	3	2	2	1.86	25.2	0.88	1.04	0.68	0.71
3	1	2	2	0.62	25.2	0.27	0.17	0.14	0.11
3	2	2	2	1.26	25.2	0.62	0.44	0.44	0.26
3	3	2	2	1.84	25.2	0.96	0.70	0.53	0.42
4	1	2	2	0.61	25.1	0.40	0.20	0.33	0.20
4	2	2	2	1.25	25.2	0.82	0.48	0.61	0.22
4	3	2	2	1.84	25.2	1.34	1.63	0.46	0.54
5	1	2	2	0.60	25.1	0.24	0.19	0.14	0.14
5	2	2	2	1.24	25.2	0.55	0.48	0.42	0.14
5	3	2	2	1.84	25.2	0.85	0.76	0.72	0.25
6	1	1	1	0.60	14.9	0.18	0.50	0.17	0.13
6	2	1	1	1.20	15.0	0.40	0.65	0.36	0.29
6	1	2	1	0.60	25.0	0.24	1.12	0.15	0.15
6	2	2	1	1.24	25.0	0.49	1.50	0.43	0.37
6	3	2	1	1.80	25.0	0.79	0.76	0.71	0.62
6	1	3	1	0.61	35.1	0.29	0.50	0.14	0.42
6	2	3	1	1.22	35.1	0.80	0.72	0.35	0.28
6	3	3	1	1.80	35.1	0.75	2.25	2.95	0.59
7	1	1	2	0.61	15.0	0.18	0.13	0.18	0.05
7	2	1	2	1.24	15.1	0.43	0.29	0.16	0.14
7	1	2	2	0.60	25.0	0.22	0.12	0.63	0.57
7	2	2	2	1.20	25.0	0.48	0.79	0.96	0.23
7	3	2	2	1.82	25.0	0.79	0.96	1.23	0.68
7	1	3	2	0.60	35.1	0.18	0.14	0.13	0.38
7	2	3	2	1.21	35.0	0.39	0.35	0.32	0.61
7	3	3	2	1.80	35.1	0.72	0.65	0.59	0.90

"Road Rater 2000"

1	1	2	2	0.59	25.0	0.41	0.20	0.19	0.16
1	2	2	2	1.20	25.0	0.86	0.44	0.41	0.34
1	3	2	2	1.82	25.0	1.33	0.68	0.63	0.52
1	4	2	2	2.45	25.0	1.81	0.97	0.88	0.74
1	5	2	2	3.57	24.9	2.95	1.49	1.37	1.14
2	1	2	2	0.63	25.0	0.16	0.20	0.17	0.15
2	1	2	2	0.59	25.0	0.22	0.17	0.16	0.14
2	2	2	2	1.20	25.0	0.38	0.38	0.34	0.27

2	2	2	2	1.18	25.0	0.49	0.38	0.33	0.26
2	3	2	2	1.80	25.0	0.81	0.58	0.52	0.41
2	4	2	2	2.38	25.0	1.19	0.79	0.72	0.56
2	5	2	2	3.59	25.0	1.33	1.26	1.08	0.90
3	1	2	2	0.61	25.0	0.27	0.22	0.19	0.17
3	2	2	2	1.19	25.0	0.55	0.46	0.37	0.37
3	3	2	2	1.79	25.0	0.86	0.70	0.59	0.56
3	4	2	2	2.45	25.0	1.19	0.96	0.81	0.77
3	5	2	2	3.62	25.0	1.79	1.49	1.25	1.19
4	1	2	2	0.60	25.0	0.27	0.29	0.22	0.20
4	2	2	2	1.21	25.0	0.66	0.67	0.49	0.44
4	3	2	2	1.82	25.0	1.05	1.06	0.80	0.70
4	4	2	2	2.41	25.0	1.43	1.46	1.08	0.95
4	5	2	2	3.61	25.0	2.30	2.28	1.67	1.50
5	1	2	2	0.65	25.0	0.20	0.22	0.19	0.17
5	2	2	2	1.16	25.0	0.55	0.42	0.41	0.31
5	3	2	2	1.76	25.0	0.85	0.65	0.61	0.48
5	4	2	2	2.38	25.0	1.17	0.90	0.81	0.65
5	5	2	2	3.57	25.0	1.74	1.38	1.22	1.02
6	1	1	2	0.63	15.1	0.24	0.20	0.20	0.14
6	2	1	2	1.19	15.1	0.49	0.37	0.45	0.29
6	3	1	2	1.80	15.1	0.75	0.62	0.67	0.45
6	4	1	2	2.46	15.1	1.03	0.84	0.96	0.64
6	5	1	2	3.55	15.1	1.65	1.47	1.47	1.00
6	1	2	2	0.57	25.0	0.24	0.21	0.22	0.16
6	2	2	2	1.18	25.0	0.52	0.44	0.45	0.32
6	3	2	2	1.79	25.0	0.80	0.69	0.70	0.51
6	4	2	2	2.43	25.0	1.09	0.96	0.92	0.69
6	5	2	2	3.62	25.0	1.67	1.48	1.31	1.08
6	1	3	2	0.63	35.1	0.22	0.18	0.17	0.14
6	2	3	2	1.25	35.1	0.42	0.37	0.33	0.25
6	3	3	2	1.83	35.1	0.65	0.55	0.48	0.37
6	4	3	2	2.41	35.1	0.86	0.73	0.64	0.50
6	5	3	2	3.62	35.1	1.33	1.13	0.97	0.78
7	1	2	1	0.58	25.1	0.37	0.30	0.28	0.23
7	2	2	1	1.19	25.1	0.79	0.63	0.55	0.51
7	3	2	1	1.84	25.1	1.23	1.00	0.88	0.80
7	4	2	1	2.44	25.1	1.72	1.37	1.20	1.09
7	5	2	1	3.59	25.2	2.67	2.13	1.91	1.70
"Dynatest FWD"									
1	2	2	432	96	79	65	46	33	0
1	4	2	960	202	169	136	96	70	0
2	2	2	424	118	79	67	53	43	0
2	4	2	955	239	169	141	114	92	0
3	2	2	424	102	80	53	42	33	0
3	4	2	942	213	164	114	87	73	0
4	2	2	431	159	114	82	56	44	0
4	4	2	945	312	237	168	119	91	0
5	2	2	423	80	67	59	49	39	27
5	4	2	954	167	140	126	106	92	61
6	2	1	419	91	72	55	46	35	0
6	4	1	945	191	146	123	100	91	0
7	1	2	214	42	31	27	19	17	0
7	2	2	417	86	66	54	44	33	0
7	3	2	674	131	101	84	66	51	0
7	4	2	936	178	137	116	91	70	0
"09-03-86"									
1	1	0	1	0950	1017	91	85	92	79
"Dynaflect"									
1	2	1.0	8	0.35	0.30	0.25	0.19	0.13	
2	2	1.0	8	0.39	0.32	0.27	0.22	0.18	
3	2	1.0	8	0.44	0.34	0.28	0.24	0.21	
4	2	1.0	8	0.47	0.40	0.30	0.23	0.17	
5	2	1.0	8	0.27	0.25	0.23	0.19	0.15	
6	1	1.0	8	0.32	0.26	0.22	0.17	0.13	
7	2	1.0	8	0.30	0.25	0.22	0.17	0.13	
"Road Rater 400"									
1	1	2	2	0.60	25.1	0.25	0.47	0.17	0.14
1	2	2	2	1.23	25.2	0.63	1.24	0.45	0.35
1	3	2	2	1.84	25.2	1.15	0.92	0.76	1.01
2	1	2	2	0.61	25.1	0.24	0.20	0.17	0.11

2	2	2	2	1.21	25.2	0.50	0.86	0.40	0.30
2	2	2	2	1.81	25.2	0.81	0.74	0.66	1.82
3	1	2	2	0.59	25.1	0.27	0.63	0.20	1.95
3	2	2	2	1.25	25.2	0.61	2.96	0.50	0.35
3	3	2	2	1.83	25.2	0.96	0.90	0.72	2.92
4	1	2	2	0.59	25.1	0.40	0.32	0.22	0.14
4	2	2	2	1.23	25.2	0.91	0.76	0.56	0.39
4	3	2	2	1.80	25.2	1.45	1.25	0.91	0.65
5	1	2	2	0.59	25.1	0.21	0.18	0.16	0.13
5	2	2	2	1.25	25.1	0.50	0.48	0.44	0.37
5	3	2	2	1.84	25.2	0.89	1.31	0.67	0.59
6	1	2	1	0.61	25.2	0.35	0.24	0.16	0.11
6	2	2	1	1.22	25.2	0.79	0.59	-0.57	0.33
6	3	2	1	1.85	25.2	1.31	1.00	1.81	8.16
7	1	1	2	0.59	15.0	0.21	0.18	0.15	0.12
7	2	1	2	1.25	15.1	0.51	0.44	0.60	0.28
7	1	2	2	0.62	25.0	0.28	0.19	0.16	0.12
7	2	2	2	1.22	25.0	0.63	0.52	0.42	1.73
7	3	2	2	1.80	25.0	0.99	0.80	0.67	1.50
7	1	3	2	0.60	35.1	0.23	0.18	0.34	0.40
7	2	3	2	1.26	35.2	0.64	0.53	0.43	0.34

"Dynatest FWD"

1	2	2	394	86	63	54	38	26	21	14
1	4	2	905	185	146	124	92	69	52	27
2	2	2	394	119	70	57	45	36	0	0
2	4	2	904	247	163	130	103	82	0	0
3	2	2	391	88	67	47	34	29	24	16
3	4	2	903	200	146	105	77	64	54	37
4	2	2	387	129	88	64	45	34	0	0
4	4	2	902	278	200	144	104	79	0	0
5	2	2	386	73	51	44	36	29	24	12
5	4	2	903	162	115	103	86	68	56	29
6	2	1	386	94	57	47	38	28	0	0
6	4	1	898	210	130	108	86	67	0	0
7	1	2	0	0	0	0	0	0	0	0
7	2	2	386	84	52	44	36	28	0	0
7	3	2	606	126	84	69	56	44	0	0
7	4	2	901	179	120	101	81	63	0	0

"S5" 53 "SR" 45 9200 11.0 1012 "S"

"F. Greene/Monroe CL to SR37" 7.28

"F. Harmony Rd. (4.4m. s. of SR37) southerly to Elwren Dr. (SB)" 0.25

2 14936 84 2 2.5 0.16 5.1 8.5 0.0 "N"

"A-6" 10 "CL" 105.1 20.6 6 31.9 16.8 15.1 2.65

77 3.6 0

2

"03-26-86" 1 1 0 1 1615 1645 62 0 0 60 66

"Dynalect"

1	2	1.0	8	0.42	0.34	0.30	0.26	0.18
2	2	1.0	8	0.36	0.29	0.25	0.23	0.16
3	2	1.0	8	0.42	0.35	0.30	0.26	0.19
4	2	1.0	8	0.42	0.34	0.30	0.27	0.20
5	2	1.0	8	0.39	0.30	0.25	0.23	0.16
6	2	1.0	8	0.37	0.29	0.24	0.21	0.14

"Road Rater 400"

1	1	2	2	0.60	25.0	0.27	0.18	0.22	0.24
1	2	2	2	1.18	25.0	0.58	0.47	0.14	0.40
1	3	2	2	1.84	25.0	1.14	2.46	0.93	1.58
2	1	2	2	0.60	25.0	0.26	0.14	0.18	0.14
2	2	2	2	1.23	25.0	0.55	0.34	0.40	0.34
2	3	2	2	1.83	25.1	1.09	1.48	0.94	0.67
3	1	2	2	0.59	25.0	0.29	0.15	1.16	0.23
3	2	2	2	1.23	25.0	0.62	0.48	1.88	0.43
3	3	2	2	1.80	25.1	1.18	3.06	0.95	2.19
4	1	2	2	0.60	25.0	0.28	0.21	0.22	0.11
4	2	2	2	1.22	25.0	0.61	0.51	0.51	0.31
4	3	2	2	1.84	25.1	1.20	1.28	1.41	0.90

5	1	2	2	0.60	25.0	0.25	0.15	0.17	0.20
5	2	2	2	1.22	25.0	0.54	0.41	0.55	0.53
5	3	2	2	1.84	25.1	1.07	0.90	1.47	0.86
6	1	1	2	0.60	15.0	0.23	0.17	0.22	0.10
6	2	1	2	1.21	15.0	0.57	0.44	1.25	0.74
6	1	2	2	0.62	25.1	0.25	0.16	1.15	0.69
6	2	2	2	1.23	25.1	0.54	0.78	0.73	1.63
6	3	2	2	1.85	25.1	1.00	0.88	1.20	0.55
6	1	3	2	0.58	35.0	0.19	0.13	0.10	0.11
6	2	3	2	1.19	34.9	0.44	0.34	0.23	0.29
6	3	3	2	1.80	35.0	1.32	1.02	0.88	1.08

"Dynatest FWD"

1	2	2	436	104	75	66	54	43	0	0
1	4	2	929	237	185	160	135	107	0	0
2	2	2	435	97	67	58	49	39	0	0
2	4	2	917	206	155	133	111	91	0	0
3	2	2	424	105	80	70	56	46	0	0
3	4	2	910	231	183	159	129	106	0	0
4	2	2	432	97	79	69	58	48	0	0
4	4	2	915	210	175	155	133	111	0	0
5	2	2	432	97	71	60	47	37	0	0
5	4	2	922	212	164	136	109	88	0	0
6	1	2	208	39	28	20	16	12	0	0
6	2	2	431	84	60	46	36	26	0	0
6	3	2	663	132	97	75	57	43	0	0
6	4	2	914	186	137	109	82	61	0	0

"08-12-86" 1 1 1 1 0925 0955 82 84 0 71 71

"Dynalect"

1	2	1.0	8	0.79	7.51	9.21	0.21	0.16
2	2	1.0	8	0.30	0.27	0.24	0.20	0.15
3	2	1.0	8	0.34	0.30	0.27	0.22	0.16
4	2	1.0	8	0.34	0.31	0.28	0.23	0.18
5	2	1.0	8	0.31	0.27	0.23	0.18	0.14
6	2	1.0	8	0.29	0.26	0.22	0.16	0.12

"Road Rater 400"

1	1	2	2	0.61	25.1	0.33	0.29	0.25	0.21
1	2	2	2	1.23	25.1	0.73	0.65	0.57	0.49
1	3	2	2	1.84	25.1	1.33	1.15	1.07	0.91
2	1	2	2	0.61	25.1	0.27	0.23	0.20	0.15
2	2	2	2	1.20	25.1	0.65	0.56	0.50	0.41
2	3	2	2	1.81	25.1	1.08	0.94	0.95	0.70
3	1	2	2	0.60	25.0	0.28	0.23	0.22	0.17
3	2	2	2	1.24	25.1	0.70	0.61	0.57	0.47
3	3	2	2	1.83	25.1	1.19	1.04	0.96	0.82
4	1	2	2	0.61	25.1	0.34	0.10	0.27	0.23
4	2	2	2	1.23	25.1	0.82	0.16	0.64	0.56
4	3	2	2	1.84	25.1	1.33	0.48	1.68	0.96
5	1	2	2	0.59	25.0	0.27	1.06	0.19	0.14
5	2	2	2	1.22	25.1	0.58	2.35	0.42	1.00
5	3	2	2	1.83	25.1	1.01	1.56	0.78	0.66
6	1	1	2	0.61	15.0	0.23	0.16	0.16	0.13
6	2	1	2	1.20	15.1	0.59	0.64	0.41	0.33
6	1	2	2	0.61	25.0	0.24	0.75	0.16	0.12
6	2	2	2	1.24	25.1	0.58	1.24	0.42	0.32
6	3	2	2	1.83	25.1	0.92	0.69	0.67	0.53
6	1	3	2	0.60	35.0	0.20	0.15	0.12	0.08
6	2	3	2	1.17	34.9	0.51	0.41	0.35	0.26
6	3	3	2	1.80	35.0	0.99	0.82	1.06	0.93

"Road Rater 2000"

1	1	2	2	0.61	24.8	0.45	0.26	0.23	0.19
1	2	2	2	1.19	24.8	0.88	0.51	0.46	0.36
1	3	2	2	1.79	25.1	1.35	0.76	0.67	0.54
1	4	2	2	2.42	25.1	1.87	1.05	0.93	0.75
1	5	2	2	3.58	25.1	3.01	1.62	1.45	1.16
2	1	2	2	0.58	25.1	0.37	0.20	0.18	0.14
2	2	2	2	1.18	25.1	0.78	0.44	0.39	0.32
2	3	2	2	1.81	25.1	1.22	0.67	0.59	0.49
2	4	2	2	2.42	25.1	1.67	0.91	0.81	0.67
2	5	2	2	3.61	25.1	2.84	1.40	1.23	1.02
3	1	2	2	0.62	25.1	0.45	0.24	0.25	0.18

3	2	2	2	1.21	25.1	0.92	0.50	0.51	0.36
3	3	2	2	1.81	25.1	1.43	0.76	0.74	0.56
3	4	2	2	2.43	25.0	1.95	1.04	0.95	0.76
3	5	2	2	3.63	25.1	3.06	1.59	1.42	1.16
4	1	2	2	0.58	25.1	0.43	0.33	0.25	0.22
4	2	2	2	1.22	25.1	0.89	0.67	0.55	0.48
4	3	2	2	1.84	25.1	1.31	0.88	0.82	0.71
4	4	2	2	2.38	25.1	1.72	1.20	1.10	0.97
4	5	2	2	3.61	25.1	2.71	1.85	1.71	1.49
5	1	2	2	0.56	25.1	0.34	0.19	0.17	0.17
5	2	2	2	1.23	25.1	0.70	0.41	0.36	0.31
5	3	2	2	1.80	25.1	1.04	0.60	0.53	0.44
5	4	2	2	2.39	25.1	1.45	0.83	0.75	0.62
5	5	2	2	3.62	25.1	2.09	1.28	1.14	0.96
6	1	1	2	0.59	15.1	0.30	0.20	0.17	0.14
6	2	1	2	1.23	15.1	0.60	0.42	0.35	0.30
6	3	1	2	1.79	15.1	0.90	0.63	0.56	0.46
6	4	1	2	2.41	15.1	1.26	0.88	0.78	0.63
6	5	1	2	3.58	15.1	2.08	1.34	1.19	0.99
6	1	2	2	0.60	25.0	0.24	0.18	0.16	0.15
6	2	2	2	1.17	25.0	0.49	0.36	0.31	0.25
6	3	2	2	1.80	25.0	0.79	0.55	0.48	0.40
6	4	2	2	2.39	25.0	1.09	0.74	0.66	0.53
6	5	2	2	3.58	25.0	1.71	1.19	1.03	0.85
6	1	3	2	0.63	35.1	0.27	0.18	0.16	0.13
6	2	3	2	1.23	35.1	0.55	0.36	0.30	0.24
6	3	3	2	1.79	35.1	0.84	0.53	0.45	0.36
6	4	3	2	2.42	35.1	1.17	0.73	0.63	0.49
6	5	3	2	3.63	35.1	1.33	1.14	0.98	0.77

"Dynatest FWD"

1	2	2	397	127	83	72	57	45	34	14
1	4	2	844	265	184	160	135	102	73	37
2	2	2	397	106	70	60	49	40	0	0
2	4	2	842	227	154	133	110	87	0	0
3	2	2	395	126	85	71	57	46	35	18
3	4	2	839	270	186	157	129	103	81	38
4	2	2	394	102	82	72	61	49	0	0
4	4	2	836	230	181	159	137	113	0	0
5	2	2	392	103	66	57	44	36	28	15
5	4	2	835	218	149	127	99	86	64	33
6	1	2	0	0	0	0	0	0	0	0
6	2	2	391	108	67	52	42	30	0	0
6	3	2	606	165	106	85	66	48	0	0
6	4	2	835	226	148	120	94	58	0	0

"S6" 72 "I" 65 21930 31.0 6798 "S"

"F. Scott/Clark CL to SR56" 5.25

"F. Leoto Rd. (7.5m. n. of SR160, betw. MP 27&28) northerly (NB)" 0.25

2 11239 78 8 3.7 0.27 0.0 10.2 3.5 "S"

"A-6" 11 "CL" 117.9 13.4 6 32.8 14.0 18.8 2.69

65 3.4 0

3

"03-21-86" 1 1 1 0 1300 1330 46 0 0 34 45

"Dynalect"

1	2	1.0	8	0.31	0.25	0.19	0.21	0.15
2	2	1.0	8	0.35	0.23	0.25	0.23	0.16
3	2	1.0	8	0.32	0.26	0.22	0.21	0.15
4	2	1.0	8	0.28	0.21	0.19	0.17	0.11
5	2	1.0	8	0.38	0.31	0.28	0.26	0.18
6	2	1.0	8	0.46	0.38	0.35	0.33	0.25

"Road Rater 400"

1	1	2	2	0.60	24.9	0.18	0.17	0.14	1.21
1	2	2	2	1.18	24.9	0.32	0.29	0.26	0.21
1	3	2	2	1.84	25.0	0.62	0.49	0.51	0.45
2	1	2	2	0.61	24.9	0.17	0.15	0.14	0.11
2	2	2	2	1.21	25.0	0.34	0.30	0.28	0.21
2	3	2	2	1.82	25.0	0.69	0.64	0.58	0.48

3	1	2	2	0.60	24.9	0.19	0.76	0.26	1.11
3	2	2	2	1.19	24.9	0.37	0.55	0.22	0.27
3	3	2	2	1.83	25.0	0.67	0.61	0.56	2.16
4	1	2	2	0.61	24.9	0.17	0.14	2.14	0.77
4	2	2	2	1.20	25.0	0.34	0.30	1.14	1.42
4	3	2	2	1.83	25.0	0.61	0.60	0.45	2.70
5	1	2	2	0.60	24.9	0.21	0.18	0.15	0.34
5	2	2	2	1.22	25.0	0.45	0.42	0.37	1.55
5	3	2	2	1.83	25.0	0.84	1.72	0.67	1.95
6	1	1	2	0.59	15.0	0.21	0.19	0.26	0.14
6	2	1	2	1.22	15.1	0.48	0.44	1.12	0.28
6	1	2	2	0.61	25.0	0.19	0.16	1.73	0.39
6	2	2	2	1.21	25.0	0.43	0.37	1.62	1.83
6	3	2	2	1.83	25.1	0.90	0.86	4.18	3.62
6	1	3	2	0.62	35.3	0.17	0.13	0.11	0.24
6	2	3	2	1.23	35.3	0.33	0.25	0.26	0.69
6	2	3	2	1.15	35.3	6.25	0.92	1.45	1.31
"Road Rater 2000"									
1	1	2	2	0.58	25.0	0.05	0.13	0.13	0.13
1	2	2	2	1.26	25.0	0.11	0.30	0.26	0.22
1	3	2	2	1.78	24.7	0.15	0.42	0.38	0.32
1	4	2	2	2.41	25.0	0.11	0.56	0.52	0.43
2	1	2	2	0.61	25.0	0.07	0.16	0.16	0.18
2	2	2	2	1.19	25.0	0.13	0.33	0.30	0.30
2	3	2	2	1.80	25.1	0.11	0.49	0.45	0.42
2	4	2	2	2.42	25.0	0.10	0.64	0.60	0.52
3	1	2	2	0.57	25.1	0.10	0.15	0.14	0.13
3	2	2	2	1.19	25.1	0.16	0.30	0.27	0.21
3	3	2	2	1.77	25.0	0.14	0.44	0.40	0.32
3	4	2	2	2.43	25.0	0.10	0.60	0.53	0.44
4	1	2	2	0.57	25.0	0.07	0.14	0.13	0.12
4	2	2	2	1.21	25.0	0.13	0.26	0.22	0.19
4	3	2	2	1.77	25.0	0.13	0.37	0.32	0.27
4	4	2	2	2.39	25.0	0.08	0.47	0.42	0.35
5	1	2	2	0.59	25.1	0.10	0.19	0.17	0.13
5	2	2	2	1.19	25.0	0.15	0.39	0.34	0.28
5	3	2	2	1.81	25.1	0.15	0.56	0.50	0.42
5	4	2	2	2.40	25.0	0.10	0.75	0.69	0.57
6	1	1	2	0.61	15.2	0.11	0.20	0.21	0.15
6	2	1	2	1.24	15.2	0.16	0.36	0.39	0.34
6	3	1	2	1.85	15.2	0.16	0.54	0.57	0.47
6	4	1	2	2.40	15.2	0.11	0.77	0.79	0.62
6	1	2	2	0.56	25.1	0.10	0.17	0.19	0.14
6	2	2	2	1.19	25.1	0.16	0.36	0.33	0.25
6	3	2	2	1.79	25.1	0.15	0.49	0.44	0.39
6	4	2	2	2.40	25.1	0.12	0.66	0.55	0.53
6	1	3	2	0.61	35.2	0.09	0.14	0.12	0.13
6	2	3	2	1.24	35.1	0.13	0.29	0.24	0.21
6	3	3	2	1.83	35.2	0.10	0.42	0.35	0.32
6	4	3	2	2.41	35.2	0.13	0.57	0.50	0.43
"04-24-86" 0 0 0 1 0830 0900 58 0 0 50 50									
"Dynatest FWD"									
1	2	2	445	56	47	40	37	31	0
1	4	2	920	115	98	90	77	66	0
2	2	2	439	57	50	45	36	31	0
2	4	2	918	116	104	93	78	65	0
3	2	2	435	79	72	65	55	45	0
3	4	2	907	159	145	132	115	93	0
4	2	2	427	56	50	44	36	29	0
4	4	2	909	117	106	93	78	61	0
5	2	2	428	76	67	63	57	45	37
5	4	2	904	157	142	131	113	94	77
6	1	2	175	32	31	27	23	19	0
6	2	2	425	78	70	63	54	47	0
6	3	2	662	120	107	97	85	72	0
6	4	2	899	161	145	131	113	97	0
"08-07-86" 1 1 1 1 1345 1420 94 104 109 88 73									
"Dynaflect"									
1	2	1.0	8	0.28	0.26	0.24	0.20	0.15	
2	2	1.0	8	0.34	0.33	0.29	0.24	0.19	

3	2	1.0	8	0.29	0.27	0.25	0.20	0.15
4	2	1.0	8	0.23	0.22	0.19	0.15	0.11
5	2	1.0	8	0.37	0.35	0.31	0.26	0.21
6	2	1.0	8	0.46	0.44	0.37	0.34	0.28
"Road Rater 400"								
1	1	2	2	0.61	25.2	0.23	0.18	0.46
1	2	2	2	1.21	25.1	0.44	0.35	0.92
1	3	2	2	1.79	25.1	0.68	0.60	1.24
2	1	2	2	0.61	25.0	0.23	0.20	0.18
2	2	2	2	1.22	25.1	0.55	0.51	0.26
2	3	2	2	1.79	25.0	0.86	0.75	0.21
3	1	2	2	0.59	25.0	0.21	0.56	0.12
3	2	2	2	1.20	25.0	0.43	0.93	1.71
3	3	2	2	1.80	25.1	0.73	1.50	1.71
4	1	2	2	0.60	25.0	0.18	0.17	0.14
4	2	2	2	1.19	25.0	0.32	0.50	0.51
4	3	2	2	1.80	25.1	0.53	0.28	0.41
5	1	2	2	0.60	25.0	0.25	0.19	0.20
5	2	2	2	1.20	25.1	0.54	0.48	0.43
5	3	2	2	1.81	25.1	0.86	0.80	0.71
6	1	1	2	0.61	15.1	0.25	0.23	0.14
6	2	1	2	1.20	15.1	0.55	0.47	0.19
6	1	2	2	0.60	25.0	0.25	0.20	0.57
6	2	2	2	1.21	25.0	0.52	0.43	1.42
6	3	2	2	1.81	25.1	0.86	0.67	2.35
6	1	3	2	0.60	35.0	0.18	0.17	0.17
6	2	3	2	1.19	35.0	0.44	0.49	0.58
6	3	3	2	1.80	35.0	0.80	0.76	0.92
"Road Rater 2000"								
1	1	2	2	0.57	25.2	0.23	0.18	0.14
1	2	2	2	1.19	25.2	0.48	0.36	0.33
1	3	2	2	1.76	25.2	0.70	0.55	0.48
1	4	2	2	2.45	25.2	0.98	0.76	0.68
1	5	2	2	3.63	25.2	1.51	1.20	1.13
2	1	2	2	0.62	25.2	0.29	0.18	0.20
2	2	2	2	1.24	25.2	0.64	0.37	0.40
2	3	2	2	1.82	25.2	0.94	0.56	0.60
2	4	2	2	2.43	25.2	1.30	0.82	0.85
2	5	2	2	3.59	25.2	2.17	1.32	1.36
3	1	2	2	0.64	25.3	0.35	0.19	0.17
3	2	2	2	1.18	25.2	0.51	0.38	0.33
3	3	2	2	1.80	25.2	0.77	0.58	0.52
3	4	2	2	2.43	25.2	1.04	0.80	0.70
3	5	2	2	3.61	25.2	1.60	1.22	1.09
4	1	2	2	0.57	25.2	0.21	0.15	0.15
4	2	2	2	1.24	25.2	0.39	0.29	0.25
4	3	2	2	1.81	25.2	0.55	0.42	0.37
4	4	2	2	2.39	25.2	0.72	0.58	0.50
4	5	2	2	3.61	25.2	1.09	0.87	0.78
5	1	2	2	0.59	25.2	0.37	0.24	0.23
5	2	2	2	1.23	25.2	0.72	0.52	0.46
5	3	2	2	1.83	25.2	0.95	0.77	0.67
5	4	2	2	2.43	25.2	1.29	1.05	0.87
5	5	2	2	3.60	25.2	2.03	1.57	1.37
6	1	1	2	0.60	15.2	0.31	0.25	0.24
6	2	1	2	1.24	15.1	0.62	0.51	0.48
6	3	1	2	1.78	15.1	0.99	0.79	0.76
6	4	1	2	2.38	15.2	1.34	1.10	1.04
6	5	1	2	3.55	15.2	2.03	1.71	1.61
6	1	2	2	0.59	25.2	0.32	0.26	0.24
6	2	2	2	1.25	25.2	0.66	0.51	0.48
6	3	2	2	1.82	25.2	0.96	0.77	0.72
6	4	2	2	2.44	25.2	1.30	1.03	0.99
6	5	2	2	3.57	25.2	1.94	1.63	1.54
6	1	3	2	0.62	35.2	0.27	0.20	0.19
6	2	3	2	1.20	35.3	0.54	0.40	0.38
6	3	3	2	1.82	35.3	0.81	0.62	0.57
6	4	3	2	2.42	35.3	1.06	0.83	0.78
6	5	3	2	3.62	35.3	1.53	1.30	1.20
"Dynatest FWD"								

1	2	2	392	86	53	48	41	32	29	17
1	4	2	832	176	114	103	88	71	57	29
2	2	2	387	89	66	50	49	42	0	0
2	4	2	832	178	136	124	103	85	0	0
3	2	2	388	69	56	52	42	34	29	13
3	4	2	833	153	121	112	91	76	61	28
4	2	2	386	53	41	36	30	23	0	0
4	4	2	830	124	89	80	64	51	0	0
5	2	2	384	83	63	59	48	42	34	19
5	4	2	829	171	136	124	105	88	73	48
6	1	2	0	0	0	0	0	0	0	0
6	2	2	378	94	72	64	54	46	0	0
6	3	2	595	145	111	101	86	72	0	0
6	4	2	824	198	151	138	117	96	0	0

"S7" 31 "SR" 135 4630 8.0 370 "S"
 "F. SR64 to 0.4m. n. of 164" 5.53
 "F. Old SR135 (4.0m. s. of SR64) southerly (NB)" 0.25
 2 11065 77 9 2.6 0.26 1.2 6.2 0.0 "N"
 "A-7-6" 19 "CH" 99.0 26.6 3 52.6 19.5 33.1 2.71
 60 4.3 0

3
 "03-21-86" 1 1 1 0 0900 0930 38 0 0 25 46
 "Dynalect"

1	2	1.0	8	0.78	0.65	0.53	0.45	0.30
2	2	1.0	8	0.54	0.42	0.33	0.28	0.17
3	2	1.0	8	0.30	0.21	0.13	0.11	0.04
4	2	1.0	8	0.52	0.41	0.32	0.27	0.16
5	2	1.0	8	0.49	0.40	0.34	0.31	0.20
6	2	1.0	8	0.41	0.32	0.26	0.23	0.14

"Road Rater 400"

1	1	2	2	0.65	25.1	0.55	1.89	0.41	3.78
1	2	2	2	1.26	25.2	1.09	1.62	0.86	3.93
1	3	2	2	1.85	25.2	2.39	3.67	5.29	4.78
2	1	2	2	0.66	25.2	0.48	0.86	2.98	0.23
2	2	2	2	1.25	25.2	0.24	0.56	0.63	3.06
2	3	2	2	1.87	25.2	1.94	1.35	1.23	3.56
3	1	2	2	0.63	25.0	0.24	0.50	3.04	0.06
3	2	2	2	1.25	25.1	0.42	1.43	4.63	0.15
3	3	2	2	1.83	25.0	2.50	0.94	4.12	4.00
4	1	2	2	0.61	25.0	0.39	0.31	0.30	0.22
4	2	2	2	1.24	25.0	0.85	0.74	0.70	0.51
4	3	2	2	1.84	25.1	1.75	1.42	0.65	1.03
5	1	2	2	0.60	25.0	0.28	0.24	0.14	0.40
5	2	2	2	1.20	25.0	0.64	0.57	0.60	0.71
5	3	2	2	1.87	25.1	0.69	1.07	3.86	3.50
6	1	1	2	0.66	15.4	0.27	0.22	1.02	0.16
6	2	1	2	1.29	15.4	0.62	1.23	5.09	0.41
6	1	2	2	0.59	25.1	0.27	0.96	3.08	0.18
6	2	2	2	1.24	25.2	0.55	0.38	4.22	0.79
6	3	2	2	1.83	25.1	1.08	1.48	1.69	3.07
6	1	3	2	0.58	35.3	0.24	0.20	0.16	0.50
6	2	3	2	1.23	35.3	0.57	0.50	0.40	1.11
6	3	3	2	1.74	35.3	1.58	1.68	3.80	16.49

"Road Rater 2000"

1	1	2	2	0.62	24.9	0.06	0.43	0.31	0.41
1	2	2	2	1.23	25.0	0.11	0.90	0.62	0.84
1	3	2	2	1.77	25.0	0.15	1.35	0.94	1.27
1	4	2	2	2.44	25.0	0.09	1.91	1.33	1.79
2	1	2	2	0.62	24.9	0.07	0.31	0.20	0.27
2	2	2	2	1.19	25.0	0.15	0.64	0.44	0.57
2	3	2	2	1.81	24.9	0.13	0.96	0.67	0.84
2	4	2	2	2.43	25.0	0.09	1.32	0.90	1.12
3	1	2	2	0.57	25.0	0.07	0.12	0.08	0.09
3	2	2	2	1.19	24.9	0.13	0.27	0.14	0.18
3	3	2	2	1.75	24.9	0.13	0.41	0.19	0.28
3	4	2	2	2.43	25.0	0.11	0.60	0.26	0.40

4	1	2	2	0.60	25.0	0.08	0.33	0.25	0.31
4	2	2	2	1.17	25.0	0.15	0.68	0.49	0.61
4	3	2	2	1.82	25.0	0.09	1.05	0.74	0.93
4	4	2	2	2.41	25.0	0.11	1.45	1.00	1.29
5	1	2	2	0.60	25.0	0.06	0.26	0.21	0.23
5	2	2	2	1.17	25.0	0.15	0.56	0.41	0.47
5	3	2	2	1.79	25.0	0.13	0.83	0.62	0.69
5	4	2	2	2.38	25.0	0.07	1.12	0.80	0.93
6	1	1	2	0.61	15.0	0.10	0.23	0.15	0.18
6	2	1	2	1.24	15.1	0.17	0.44	0.30	0.38
6	3	1	2	1.78	15.0	0.11	0.71	0.48	0.58
6	4	1	2	2.37	15.0	0.12	1.00	0.63	0.79
6	1	2	2	0.58	25.1	0.08	0.22	0.15	0.19
6	2	2	2	1.18	25.1	0.15	0.46	0.31	0.36
6	3	2	2	1.82	25.1	0.14	0.70	0.45	0.55
6	4	2	2	2.37	25.1	0.11	0.93	0.62	0.75
6	1	3	2	0.59	35.2	0.07	0.20	0.13	0.17
6	2	3	2	1.23	35.1	0.14	0.44	0.27	0.34
6	3	3	2	1.85	35.2	0.12	0.66	0.39	0.51
6	4	3	2	2.39	35.1	0.14	0.87	0.52	0.69
"04-23-86" 0 0 0 1 1245 1315 77 0 0 62 52									
"Dynatest FWD"									
1	2	2	421	222	189	149	116	84	0 0
1	4	2	886	454	395	314	242	178	0 0
2	2	2	414	162	133	109	81	59	0 0
2	4	2	894	325	272	220	165	121	0 0
3	2	2	417	133	107	76	54	33	0 0
3	4	2	893	255	202	146	99	62	0 0
4	2	2	408	165	127	98	71	49	0 0
4	4	2	880	345	273	209	150	105	0 0
5	2	2	410	121	101	83	64	47	35 19
5	4	2	880	258	219	179	137	101	73 39
6	1	2	174	47	34	24	17	12	0 0
6	2	2	400	111	81	62	43	31	0 0
6	3	2	640	172	128	96	70	50	0 0
6	4	2	870	231	173	131	95	68	0 0
"08-07-86" 1 0 1 1 0840 0930 88 92 0 82 71									
"Dynaflect"									
1	2	1.0	8	0.76	0.71	0.56	0.43	0.31	
2	2	1.0	8	0.54	0.48	0.38	0.28	0.19	
3	2	1.0	8	0.34	0.28	0.20	0.12	0.06	
4	2	1.0	8	0.53	0.46	0.36	0.25	0.17	
5	2	1.0	8	0.52	0.47	0.39	0.29	0.21	
6	2	1.0	8	0.40	0.34	0.27	0.20	0.14	
"Road Rater 2000"									
1	1	2	2	0.58	25.1	0.66	0.47	0.40	0.30
1	2	2	2	1.22	25.1	1.45	1.02	0.85	0.67
1	3	2	2	1.82	25.1	2.28	1.56	1.30	1.01
1	4	2	2	2.40	25.1	3.07	2.09	1.73	1.35
1	5	2	2	3.61	25.1	4.93	3.29	2.73	2.12
2	1	2	2	0.63	25.1	0.65	0.39	0.31	0.25
2	2	2	2	1.18	25.1	1.23	0.76	0.63	0.47
2	3	2	2	1.80	25.1	1.96	1.21	0.99	0.75
2	4	2	2	2.44	25.1	2.76	1.68	1.36	1.02
2	5	2	2	3.60	25.1	4.32	2.60	2.12	1.61
3	1	2	2	0.58	25.2	0.35	0.16	0.21	0.11
3	2	2	2	1.22	25.2	0.77	0.38	0.29	0.18
3	3	2	2	1.84	25.1	1.17	0.62	0.44	0.30
3	4	2	2	2.44	25.2	1.61	0.88	0.60	0.43
3	5	2	2	3.62	25.2	2.57	1.45	1.03	0.74
4	1	2	2	0.62	25.1	0.65	0.43	0.37	0.29
4	2	2	2	1.20	25.2	1.29	0.87	0.74	0.55
4	3	2	2	1.82	25.1	1.97	1.40	1.15	0.88
4	4	2	2	2.40	25.1	2.68	1.90	1.56	1.20
4	5	2	2	3.62	25.2	4.29	2.95	2.43	1.86
5	1	2	2	0.61	25.2	0.47	0.47	0.32	0.24
5	2	2	2	1.22	25.1	0.97	0.96	0.69	0.49
5	3	2	2	1.80	25.1	1.45	1.29	0.99	0.71
5	4	2	2	2.42	25.1	1.96	1.65	1.29	0.95
5	5	2	2	3.58	25.2	2.88	2.34	1.59	1.43

6	1	1	2	0.64	15.3	0.47	0.27	0.32	0.17
6	2	1	2	1.19	15.2	0.94	0.53	0.65	0.32
6	3	1	2	1.77	15.2	1.42	0.81	0.90	0.49
6	4	1	2	2.40	15.2	1.95	1.15	1.16	0.66
6	5	1	2	3.64	15.2	2.61	1.99	1.57	1.07
6	1	2	2	0.60	25.1	0.35	0.27	0.19	0.15
6	2	2	2	1.22	25.1	0.70	0.51	0.39	0.28
6	3	2	2	1.77	25.1	1.01	0.73	0.57	0.41
6	4	2	2	2.42	25.1	1.43	1.01	0.77	0.57
6	5	2	2	3.61	25.1	2.21	1.52	1.21	0.86
6	1	3	2	0.63	35.2	0.34	0.29	0.18	0.14
6	2	3	2	1.21	35.2	0.70	0.57	0.37	0.26
6	3	3	2	1.83	35.1	1.07	0.85	0.56	0.39
6	4	3	2	2.42	35.2	1.45	1.14	0.78	0.54
6	5	3	2	3.62	35.2	2.28	1.60	1.20	0.83

"Dynatest FWD"

1	2	2	397	188	159	132	103	78	60	34
1	4	2	852	408	349	288	226	171	126	65
2	2	2	396	136	117	95	70	51	0	0
2	4	2	843	298	249	208	151	110	0	0
3	2	2	400	103	82	58	42	26	17	06
3	4	2	854	215	165	117	80	52	32	09
4	2	2	394	141	113	87	64	46	0	0
4	4	2	844	309	246	191	142	100	0	0
5	2	2	400	120	98	80	61	48	34	18
5	4	2	842	259	211	171	132	100	73	34
6	1	2	0	0	0	0	0	0	0	0
6	2	2	391	101	71	56	39	28	0	0
6	3	2	611	160	112	85	62	45	0	0
6	4	2	838	222	152	118	84	63	0	0

"V1" 51 "US" 150 1450 13.0 189 "S"

"F. e. of SR550 easterly to beginning of concrete pavement" 4.83

"F. 3.1m. w. of Martin/Orange CL westerly to 3.2m. e. of SR550(EB)" 0.15

2 12429 80 6 1.9 0.15 4.9 6.0 2.5 "G"

"A-4" 8 "ML-CL" 115.4 15.7 8 22.8 16.3 6.5 2.66

74 4.3 0

3

"03-20-86" 1 1 1 0 1110 1140 46 50 0 32 49

"Dynaflect"

1	2	1.0	8	0.63	0.52	0.43	0.40	0.30
2	2	1.0	8	0.59	0.51	0.43	0.40	0.29
3	2	1.0	8	0.48	0.38	0.31	0.28	0.20
4	2	1.0	8	0.63	0.52	0.41	0.37	0.25
5	2	1.0	8	0.49	0.41	0.32	0.29	0.19
6	2	1.0	8	0.71	0.65	0.53	0.47	0.35

"Road Rater 400"

1	1	2	2	0.60	25.0	0.49	0.42	0.35	2.12
1	2	2	2	1.21	25.0	1.01	0.87	0.73	0.69
1	3	2	2	1.83	25.0	1.33	1.27	1.06	2.51
2	1	2	2	0.62	25.0	0.60	0.53	0.50	0.49
2	2	2	2	1.20	25.0	1.14	1.12	0.99	1.26
2	3	2	2	1.80	25.0	1.54	1.14	1.40	4.90
3	1	2	2	0.61	25.0	0.49	1.23	0.40	0.85
3	2	2	2	1.22	25.0	0.99	1.75	0.30	0.73
3	3	2	2	1.83	25.0	1.43	2.75	5.31	0.00
4	1	2	2	0.62	25.0	0.92	0.81	0.75	2.11
4	2	2	2	1.25	25.0	1.71	1.52	1.40	1.15
4	3	2	2	1.81	25.0	2.55	2.58	2.11	1.82
5	1	2	2	0.85	29.6	0.61	0.79	0.46	0.58
5	2	2	2	1.21	25.0	1.11	1.02	0.86	2.08
5	3	2	2	1.81	25.0	1.72	1.51	1.21	1.38
6	1	1	2	0.63	15.4	1.47	3.38	6.59	19.77
6	2	1	2	1.28	15.4	2.21	2.31	2.04	8.62
6	1	2	2	0.62	25.2	0.70	0.71	1.00	1.61
6	2	2	2	1.26	25.3	1.31	1.87	1.65	1.61
6	3	2	2	1.88	25.3	1.96	1.80	2.39	2.55

6	3	2	2	1.81	25.0	2.55	2.58	2.11	1.82
6	2	3	2	1.21	35.1	1.52	1.19	1.10	1.11
6	3	3	2	1.85	35.1	2.01	1.77	1.48	1.61
"Road Rater 2000"									
1	1	2	2	0.60	25.0	0.08	0.27	0.24	0.19
1	2	2	2	1.22	25.0	0.12	0.55	0.49	0.37
1	3	2	2	1.78	25.0	0.11	0.82	0.72	0.55
1	4	2	2	2.39	25.0	0.10	1.11	0.98	0.77
2	1	2	2	0.61	25.0	0.08	0.40	0.35	0.25
2	2	2	2	1.18	25.0	0.13	0.80	0.71	0.51
2	3	2	2	1.77	25.0	0.12	1.16	1.07	0.78
2	4	2	2	2.43	25.0	0.11	1.59	1.42	1.04
3	1	2	2	0.59	25.1	0.07	0.27	0.23	0.19
3	2	2	2	1.20	25.0	0.11	0.58	0.48	0.33
3	3	2	2	1.81	25.0	0.09	0.90	0.75	0.53
3	4	2	2	2.39	25.0	0.09	1.21	1.02	0.71
4	1	2	2	0.60	25.0	0.07	0.52	0.47	0.36
4	2	2	2	1.22	25.0	0.13	1.14	1.00	0.78
4	3	2	2	1.80	25.0	0.12	1.71	1.54	1.18
4	4	2	2	2.37	25.0	0.08	2.38	2.12	1.63
5	1	2	2	0.58	25.1	0.11	0.31	0.26	0.20
5	2	2	2	1.21	25.0	0.13	0.64	0.52	0.41
5	3	2	2	1.82	25.0	0.09	0.97	0.82	0.60
5	4	2	2	2.39	25.0	0.09	1.32	1.09	0.82
6	1	1	2	0.59	15.0	0.10	0.50	0.42	0.40
6	2	1	2	1.21	15.0	0.16	1.04	0.91	0.84
6	3	1	2	1.78	15.0	0.13	1.60	1.41	1.30
6	4	1	2	2.40	15.0	0.12	2.35	1.97	1.81
6	1	2	2	0.58	25.0	0.07	0.36	0.30	0.22
6	2	2	2	1.22	25.0	0.12	0.80	0.67	0.39
6	3	2	2	1.80	25.0	0.10	1.21	1.02	0.52
6	4	2	2	2.45	25.0	0.09	1.66	1.37	0.66
6	1	3	2	0.60	34.9	0.07	0.28	0.24	0.15
6	2	3	2	1.22	35.0	0.09	0.61	0.49	0.28
6	3	3	2	1.79	35.0	0.12	0.89	0.73	0.40
6	4	3	2	2.43	35.0	0.10	1.21	1.00	0.53
"04-23-86" 0 0 0 1 1045 1115 70 0 0 56 52									
"Dynatest FWD"									
1	2	2	421	186	149	122	101	81	0 0
1	4	2	895	386	314	261	216	175	0 0
2	2	2	415	200	163	142	123	99	0 0
2	4	2	884	415	344	303	261	216	0 0
3	2	2	411	194	156	127	102	75	0 0
3	4	2	883	406	335	277	220	170	0 0
4	2	2	408	222	174	143	115	83	0 0
4	4	2	876	469	373	310	247	182	0 0
5	2	2	409	223	181	127	100	67	44 17
5	4	2	872	477	384	286	219	155	104 43
6	1	2	174	78	68	52	44	31	0 0
6	2	2	403	204	176	143	116	91	0 0
6	3	2	637	320	282	228	186	146	0 0
6	4	2	868	433	381	312	253	199	0 0
"08-06-86" 1 1 1 1 1515 1557 108 105 105 0 71									
"Dynaflect"									
1	2	1.0	8	0.71	0.64	0.54	0.45	0.35	
2	2	1.0	8	0.76	0.71	0.62	0.51	0.40	
3	2	1.0	8	0.61	0.55	0.45	0.34	0.26	
4	2	1.0	8	0.76	0.67	0.55	0.42	0.30	
5	2	1.0	8	0.79	0.61	0.45	0.32	0.20	
6	2	1.0	8	0.86	0.77	0.61	0.49	0.36	
"Road Rater 400"									
1	1	2	2	0.61	25.2	0.50	0.42	0.39	0.31
1	2	2	2	1.22	25.0	1.03	0.83	0.82	0.72
1	3	2	2	1.79	25.0	1.74	2.60	1.35	2.40
2	1	2	2	0.59	25.0	0.66	0.60	0.56	0.49
2	2	2	2	1.21	25.0	1.37	1.30	1.19	1.05
2	3	2	2	1.79	25.1	2.38	2.23	2.09	1.85
3	1	2	2	0.59	25.0	0.53	1.68	0.40	0.49
3	2	2	2	1.19	25.0	1.09	1.64	0.89	1.29
3	3	2	2	1.80	25.1	2.05	1.95	1.64	2.27

4	1	2	2	0.59	25.0	0.84	0.72	0.65	0.61
4	2	2	2	1.21	25.1	1.92	1.73	1.56	1.33
4	3	2	2	1.81	25.1	3.32	2.98	2.70	2.31
5	1	2	2	0.60	24.9	0.60	0.56	0.38	0.27
5	2	2	2	1.20	25.1	1.36	1.16	0.93	0.69
5	3	2	2	1.81	25.1	2.46	2.18	1.63	1.26
6	1	1	2	0.60	15.1	0.65	0.71	2.12	0.47
6	2	1	2	1.22	15.1	1.48	1.61	3.54	1.06
6	1	2	2	0.60	25.0	0.56	0.47	0.39	2.09
6	2	2	2	1.20	25.1	1.22	1.09	0.98	2.78
6	3	2	2	1.82	25.1	2.00	1.84	1.65	1.45
6	1	3	2	0.59	35.0	0.47	0.43	0.36	0.78
6	2	3	2	1.20	34.9	1.22	1.08	0.94	0.72
6	3	3	2	1.80	35.0	1.99	2.02	6.69	1.26

"Road Rater 2000"

1	1	2	2	0.60	25.0	0.08	0.27	0.24	0.19
1	2	2	2	1.22	25.0	0.12	0.55	0.49	0.37
1	3	2	2	1.78	25.0	0.11	0.82	0.72	0.55
1	4	2	2	2.39	25.0	0.10	1.11	0.98	0.77
2	1	2	2	0.61	25.0	0.08	0.40	0.36	0.25
2	2	2	2	1.18	25.0	0.13	0.80	0.71	0.51
2	3	2	2	1.77	25.0	0.12	1.16	1.07	0.78
2	4	2	2	2.43	25.0	0.11	1.59	1.42	1.04
3	1	2	2	0.59	25.1	0.07	0.27	0.23	0.19
3	2	2	2	1.20	25.0	0.11	0.58	0.48	0.33
3	3	2	2	1.81	25.0	0.09	0.90	0.75	0.53
3	4	2	2	2.39	25.0	0.09	1.21	1.02	0.71
4	1	2	2	0.60	25.0	0.07	0.52	0.47	0.36
4	2	2	2	1.22	25.0	0.13	1.14	1.00	0.78
4	3	2	2	1.80	25.0	0.12	1.71	1.54	1.18
4	4	2	2	2.37	25.0	0.08	2.38	2.12	1.63
5	1	2	2	0.58	25.1	0.11	0.31	0.26	0.20
5	2	2	2	1.21	25.0	0.13	0.64	0.52	0.41
5	3	2	2	1.82	25.0	0.09	0.97	0.82	0.60
5	4	2	2	2.39	25.0	0.09	1.32	1.09	0.82
6	1	1	2	0.59	15.0	0.10	0.50	0.42	0.40
6	2	1	2	1.21	15.0	0.16	1.04	0.91	0.84
6	3	1	2	1.78	15.0	0.13	1.60	1.41	1.30
6	4	1	2	2.40	15.0	0.12	2.35	1.97	1.81
6	1	2	2	0.58	25.0	0.07	0.36	0.30	0.22
6	2	2	2	1.22	25.0	0.12	0.80	0.67	0.39
6	3	2	2	1.80	25.0	0.10	1.21	1.02	0.52
6	4	2	2	2.45	25.0	0.09	1.66	1.37	0.66
6	1	3	2	0.60	34.9	0.07	0.28	0.24	0.15
6	2	3	2	1.22	35.0	0.09	0.61	0.49	0.23
6	3	3	2	1.79	35.0	0.12	0.89	0.73	0.40
6	4	3	2	2.43	35.0	0.10	1.21	1.00	0.53

"Dynatest FWD"

1	2	2	388	290	192	142	114	90	70	43
1	4	2	831	565	387	303	244	194	160	98
2	2	2	385	246	175	161	131	106	0	0
2	4	2	826	507	378	339	283	232	0	0
3	2	2	386	251	174	134	103	74	60	31
3	4	2	833	521	374	291	224	166	130	72
4	2	2	380	338	213	155	109	82	0	0
4	4	2	825	693	465	338	245	181	0	0
5	2	2	385	368	242	154	95	67	43	21
5	4	2	810	738	508	330	209	143	91	42
6	1	2	0	0	0	0	0	0	0	0
6	2	2	376	401	249	151	104	77	0	0
6	3	2	593	582	383	244	170	124	0	0
6	4	2	822	777	518	338	238	173	0	0

"V2" 14 "SR" 57 4680 17.0 796 "S"

"F. n. Washington C/L northerly" 0.54

"F. n. Washington C/L (1.3m. n. of US50/150) northerly (NS)" 0.30

2 10192 75 11 0.9 0.06 4.2 8.8 2.5 "G"

"A-6" 11 "CL" 110.9 18.2 5 33.8 15.6 18.2 2.73
60 2.6 0

"03-20-86" 1 1 1 0 0910 0940 27 34 0 30 47

"Dynalect"

1	2	1.0	8	0.47	0.38	0.27	0.29	0.19
2	2	1.0	8	0.54	0.46	0.37	0.40	0.33
3	2	1.0	8	0.52	0.44	0.32	0.34	0.24
4	2	1.0	8	0.59	0.51	0.40	0.43	0.33
5	2	1.0	8	0.64	0.54	0.38	0.42	0.33
6	2	1.0	3	0.76	0.68	0.55	0.63	0.52

"Road Rater 400"

1	1	2	2	0.66	25.2	0.62	0.58	3.64	0.33
1	2	2	2	1.20	25.2	0.99	1.33	2.63	2.70
1	3	2	2	1.85	25.3	1.51	1.30	1.61	0.92
2	1	2	2	0.61	25.2	0.43	0.48	0.53	4.29
2	2	2	2	1.21	25.2	0.42	2.02	0.42	4.02
2	3	2	2	1.87	25.2	0.74	1.00	0.56	2.27
3	1	2	2	0.64	25.2	0.80	0.69	0.69	0.55
3	2	2	2	1.19	25.2	1.14	2.58	11.89	9.19
3	3	2	2	1.84	25.3	1.43	1.25	1.15	2.76
4	1	2	2	0.63	25.2	0.47	0.66	1.09	1.13
4	2	2	2	1.16	25.3	0.68	0.72	0.99	2.77
4	3	2	2	1.84	25.3	1.05	0.95	0.88	3.16
5	1	2	2	0.64	25.2	0.52	0.82	0.40	0.55
5	2	2	2	1.21	25.3	0.98	0.98	0.97	0.95
5	3	2	2	1.85	25.3	1.23	1.94	1.14	6.87
6	1	1	2	0.63	14.9	0.77	0.66	0.64	0.51
6	2	1	2	1.20	15.0	1.20	2.67	7.36	17.80
6	1	2	2	0.62	25.1	0.33	0.27	0.24	0.19
6	2	2	2	1.23	25.2	0.66	0.65	0.56	0.57
6	3	2	2	1.85	25.2	1.01	1.54	0.79	2.99
6	2	3	2	1.21	34.3	0.75	1.15	0.58	0.99
6	3	3	2	1.77	35.0	1.04	1.20	0.83	0.85
6	3	3	2	2.07	35.0	1.22	1.26	0.97	0.61

"Road Rater 2000"

1	1	2	2	0.63	25.0	0.07	0.33	0.29	0.25
1	2	2	2	1.30	24.9	0.10	0.69	0.63	0.55
1	3	2	2	1.82	25.0	0.11	0.99	0.90	0.78
1	4	2	2	2.39	25.0	0.10	1.37	1.24	1.08
2	1	2	2	0.57	25.0	0.08	0.18	0.16	0.17
2	2	2	2	1.21	25.0	0.14	0.38	0.34	0.35
2	3	2	2	1.77	25.0	0.15	0.56	0.49	0.53
2	4	2	2	2.44	24.9	0.09	0.76	0.67	0.71
3	1	2	2	0.62	25.0	0.07	0.34	0.31	0.24
3	2	2	2	1.21	25.0	0.13	0.67	0.63	0.47
3	3	2	2	1.80	25.0	0.10	1.01	0.96	0.72
3	4	2	2	2.45	25.0	0.10	1.39	1.33	1.00
4	1	2	2	0.57	24.9	0.07	0.24	0.22	0.20
4	2	2	2	1.21	25.0	0.11	0.52	0.47	0.42
4	3	2	2	1.81	24.9	0.11	0.80	0.71	0.65
4	4	2	2	2.41	25.0	0.10	1.09	0.98	0.89
5	1	2	2	0.64	25.0	0.07	0.38	0.32	0.27
5	2	2	2	1.24	25.0	0.12	0.78	0.63	0.52
5	3	2	2	1.78	25.0	0.10	1.14	0.94	0.78
5	4	2	2	2.45	25.0	0.10	1.59	1.29	1.08
6	1	1	2	0.62	15.1	0.12	0.33	0.31	0.28
6	2	1	2	1.20	15.1	0.15	0.66	0.62	0.56
6	3	1	2	1.81	15.1	0.15	0.98	0.90	0.84
6	4	1	2	2.41	15.1	0.14	1.39	1.27	1.09
6	1	2	2	0.58	25.2	0.07	0.24	0.21	0.19
6	2	2	2	1.22	25.0	0.11	0.50	0.44	0.38
6	3	2	2	1.85	25.0	0.09	0.75	0.67	0.57
6	4	2	2	2.45	25.0	0.10	1.01	0.90	0.77
6	1	3	2	0.61	35.1	0.11	0.21	0.17	0.15
6	2	3	2	1.20	35.1	0.13	0.39	0.34	0.28
6	3	3	2	1.77	35.2	0.16	0.59	0.50	0.41
6	4	3	2	2.40	35.0	0.08	0.77	0.70	0.55

"04-23-86" 0 0 0 1 0830 0900 56 0 0 41 54

"Dynatest FWD"

1	2	2	442	130	110	97	80	64	0	0
1	4	2	936	273	239	211	179	142	0	0
2	2	2	438	119	105	97	83	71	0	0
2	4	2	940	251	226	207	180	154	0	0
3	2	2	439	123	102	90	75	59	0	0
3	4	2	927	262	228	202	172	136	0	0
4	2	2	432	165	141	128	110	93	0	0
4	4	2	917	335	296	269	234	198	0	0
5	2	2	429	142	123	109	91	73	59	32
5	4	2	921	305	269	240	204	166	133	76
6	1	2	192	58	49	43	37	30	0	0
6	2	2	430	131	113	104	88	75	0	0
6	3	2	673	201	177	162	139	117	0	0
6	4	2	918	268	239	220	190	159	0	0
"08-06-86" 1 1 1 1 1350 1437 103 109 113 0 71										
"Dynalect"										
1	2	1.0	8	0.56	0.52	0.44	0.35	0.25		
2	2	1.0	8	0.58	0.55	0.50	0.43	0.35		
3	2	1.0	8	0.52	0.48	0.43	0.34	0.24		
4	2	1.0	8	0.80	0.75	0.67	0.55	0.44		
5	2	1.0	8	0.51	0.49	0.44	0.37	0.29		
6	2	1.0	8	0.76	0.73	0.67	0.59	0.49		
"Road Rater 400"										
1	1	2	2	0.59	25.0	0.40	0.31	1.70	0.24	
1	2	2	2	1.22	25.1	0.85	0.83	2.76	0.58	
1	3	2	2	1.81	25.1	1.47	1.61	3.99	1.12	
2	1	2	2	0.60	25.0	0.30	0.62	0.24	0.17	
2	2	2	2	1.22	25.1	0.64	0.28	0.55	0.48	
2	3	2	2	1.81	25.1	1.06	1.15	0.94	0.83	
3	1	2	2	0.59	25.0	0.36	0.33	0.34	0.25	
3	2	2	2	1.22	25.1	0.76	0.65	0.67	0.57	
3	3	2	2	1.91	25.1	1.32	1.12	1.18	4.96	
4	1	2	2	0.59	25.0	0.52	0.47	0.43	0.36	
4	2	2	2	1.21	25.1	1.09	1.07	0.95	0.82	
4	3	2	2	1.82	25.1	1.83	1.77	1.57	1.41	
5	1	2	2	0.59	25.0	0.44	0.37	0.32	1.64	
5	2	2	2	1.21	25.1	0.93	0.84	0.75	2.33	
5	3	2	2	1.82	25.1	1.55	1.43	1.28	2.75	
6	1	1	2	0.60	15.1	0.44	0.41	0.36	0.16	
6	2	1	2	1.22	15.1	0.92	0.82	0.78	0.68	
6	1	2	2	0.59	25.0	0.34	0.30	0.27	0.22	
6	2	2	2	1.22	25.1	0.74	0.68	0.62	0.46	
6	3	2	2	1.81	25.1	1.21	1.13	1.02	2.60	
6	1	3	2	0.60	35.1	0.26	0.22	0.20	0.47	
6	2	3	2	1.21	35.1	0.64	0.59	0.53	0.83	
6	3	3	2	1.82	35.2	1.14	1.08	0.98	1.07	
"Road Rater 2000"										
1	1	2	2	0.62	25.1	0.63	0.50	0.46	0.37	
1	2	2	2	1.22	25.1	1.34	1.10	0.97	0.79	
1	3	2	2	1.79	25.1	2.09	1.68	1.52	1.24	
1	4	2	2	2.41	25.1	3.00	2.40	2.15	1.74	
1	5	2	2	3.58	25.1	4.76	3.90	3.52	2.90	
2	1	2	2	0.62	25.1	0.54	0.34	0.31	0.25	
2	2	2	2	1.23	25.1	1.02	0.70	0.62	0.51	
2	3	2	2	1.82	25.1	1.51	1.04	0.95	0.78	
2	4	2	2	2.40	25.1	2.04	1.42	1.28	1.06	
2	5	2	2	3.62	25.1	3.15	2.25	2.01	1.63	
3	1	2	2	0.60	25.1	0.58	0.39	0.34	0.29	
3	2	2	2	1.21	25.1	1.34	0.84	0.75	0.64	
3	3	2	2	1.81	25.1	2.13	1.30	1.16	0.98	
3	4	2	2	2.39	25.1	2.88	1.80	1.58	1.36	
3	5	2	2	3.61	25.1	4.38	2.87	2.58	2.17	
4	1	2	2	0.61	25.1	0.58	0.52	0.47	0.40	
4	2	2	2	1.20	25.1	1.21	1.09	0.99	0.86	
4	3	2	2	1.85	25.0	1.92	1.78	1.63	1.41	
4	4	2	2	2.38	25.1	2.65	2.38	2.21	1.92	
4	5	2	2	3.61	25.1	4.34	3.90	3.61	3.15	
5	1	2	2	0.60	25.1	0.46	0.37	0.27	0.29	
5	2	2	2	1.20	25.1	0.95	0.79	0.59	0.60	
5	3	2	2	1.85	25.1	1.44	1.23	0.97	0.95	

5	4	2	2	2.42	25.1	2.00	1.68	1.33	1.31
5	5	2	2	3.58	25.1	3.02	2.59	2.22	2.02
5	1	1	2	0.62	15.0	0.72	0.53	0.52	0.40
6	2	1	2	1.22	15.0	1.49	1.04	1.08	0.80
6	3	1	2	1.79	15.1	2.39	1.61	1.53	1.27
6	4	1	2	2.39	15.0	3.19	2.32	2.04	1.68
6	5	1	2	3.52	15.1	4.49	3.69	2.97	3.00
6	1	2	2	0.63	25.1	0.48	0.39	0.30	0.29
6	2	2	2	1.21	25.2	0.99	0.80	0.59	0.59
6	3	2	2	1.78	25.2	1.54	1.25	0.95	0.93
6	4	2	2	2.39	25.2	2.08	1.71	1.29	1.27
6	5	2	2	3.61	25.1	3.23	2.74	2.17	2.01
6	1	3	2	0.63	35.2	0.40	0.30	0.24	0.23
6	2	3	2	1.25	35.2	0.82	0.63	0.47	0.47
6	3	3	2	1.84	35.2	1.23	0.93	0.67	0.69
6	4	3	2	2.42	35.2	1.61	1.18	0.91	0.96
6	5	3	2	3.60	35.2	2.49	1.84	1.45	1.47

"Dynatest FWD"

1	2	2	397	158	133	120	97	78	59	26
1	4	2	845	334	291	265	218	176	136	64
2	2	2	388	171	122	114	98	81	0	0
2	4	2	842	339	263	247	213	179	0	0
3	2	2	390	131	106	100	80	66	50	21
3	4	2	841	294	247	231	191	154	116	45
4	2	2	384	217	182	166	143	116	0	0
4	4	2	838	451	387	359	311	258	0	0
5	2	2	382	132	107	97	81	67	49	28
5	4	2	834	300	257	232	195	160	113	68
6	1	2	0	0	0	0	0	0	0	0
6	2	2	384	168	134	123	106	86	0	0
6	3	2	601	253	212	193	166	135	0	0
6	4	2	835	343	290	267	228	188	0	0

"V3" 63 "SR" 64 1670 17.0 284 "S"

"F. 3.23m. e. of/to Pike/Dubois CL" 3.23

"F. 2.55m. e. of SR257 easterly to 2.7m. w. of SR161 (WB)" 0.25

2 11525 78 8 4.0 0.33 0.0 8.2 6.0 "B"

"A-6" 3 "SC" 120.0 12.5 12 27.0 14.5 12.5 2.70

91 3.0 0

3

"03-19-86" 1 1 1 0 1600 1640 42 0 0 48 47

"Dynalect"

1	2	1.0	8	0.50	0.43	0.45	0.32	0.23
2	2	1.0	8	0.47	0.40	0.34	0.30	0.21
3	2	1.0	8	0.46	0.39	0.32	0.29	0.21
4	2	1.0	8	0.51	0.45	0.38	0.35	0.29
5	2	1.0	8	0.44	0.38	0.31	0.28	0.21
6	2	1.0	8	0.42	0.36	0.30	0.26	0.19

"Road Rater 400"

1	1	2	2	0.60	25.0	0.49	2.40	0.44	0.92
1	2	2	2	1.21	25.1	0.90	3.30	0.87	5.52
1	3	2	2	1.83	25.1	1.48	1.28	1.27	1.84
2	1	2	2	0.61	25.0	2.49	0.41	0.35	42.2
2	2	2	2	1.24	25.1	0.89	0.85	1.00	4.82
2	3	2	2	1.85	25.1	2.94	1.45	1.30	0.00
3	1	2	2	0.60	25.0	0.41	0.39	0.33	0.29
3	2	2	2	1.21	25.1	1.14	1.60	0.66	0.55
3	3	2	2	1.86	25.1	1.13	2.21	1.53	2.76
4	1	2	2	0.61	25.1	0.41	0.37	0.26	0.33
4	2	2	2	1.22	25.1	0.80	0.74	0.66	1.69
4	3	2	2	1.82	25.1	1.14	3.79	2.28	0.00
5	1	2	2	0.59	25.1	0.42	0.35	2.95	0.29
5	2	2	2	1.27	25.1	0.80	0.82	2.95	0.53
5	3	2	2	1.86	25.2	1.13	0.90	1.24	0.91
6	1	1	2	0.62	14.9	0.73	0.72	0.61	5.35
6	2	1	2	1.19	14.9	0.85	3.10	1.64	15.84
6	1	2	2	0.58	24.4	0.50	3.09	0.34	3.17

6	2	2	2	1.15	24.4	2.44	1.79	0.72	5.48
6	3	2	2	1.87	25.1	1.40	1.63	1.15	14.02
6	2	3	2	1.29	34.3	1.08	4.49	3.74	9.81
6	3	3	2	1.78	34.9	1.36	3.83	3.29	12.75
6	4	3	2	2.41	34.9	1.73	2.96	1.39	1.05
"Road Rater 2000"									
1	1	2	2	0.56	25.2	0.18	0.16	0.00	0.29
1	2	2	2	1.20	25.2	0.33	0.26	0.00	0.56
1	3	2	2	1.77	25.2	0.47	0.36	0.00	0.81
1	4	2	2	2.24	25.1	0.66	0.50	0.00	1.01
2	1	2	2	0.59	25.2	0.16	0.13	0.00	0.18
2	2	2	2	1.17	25.1	0.30	0.22	0.00	0.31
2	3	2	2	1.78	25.1	0.41	0.34	0.00	0.52
2	4	2	2	2.39	25.1	0.44	0.37	0.00	0.89
3	1	2	2	0.55	25.2	0.14	0.13	0.00	0.14
3	2	2	2	1.22	25.2	0.27	0.21	0.00	0.24
3	3	2	2	1.79	25.2	0.40	0.33	0.00	0.54
3	4	2	2	2.42	25.2	0.52	0.37	0.00	0.63
4	1	2	2	0.66	25.1	0.15	0.13	0.01	0.19
4	2	2	2	1.26	25.1	0.27	0.21	0.00	0.36
4	3	2	2	1.76	25.1	0.40	0.31	0.00	0.53
4	4	2	2	2.37	25.1	0.48	0.36	0.00	0.65
5	1	2	2	0.64	25.1	0.14	0.13	0.00	0.14
5	2	2	2	1.23	25.2	0.28	0.21	0.00	0.31
5	3	2	2	1.80	25.2	0.43	0.34	0.00	0.49
5	4	2	2	2.36	25.1	0.62	0.50	0.00	0.69
6	1	1	2	0.55	15.1	0.24	0.34	0.00	0.35
6	2	1	2	1.25	15.0	0.52	0.33	0.00	0.75
6	3	1	2	1.79	15.1	0.91	0.47	0.00	1.05
6	4	1	2	2.35	15.1	1.07	0.63	0.00	1.36
6	1	2	2	0.63	25.1	0.17	0.15	0.00	0.16
6	2	2	2	1.19	25.1	0.33	0.25	0.00	0.47
6	3	2	2	1.77	25.2	0.50	0.43	0.00	0.63
6	4	2	2	2.46	25.2	0.69	0.59	0.00	1.14
6	1	3	2	0.62	35.1	0.31	0.16	0.00	0.26
6	2	3	2	1.23	35.0	0.40	0.25	0.00	0.41
6	3	3	2	1.75	35.1	0.59	0.40	0.00	1.07
6	4	3	2	2.35	35.0	0.81	0.57	0.00	1.26
"04-22-86" 0 0 0 1 1245 1315 74 0 0 50 53									
"Dynatest FWD"									
1	2	2	426	115	92	84	73	57	0 0
1	4	2	902	245	203	182	153	125	0 0
2	2	2	421	123	98	92	77	63	0 0
2	4	2	897	268	228	207	175	144	0 0
3	2	2	420	115	95	82	69	54	0 0
3	4	2	894	246	210	184	155	125	0 0
4	2	2	415	113	91	81	69	57	0 0
4	4	2	887	234	199	173	150	125	0 0
5	2	2	414	118	98	81	70	56	45 27
5	4	2	879	254	214	183	161	131	105 63
6	1	2	173	41	35	29	28	17	0 0
6	2	2	416	105	85	72	58	45	0 0
6	3	2	642	163	133	116	95	74	0 0
6	4	2	875	219	180	159	126	102	0 0
"08-06-86" 1 1 1 1 1150 1233 78 79 80 0 73									
"Dynaflect"									
1	2	1.0	8	0.46	0.41	0.37	0.29	0.23	
2	2	1.0	8	0.47	0.42	0.37	0.29	0.22	
3	2	1.0	8	0.39	0.35	0.31	0.24	0.19	
4	2	1.0	8	0.45	0.41	0.37	0.31	0.26	
5	2	1.0	8	0.42	0.38	0.34	0.27	0.21	
6	2	1.0	8	0.37	0.33	0.29	0.23	0.17	
"Road Rater 400"									
1	1	2	2	0.61	25.2	0.34	0.29	0.26	0.23
1	2	2	2	1.21	25.2	0.76	2.46	0.65	0.55
1	3	2	2	1.78	25.0	1.49	1.38	1.30	1.16
2	1	2	2	0.59	25.0	0.32	0.31	0.25	0.13
2	2	2	2	1.19	25.0	0.69	0.66	0.62	0.29
2	3	2	2	1.78	25.0	1.35	1.86	0.77	0.39
3	1	2	2	0.59	25.0	0.25	0.58	0.17	0.13

3	3	3	3	3	1.19	25.0	0.56	2.25	0.43	0.33
3	3	3	3	3	1.81	25.0	1.12	0.97	0.83	0.67
4	1	3	3	3	0.60	25.0	0.29	0.22	0.29	0.11
4	2	3	3	3	1.21	25.0	0.62	0.47	0.46	0.32
4	3	3	3	3	1.79	25.0	1.11	0.92	0.86	0.47
5	1	3	3	3	0.59	25.0	0.31	1.33	0.25	0.19
5	2	3	3	3	1.19	25.0	0.66	1.20	0.53	0.43
5	3	3	3	3	1.80	25.0	1.14	1.74	0.89	0.75
6	1	1	3	3	0.59	14.9	0.27	0.30	0.20	0.22
6	2	1	3	3	1.19	15.0	0.59	0.51	0.43	0.14
6	1	2	3	3	0.61	25.1	0.34	0.20	0.27	0.07
6	2	2	3	3	1.21	25.1	0.76	0.62	0.62	0.30
6	3	3	3	3	1.82	25.2	1.23	1.62	1.02	0.56
6	1	3	3	3	0.60	35.1	0.22	0.17	0.15	0.19
6	2	3	3	3	1.21	35.1	0.52	0.45	0.39	0.40
6	3	3	3	3	1.80	35.1	1.01	0.88	0.78	0.80
"Road Rater 2000"										
1	1	2	2	2	0.61	25.0	0.46	0.33	0.30	0.26
1	2	2	2	2	1.21	25.0	0.92	0.67	0.61	0.52
1	3	2	2	2	1.78	25.0	1.39	0.99	0.91	0.77
1	4	2	2	2	2.44	25.1	1.94	1.39	1.26	1.07
1	5	2	2	2	3.62	25.0	3.08	2.15	1.93	1.66
2	1	2	2	2	0.56	25.0	0.48	0.29	0.23	0.19
2	2	2	2	2	1.22	25.0	1.07	0.70	0.56	0.45
2	3	2	2	2	1.79	25.0	1.65	1.04	0.86	0.70
2	4	2	2	2	2.41	25.0	2.36	1.49	1.25	1.00
2	5	2	2	2	3.60	25.0	3.85	2.53	2.03	1.68
3	1	2	2	2	0.62	25.0	0.31	0.25	0.20	0.17
3	2	2	2	2	1.23	25.0	0.68	0.54	0.45	0.36
3	3	2	2	2	1.79	25.0	1.05	0.82	0.70	0.56
3	4	2	2	2	2.43	25.0	1.48	1.16	1.00	0.80
3	5	2	2	2	3.61	25.0	2.42	1.91	1.62	1.32
4	1	2	2	2	0.64	24.9	0.39	0.26	0.24	0.19
4	2	2	2	2	1.20	25.0	0.78	0.53	0.50	0.37
4	3	2	2	2	1.80	25.0	1.17	0.81	0.76	0.59
4	4	2	2	2	2.42	25.0	1.65	1.13	1.02	0.83
4	5	2	2	2	3.60	25.0	2.63	1.79	1.58	1.30
5	1	2	2	2	0.60	25.0	0.43	0.25	0.20	0.18
5	2	2	2	2	1.21	25.0	0.86	0.54	0.43	0.39
5	3	2	2	2	1.83	25.0	1.36	0.84	0.68	0.61
5	4	2	2	2	2.41	25.0	1.86	1.18	0.95	0.84
5	5	2	2	2	3.59	25.0	3.05	1.90	1.59	1.38
6	1	1	2	2	0.61	15.2	0.48	0.24	0.37	0.19
6	2	1	2	2	1.21	15.2	0.81	0.50	0.54	0.36
6	3	1	2	2	1.83	15.2	1.23	0.77	0.79	0.53
6	4	1	2	2	2.40	15.2	1.88	1.06	1.11	0.78
6	5	1	2	2	3.63	15.2	2.95	1.71	1.68	1.25
6	1	2	2	2	0.62	25.1	0.46	0.34	0.29	0.25
6	2	2	2	2	1.19	25.1	0.90	0.64	0.60	0.50
6	3	2	2	2	1.84	25.2	1.45	1.01	0.95	0.78
6	4	2	2	2	2.43	25.1	1.94	1.34	1.25	1.04
6	5	2	2	2	3.61	25.1	3.15	2.09	1.84	1.58
6	1	3	2	2	0.62	35.1	0.33	0.21	0.20	0.15
6	2	3	2	2	1.23	35.1	0.68	0.41	0.39	0.29
6	3	3	2	2	1.84	35.1	1.08	0.63	0.58	0.44
6	4	3	2	2	2.44	35.1	1.50	0.86	0.77	0.60
6	5	3	2	2	3.62	35.1	2.45	1.34	1.16	0.91
"Dynatest FWD"										
1	2	2	401	122	104	90	75	59	50	30
1	4	2	855	271	229	200	167	138	110	68
2	2	2	398	161	137	121	99	81	0	0
2	4	2	849	353	307	266	222	186	0	0
3	2	2	399	124	108	91	75	61	47	26
3	4	2	849	276	239	209	171	141	110	66
4	2	2	399	108	88	77	63	50	0	0
4	4	2	847	237	198	178	145	118	0	0
5	2	2	393	129	110	96	80	65	54	30
5	4	2	842	291	255	224	190	157	128	76
6	1	2	0	0	0	0	0	0	0	0
6	2	2	393	111	90	80	62	50	0	0

6	3	2	616	178	146	126	101	80	0	0
6	4	2	847	246	201	172	138	111	0	0

"V4" 82 "US" 41 20900 5.0 1045 "S"
 "F. SR57 to 6.13m. s. of Vanderburgh/Gibson CL" 4.83
 "F. MP10 (1.1m. n. of SR57) northerly (NB)" 0.25
 2 10207 76 10 4.7 0.39 0.0 7.2 2.5 "G"
 "A-4" 10 "ML" 109.6 18.4 9 23.8 0.0 0.0 2.67
 63 2.9 0

3
 "03-18-86" 1 0 0 0 0935 1005 55 0 0 55 51
 "Dynaflect"

1	2	1.0	8	0.54	0.45	0.40	0.40	0.31
2	2	1.0	8	0.60	0.51	0.46	0.43	0.34
3	2	1.0	8	0.58	0.48	0.42	0.40	0.31
4	2	1.0	8	0.59	0.48	0.41	0.38	0.29
5	2	1.0	8	0.57	0.47	0.42	0.40	0.31
6	2	1.0	8	0.58	0.49	0.43	0.41	0.33

"04-18-86" 0 1 1 1 1110 1130 74 0 0 60 56
 "Road Rater 400"

1	1	2	2	0.62	25.1	0.39	0.27	0.30	0.13
1	2	2	2	1.23	25.1	0.77	1.38	0.66	0.77
1	3	2	2	1.82	25.1	1.26	1.38	1.12	1.61
2	1	2	2	0.60	25.0	0.35	0.31	0.28	0.22
2	2	2	2	1.23	25.1	0.81	0.69	0.69	0.61
2	3	2	2	1.85	25.1	1.33	1.18	1.17	1.06
3	1	2	2	0.60	25.0	0.46	0.36	0.22	0.11
3	2	2	2	1.19	24.8	0.72	1.27	0.59	0.43
3	3	2	2	1.81	25.0	1.18	1.39	0.90	0.72
4	1	2	2	0.58	24.7	0.26	0.15	0.17	0.21
4	2	2	2	1.20	24.7	0.66	2.04	0.43	0.95
4	3	2	2	1.82	25.0	1.15	2.16	0.93	0.70
5	1	2	2	0.59	25.0	0.51	0.58	0.34	0.12
5	2	2	2	1.21	24.8	0.73	1.74	0.41	0.36
5	3	2	2	1.84	25.2	1.33	0.88	1.30	0.56
6	1	1	2	0.62	15.0	0.50	0.37	0.23	0.15
6	2	1	2	1.18	14.8	0.70	0.55	0.43	0.38
6	1	2	2	0.59	24.5	0.26	0.20	0.21	0.16
6	2	2	2	1.22	25.1	0.75	1.27	0.63	0.36
6	3	2	2	1.81	25.1	1.03	1.42	0.84	0.66
6	1	3	2	0.57	35.1	0.21	0.23	0.14	0.11
6	2	3	2	1.20	35.3	0.57	0.62	0.40	0.25
6	3	3	2	1.75	34.8	1.04	0.39	0.80	0.55

"Road Rater 2000"

1	1	2	2	0.58	25.0	0.04	0.03	0.02	0.02
1	2	2	2	1.16	25.0	0.83	0.59	0.54	0.46
1	3	2	2	1.79	25.0	1.49	1.07	0.99	0.82
1	4	2	2	2.43	25.1	2.14	1.52	1.42	1.15
1	5	2	2	3.57	25.0	3.50	2.53	2.36	1.98
2	1	2	2	0.65	25.0	0.14	0.12	0.12	0.11
2	2	2	2	1.24	25.0	0.79	0.57	0.53	0.43
2	3	2	2	1.81	25.0	1.36	0.98	0.90	0.76
2	4	2	2	2.42	25.1	1.93	1.38	1.28	1.08
2	5	2	2	3.60	25.0	3.16	2.15	1.99	1.67
3	1	2	2	0.59	25.1	0.13	0.13	0.08	0.11
3	2	2	2	1.18	25.1	0.65	0.52	0.46	0.37
3	3	2	2	1.81	25.0	1.17	0.96	0.77	0.70
3	4	2	2	2.40	25.1	1.61	1.28	1.04	0.96
3	5	2	2	3.62	25.2	2.61	2.13	1.77	1.59
4	1	2	2	0.62	25.1	0.23	0.17	0.14	0.11
4	2	2	2	1.20	25.1	0.74	0.52	0.41	0.33
4	3	2	2	1.85	25.1	1.26	0.85	0.70	0.54
4	4	2	2	2.39	25.0	1.80	1.21	0.98	0.76
4	5	2	2	3.56	25.1	3.03	1.99	1.62	1.22
5	1	2	2	0.57	25.1	0.29	0.20	0.17	0.15
5	2	2	2	1.23	25.0	0.78	0.53	0.46	0.39
5	3	2	2	1.84	25.1	1.31	0.89	0.80	0.75

5	4	2	2	2.38	25.1	1.84	1.18	1.03	0.90
5	5	2	2	3.58	25.1	3.03	1.94	1.72	1.44
6	1	1	2	0.61	15.0	0.13	0.13	0.12	0.12
6	2	1	2	1.18	15.0	0.70	0.46	0.48	0.36
6	3	1	2	1.77	15.1	1.19	0.85	0.85	0.63
6	4	1	2	2.45	15.0	1.79	1.25	1.26	0.93
6	5	1	2	3.71	15.0	2.99	2.01	2.08	1.62
6	1	2	2	0.64	25.2	0.10	0.07	0.13	0.12
6	2	2	2	1.25	25.1	0.68	0.48	0.57	0.36
6	3	2	2	1.78	25.2	1.08	0.77	0.83	0.58
6	4	2	2	2.45	25.1	1.54	1.09	1.09	0.82
6	5	2	2	3.63	25.1	2.73	1.88	1.74	1.44
6	1	3	2	0.67	35.0	0.16	0.15	0.16	0.18
6	2	3	2	1.19	34.9	0.54	0.39	0.37	0.29
6	3	3	2	1.77	35.0	0.95	0.67	0.65	0.52
6	4	3	2	2.44	34.9	1.39	1.00	0.93	0.75
6	5	3	2	3.60	35.0	2.29	1.57	1.44	1.21
"Dynatest FWD"									
1	2	2	2	395	124	116	104	92	78
1	4	2	2	885	268	247	229	201	173
2	2	2	2	400	123	127	116	100	83
2	4	2	2	870	289	269	245	213	180
3	2	2	2	406	113	109	97	84	67
3	4	2	2	872	248	233	211	184	148
4	2	2	2	405	144	100	83	67	53
4	4	2	2	869	259	219	183	151	121
5	2	2	2	408	105	96	85	71	59
5	4	2	2	870	226	205	183	157	129
6	1	2	2	220	52	47	45	34	29
6	2	2	2	406	103	95	86	71	57
6	3	2	2	637	164	152	139	116	94
6	4	2	2	873	223	209	191	160	130
"08-05-86" 1 1 1 1 1620 1700 115 115 115 0 74									
"Dynaflect"									
1	2	1.0	8	0.48	0.46	0.41	0.36	0.29	
2	2	1.0	8	0.61	0.59	0.52	0.48	0.43	
3	2	1.0	8	0.55	0.53	0.46	0.41	0.34	
4	2	1.0	8	0.47	0.45	0.40	0.35	0.27	
5	2	1.0	8	0.52	0.51	0.43	0.38	0.30	
6	2	1.0	8	0.51	0.49	0.42	0.35	0.28	
"Road Rater 400"									
1	1	2	2	0.60	24.9	0.32	0.26	0.25	0.19
1	2	2	2	1.19	24.8	0.69	0.62	0.56	0.47
2	1	2	2	0.61	25.1	0.37	0.33	0.31	0.24
2	2	2	2	1.23	25.1	0.82	0.76	0.73	0.61
2	3	2	2	1.83	25.1	1.49	2.00	1.35	1.12
3	1	2	2	0.60	25.1	0.31	0.38	0.23	0.18
3	2	2	2	1.23	25.1	0.69	0.68	0.55	0.45
3	3	2	2	1.78	25.1	1.22	1.23	1.68	0.88
4	1	2	2	0.61	25.1	0.29	0.26	0.22	0.17
4	2	2	2	1.23	25.1	0.64	0.60	0.54	0.43
4	3	2	2	1.83	25.2	1.09	1.12	1.66	0.81
5	1	2	2	0.59	25.1	0.30	0.30	0.24	0.17
5	2	2	2	1.19	25.1	0.66	0.79	0.55	0.45
5	3	2	2	1.83	25.1	1.19	0.90	1.02	0.84
6	1	1	2	0.59	15.0	0.28	0.35	0.24	0.18
6	2	1	2	1.18	15.0	0.64	0.70	0.51	0.38
6	1	2	2	0.60	25.1	0.29	0.26	0.22	0.14
6	2	2	2	1.22	25.1	0.65	0.65	0.51	0.38
6	3	2	2	1.81	25.1	1.19	1.10	0.92	0.72
6	1	3	2	0.60	35.1	0.26	0.14	0.22	0.13
6	2	3	2	1.20	35.1	0.68	0.55	0.73	0.39
6	3	3	2	1.80	35.1	1.15	0.83	1.05	0.72
"Road Rater 2000"									
1	1	2	2	0.59	25.1	0.55	0.38	0.36	0.29
1	2	2	2	1.19	25.1	1.07	0.71	0.66	0.52
1	3	2	2	1.83	25.2	1.62	1.00	0.88	0.70
1	4	2	2	2.38	25.1	2.24	1.35	1.16	0.94
1	5	2	2	3.61	25.2	3.82	2.26	1.98	1.60
2	1	2	2	0.59	25.2	0.52	0.32	0.29	0.23

2	2	2	2	1.23	25.1	1.14	0.70	0.64	0.51
2	3	2	2	1.81	25.1	1.76	1.10	0.99	0.80
2	4	2	2	2.41	25.1	2.46	1.55	1.37	1.13
2	5	2	2	3.59	25.1	4.05	2.47	2.23	1.31
3	1	2	2	0.58	25.1	0.37	0.29	0.24	0.21
3	2	2	2	1.17	25.1	0.77	0.64	0.53	0.46
3	3	2	2	1.81	25.1	1.31	0.99	0.79	0.71
3	4	2	2	2.40	25.1	1.76	1.35	1.11	0.95
3	5	2	2	3.61	25.1	2.89	2.21	1.85	1.58
4	1	2	2	0.59	25.2	0.34	0.27	0.23	0.19
4	2	2	2	1.19	25.1	0.75	0.55	0.48	0.38
4	3	2	2	1.81	25.1	1.19	0.88	0.77	0.60
4	4	2	2	2.40	25.1	1.68	1.23	1.07	0.84
4	5	2	2	3.59	25.2	2.63	1.95	1.71	1.34
5	1	2	2	0.59	25.1	0.46	0.28	0.24	0.19
5	2	2	2	1.23	25.1	0.93	0.56	0.47	0.37
5	3	2	2	1.82	25.1	1.42	0.89	0.75	0.57
5	4	2	2	2.41	25.1	1.97	1.22	1.04	0.80
5	5	2	2	3.59	25.1	3.28	1.98	1.70	1.29
6	1	1	2	0.60	15.3	0.37	0.26	0.25	0.21
6	2	1	2	1.21	15.0	0.77	0.57	0.54	0.45
6	3	1	2	1.84	15.0	1.20	0.97	0.84	0.71
6	4	1	2	2.40	15.1	1.65	1.33	1.16	0.94
6	5	1	2	3.62	15.1	2.75	2.23	1.92	1.59
6	1	2	2	0.62	25.3	0.35	0.26	0.24	0.20
6	2	2	2	1.23	25.2	0.72	0.56	0.50	0.40
6	3	2	2	1.82	25.2	1.14	0.86	0.76	0.61
6	4	2	2	2.43	25.3	1.57	1.19	1.05	0.85
6	5	2	2	3.61	25.3	2.50	1.87	1.68	1.37
6	1	3	2	0.63	35.3	0.34	0.24	0.22	0.18
6	2	3	2	1.21	35.3	0.68	0.49	0.44	0.36
6	3	3	2	1.81	35.3	1.08	0.79	0.73	0.59
6	4	3	2	2.42	35.3	1.45	1.05	0.93	0.78
6	5	3	2	3.62	35.3	2.28	1.64	1.49	1.22

"Dynatest FWD"

1	2	2	377	115	79	87	71	61	51	30
1	4	2	841	261	219	191	165	137	113	67
2	2	2	380	123	109	99	81	67	0	0
2	4	2	839	249	248	219	184	151	0	0
3	2	2	381	103	94	86	69	57	39	19
3	4	2	839	228	212	193	159	130	101	58
4	2	2	381	114	76	78	65	51	0	0
4	4	2	842	257	226	185	150	121	0	0
5	2	2	383	100	91	83	67	56	43	23
5	4	2	840	221	203	182	153	124	99	57
6	1	2	165	39	0	29	24	18	0	0
6	2	2	380	109	0	79	60	49	0	0
6	3	2	602	173	0	126	99	80	0	0
6	4	2	839	237	0	175	139	111	0	0

"V5" 19 "US" 231 10200 19.5 1989 "S"

"F. 9.8m. n. of Spencer/Dubois CL northerly" 2.08

"F. 1.8m. n. of SR64 (1.5m. n. of concrete pvt.) northerly (NB)" 0.25

5 6887 66 20 0.0 0.00 0.0 9.6 5.0 "B"

"A-4" 8 "ML" 101.4 24.8 12 5.3 3.5 1.8 2.75

0 2.8 0

3

"03-19-86" 1 1 1 0 1355 1425 42 0 0 44 47

"Dynaflect"

1	2	1.0	8	0.57	0.49	0.55	0.39	0.30
2	2	1.0	8	0.56	0.48	0.53	0.38	0.30
3	2	1.0	8	0.49	0.41	0.44	0.31	0.23
4	2	1.0	8	0.50	0.42	0.46	0.32	0.24
5	2	1.0	8	0.50	0.42	0.45	0.32	0.23
6	2	1.0	8	0.47	0.40	0.43	0.30	0.22

"Road Rater 400"

1	1	2	2	0.62	25.3	0.36	0.35	1.29	1.30
---	---	---	---	------	------	------	------	------	------

1	2	1.0	8	0.56	0.52	0.48	0.43	0.26
2	2	1.0	8	0.70	0.66	0.61	0.53	0.45
3	2	1.0	8	0.55	0.50	0.45	0.37	0.29
4	2	1.0	8	0.50	0.47	0.43	0.36	0.29
5	2	1.0	8	0.51	0.47	0.42	0.34	0.27
6	2	1.0	8	0.50	0.46	0.42	0.35	0.27
"Road Rater 400"								
1	1	2	2	0.61	25.1	0.31	0.23	0.27
1	2	2	2	1.20	25.1	0.69	0.52	0.55
1	3	2	2	1.82	25.1	1.23	2.21	3.41
2	1	2	2	0.60	25.1	0.40	0.53	0.88
2	2	2	2	1.19	25.1	0.82	0.62	0.44
2	3	2	2	1.82	25.1	1.53	2.10	2.33
3	1	2	2	0.59	25.0	0.30	0.27	0.24
3	2	2	2	1.20	25.1	0.66	0.62	0.52
3	3	2	2	1.81	25.1	1.19	1.62	2.65
4	1	2	2	0.59	25.0	0.30	0.84	0.23
4	2	2	2	1.20	25.1	0.69	1.77	0.56
4	3	2	2	1.79	25.1	1.17	1.44	1.01
5	1	2	2	0.60	25.0	0.33	0.24	0.24
5	2	2	2	1.21	25.1	0.71	0.32	0.56
5	3	2	2	1.81	25.1	1.25	1.00	0.97
6	1	1	2	0.60	15.1	0.27	0.32	0.48
6	2	1	2	1.19	15.1	0.63	0.66	0.38
6	1	2	2	0.59	25.0	0.28	0.23	0.43
6	2	2	2	1.20	25.0	0.61	1.23	1.04
6	3	2	2	1.79	25.1	1.09	2.41	2.07
6	1	3	2	0.60	35.0	0.25	0.08	0.13
6	2	3	2	1.19	35.0	0.69	0.50	0.29
6	3	3	2	1.62	35.0	1.38	3.86	10.00
"Road Rater 2000"								
1	1	2	2	0.63	25.1	0.52	0.33	0.31
1	2	2	2	1.19	25.2	1.06	0.67	0.60
1	3	2	2	1.77	25.1	1.65	1.02	0.87
1	4	2	2	2.42	25.2	2.35	1.43	1.25
1	5	2	2	3.64	25.1	3.90	2.30	1.99
2	1	2	2	0.60	25.2	0.64	0.39	0.32
2	2	2	2	1.17	25.2	1.50	0.88	0.81
2	3	2	2	1.83	25.1	2.50	1.49	1.37
2	4	2	2	2.39	25.1	3.45	2.14	1.99
2	5	2	2	3.60	25.2	5.64	3.59	3.34
3	1	2	2	0.57	25.2	0.48	0.27	0.24
3	2	2	2	1.23	25.2	1.10	0.59	0.52
3	3	2	2	1.80	25.2	1.63	0.90	0.83
3	4	2	2	2.44	25.2	2.29	1.30	1.16
3	5	2	2	3.61	25.2	3.72	2.06	1.87
4	1	2	2	0.58	25.2	0.44	0.29	0.25
4	2	2	2	1.22	25.2	0.96	0.61	0.52
4	3	2	2	1.84	25.2	1.50	0.92	0.83
4	4	2	2	2.41	25.2	2.03	1.30	1.16
4	5	2	2	3.59	25.2	3.21	1.98	1.77
5	1	2	2	0.60	25.1	0.46	0.30	0.21
5	2	2	2	1.19	25.1	1.00	0.62	0.45
5	3	2	2	1.82	25.1	1.50	0.97	0.75
5	4	2	2	2.42	25.1	1.99	1.33	1.04
5	5	2	2	3.60	25.1	3.26	2.10	1.68
6	1	1	2	0.59	15.1	0.38	0.28	0.24
6	2	1	2	1.20	15.1	0.76	0.55	0.44
6	3	1	2	1.77	15.1	1.10	0.85	0.76
6	4	1	2	2.36	15.1	1.60	1.18	1.09
6	5	1	2	3.61	15.1	2.54	1.91	1.75
6	1	2	2	0.63	25.2	0.38	0.31	0.30
6	2	2	2	1.24	25.2	0.74	0.55	0.47
6	3	2	2	1.82	25.2	1.11	0.83	0.74
6	4	2	2	2.45	25.2	1.54	1.15	1.03
6	5	2	2	3.62	25.2	2.45	1.78	1.58
6	1	3	2	0.63	35.2	0.42	0.28	0.26
6	2	3	2	1.24	35.2	0.80	0.56	0.50
6	3	3	2	1.82	35.2	1.21	0.87	0.78
6	4	3	2	2.41	35.2	1.63	1.19	1.07

	6	5	3	2	3.61	35.2	3.00	1.93	1.72	1.45
"Dynatest FWD"										
1	2	2	401	110	106	101	85	78	69	48
1	4	2	862	233	226	209	183	162	141	100
2	2	2	401	189	185	164	148	120	0	0
2	4	2	853	365	356	322	284	237	0	0
3	2	2	399	136	133	116	98	78	66	38
3	4	2	860	288	276	241	205	167	135	83
4	2	2	399	133	126	113	97	80	0	0
4	4	2	855	289	275	250	213	180	0	0
5	2	2	396	148	143	125	105	85	69	39
5	4	2	853	324	308	273	233	192	154	93
6	1	2	0	0	0	0	0	0	0	0
6	2	2	396	140	130	117	93	76	0	0
6	3	2	620	218	203	180	147	118	0	0
6	4	2	856	298	278	248	203	165	0	0

Appendix D - Statistical Overlay Design Program

The computer program contained in this chapter uses the regression equation discussed in chapter 4 to determine the required overlay thickness on a PC concrete or composite pavement. FORTRAN 77 is the language in which the program is written. It has been documented so that the user may easily investigate what function the various command sets are performing. Because the program is interactive, the user will find that using the program is very convenient once it has been compiled and is running.

The designer should have the following data readily available before attempting to use the program:

- + thickness in inches of any asphaltic concrete currently on the existing concrete pavement.
- + average daily trucks during the overlay design life.
- + design life of the overlay
- + present serviceability index (psi) desired at the end of the overlay's life.

Two major limitations are inherent in the design equation. First, the equation used in this program was derived from analysis of pavement sections in Indiana and, thus, may not be applicable to any other locations. Secondly, the upper and lower values for existing asphaltic concrete thickness, daily trucks during the overlay life, overlay

design life, and psi form bounds which should not be exceeded. Extrapolation past these values result in overlay thicknesses which have no reliable statistical basis.

c This interactive program reads input variables of
 c the pavement system and using regression equations
 c developed by Norman Pumphrey on pucc-SAS, computes
 c a design thickness for an overlay.

```
character*1 ch, file, more
character*15 name
real dailtrk, age, aspthk, psi
real overthik
real npsi, xpsi
integer change, j
```

c Write the introduction

```
do 1 j=1,22
  write(6,*)' '
1  continue
  write(6,3)' ASPHALT OVERLAY THICKNESS DESIGN CALCULATION'
  do 2 j=1,6
    write(6,*)' '
2  continue
4  continue
```

c The variable xpsi represents the mean value of all
 c data collected for FWD test sections in the summer
 c testing session. Any input psi is normalized by
 c this value.

```
xpsi=3.283
```

c Now write the input prompts and read in the input
 c data for the four variables

```
c
c --trucks/day, asphalt thickness,
c --design life of overlay, psi
c
c Also, check to see if each input is valid if not,
c then prompt again
```

```
write(6,*)' '
235 write(6,68)'Input present asphalt thickness in inches ...'
    read(5,*) aspthk
    if (aspthk.lt.0) then
      goto 235
    endif
```

```
write(6,*)' '
220 write(6,5)'Input predicted future trucks per day ...'
    read(5,*) dailtrk
    if (dailtrk.lt.0) then
      goto 220
```

```

endif

write(6,*)' '

240 write(6,5)'Input design life of overlay in years ...'
    read(5,*) age
    if (age.lt.0) then
        goto 240
    endif

write(6,*)' '
250 write(6,5)'Input terminal present serviceability index, '
    write(6,5)'PSI, at end of overlay life ... '
    read(5,*) psi

c Here, check that psi is within its defined range

    if ((psi.lt.0).or.(psi.gt.5)) then
        goto 250
    endif
    npsi=psi-xpsi

c Call the subroutine to determine overlay
c thickness. Coefficients were developed on SAS

270 call fsu9(dailtrk,aspthk,age,npsi,overthik)

c Print the original input values and the resulting
c thickness

write(6,*)' '
write(6,*)' '
write(6,84)'*****',
& '*****'
write(6,85)'          OUTPUT SUMMARY '
write(6,*)' '
write(6,90)'          Asp. Thickness.....',aspthk
write(6,90)'          Trucks/day.....',dailtrk
write(6,90)'          Design Life.....',age
write(6,90)'          PSI.....',psi
write(6,*)' '
write(6,99)' Estimated design overlay thickness (inches):'
& 'overthik
write(6,*)' '
write(6,84)'*****',
& '*****'

c Now ask if these results should be saved in a file
c If so, then prompt for the filename and then write
c the input values and output thickness to the file

```



```

write(6,*)' '
write(6,85)'Do you wish to file the results? (y/n) '
read(5,*) file
write(6,*)' '
if (file.eq.'y') then
  write(6,85)'Name of file...'
  read(5,*)name
  open (7,file=name,status='unknown')

  rewind 7
  write(7,71)name
  write(7,*)' '
  write(7,84)'*****',
&      '*****'
  write(7,85)'          OUTPUT SUMMARY '
  write(7,*)' '
  write(7,90)'          Asp. Thickness.....',aspthk
  write(7,90)'          Trucks/day.....',dailtrk
  write(7,90)'          Design Life.....',age
  write(7,90)'          PSI.....',psi
  write(7,*)' '
  write(7,99)' Estimated design overlay thickness (inches):',
&      overthik
  write(7,*)' '
  write(7,84)'*****',
&      '*****'
endif

```

c Here, the program asks if any of the input values
c should be changed The user selects the input to be
c changed from the menu and is then prompted for its
c new value. Then, he is asked again if he wishes
c to change another input, etc. this is achieved by
c the 'goto 301' statements. The changes are
c stopped by a '0' (or any input value not 1-4).
c The values of any inputs untouched are, unchanged
c from the original (or previously revised) values.
c Again, the program checks for validity of inputs,
c and if invalid, re-prompts for input.

```

write(6,85)'Do you wish to change any inputs? (y/n) '
read(5,*) ch
write(6,*)' '
if (ch.eq.'y') then
301  continue
    write(6,*)' '
    write(6,85)'Which input do you wish to change? '
    write(6,85)'If you wish to change more than one item,'
    write(6,85)'you will be prompted for each separately.'
    write(6,*)' '
    write(6,*)' 0 quit changes (value)'

```

```

write(6,103)^      1  Asp. Thick.  ^,aspthk
write(6,104)^      2  Trucks      ^,dailtrk
write(6,103)^      3  Pvt. Life   ^,age
write(6,103)^      4  PSI         ^,psi
write(6,*)^ -----^
write(6,*)^ ^
      read(5,*)change
      write(6,*)^ ^

      if (change.eq.1) then
340  write(6,5)^Input new asphalt thickness in inches ...^
      read(5,*) aspthk

      if (aspthk.lt.0) then
        goto 340
      endif
      goto 301
    endif

      if (change.eq.2) then
320  write(6,68)^Input new predicted future trucks per day
      read(5,*) dailtrk
      if (dailtrk.lt.0) then
        goto 320
      endif
      goto 301
    endif

      if (change.eq.3) then
350  write(6,68)^Input new design life of overlay in years
      read(5,*) age
      if (age.lt.0) then
        goto 350
      endif
      nage=age
      goto 301
    endif

      if (change.eq.4) then
360  write(6,9)^Input new terminal present serviceability
      &      ^index...^
      read(5,*) psi
      if ((psi.lt.0).or.(psi.gt.5)) then
        goto 360
      endif
      npsi=psi-xpsi
      goto 301
    endif

c If change does not equal 1-4 then above statements
c will be skipped. This exits the loop of asking

```

c for input changes and skips the terminate program
c statements.

goto 270

c If there are no changes to the input to be made,
c then ask if another problem should be run.

```

      else
        write(6,68)'Do you want to run another problem?
&          (y/n) ...'
        read(5,*)more

```

c If yes, then go to line 2 at the beginning of the
c program, otherwise terminate the program

```

      if (more.eq.'y') then
        write(6,*)'- '
        write(6,*)'- '
        write(6,*)'- '
        goto 4
      else
        write(6,*)'- '
        write(6,*)'- '
        write(6,*)'- '
        write(6,*)'- '
        write(6,*)'- '
        write(6,*)'- '
        stop
      endif
    endif

```

c Format statements

```

      3 format (a54)
      5 format (a41)
      8 format (a21)
      9 format (a42,a8)
     68 format (a45)
     69 format (a7,a3)
     71 format (a15)
     84 format (a41,a11)
     85 format (a40)
     90 format (a31,f7.1)
     99 format (a45,f6.2)
    103 format (a20,7x,f4.1)
    104 format (a20,4x,f7.1)
    105 format (a20,8x,i1)
    106 format (a20,7x,f4.2)

```

c End of program

end

c The following is the concrete overlay thickness
 c design subroutine. Again, age is actually design
 c life of the overlay. Tottrk, which represents
 c trucks per day is changed to (actual total
 c trucks/1000000) Npsi is psi normalized by the mean
 c value of all test data.

```

subroutine fsu9(dailtrk,aspthk,age,npsi,othik)
  real dailtrk,aspthk,age,npsi,othik
  real ntrk
  ntrk=((dailtrk*age*365)/1000000)
  othik=4.407-(0.4011*aspthk)+(1.0215*npsi)-
&      (0.08803*ntrk*npsi)-(1.7351*npsi*npsi)
  return
end

```

Appendix E - Additional Regression Models Considered - JRCP

A substantial number of variable combinations were considered when evaluating the best regression equation which could be used to determine overlay thickness requirements. Most of these combinations were rejected in the early stages of analysis (General Linear Model). However, those which showed particular promise (approximately 25) were investigated in more detail. A stepwise analysis was used, as described in Chapter 4, to choose the variables which were the most statistically efficient and appropriate in predicting this required overlay thickness. From this analysis, regression models were developed and analyzed for sensitivity of overlay thickness with change in values of the dependent variables.

Table E1 contains four equations which are typical of the models which were rejected for use as the statistical model in designing overlay thickness. Variable definitions may be found in Table 4.1 of Chapter 4.

The remaining discussion in this appendix focuses on each of these four equations and the problems associated with each. The criteria for evaluating each equation, discussed in detail in Chapter 4, are as follows:

1. Normality of overlay values

Table E1 Selected Regression Equations Which Were Rejected.

No.	Equation	R ²	Adj. R ²
E.1	OLAY = 3.352 - 0.524(NASPTHK) + 0.044(NCBR) - 0.078(NAGE) - 0.069(NCONAGE) - 0.0045(NCBR) ²	0.833	0.793
E.2	OLAY = 4.537 + 0.276(TOTTRK) - 0.421(ASPTHK) + 0.981(NPSI) ₂ - 0.090(TRKPSI) - 1.689(NPSI) ²	0.786	0.735
E.3	OLAY = 3.793 - 0.281(NCONTHK) - 0.445(NASPTHK) + 0.568(NPSI) ₂ - 0.0038(NTRKCBR) - 1.974(NPSI) ²	0.784	0.733
E.4	OLAY = 2.265 - 0.637(NASPTHK) + 0.0087(NAGESPD) + 0.131(NASPTHK) ²	0.751	0.719

NCONAGE = NCONTHK * NAGE

NCBR² = NCBR * NCBR

TRKPSI = TOTTRK * PSI

NPSI² = NPSI * NPSI

NTRKCBR = NTOTTRK * NCBR

NAGESPD = NAGE * NSPD

NASPTHK² = NASPTHK * NASPTHK

2. Value of Mallow's C_p
3. Correlation of independent variables (r_{ij})
4. Value of coefficient of multiple determination (R^2)
5. Trends in overlay thickness due to changes in independent variable (i.e., a higher value of total trucks should predict an increase in overlay thickness) and sensitivity of overlay thickness to change in independent variable.

Tables E2 through E5 contain the sensitivity studies for equations E.1 through E.4, respectively. To check the sensitivity of the overlay thickness to change in each independent variable, the value of each independent term was varied over a range while holding all other variables constant.

Note that the independent variable AGE is present in some form in equations E.1 and E.4 but is not specifically present in E.2 and E.3. Note also that the input Trk/day (trucks per day) is not present in any of the four equations. However, AGE and Trk/day are used in calculating TOTTRK and are thus indirectly present in the TOTTRK term of equation E.2 and in the NTRKCBR term of equation E.3. Therefore, each is varied in the sensitivity analyses for every equation to determine their effects on overlay thickness.

Three cases were investigated for each equation, and the results are reported in these tables.

Table E2 Sensitivity Analysis of Equation E.1.

<u>Case No. 1</u>		<u>Case No. 2</u>	
ASPTHK=4"	AGE=10 yrs	ASPTHK=0"	AGE=10 yrs
CBR=3%	CONTHK=10"	CBR=16%	CONTHK=8"
Predicted Thickness = 0.72"		Predicted Thickness = 4.27"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>	<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
ASPTHK=0"	2.81	ASPTHK=2"	3.23
ASPTHK=2"	1.76	ASPTHK=4"	2.18
ASPTHK=6"	-0.33	ASPTHK=6"	1.13
ASPTHK=8"	-1.38	ASPTHK=8"	0.08
CBR=16%	1.87	CBR=3%	3.12
CBR=30%	1.40	CBR=30%	3.81
AGE=5 yrs	1.79	AGE=5 yrs	4.66
AGE=15 yrs	-0.36	AGE=15 yrs	3.89
CONTHK=6"	1.34	CONTHK=6"	4.59
CONTHK=8"	1.03	CONTHK=10"	3.96
<u>Case No. 3</u>			
ASPTHK=4"	AGE=10 yrs		
CBR=30%	CONTHK=8"		
Predicted Thickness = 1.71"			
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>		
ASPTHK=0"	3.81		
ASPTHK=2"	2.76		
ASPTHK=6"	0.67		
ASPTHK=8"	-0.38		
CBR=3%	1.03		
CBR=16%	2.18		
AGE=5 yrs	2.10		
AGE=15 yrs	1.33		
CONTHK=6"	2.03		
CONTHK=10"	1.40		

Table E3 Sensitivity Analysis of Equation E.2.

<u>Case No. 1</u>		<u>Case No. 2</u>	
Trk/day=500	PSI=2.5	Trk/day=5000	PSI=2.5
ASPTHK=4"	AGE=10 yrs	ASPTHK=4"	AGE=10 yrs
Predicted Thickness = 1.14"		Predicted Thickness = 1.98"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>	<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
Trk/day=2500	1.51	Trk/day=500	1.14
Trk/day=5000	1.98	Trk/day=2500	1.51
ASPTHK=0"	2.83	ASPTHK=0"	3.66
ASPTHK=2"	1.98	ASPTHK=2"	2.82
ASPTHK=6"	0.30	ASPTHK=6"	1.14
ASPTHK=8"	-0.54	ASPTHK=8"	0.29
PSI=2.0	-1.01	PSI=2.0	0.56
PSI=3.0	2.45	PSI=3.0	2.55
AGE=5 yrs	1.09	AGE=5 yrs	1.51
AGE=15 yrs	1.19	AGE=15 yrs	2.44

Case No. 3

Trk/day=2500 PSI=2.0
ASPTHK=0" AGE=10 yrs

Predicted Thickness = 1.37"

<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
Trk/day=500	0.67
Trk/day=5000	2.25
ASPTHK=2"	0.53
ASPTHK=4"	-0.31
ASPTHK=6"	-1.15
ASPTHK=8"	-2.00
PSI=2.5	3.20
PSI=3.0	4.18
AGE=5 yrs	0.93
AGE=15 yrs	1.81

Table E4 Sensitivity Analysis of Equation E.3.

<u>Case No. 1</u>		<u>Case No. 2</u>	
CONTHK=8"	Trk/day=2500	CONTHK=10"	Trk/day=5000
ASPTHK=4"	CBR=16%	ASPTHK=0"	CBR=3%
PSI=2.5	AGE=10 yrs	PSI=2.5	AGE=10 yrs
Predicted Thickness = 1.26"		Predicted Thickness = 2.98"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>	<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
CONTHK=6"	1.83	CONTHK=6"	4.10
CONTHK=10"	0.70	CONTHK=8"	3.54
ASPTHK=0"	3.04	ASPTHK=2"	2.09
ASPTHK=2"	2.15	ASPTHK=4"	1.20
ASPTHK=6"	0.37	ASPTHK=6"	0.31
ASPTHK=8"	-0.52	ASPTHK=8"	-0.58
PSI=2.0	-1.06	PSI=2.0	0.65
PSI=3.0	2.60	PSI=3.0	4.32
Trk/day=500	1.31	Trk/day=500	2.26
Trk/day=5000	1.21	Trk/day=2500	2.58
CBR=3%	1.36	CBR=16%	2.43
CBR=30%	1.16	CBR=30%	1.84
AGE=5 yrs	1.29	AGE=5 yrs	2.58
AGE=15 yrs	1.24	AGE=15 yrs	3.37

Case No. 3

CONTHK=10" Trk/day=5000
 ASPTHK=6" CBR=30%
 PSI=2.5 AGE=10 yrs

Predicted Thickness = -0.83"

<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
CONTHK=6"	0.29
CONTHK=8"	-0.27
ASPTHK=0"	1.84
ASPTHK=2"	0.95
ASPTHK=4"	0.06
ASPTHK=8"	-1.72
PSI=2.0	-3.16
PSI=3.0	0.50
Trk/day=500	0.14
Trk/day=2500	-0.29
CBR=3%	0.31
CBR=16%	-0.24
AGE=5 yrs	-0.29
AGE=15 yrs	-1.37

Table E5 Sensitivity Analysis of Equation E.4.

<u>Case No. 1</u>		<u>Case No. 2</u>	
ASPTHK=0"	SPD=85%	ASPTHK=6"	SPD=70%
AGE=10 yrs		AGE=10 yrs	
Predicted Thickness = 4.51"		Predicted Thickness = 1.79"	
<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>	<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
ASPTHK=2"	2.68	ASPTHK=0"	4.13
ASPTHK=4"	1.90	ASPTHK=2"	2.30
ASPTHK=6"	2.17	ASPTHK=4"	1.52
ASPTHK=8"	3.49	ASPTHK=8"	3.10
AGE=5 yrs	3.86	AGE=5 yrs	1.79
AGE=15 yrs	5.16	AGE=15 yrs	1.78
SPD=55%	3.74	SPD=55%	1.41
SPD=70%	4.13	SPD=85%	2.17

Case No. 3

ASPTHK=4" SPD=55%
AGE=10 yrs

Predicted Thickness = 1.14"

<u>Sensitivity</u>	<u>New Thick- ness (in.)</u>
ASPTHK=0"	3.74
ASPTHK=2"	1.92
ASPTHK=6"	1.41
ASPTHK=8"	2.72
AGE=5 yrs	1.79
AGE=15 yrs	0.48
SPD=70%	1.52
SPD=85%	1.90

Equation E.1

Normality of overlay values. The Shapiro-Wilk test statistic (W) is calculated at 0.920. For a level of significance (α) of 0.05 and number of overlay values (n) of 30, $W(0.05, 30) = 0.927$. Therefore, since $0.920 < 0.927$, the data set does not meet the requirement for normality of the residuals.

Mallow's C_p . To eliminate undesirable bias in the regression equation, C_p should be approximately equal to the number of predictor terms (p) (independent variables and y-intercept coefficient) used to predict the value of the dependent variable (overlay thickness). In this case, $C_p = 3.64$ and $p = 6$, so the regression equation contains little bias.

Correlation of independent variables. Correlation coefficients which equal 1 or -1 indicate exact correlation between two variables. Therefore, by including both of the correlated terms in an equation, an effect on the dependent variable (overlay thickness) would essentially be "double counted". One of the terms would have to be removed or transformed for the equation to be considered valid. In this analysis, a correlation coefficient (r_{ij}) of ± 0.90 was set as the break point for the correlation test. Those values of r_{ij} algebraically greater than ± 0.90 were

considered unacceptable. No correlation coefficients (r_{ij}) in this equation are algebraically greater than ± 0.90 , according to the correlation matrix; thus, all terms can remain in the equation.

Coefficient of multiple determination. The $R^2 = 0.833$, and the adjusted $R^2 = 0.793$. These values are as high as most five variable equations that were investigated. In fact, a value of R^2 of 0.700 or greater indicates a good regression curve fit for the purposes of this analysis.

Trends and sensitivity. When considering the three cases for equation E.1, CBR ranging from 3% to 30% produces a peak reading for thickness in case 1 and a low reading in cases 2 and 3 for the middle CBR value (16%). The AGE variable range from 5 years to 15 years results in a 2.15" change in overlay thickness for case 1 and a 0.77" change in cases 2 and 3. Additionally, the trend of this change is the reverse of that which should be expected. As AGE increases, the predicted overlay thickness decreases when, in fact, it should increase. Finally, a range from 6" to 10" in CONTHK produces virtually no change (0.63") in the overlay thickness in all cases. The ASPTHK variable substantially and correctly affects the overlay thickness, producing a 4.19" change in all cases over a ASPTHK range of 0" to 8".

In summary, equation E.1 was rejected because 1) the overlay numbers are not normally distributed, 2) the overlay thickness is not very sensitive to the CONTHK variable change, 3) the AGE variable range produces a change in overlay thickness which is the reverse of what should be expected, and 4) the CBR variable causes a peak or valley reading at 16% for the three cases instead of showing a decrease in overlay thickness with increasing CBR.

Equation E.2

Normality of overlay values. The W test statistic is calculated at 0.940; $W(0.05, 27) = 0.923$. Since $0.940 > 0.923$, the residuals of the data set are considered normally distributed.

Mallow's C_p . Because $C_p = 6.00$ and $p = 6$, the regression equation contains little bias.

Correlation of independent variables. The terms TOTTRK and TRKPSI have a correlation coefficient of -0.98. Since $-0.98 < -0.90$, the terms are correlated and one would have to be transformed or removed from the equation. Equation 4.1 is the result of this transformation in which TRKPSI (= TOTTRK * PSI) was replaced by XTRKPSI (= TOTTRK * NPSI), and the correlation problem was eliminated.

Coefficient of multiple determination. The $R^2 = 0.786$ and the adjusted $R^2 = 0.735$. These values are acceptable.

Trends and sensitivity. The overlay thickness is significantly sensitive to all independent variables in the equation, and all changes in overlay thickness are in the appropriate direction for each variable. Trucks per day range from 500 to 5000 and cause a maximum of 1.58" thickness increase in case 3. ASPTHK range from 0" to 8", resulting in a 3.37" increase in all cases. PSI, varying from 2.0 to 3.0, increases the thickness of overlay 3.46" in case 1. Finally, the range of 5 years to 15 years in AGE increases the thickness by a maximum of 0.93" in case 2.

In summary, equation E.2 was rejected only because two of the independent variables are correlated.

Equation E.3

Normality of overlay values. The W test statistic is calculated at 0.980; $W(0.05, 27) = 0.923$. Since $0.980 > 0.923$, the residuals of the data set are considered normally distributed.

Mallow's C_p . Because $C_p = 65.07$ and $p = 6$, the regression equation contains substantial bias.

Correlation of independent variables. No correlation coefficient algebraically exceeds the limiting value of ± 0.90 . Therefore, no term is highly correlated with any of the other terms.

Coefficient of multiple determination. The $R^2 = 0.784$, and the adjusted $R^2 = 0.733$. These values are acceptable.

Trends and sensitivity. A range of 6" to 10" for CONTHK produces a change in overlay thickness of 1.12" in all cases, a range of 2.0 to 3.0 in PSI causes a difference of 3.66" for all three cases, and ASPTHK, which ranges from 0" to 8", produces a 3.56" in the overlay thickness for all three cases. The range of CBR from 3% to 30% produces a change in overlay thickness of only 0.20" in case 1 and a maximum of 1.24" in case 3. Each of these effects were in the correct direction.

The trk/day variable causes an incorrect decrease in overlay thickness in cases 1 and 3 as the variable increases. In case 3, the change in thickness is in the correct direction; however, the change is only 0.72". AGE causes an increase in thickness with increasing AGE in cases 2 and 3, but case 1 results in a slight 0.05" decrease in overlay thickness as AGE changes from 5 years to 15 years.

In summary, equation E.3 was rejected because 1) the regression equation is substantially biased according to Mallow's C_p , 2) the Trk/day variable causes an incorrect decrease in overlay thickness in two of three cases as it increases from 500 to 5000, 3) the change in the AGE variable causes essentially no overlay thickness change in one of the three cases.

Equation E.4

Normality of overlay values. The W test statistic is calculated at 0.957; $W(0.05, 27) = 0.923$. Since $0.957 > 0.923$, the residuals of the data set are considered normally distributed.

Mallow's C_p . Because $C_p = 20.82$ and $p = 4$, the regression equation contains substantial bias.

Correlation of independent variables. No correlation coefficient algebraically exceeds the limiting value of ± 0.90 . Therefore, no term is highly correlated with any of the other terms.

Coefficient of multiple determination. The $R^2 = 0.751$, and the adjusted $R^2 = 0.719$. These values are acceptable.

Trends and sensitivity. In all three cases, the ASPTHK variable causes a "valley" to be produced in overlay

thickness calculations as the ASPTHK increases from 0" to 8". This valley occurs at ASPTHK = 4" in all three cases. The AGE variable transitions from a correct increase in thickness of 1.30" in case 1, to no change in case 2, to an incorrect decrease in thickness of 1.31" in case 3 as the AGE increases from 5 to 15 years. Finally, in all cases, the SPD or stiffness variable produces a 0.76" decrease in overlay thickness as the SPD variable increases from 55% to 85%. This change is the opposite of what should be expected.

In summary, equation E.4 was rejected because 1) the regression equation is considered biased according to Mallow's C_p , 2) the ASPTHK variable produced first a decreasing then an increasing thickness with increasing ASPTHK, 3) the AGE variable produced a change in thickness which is reverse of that expected in one of three cases, and 4) the SPD variable predicted thicknesses that were reversed in all three cases.

Additional Considerations

All of the equations analyzed above, as well as equation 4.1 in Chapter 4, contain the independent variable ASPTHK. It is the term which is always added first in a stepwise regression regardless of the terms which accompany it in an analysis. ASPTHK immediately raises the R^2 to

0.65 when it is added to the regression equation for predicting overlay thickness.

Several attempts were made to develop a regression equation without considering the ASPTHK term. For equations containing a reasonable number of independent variables (5 or 6) for the number of data sets available, the R^2 ranged from 0.30 to 0.50. These attempts were abandoned when it became apparent that the equations being obtained would not be accurate predictors of overlay thickness.

Appendix F - Overlay Design Guide

This guide is written to help the pavement design engineer in selecting an asphaltic concrete (AC) overlay for portland cement concrete (PCC) or composite (AC over PCC) pavements.

First, background and type of data required for the overlay analysis will be discussed. Secondly, an empirical design procedure is demonstrated for jointed reinforced concrete (JRC) pavements. This procedure was developed from observations and measurements of test sections on Federal-aid interstate (FAI) and Federal-aid primary (FAP) highways in Indiana. Included in the design equation are terms that consider structural, performance, and traffic characteristics of pavement sections being considered for overlay.

Next, an empirical relationship developed from a small data set (7 pavements) for overlay design of CRC pavements is discussed. This equation is intended for general guidance only in determining the AC overlay requirements. Additional data is needed to reinforce this basic relationship.

Fourthly, structural design techniques described in the 1986 AASHTO Guide for Design of Pavement Structures are

discussed. A JRC pavement that has shown some signs of PCC structural failure (as in cracking or breaking of a PCC slab), causing the slab to act more like a "semi-rigid" or "flexible" pavement, can be analyzed using these methods. These techniques do not consider failure of other pavement layers nor do they include performance failure that is unrelated to the PCC structural failure. Similar analyses are applicable for distressed CRC pavements.

Next, two techniques are investigated for JRC overlays that consider the reduction in the rate of reflective cracking of underlying JRC pavement joints or cracks through the AC overlay.

Finally, an example problem is completed analyzing one of the JRC pavement sections tested in this study. The required overlay is calculated using the empirical and the AASHTO structural, reflective cracking, and break-and-seat overlay design techniques.

A word of caution is advisable before using this handbook exclusively for rehabilitation of existing PCC or composite pavements. Even though AC overlay is the most common of the PCC rehabilitation strategies in Indiana, others have shown promise in Indiana and around the country. The alternatives, depending on the distress type,

might include undersealing and grinding, installing underdrains, providing edge support, and local full-depth repairs, etc. Rigid overlays, bound or unbound, are also good possibilities. One of these alternatives might be a better rehabilitation method and could result in economic savings for the given situation.

In general, pavement overlay of any type (AC or PCC) for a PCC pavement should normally be the last alternative that is considered unless the pavement has completely lost its structural or functional integrity. At that point, overlaying or the complete removal and reconstruction from the subgrade up may be the only reasonable options available.

Background and Testing Information

Several assumptions are made before the procedures included here are applied:

1. A nondestructive deflection testing device is used to test the pavement site.
2. The site will be properly prepared for construction of the overlay to a somewhat constant level of readiness.
3. Proper construction methods and material specifications will be followed for the overlay.

The following information is required for preliminary analysis of the proposed overlay site. The site should be divided into relatively homogeneous design units. Data

should include layer thicknesses and types, construction history, subgrade type, and traffic. Much of this information may be obtained from the InDOT Program Development Division through its Road Life Record and traffic files.

If a PCC layer is present in the pavement system, then this guide is applicable. If not, refer to Appendix E of JHRP Report FHWA/IN/JHRP-87/9, "Development of an Overlay Design Procedure for Flexible Pavements in Indiana" by Jay K. Lindly and Thomas D. White, for the overlay design for flexible pavements.

Pavement Cross Section Data. Pavement cores and subgrade samples should be obtained to verify the pavement cross section layer types and thicknesses and the subgrade type and properties that were obtained from Road Life Records. At least two cores and subgrade samples should be taken per design unit and the average layer thicknesses calculated. If the design unit exceeds one mile, at least two samples should be taken per mile.

Undisturbed subgrade samples are preferred so that laboratory strength tests may be run, if desired. Pushing standard three-inch diameter, two-foot length shelby tubes into the subgrade through a pavement core hole is a satisfactory method for obtaining these samples. Particle

size distribution and Atterberg limit tests should be run so that classification by the AASHTO (AASHTO M145-82) or the Unified (ASTM D2487-85) soil classification systems may be determined. Strength estimates can be made, if desired, from these classifications using Figure F1 taken from the Portland Cement Association's "Thickness Design for Concrete Highway and Street Pavements" published in 1984. Also, a handy relationship mentioned in Yoder and Witzczak's Principles of Pavement Design textbook for converting CBR to resilient modulus (M_R) is

$$M_R \text{ in lb/in}^2 = 1500(\text{CBR}) \quad \text{F1}$$

The additional information obtained can also be used to refine or change the location of the design units.

If pavement cross section data are not available or are not reliable, an alternative is to use some type of pavement response variable, such as NDT deflection, to delineate the homogeneous design units. A plot similar to Figure F2 should be developed over the length of the project so that the design units may be readily identified.

Traffic Data. The InDOT Program Development Division can provide recent traffic information for all state highways. However, this information does not include data on traffic mix, a fact that presents a problem since truck traffic is responsible for most of the pavement damage. Figures F3 and F4 contain percent truck figures for FAI and

(1) For the basic idea, see O. J. Porter, "Foundations for Flexible Pavements," Highway Research Board *Proceedings of the Twenty-second Annual Meeting*, 1942, Vol. 22, pages 100-136.

(2) ASTM Designation D2487.

(3) "Classification of Highway Subgrade Materials," Highway Research Board *Proceedings of the Twenty-fifth Annual Meeting*, 1945, Vol. 25, pages 376-392.

(4) *Airport Paving*, U.S. Department of Commerce, Federal Aviation Agency, May 1948, pages 11-16. Estimated using values given in FAA *Design Manual for Airport Pavements* (Formerly used FAA Classification, Unified Classification now used).

(5) C. E. Warrens, "Correlation Between R Value and k Value," unpublished report, Portland Cement Association, Rocky Mountain-Northwest Region, October 1971 (best-fit correlation with correction for saturation).

(6) See T. A. Middlebrooks and G. E. Bertram, "Soil Tests for Design of Runway Pavements," Highway Research Board *Proceedings of the Twenty-second Annual Meeting*, 1942, Vol. 22, page 152.

(7) See item (6), page 184.

Figure F1 Approximate Interrelationships of Soil Classifications and Bearing Values.

Figure F2 Typical NDT Deflection Versus Distance Plot for a Pavement.

Figure F3 Percent Trucks -- Rural Primary Highways.

FAP highways by county which can be used if no more detailed input is available. This information was obtained from various truck count stations located on FAI and FAP highways around Indiana during the early 1980s.

Since no truck factors were calculated to convert the truck applications to 18-kip equivalent single axle loads (ESAL) at these individual stations, the 1985 statewide averages obtained from the InDOT Research Division were used:

- interstates: 0.85 18-kip ESAL per truck
- other highways: 0.55 18-kip ESAL per truck

If specific or more recent data are available, it should be used to convert truck traffic to 18-kip ESAL instead of the values shown above.

Design Unit Selection. Once this data is obtained, a plot like that shown in Figure F5 is used to determine these homogeneous design units by pavement type and cross section, subgrade type, construction history, and traffic.

NDT Testing. After the design units are set, nondestructive testing can begin. Although any NDT device for deflection testing can be used if user experience, historical data, and procedures have been developed, use of the falling weight deflectometer (FWD) is recommended.

Figure F5 Idealized Method for Analysis Unit Delineation.

Testing should ideally be performed during the spring thaw period. Deflections are usually the highest and subgrade strengths the lowest during this period, even in climates that are fairly mild. Figure F6 shows the seasonal variation of deflection readings at two distinctly different locations in the United States.

However, because this period usually lasts, at best, only several weeks, most locations will be tested at different times throughout the year. If possible, a pavement section that has been targeted for rehabilitation (particularly one chosen for an overlay) should be tested at various times during the year to determine the variation in subgrade strength. The AASHTO design guide recommends that an effective subgrade modulus for design be calculated at an overlay site using subgrade moduli values obtained or estimated for each month of the year. Figure F7 illustrates how this effective subgrade modulus is calculated based upon relative damage under traffic that occurs each month.

This regular testing also allows the investigation of the variation in strength properties of any visco-elastic (asphaltic concrete) layers that may be present in the pavement system.

Tests should be run in the outer (right) wheel path in

Figure F6 Effect of Geographic Location on Seasonal Deflection Variation.

Month	Roadbed Soil Modulus, M_R (psi)	Relative Damage u_f
Jan	20,000	0.01
Feb.	20,000	0.01
Mar	2,500	1.51
Apr	4,000	0.51
May	4,000	0.51
June	7,000	0.13
July	7,000	0.13
Aug.	7,000	0.13
Sept.	7,000	0.13
Oct .	7,000	0.13
Nov	4,000	0.51
Dec.	20,000	0.01
Summation: $\sum u_f =$		3.72

$$\text{Average: } \bar{u}_f = \frac{\sum u_f}{n} = \frac{3.72}{12} = 0.31$$

$$\text{Effective Roadbed Soil Resilient Modulus, } M_R \text{ (psi)} = \underline{5,000} \quad (\text{corresponds to } \bar{u}_f)$$

Figure F7 Estimating Effective Subgrade M_R .

the outside lane of traffic with an impact load of 9000 pounds (one wheel of an 18-kip single axle load). At a given site, the number of deflection sensors required should at least equal the number of different pavement layers present so that computerized layer modulus backcalculation techniques will be likely to converge to a solution. One of these sensors should be placed at the load center. Most current FWD devices contain seven sensors, which is generally more than sufficient.

The frequency of the tests on a particular design unit depends upon the possible variability of properties being tested, particularly the variability in the subgrade soil. A minimum of 10 test points should be run per design unit. Recommended spacing of the test points is 250 feet for nonvariable sections, such as level terrain with similar subgrade throughout, and 100 feet for highly variable sections, such as rolling terrain or areas of cut/fill transitions.

Finally, the deflection at the load center (the maximum deflection) may have to be adjusted to a standard pavement temperature if an AC surface layer is involved. This adjustment is required when using the AASHTO structural overlay design technique, but it should not be applied when using layer modulus backcalculation routines.

The AASHTO Design guide has suggested a technique using the pavement surface temperature at the time of testing and the 5-day mean air temperature (the average of the mean air temperatures for the five days preceding the testing). Enter Figure F8 with the sum of the pavement surface and the 5-day mean air temperatures, and find the pavement temperature at the middle of the AC layer. This value can be considered the average pavement temperature. Next, enter Figure F9 with this average value and, using curve G (PCC base), find the pavement adjustment factor. The deflection at load center is multiplied by this factor to obtain the standardized deflection.

Empirical Overlay Design -- JRC

The following overlay design procedure consists of two statistical regression equations developed for JRC pavements using test sections that are representative of the pavements on the FAI and FAP systems throughout the state. The first equation is primarily a structural equation, with the existing total AC overlay thickness being the factor that controls the required thickness of new overlay.

The equation used in this structural design procedure is

$$\text{OLAY} = 4.407 - 0.410(\text{ASPTHK}) + 1.021(\text{NPSI}) - 0.088(\text{XTRKPSI}) - 1.735(\text{NPSI})^2 \quad \text{F2}$$

Figure F8 Predicted Pavement Temperature.

Curve Identification

Base Material	Curve (Base Thickness)
Asphalt (Full Depth)	A (All Thicknesses)
Asphalt (Deep Strength)	B (4" of granular subbase) *
Portland Cement Concrete	G
Granular (Non Stabilized)	C(6"); D(12"); E(20"); F(25")
Cement Treated Base	
Sound	D(4"); E(8")
Cracked	C(4"); D(8")

(*) If more than 4" of granular material present use "Granular (Non-Stabilized)" base material category

Figure F9 Temperature Adjustment Factor for Deflections.

where OLAY = required thickness in inches of required AC overlay (experience has shown that minimum 3" overlay directly on concrete is required)

ASPTHK = total thickness in inches of AC currently on the PCC (before overlay)

NPSI = centered value of terminal present serviceability index (PSI) desired for the overlay (or $PSI - 3.283$)

XTRKPSI = two-factor interaction between 1) total trucks (TOTTRK) in millions that will pass over the new overlay during its lifetime and 2) NPSI (or $TOTTRK * NPSI$)

$$\text{where } TOTTRK = \frac{(\text{Trks per day})(365)(AGE)}{1,000,000}$$

AGE = age in years that the new overlay should last

$NPSI^2 = NPSI * NPSI$

Note that this equation is applicable only for the following variable ranges:

1. ASPTHK from 0" through 8"
2. PSI from 1.7 through 4.5
3. Trucks/day from 400 through 5000 (or TOTTRK from 0.15 through 25 million)
4. AGE from 0 through 15 years

The engineer should be aware that if this or any other statistical relationship is used outside of the independent variable range of values, then the model may not be applicable.

The required overlay thickness obtained from equation F2 is an average thickness; that is, the overlay value has a 50% "reliability." A 50% reliability means that the calculated overlay has a 50% chance of performing for the entire design period, or 50 out of 100 pavements will meet or exceed the design period with the calculated overlay

thickness and the remaining 50 will not. Obviously, most highways will require a much greater reliability than the 50% value. Thus, the following reliabilities can be achieved by adding the additional required thickness to the overlay calculated from equation F2.

Reliability (%):	99	95	90	80	70
Add'l Thickness (in.):	1.8	1.3	1.0	0.7	0.4

The second equation is more of a functional equation which excludes all pavement layer thickness terms which might be part of a structural analysis technique. The equation for the functional overlay design is

$$\text{OLAY} = 0.712 + 0.0118(\text{TOTTRK})^2 + 0.000153(\text{PCI})^2 + 0.00329(\text{AGE})^2 + 0.393(\text{TYPE}) \quad \text{F3}$$

where OLAY = required thickness in inches of AC overlay (experience has shown that a minimum 3" overlay directly on concrete is required)

TOTTRK = the total trucks in millions that will pass over the new overlay in its lifetime (see equation F2 for the formula for calculating total trucks)

PCI = pavement condition index

AGE = design lifetime in years of the proposed overlay

TYPE = type of pavement (1 = JRCP or composite JRCP, 0 = AC)

Like the structural equation, this functional equation is strictly applicable only in the range of data upon which the model was developed:

1. Trk/day - 100 through 3000 (or TOTTRK from 0.15 million through 11 million)

2. PCI - 29 through 100
3. AGE - 0 through 15 years
4. TYPE - For JRC or JRC composite pavements, TYPE = 1.

The reliability concept must also be considered in this equation, since this formula is used to calculate the average or 50th percentile overlay thickness. To achieve higher reliabilities, use the table below to find the additional AC thickness to be added to that calculated from equation F3.

Reliability (%):	99	95	90	80	70
Add'l Thickness (in.):	3.0	2.1	1.7	1.1	0.7

Finally, the design engineer must have a tool to aid him in deciding which of the two empirical equations is applicable for a given situation. A chart was devised, based upon stress at the bottom of the PCC under a given surface load, to help the designer in making this decision. This chart is shown in Figure F10. To use this chart, the designer enters with the PCC thickness, the AC total overlay thickness, and the subgrade strength. If the AC versus PCC thickness plots above and to the right of the curve representing a particular subgrade strength, the functional equation should be used. Otherwise, the structural equation is appropriate.

Figure F10 Determining Applicable Empirical Model.

Empirical Overlay Design -- CRCP

The CRC pavement model is stated as

$$\text{OLAY} = -0.0138 + 1.264(\text{PSI}) + 0.0677(\text{CBR}) \quad \text{F4}$$

where OLAY = required thickness in inches of AC overlay (experience has shown that a minimum 3" overlay directly on concrete is required)

PSI = terminal present serviceability index

CBR = estimated California Bearing Ratio of subgrade in %

The ranges of independent variables over which equation F4 is applicable are

1. PSI - 2.8 through 3.9
2. CBR - 5% through 14%

Note that these ranges are relatively narrow and do not include all possible reasonable values for PSI and CBR. This situation occurs because of the small number of data points that were used to develop equation F4. Their range of values were very limited, thus causing the range of applicability for equation F4 to also be small. It should be used with caution to predict overlay thicknesses using variable values that are outside of these ranges.

Finally, to achieve additional reliability for the overlay calculated from equation F4, the following additional AC thicknesses should be added to the calculated thickness from F4.

Reliability (%):	99	95	90	80	70
Add'l Thickness (in.):	2.8	2.0	1.5	1.0	0.6

AASHTO Structural Overlay Analysis

As mentioned earlier, a PCC pavement that has shown signs of structural failure in the form of slab cracking tends to act as a "semi-rigid" pavement, with characteristics approaching those of a flexible pavement. Thus, a PCC pavement can often be analyzed for AC overlay using the flexible pavement technique. This technique uses structural number (SN) as a measure of the structural capacity of the pavement.

First, the effective structural number (SN_{xeff}) of the existing pavement is determined using NDT deflections. Next, the SN required to carry the total 18-kip ESALs applied during the overlay design period is calculated. This value is called the future overlay structural number (SN_y). Finally, the remaining life factor (F_{RL}) is determined. These three terms are used in the following equation to find the structural number of the AC overlay (SN_{ol}):

$$SN_{ol} = SN_y - F_{RL} SN_{\text{xeff}} \quad F5$$

Before proceeding with this technique, the pavement design engineer should have divided the proposed project into design units (Step 1) and should have obtained traffic information (Step 2), as was discussed previously in this

manual. If this information has been obtained, the engineer may proceed with the remaining five steps:

1. Materials and Environmental Study
2. Future Overlay Structural Capacity Analysis
3. Remaining Life Investigation
4. Overlay Structural Number Calculation
5. Overlay Thickness Determination

Each of these steps will be discussed in detail in the remainder of this section.

Step 3 - Materials and Environmental Study. In this step, the pavement strength properties are obtained from the NDT deflection and load information. There are two methods for determining these strength properties. NDT Method 1 uses NDT load and sensor deflections and a computerized backcalculation routine based upon elastic layer theory to calculate the moduli of the individual layers in the pavement. There are several programs that can be used for this step, but often the calculated moduli for the various layers are unreasonable or highly variable, particularly the values obtained for the surface layer. The subgrade moduli, however, are usually reasonable and can be used with some confidence in the strength analysis of a pavement structure. Therefore, until these backcalculation routines are refined further, they should not be used except to determine the subgrade strength.

NDT Method 2 is used to determine the subgrade strength and a composite pavement strength. The subgrade modulus is calculated using a load and a pavement deflection which is far enough away from the load so that the strength of the layers overlying the subgrade do not affect the deflection (i.e., all of the deflection measured by the sensor is due only to subgrade deflection). This technique is not usually viable because the stiffness of a cracked or broken PCC pavement is often high enough so that the distance from the load to the necessary deflection may be several hundred inches before these overlying layer effects are eliminated. An effective structural number (SN_{xeff}), which is a composite strength value for all layers above the subgrade, is then obtained using a load and the pavement deflection at the center of that load (i.e., the maximum deflection).

Because each of these NDT methods have inherent problems, a "hybrid" of the two methods must be used to obtain the information that is required in the AASHTO overlay design technique. The subgrade modulus for the pavement design unit is obtained from NDT Method 1 using a backcalculation technique of the design engineer's choice. The effective structural number (SN_{xeff}) may be calculated by iteratively using equations F6 and F7.

$$F_b = \left[1 + \frac{36161.5 \text{ SN}_{\text{xeff}}^2}{a_c^2 E_{\text{RS}}^{2/3}} \right]^{-1/2} \quad \text{F6}$$

where F_b = Boussinesq's one layer deflection factor

SN_{xeff} = effective pavement structural number

a_c = radius of the loading plate

E_{RS} = modulus of the subgrade (roadbed) soil = M_R

$$d_o = \left[\frac{2 P (0.0043 h_t)^3}{3.1416 a_c \text{ SN}_{\text{xeff}}} \right] \left[1 + F_b \left[\frac{\text{SN}_{\text{xeff}}^3 (1 - \mu_{\text{RS}}^2)}{E_{\text{RS}} (0.0043 h_t)^3} - 1 \right] \right] \quad \text{F7}$$

where d_o = maximum NDT deflection under P load

P = dynamic load applied by NDT device

h_t = total pavement thickness above subgrade

μ_{RS} = Poisson's ratio of subgrade (assumed = 0.5)

a_c , SN_{xeff} , F_b , and E_{RS} are previously defined

The following steps should be followed when using the equations above:

1. Enter equation F6 with a_c (known), E_{RS} (known from backcalculation procedure), and a first guess for SN_{xeff} , and calculate F_b .
2. Enter equation F7 with the same a_c , E_{RS} , and SN_{xeff} as in Step 1. Also, enter equation F7 with the values for P, h_t , and μ_{RS} , and calculate d_o . This d_o is the theoretical maximum deflection that would be obtained if the pavement tested had the SN_{xeff} that was assumed

in Step 1.

3. Compare the d_o from Step 2 with the actual d_o from the test data for the section. If the actual d_o is greater than the calculated d_o , assume a lower SN_{xeff} , and go back to Step 1. If the actual d_o is less, assume a higher SN_{xeff} and go back to Step 1.
4. If the deflection values are the same, the value of SN_{xeff} has been determined correctly.

Alternatively, the design engineer can use the computer program at the end of this manual. This program uses equations F6 and F7 to calculate the SN_{xeff} to the nearest 0.01. An input file must be created in which the first line must be the number of SN_{xeff} calculations that are to be made. This should also be the number of lines which are to follow in the input file. Subsequent lines should contain the following information in the order shown with a space between each item:

1. one-word title (usually section number)
2. modulus of subgrade soil (psi)
3. Poisson's ratio of subgrade soil (assume = 0.5)
4. thickness of pavement above the subgrade (in.)
5. total NDT load (lb.)
6. temperature-corrected maximum deflection (mils/1000 lb.)

Once the subgrade modulus at the time of testing has been found, the procedure for determining the effective

subgrade modulus, described previously in the Background and Testing Information section, can be used.

Step 4 - Future Overlay Structural Capacity Analysis.

The future overlay structural number SN_y may be calculated using the following steps:

1. Obtain the design 18-kip ESALs determined previously for the design period.
2. Use an appropriate reliability value from Table F1 for the facility being overlaid. Although greater reliability might sometimes be required, values of 95% for both urban and rural interstates and 90% for both urban and rural primary highways are acceptable.
3. Use a standard deviation of 0.35 for flexible overlays since this was the average performance prediction error of the flexible pavements for the AASHTO Road Test. The AASHTO Design Guide is not clear as to whether the standard deviation is affected by overlay type or original pavement type. However, in this structural analysis, recall that the PCC pavement is assumed to be sufficiently deteriorated so that the flexible overlay design technique can be used.
4. Determine the effective resilient modulus of the subgrade using methods described in the last section.

Table F1 Suggested Levels of Reliability.

Functional Classification	Recommended Level of Reliability	
	Urban	Rural
Interstate and other freeways	85 - 99.9	80 - 99.9
Principal Arterials	80 - 99	75 - 95
Collectors	80 - 95	75 - 95
Local	50 - 80	50 - 80

Note: Results based on a survey of the AASHTO Pavement Design Task Force

5. Obtain the initial (p_o) and terminal (p_t) serviceabilities for the overlay. Generally, a initial value of 4.2 is used for new flexible pavements. This is the average value obtained for all flexible pavements during the AASHO Road Test. A terminal value of 2.5 is recommended for major (high traffic volume) facilities and 2.0 for minor facilities.
6. Find the SN_y using the above inputs and the nomograph shown in Figure F11.

Step 5 - Remaining Life Investigation. The remaining life factor (F_{RL}) may be calculated as follows:

1. First, determine the remaining life prior to the overlay (R_{Lx}) using both the NDT and the Visual Condition Survey approaches. Choose the lower value of R_{Lx} (lower remaining life) to use in the remainder of the design procedure.

- a. NDT approach. First, calculate the initial structural number (SN_o) of the existing pavement assuming that the existing pavement is new using

- i. $a_{base} = 0.14$ (from InDOT)
- ii. $a_{AC} = 0.34$ (from InDOT)
- iii. $a_{PCC} = 1.00$

(Note that it was assumed that the structural

Figure F11 Design Chart for Determining SN_y .

number of each inch of PCC is 1.00 when the PCC is at its peak strength. This estimate is likely conservative, since E_{AC} is about 300,000 psi in asphaltic concrete at 70°F and E_{PCC} is about 3,000,000 psi for normal strength concrete, reflecting a 10-fold difference in modulus. The a_{PCC} of 1.00 for concrete versus the a_{AC} of 0.34 for asphaltic concrete represents only a 3-fold difference in relative strength instead of the 10-fold modulus difference.) Next, calculate the pavement condition factor (C_x) as

$$C_x = \frac{SN_{xeff}}{SN_o} \quad F8$$

where all terms have been previously defined. (SN_{xeff} was calculated in the "Materials and Environmental Study" section.) Finally, enter Figure F12 with C_x to obtain R_{Lx} .

- b. Visual Condition Survey Approach. Conduct a visual condition survey using an appropriate procedure approved by the InDOT, if available. Enter Table F2 to find the C_x using the available description that most accurately describes the condition of the pavement section. Note that provisions have been made to calculate the C_x value using the visual condition factor C_v of

Figure Fl2 Remaining Life Estimate from Pavement Condition.

Table F2 Visual and Structural Condition Values.

Layer Type	Pavement Condition	C _v Visual Condition Factor Range	C _s Struct. Cond Factor Value
Asphaltic	1. Asphalt layers that are sound, stable, uncracked and have little to no deformation in the wheel paths	0.9-1.0	95
	2. Asphalt layers that exhibit some intermittent cracking with slight to moderate wheel path deformation but are still stable.	0.7-0.9	85
	3. Asphalt layers that exhibit some moderate to high cracking, have ravelling or aggregate degradation and show moderate to high deformations in wheel path	0.5-0.7	70
	4. Asphalt layers that show very heavy (extensive) cracking, considerable ravelling or degradation and very appreciable wheel path deformations	0.3-0.5	60
PCC	1. PCC pavement that is uncracked, stable and under-sealed, exhibiting no evidence of pumping	0.9-1.0	95
	2. PCC pavement that is stable and undersealed but shows some initial cracking (with tight, non working cracks) and no evidence of pumping	0.7-0.9	85
	3. PCC pavement that is appreciably cracked or faulted with signs of progressive crack deterioration: slab fragments may range in size from 1 to 4 sq.yds., pumping may be present	0.5-0.7	70
	4. PCC pavement that is very badly cracked or shattered into fragments 2-3 ft. in maximum size	0.3-0.5	60
Pozzolanic Base/ Subbase	1. Chemically stabilized bases (CTB, LCF...) that are relatively crack free, stable and show no evidence of pumping	0.9-1.0	95
	2. Chemically stabilized bases (CTB, LCF...) that have developed very strong pattern or fatigue cracking, with wide and working cracks that are progressive in nature: evidence of pumping or other causes of instability may be present	0.3-0.5	60
Granular Base/ Subbase	1. Unbound granular layers showing no evidence of shear or densification distress, reasonably identical physical properties as when constructed and existing at the same "normal" moisture-density conditions as when constructed	0.9-1.0	95
	2. Visible evidence of significant distress within layers (shear or densification), aggregate properties have changed significantly due to abrasion, intrusion of fines from subgrade or pumping, and/or significant change in in situ moisture caused by surface infiltration or other sources	0.3-0.5	60

Special Notes:

1. The visual condition factor, C_v, is related to the structural condition factor, C_s, by

$$C_v = C_s^2$$

2. The structural condition factor, C_s, and not the C_v value, is the variable used in the structural overlay design equation for a overlay-existing pavement types). It is defined by:

$$SC_{eff} = C_s SC_o$$

each of the pavement layers using the equation

$$C_x = \frac{h_1 C_{v1} + h_2 C_{v2} + \dots + h_n C_{vn}}{h_1 + h_2 + \dots + h_n} \quad F9$$

Realistically, however, the surface layer is commonly the only one that will be evaluated since it will be the only one visible, so the C_x is normally determined directly from Table F2. Finally, using this C_x value, enter Figure F12 to obtain R_{Lx} .

2. Find the remaining life factor of the newly overlaid pavement system (R_{Ly}). First, obtain the design 18-kip ESAL value (y) determined previously. Next, determine the number of repetitions (N_{fy}) that would have to be applied to the pavement to cause failure. Failure is defined as the reduction in PSI from the original 4.2 value to a value of 2.0, for a ΔPSI of 2.2 ($\Delta PSI = 4.2 - 2.0$). To obtain this N_{fy}
 - a. re-enter Figure F11 with the same reliability and standard deviation as were used in Step 4, and find the corresponding point on the left turning line;
 - b. re-enter Figure F11 with the SN_y and M_R from Step 4 and the ΔPSI of 2.2; then work backwards from the structural number to find a point on the

turning line just to the right of the 18-kip ESAL line; and

- c. connect the points found in a and b. The point where this line crosses the ESAL scale is N_{fy} .

To find R_{Ly} use the equation

$$R_{Ly} = \frac{N_{fy} - y}{N_{fy}} \quad F10$$

3. Enter Figure F13 with the R_{Lx} and R_{Ly} values found above to find the remaining life factor F_{RL} .

Step 6 - Overlay Structural Number Calculation.

Calculate the structural number of the overlay (SN_{ol}) using equation F5.

Step 7 - Overlay Thickness Calculation. Obtain the

thickness of the required overlay (h_{ol}):

$$h_{ol} = \frac{SN_{ol}}{a_{AC}} \quad F11$$

where a_{AC} is the layer coefficient of the AC to be used in the overlay. The InDOT has a listing of layer coefficients typically used for its various mix designs. Note that if SN_{ol} is zero or negative, the pavement is structurally sound to support the projected traffic, and the overlay required, if any, will be due to performance deficiencies or reflective cracking problems.

Figure F13 - Remaining Life Factor.

AASHTO Reflective Cracking Design

The AASHTO Design Guide recognizes the possibility that reflective cracking of PCC pavement joints may be the controlling factor in the design of an AC overlay. Thus, several techniques are suggested for designing the AC overlay to reduce or eliminate the potential for reflective cracking. Two of these techniques are discussed in this section.

Thick Overlay Approach. This procedure is strictly empirical and is based upon experience of various highway agencies throughout the country.

1. Enter Table F3, find the location of the city closest to the site of the overlay project, and obtain the maximum annual temperature differential. If the overlay project site is between two of the locations on the map, take the average of the two temperature differentials.
2. Obtain the existing PCC slab length (distance between joints) for the pavement to be overlaid.
3. Find the minimum AC overlay thickness from Table F4 using the input from steps 1 and 2. This is the thickness that has shown promise in controlling reflective cracking at locations throughout the United

Table F3 Maximum Annual Temperature Differential ($^{\circ}\text{F}$).

State	City	Temp. Diff.	State	City	Temp. Diff.
Ala	Mobile	49	Nev	Reno	73
Alaska	Juneau	46	N.H.	Concord	73
Ariz	Phoenix	67	N.J.	Atlantic City	61
Ark	Little Rock	64	N.Mex	Albuquerque	69
Calif	Los Angeles	30	N.Y.	Albany	71
	Sacramento	56		Buffalo	62
	San Francisco	32		New York	59
Colo	Denver	71	N.C.	Charlotte	56
Conn	Hartford	68		Raleigh	58
Del	Wilmington	62	N.Dak	Bismark	87
D.C.	Washington	61	Ohio	Cincinnati	64
Fla	Jacksonville	46		Cleveland	61
	Miami	31		Columbus	64
Ga	Atlanta	53	Okla	Okla City	67
Hawaii	Honolulu	22	Oreg	Portland	47
Idaho	Boise	69	Pa	Philadelphia	62
Ill	Chicago	68		Pittsburgh	62
	Peoria	70	R.I.	Providence	61
Ind	Indianapolis	66	S.C.	Columbia	58
Iowa	Des Moines	74	S.Dak	Sioux Falls	81
Kans	Wichita	71	Tenn	Memphis	60
Ky	Louisville	63		Nashville	61
La	New Orleans	47	Tex	Dallas-Fort Worth	62
Maine	Portland	67		El Paso	64
Md	Baltimore	62		Houston	53
Mass	Boston	59	Utah	Salt Lake City	74
Mich	Detroit	64	Vt	Burlington	73
	Sault Ste Marie	69	Va	Norfolk	54
Minn	Duluth	77		Richmond	61
	Minn - St. Paul	79	Wash	Seattle-Tacoma	42
Miss	Jackson	57		Spokane	65
Mo	Kansas City	69	W.Va	Charleston	60
	St. Louis	66	Wis	Milwaukee	69
Mont	Great Falls	72	Wyo	Cheyenne	69
Nebr	Omaha	76	P.R.	San Juan	19

Special Note: Data obtained from The Asphalt Institute MS-17 Manual

Table F4 Minimum AC Overlay Thickness for PCC Pavements.

Existing PCC Slab Length (ft)	h _{ol} (min - inches) Maximum Annual Temperature Differential (°F)					
	30	40	50	60	70	80
10	4	4	4	4	4	4
15	4	4	4	4	4	4
20	4	4	4	4	5	5.5
25	4	4	4	5	6	7
30	4	4	5	6	7	8
35	4	4.5	6	7	8.5	*
40	4	5.5	7	8	*	*
45	4.5	6	7.5	9	*	*
50	5	7	8.5	*	*	*
60	6	8	*	*	*	*

*Alternate other than thickness of AC overlay should definitely be considered to minimize reflective cracking.

Note: Data taken from Asphalt Institute MS-17 Manual.

States.

Break and Seat Approach. Applicable to Jointed PCC, the break and seat approach to reducing reflective cracking is based upon the fact that smaller underlying concrete pieces (2' to 3.5' square) will not produce large temperature-induced stresses in the AC overlay. Thus, the tensile strength of the AC will not be exceeded, and a reflective crack will not form. The general equation for determining the required structural number for the overlay (SN_{ol}) is

$$SN_{ol} = SN_y - 0.7 (0.4D_o + SN_{xeff-rp}) \quad F12$$

where SN_{ol} & SN_y are previously defined

D_o = original thickness of PCC in inches

$SN_{xeff-rp}$ = structural number of all layers present excluding the PCC

This equation is a special form of equation F5. In this special case, the F_{RL} value from equation F5 is 0.7 because the broken pavement has been transformed into a common state of damage with nominal slab sizes assumed to range from 24" to 42".

SN_{xeff} from equation F5 now consists of two parts. The first part contains the contribution of the broken PCC pavement to the overlaid pavement structure. For purposes of design, the broken concrete is assumed to have a structural number contribution of $0.4D_o$ for a nominal

fragment size of 30". The second part consists of the contribution to the overlaid pavement structure of all other pavement layers present in the existing pavement above the subgrade. Generally, this will only consist of any subbase below the PCC, if present. Any previous AC layers placed on the PCC should be removed since they would essentially be destroyed in the breaking and seating operations. This discarded AC material may be considered for use in a recycled AC overlay of the PCC.

The following steps should be followed when using this procedure:

1. Determine SN_y using the same procedure found in Step 4 of the AASHTO Normal Structural Overlay Analysis.
2. Find D_o from the pavement cross section data obtained from the pavement cores.
3. $SN_{\text{xeff-rp}}$ may be found using one of two techniques. The individual layer moduli may be backcalculated in the first technique from NDT data taken before the breaking of the PCC pavement layer. The layer moduli can then be used to obtain structural layer coefficients from Figures F14 through F18. The $SN_{\text{xeff-rp}}$ may then be calculated by the equation

Figure F14 Dense-graded AC Layer Coefficient.

- (1) Scale derived by averaging correlations obtained from Illinois.
- (2) Scale derived by averaging correlations obtained from California, New Mexico and Wyoming.
- (3) Scale derived by averaging correlations obtained from Texas
- (4) Scale derived on NCHRP project (3).

Figure F15 Granular Base Layer Coefficient.

- (1) Scale derived from correlations from Illinois.
- (2) Scale derived from correlations obtained from The Asphalt Institute, California, New Mexico and Wyoming.
- (3) Scale derived from correlations obtained from Texas.
- (4) Scale derived on NCHRP project (3).

Figure F16 Granular Subbase Layer Coefficient.

(1) Scale derived by averaging correlations from Illinois, Louisiana and Texas.

(2) Scale derived on NCHRP project 131.

Figure F17 Cement-treated Base Layer Coefficient.

(1) Scale derived by correlation obtained from Illinois.

(2) Scale derived on NCHRP project (3).

Figure F18 Bituminous-treated Base Layer Coefficient.

$$SN_{\text{xeff-rp}} = a_1 D_1 + a_2 D_{\text{sub2}} + \dots + a_n D_n \quad \text{F13}$$

where a_i = structural layer coefficient
of the i th layer (excludes PCC layer)

D_i = layer thickness in inches
of the i th layer (excludes PCC layer)

However, the values obtained for the layers above the subgrade are often suspect using backcalculation methods that are currently available. Instead, a second technique is used where it can be assumed that a layer loses half of its strength during the life of the layer. For example, the InDOT assigns a value of 0.14 as the structural layer coefficient for a new granular subbase; it will be given a value of 0.07 to use when calculating the effective structural number of the pavement after it has reached its anticipated design life.

4. Use equation F12 to calculate SN_{01} .
5. Calculate the required overlay thickness (h_{01}) using equation F11. (See Step 7 in the AASHTO Normal Structural Overlay Analysis procedure.)

If the SN_{01} value is zero or negative (an unlikely occurrence), the pavement is structurally sound to carry the proposed traffic even after the PCC is broken. However, a minimum thickness overlay will

have to be placed for proper performance.

Example Problem

A pavement section with the following characteristics is being considered for overlay:

1. Location is on primary, non-interstate facility near Newport, IN
2. Cross section (from pavement cores and subgrade borings):
 - + existing AC overlay = 3.7"
 - + PCC = 8.2"
 - + granular subbase = 7.5"
 - + Subgrade = high plasticity clay
3. PCC slab length = 20 feet Trucks per day = 910
4. 5-day mean air temperature = 66°F
5. Average pavement surface temperature = 78°F
6. FWD deflection testing (performed once in summer):
 - + FWD load = 13.54 kips (85th percentile based on 6 test sites on the pavement section)
 - + Sensor 0 (at load center) deflection = 16.465 mils
 - + FWD loading plate radius = 5.91"
 - + Visual condition survey (Figure F19)

Find the required overlay for this pavement section if a terminal serviceability of 2.5 or a terminal PCI of 35 at the end of a 10-year design period is desired. Use 1) the empirical overlay, 2) the AASHTO normal structural overlay,

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION C-4
 DATE 8/13/86 SAMPLE UNIT _____
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types						SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	8	10	7	15	12	
QUANTITY & SEVERITY	11M	11L (Trans) 140M		2x140L	8x140	
	11L	39L/1m				
	11M	140L/1m				
	11M					
	11L					
	11M					
	11M					
	11M					
TOTAL SEVERITY	L	22	190		280	1120
	M	66		140		
	H					
PCI CALCULATION						
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <div style="text-align: center; border-bottom: 3px double black;">41</div> RATING = <u>FAIR</u>		
8	1.4	L	3			
8	4.3	M	21			
10	12.3	L	18			
7	9.1	M	23			
15	18.2	L	23			
12	72.7	L	16			
n= 5	TOTAL DEDUCT VALUE		114			
CORRECTED DEDUCT VALUE (CDV)			59			

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

Figure F19 Condition Survey for Example Problem.

3) the AASHTO reflective cracking thick overlay, and 4) the AASHTO reflective cracking break and seat design methods.

Empirical Overlay Design. Enter Figure F10 with existing PCC thickness of 8.2", existing AC thickness on PCC of 3.7", and a subgrade CBR of 3% using Figure F1 and the knowledge that the subgrade is a high plasticity clay (CH). Using equation F1,

$$M_R = 1500(3) = 4500 \text{ lb/in}^2$$

The plot in Figure F10 is above the interpolated $M_R = 4500$ psi line. Therefore, the functional design equation F3 is applicable.

The design inputs into equation F3 are

1. $TOTTRK = \frac{(910)(365)(10)}{(1,000,000)} = 3.322$
2. $PCI = 35$
3. $AGE = 10$

Using the functional equation,

$$\begin{aligned} OLAY = & 0.712 + 0.0118(3.322)^2 + 0.000153(35)^2 \\ & + 0.00329(10)^2 + 0.393(1) \end{aligned}$$

Results: $OLAY = 1.75"$ at a 50% reliability

$OLAY = 1.75 + 1.7 = 3.45"$ at a 90% reliability
(Note: see reliability table in "Empirical Overlay Design" section)

AASHTO Structural Overlay Design. Following are the steps required to determine the necessary AC overlay using the normal structural approach (equation F5):

1. Calculate the design 18-kip ESALs to be applied to the new overlay during the design period. Zero traffic growth is assumed in this example, but 1% to 2% per year growth rate might be more reasonable in many cases.

Result: $910 \text{ trks/day} \times 365 \text{ days/yr} \times 10 \text{ yr}$
 $\times 0.55 \text{ ESAL/truck} = 1.827 \text{ million ESAL}$

2. Find the mean temperature of the existing AC overlay (if present) using Figure F8. Average the pavement temperatures at 1" depth, mid-depth, and bottom of the AC overlay.

Result: mean AC temperature = 79°F

3. Find the temperature adjustment factor using Figure F9 assuming a PCC base. This factor is used to adjust the pavement deflection to a 70°F mean AC pavement temperature.

Result: adjustment factor = 0.97

4. Calculate the corrected pavement deflection value at the center of the load.

Result: $0.97(16.465 \text{ mils}) = 15.971 \text{ mils}$

5. Standardize this adjusted deflection to deflection per 1000 lb. of load. This is done so that this pavement may be easily compared to other pavements loaded with a slightly different FWD load.

Result: $(15.971)/(13.54) = 1.180 \text{ mils or } 0.00118 \text{ in.}$

6. Determine the subgrade resilient modulus (M_R) using NDT method 1. The BISAR backcalculation program obtained from the U.S. Army Corps of Engineers was used in this example.

Result: $M_R = 5000 \text{ psi}$

7. Determine the SN_{eff} for all layers above the subgrade using equations F6 and F7 and a trial-and-error approach or using equations F6 and F7 in the computer

program listed at the end of this appendix. Inputs to this step are

- $P = 1000 \text{ lb.}$
- $h_t = 3.7" + 8.2" + 7.5" = 19.4"$
- $a_c = 5.91"$
- $\mu_{RS} = 0.5$
- $E_{RS} = M_R \text{ of subgrade} = 5000 \text{ psi}$
- actual d_o (adjusted) = 0.00118"

Result: $SN_{xeff} = 8.05$

8. Obtain SN_y using Figure F11 and the following inputs:

- Reliability = 0.90 (see Table F1)
- Overall standard deviation = 0.35
- Design ESAL = 1.827 million
- M_R of subgrade = 5000 psi
- $\Delta PSI = 4.2 - 2.5 = 1.7$

Result: $SN_y = 4.4$

9. Determine the remaining life of the existing pavement prior to overlay (R_{Lx}) using the NDT approach.

a. Find SN_o assuming

- $a_{PCC} = 1.00$
- $a_{AC} = 0.34$
- $a_{base} = 0.14$

$$SN_o = 3.7"(0.34) + 8.2"(1.00) + 7.5"(0.14)$$

$$SN_o = 10.50$$

b. Calculate C_x using equation F8.

$$C_x = 8.05/10.50 = 0.767$$

c. Determine R_{Lx} from Figure F12.

Result: $R_{Lx} = 22\%$

10. Determine the remaining life of the existing pavement prior to overlay (R_{Lx}) using the visual condition approach.

a. Using the visual condition survey, determine the condition description from Table F2 that most closely fits the pavement condition, and obtain the C_x value. In this example, the AC descriptions are used because the PCC layer was not visible during the survey. The condition seems to fall between items 2 and 3 for the AC in this table.

Therefore, $C_x = 0.77$.

b. Obtain R_{Lx} from Figure F12.

Result: $R_{Lx} = 20\%$

11. Select the R_{Lx} value for use in design. The lower (less remaining life) of the values found using the NDT and visual condition approaches controls.

Result: R_{Lx} for design = 20%

12. Calculate the remaining life of the overlaid pavement after the overlay design traffic has been reached (R_{Ly}) using equation F10.

a. Design ESAL = 1.827 million

b. Determine N_{fy} using Figure F11 and the following inputs:

- Reliability = 0.90
- Overall standard deviation = 0.35
- Design ESAL = 1.827 million
- $M_R = 5000$ psi
- $\Delta PSI = 4.2 - 2.0 = 2.2$

$$N_{fy} = 2.9 \text{ million}$$

$$\text{Result: } R_{Ly} = (2.9 - 1.83)/(2.9) = 36.9\%$$

13. Determine the remaining life factor (F_{RL}) from Figure F13 using R_{Lx} and R_{Ly} .

$$\text{Result: } F_{RL} = 0.62$$

14. Calculate the required structural number of the overlay (SN_{ol}) using equation F5 with SN_y , F_{RL} , and SN_{xeff} as inputs.

$$\text{Result: } SN_{ol} = 4.4 - (0.62)(8.05) = -0.59$$

The existing pavement structure should support the projected traffic for the 10-year design period without a new overlay. An overlay is likely required for other (e.g., performance) reasons.

15. Calculate the thickness (h_{ol}) of overlay required using equation F11.

$$\text{Result: } h_{ol} = -0.59/0.34 = -1.75"$$

Theoretically, 1.75" of the existing AC overlay could be removed and the pavement system would still support the design traffic.

AASHTO Reflective Cracking Thick Overlay Design. The following procedure should be followed for obtaining the thickness of AC overlay required to reduce the reflective cracking from the PCC pavement through the AC layer:

1. Enter Table F3 to obtain the maximum annual temperature differential. Use a value for a location near the actual location, or interpolate between locations, if necessary.

$$\text{Result: } \Delta T = 66^{\circ}\text{F (Newport is on about the same latitude as Indianapolis.)}$$

2. Enter Table F4 with ΔT and PCC slab length to get minimum recommended thickness (h_{ol}).

Result: $h_{ol} = 4.5"$

AASHTO Reflective Cracking Break and Seat Overlay Design. The following steps should be followed when using the break and seat approach (equation F9) to control reflective cracking in a designed AC overlay of a PCC pavement:

1. Repeat steps 1, 6, and 8 from the AASHTO Normal Structural Overlay Design to determine SN_y .

Result: $SN_y = 4.4$

2. Determine D_o from the pavement cross section data.

Result: $D_o = 8.2"$

3. Calculate $SN_{\text{xeff-rp}}$ using equation F13. Since the AC overlay should be removed before breaking and seating and since the PCC layer structural number is excluded from the $SN_{\text{xeff-rp}}$ calculation, only the granular subbase is considered.

Result: $SN_{\text{xeff-rp}} = 0.07(7.5") = 0.53$

4. Calculate SN_{ol} using equation F12 with the inputs of SN_y , D_o , and $SN_{\text{xeff-rp}}$.

Result: $SN_{ol} = 4.4 - 0.7[0.4(8.2) + 0.53] = 1.73$

5. Calculate the required overlay thickness (h_{ol}) using equation F11.

Result: $h_{ol} = 1.73/0.34 = 5.10"$

Overlay Recommendations. For this pavement section,

the reflective cracking controls the overlay requirements. If the PCC is allowed to remain essentially as it is except for possible undersealing or pressure grouting, the minimum AC overlay required is 4.5". If the break and seat approach is used, the required overlay is 5.5" (increased for construction purposes from the 5.10" that was calculated).

c This program calculates the effective structural
c number (sn) of a pavement based on equations from
c Appendix PP of the 1986 AASHTO Guide. It reads input
c from a file whose first line is the number of problems.
c Each subsequent line consists of: title; modulus of
c roadbed soil (psi); poisson's ratio of roadbed soil;
c thickness of pavement system above the roadbed soil
c (in.); applied NDT load (lb.); deflection beneath load
c (mils/Klb). Input problems one to a line in free
c format. The program uses an iterative
c procedure to implicitly determine effective
c structural number. It is based on the assumption that
c if the SN assumed is too low, the deflection
c calculated will be higher than that actually
c recorded. Furthermore, the program assumes a single
c load applied through a single plate whose radius is
c 5.9 inches. This is the case with the FWD. Since sn
c started low, the theoretical deflection should be
c greater than the actual deflection until sn takes on
c a value large enough to make the theoretical deflection
c just less than the actual one. At this point stop
c iterating and print the results.

```

character*10 title
real p, ht, ac, sn, urs, ers, do, fb
real increm, temp, parta, partb, diff
integer j, numprobs, iter, maxiter
c The radius of the applied load for the FWD was
c 5.9 inches
ac=5.9
c Structural Number (sn) will be incremented by
c 0.01 each loop
increm=0.01
c The maximum number of iteration will be 1500
maxiter=1500
read*, numprobs
do 10 j=1,numprobs
  read*, title, ers, urs, ht, p, do
c Convert deflection in mils/Klb to inches
do= do*p/1000000
c Start with a very low sn and initialize number of
c iterations to 0
sn=0.01
iter=0
c Calculate deflection piecewise
20  fb=((36161.5*(sn**2))/((ac**2)*
& (ers**0.667))+1)**-0.5
    parta=2*p*((0.0043*ht)**3)/
& (3.1416*ac*(sn**3))
    partb=1+fb*((sn**3)*(1-(urs**2)))/
& (ers*((0.0043*ht)**3))-1)

```



```

c Theoretical deflection is 'temp.'
  temp=parta*partb
c Since sn started low, the theoretical deflection
c should be greater than the actual deflection i
c until sn takes on a value large enough to make the
c theoretical deflection just less than the actual one.
c At this point stop iterating and print the results.
  diff=do-temp
  if (diff.gt.0) then
    goto 50
  endif
c Also, if the number of iterations is too high, data
c is probably faulty and the program should be stopped.
c With increm=0.01, this corresponds to an SN greater
c than 15.
  if (iter.gt.maxiter) then
    goto 50
  endif
c If sn is too low to give a satisfactory deflection
c value and iterations are less than the maximum,
c increment sn by 'increm' and iter by 1. Then
c re-calculate the theoretical deflection.
  iter=iter+1
  sn=sn+increm
  goto 20
c Print the results
50  print*, title
  if (iter.gt.maxiter) then
    print*, 'Maximum number of iterations reached'
  endif
  print*, ' '
  print*, 'Ers = ',ers
  print*, 'urs = ',urs
  print*, 'ht = ',ht
  print*, 'P = ',p
  print*, 'do = ',do
  print*, ' '
  print(55), 'SN = ', sn
55  format (a7,f5.2)
  print*, ' '
  print*, ' '
  print*, ' '
c Continue and read in data for the next problem
10  continue
  stop
end

```

Appendix G - Asphaltic Concrete Modulus Estimate

The program contained in this appendix allows the estimation of Young's modulus for asphaltic concrete, as discussed in chapter 5. The determination of the modulus is based upon load duration, asphalt cement binder content, pavement layer thickness, and pavement temperature.

An input data file should be created for use in the program. A space should separate the entries on a line.

Line No. 1 - Number of Pavement Sections

The number of pavement cross sections for which the modulus is to be determined is the only input on this line.

Line No. 2 - Cross Section Data

The required data for modulus determination on a given pavement cross section should be included on one line in the following order:

1. Section number.
2. Duration of the load on the asphaltic concrete in seconds.
3. Number of asphaltic concrete layers in the pavement. Surface, binder, and base are considered separate layers even though they may have been placed under the

same contract.

4. Year of the specifications under which the paving contract was let for the first layer.
5. Aggregate and asphalt type used in the first layer. For IDOH specs earlier than 1963, the type of stone gradation used for aggregate is named (i.e., 5 = number 5 stone or 11 = number 11 stone). For IDOH specs 1963 and later, the type of stone gradation and the type of asphalt are specified (i.e., 9c = number 9 stone mixed with asphalt cement or 5e = number 5 stone mixed with emulsified asphalt). The only exception to this number/letter rule is emulsified asphalt with sand aggregate, which is input as "sande".
6. Layer type for the first layer (1 = surface, 2 = binder, and 3 = base).
7. Layer thickness in inches for the first layer.
8. Repeat entries 4 through 7 for each layer until there is sufficient data for the number of layers specified in entry 3.
9. Pavement surface temperature in degrees Fahrenheit at which the asphaltic concrete modulus is desired.

Line 2 is repeated for every pavement cross section where

the asphaltic concrete modulus is needed. The number of these lines must equal the number input in Line 1.

The output consists of three entries for each pavement cross section line which was input.

1. Section number.
2. Total thickness in inches of the asphaltic concrete in the pavement cross section.
3. Composite asphaltic concrete modulus in psi for the pavement cross section at the given pavement temperature and loading rate.

```

character *5 mix(5)
character *8 section
dimension th(5),p(4),stiff(5),t(5),lay(5),spyr(5)
integer spyr,layer,lay,nol,sect
real bmin,bmax,load

read *,sect
do 999 nsect=1,sect

  read *,section,load,nol,(spyr(i),mix(i),lay(i),
&    th(i),i=1,nol),temp
    do 10 i=1,nol
      t(i)=0.
      do 8 j=1,i
        if(j.eq.i)then
          t(i)=t(i)+th(j)/3.
        else
          t(i)=t(i)+th(j)
        endif
      continue
    8    continue
    10   continue
    do 99 layer =1,nol

      tplus=temp*(1.+1./(t(layer)+4.))
      c      tplus=(tplus-32.)*5./9.
      c      tplus=(temp-32.)*5./9.
      call gtbinder(lay(layer),spyr(layer),mix(layer),
&    bmin,bmax,pen)
      pr=0.65*pen
      spr=99.13-26.35*alog10(pr)
      pir=1951.4-500.*alog10(pr)-20.*spr
      pir=pir/(50.*alog10(pr)-spr-120.14)
      sbplus=0.1157*load**(-0.368)*exp(-pir)
      &      *(spr-tplus)**5
      bplus=(bmax+bmin)/2.+(bmax-bmin)/sqrt(36.)
      bmin =(bmax+bmin)/2.-(bmax-bmin)/sqrt(36.)
      vplus=6.67
      vmin =5.33

      p(1)=smix(sbplus,bplus,vplus)
      p(2)=smix(sbplus,bplus,vmin )
      p(3)=smix(sbplus,bmin ,vplus)
      p(4)=smix(sbplus,bmin ,vmin )

      sum=0.0
      do 40 i=1,4
        sum=sum+p(i)
      40   continue
      stiff(layer)=sum/4.
    99   continue

```

```

      he=0.
      ht=0.
      do 100 i=1,nol
        he=he+th(i)*(stiff(i)/stiff(nol))*(1./3.)
        ht=ht+th(i)
100    continue
      x=stiff(nol)*(he/ht)**3.

```

```

      write (6,125) section,ht,x
125    format(a4,2x,f4.1,2x,f10.0)

```

```

999  continue
      end

```

```

function smix(sb,b,v)

```

```

vt=100.*(b/1.025+(100.-b)/2.65)/(100.-v)
va=(100.-b)/2.65/vt*100.
vb=b/1.025/vt*100.

```

```

sz=10.82-1.342*(100.-va)/(va+vb)
sy=8.+5.68e-3*va+2.135e-4*va*va
sx=0.6*aalog10((1.37*vb*vb-1.)/(1.33*vb-1.))
sw=1.12*(sz-sy)/aalog10(30.)

```

```

if (sb.lt.1.e9)then
  p=(sw+sx)*(aalog10(sb)-8.)/2.+(sw-sx)
&      *abs(aalog10(sb)-8.)/2.+sy
else
  p=sy+sw+(sz-sy-sw)*(aalog10(sb)-9.)/aalog10(3.)
endif

```

```

smix=145.*(10.** (p-6.))
end

```

```

subroutine gtbinder(lay,spyr,mix,bmin,bmax,pen)
real bmin,bmax
character *5 mix(5)
integer spyr,lay
if(lay.eq.1)goto 111
if(lay.eq.2)goto 222
if(lay.eq.3)goto 333
111  if (spyr.eq.46.and.mix(1).eq."11") then
      bmin = 6.5
      bmax = 8.5
      pen=80.
    elseif (spyr.eq.57.and.mix(1).eq."11") then
      bmin = 5.5
      bmax = 7.5
      pen=80.

```



```
elseif (spyr.eq.60.and.mix(1).eq."11") then
bmin = 5.5
bmax = 7.5
pen=80.
elseif (spyr.eq.63.and.mix(1).eq."11c") then
bmin = 5.5
bmax = 7.5
pen=80.
elseif (spyr.eq.69.and.mix(1).eq."11c") then
bmin = 5.5
bmax = 6.6
pen=80.
elseif (spyr.eq.71.and.mix(1).eq."11c") then
bmin = 5.5
bmax = 6.6
pen=80.
elseif (spyr.eq.71.and.mix(1).eq."11e") then
bmin = 5.4
bmax = 6.5
pen=80.
elseif (spyr.eq.74.and.mix(1).eq."11e") then
bmin = 5.4
bmax = 6.5
pen=80.
elseif (spyr.eq.74.and.mix(1).eq."sande") then
bmin = 7.0
bmax = 8.0
pen=80.
elseif (spyr.eq.74.and.mix(1).eq."11c") then
bmin = 5.5
bmax = 6.6
pen=80.
elseif (spyr.eq.74.and.mix(1).eq."9c") then
bmin = 5.0
bmax = 6.1
pen=80.
elseif (spyr.eq.74.and.mix(1).eq."9e") then
bmin = 4.5
bmax = 5.6
pen=80.
elseif (spyr.eq.78.and.mix(1).eq."sande") then
bmin = 7.0
bmax = 8.0
pen=80.
elseif (spyr.eq.78.and.mix(1).eq."11c") then
bmin = 5.5
bmax = 6.6
pen=80.
elseif (spyr.eq.78.and.mix(1).eq."11e") then
bmin = 5.4
bmax = 6.5
```

```

pen=80.
elseif (spyr.eq.78.and.mix(1).eq."9e") then
bmin = 4.5
bmax = 5.6
pen=80.
elseif (spyr.eq.85.and.mix(1).eq."lle") then
bmin = 5.5
bmax = 7.0
pen=80.
endif
goto 999
222 if (spyr.eq.46.and.mix(2).eq."9") then
bmin = 4.0
bmax = 6.0
pen=80.
elseif (spyr.eq.57.and.mix(2).eq."l") then
bmin = 4.0
bmax = 6.0
pen=80.
elseif (spyr.eq.63.and.mix(2).eq."9c") then
bmin = 4.0
bmax = 6.0
pen=80.
elseif (spyr.eq.69.and.mix(2).eq."9c") then
bmin = 4.3
bmax = 5.4
pen=80.
elseif (spyr.eq.71.and.mix(2).eq."9c") then
bmin = 4.3
bmax = 5.4
pen=80.
elseif (spyr.eq.71.and.mix(2).eq."9e") then
bmin = 3.9
bmax = 5.1
pen=80.
elseif (spyr.eq.71.and.mix(2).eq."llc") then
bmin = 4.6
bmax = 6.0
pen=80.
elseif (spyr.eq.74.and.mix(2).eq."8e") then
bmin = 3.4
bmax = 4.6
pen=80.
elseif (spyr.eq.74.and.mix(2).eq."9e") then
bmin = 3.9
bmax = 5.1
pen=80.
elseif (spyr.eq.74.and.mix(2).eq."9c") then
bmin = 4.3
bmax = 5.4
pen=80.

```

```

elseif (spyr.eq.74.and.mix(2).eq."11c") then
  bmin = 4.6
  bmax = 6.0
  pen=80.
elseif (spyr.eq.74.and.mix(2).eq."11e") then
  bmin = 3.7
  bmax = 5.0
  pen=80.
elseif (spyr.eq.74.and.mix(2).eq."8c") then
  bmin = 4.0
  bmax = 5.1
  pen=80.
elseif (spyr.eq.78.and.mix(2).eq."8e") then
  bmin = 3.4
  bmax = 4.6
  pen=80.
elseif (spyr.eq.78.and.mix(2).eq."8c") then
  bmin = 4.0
  bmax = 5.1
  pen=80.
elseif (spyr.eq.78.and.mix(2).eq."9e") then
  bmin = 4.3
  bmax = 5.4
  pen=80.
elseif (spyr.eq.78.and.mix(2).eq."9c") then
  bmin = 4.3
  bmax = 5.4
  pen=80.
elseif (spyr.eq.78.and.mix(2).eq."11c") then
  bmin = 4.6
  bmax = 6.0
  pen=80.
elseif (spyr.eq.85.and.mix(2).eq."9c") then
  bmin = 4.3
  bmax = 5.4
  pen=80.
endif
goto 999
333 if (spyr.eq.60.and.mix(3).eq."4") then
  bmin = 4.0
  bmax = 6.0
  pen=80.
  elseif (spyr.eq.63.and.mix(3).eq."4") then
    bmin = 4.0
    bmax = 6.0
    pen=80.
  elseif (spyr.eq.71.and.mix(3).eq."11e") then
    bmin = 3.7
    bmax = 5.0
    pen=80.
  elseif (spyr.eq.74.and.mix(3).eq."5e") then

```

```
bmin = 3.0
bmax = 4.1
pen=80.
elseif (spyr.eq.74.and.mix(3).eq."5c") then
bmin = 4.0
bmax = 5.1
pen=80.
elseif (spyr.eq.78.and.mix(3).eq."5e") then
bmin = 3.0
bmax = 4.1
pen=80.
elseif (spyr.eq.78.and.mix(3).eq."5c") then
bmin = 4.0
bmax = 5.1
pen=80.
elseif (spyr.eq.85.and.mix(3).eq."5c") then
bmin = 4.0
bmax = 5.1
pen=80.
endif
999 end
```

Appendix H - Pavement Condition Surveys

This appendix contains copies of the original pavement condition survey forms for both the CRC and JRC pavements. Appendix A describes the technique used when conducting these surveys.

Note that forms are included for all CRC and JRC sections except for test section V-5. This section was the first of the concrete pavements tested, and the survey procedure had not yet been firmly established. Thus, the data collected on V-5 was not complete, and the survey could not be used when analyzing the section data.

CRC Pavement

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____

SECTION C-1

DATE 8/13/85

SAMPLE UNIT _____

SURVEYED BY _____

AREA OF SAMPLE _____

Distress Types

1. Alligator Cracking	*10. Long & Trans Cracking
2. Bleeding	11. Patching & Util Cut Patching
3. Block Cracking	12. Polished Aggregate
*4. Bumps and Sags	*13. Potholes
5. Corrugation	14. Railroad Crossing
6. Depression	15. Rutting
*7. Edge Cracking	16. Shoving
*8. Jt Reflection Cracking	17. Slippage Cracking
*9. Lane/Shldr Drop Off	18. Swell
	19. Weathering and Raveling

SKETCH:

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY

TYPE	7	10	12	15		
QUANTITY & SEVERITY	41L	4L (long)	8x10x	2 1/2 x 150 M		
		11L (11)				
		7L (7)				
		12L (12)				
		13L (13)				
		9L (9)				
		10L (10)				
		10L (10)				
		20L (20)				
TOTAL SEVERITY	L 41	96	1200	375		
	M					
	H					

PCI CALCULATION

DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	
7	2.3	L	4	
10	5.3	L	11	
12	66.7	-	14	
15	20.8	L	35	
q=4	TOTAL DEDUCT VALUE		64	
	CORRECTED DEDUCT VALUE (CDV)		35	

PCI = 100 - CDV =

65

RATING = GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH I-65SECTION C-2DATE OCT 30 '86

SAMPLE UNIT _____

SURVEYED BY _____

SLAB SIZE 110' x 12' = 1320 FT²

10

9

8

7

SITE 5

6

5

4

3

2

1

SITE 4

1

2

3

4

Distress Types

21. Blow-Up
Buckling/Shattering
22. Corner Break
23. Divided Slab
24. Durability ("D")
Cracking
25. Faulting
26. Joint Seal Damage
27. Lane/Shldr Drop Off
28. Linear Cracking
29. Patching, Large &
Util Cuts
30. Patching, Small | 31. Polished
Aggregate
32. Popouts
33. Pumping
34. Punchout
35. Railroad
Crossing
36. Scaling/Map
Cracking/Crazing
37. Shrinkage Cracks
38. Spalling, Corner
39. Spalling, U
Joint |
|--|--|

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	M			4
37				3
28	L	6	100	23
q= 1 TOTAL DEDUCT VALUE				30
CORRECTED DEDUCT VALUE (CDV)				30
PCI = 100 - CDV =				70
RATING =				GOOD

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 31

SECTION F-1

DATE Aug 25, '86

SAMPLE UNIT _____

SURVEYED BY LINDLEY

AREA OF SAMPLE _____

Distress Types				SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking			
2. Bleeding	11. Patching & Util Cut Patching			
3. Block Cracking	12. Polished Aggregate			
*4. Bumps and Sags	*13. Potholes			
5. Corrugation	14. Railroad Crossing			
6. Depression	15. Rutting			
*7. Edge Cracking	16. Shoving			
*8. Jt Reflection Cracking	17. Slippage Cracking			
*9. Lane/Shldr Drop Off	18. Swell			
	19. Weathering and Raveling			
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY				
TYPE				
QUANTITY & SEVERITY				
TOTAL SEVERITY	L			
	M			
	H			
PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <u>100</u> $RATING =$ <u> </u>
q= TOTAL DEDUCT VALUE				
CORRECTED DEDUCT VALUE (CDV)				

1.10
2.100-
- 0.15

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 31 SECTION F-2
 DATE 12 25 30 SAMPLE UNIT _____
 SURVEYED BY LINDA AREA OF SAMPLE _____

Distress Types				SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shoulder Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling			
EXISTING DISTRESS TYPE. QUANTITY & SEVERITY				
TYPE →	10			
QUANTITY & SEVERITY	55' = L			
TOTAL SEVERITY	L 55			
M				
H				
PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <div style="text-align: center; margin-top: 10px;"> <u>92</u> </div> $RATING =$ <u>EXCELLENT</u>
10	3.4	L	8	
q = 1	TOTAL DEDUCT VALUE		8	
CORRECTED DEDUCT VALUE (CDV)			8	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____

SECTION G-1

DATE 8/14/86

SAMPLE UNIT _____

SURVEYED BY _____

SLAB SIZE _____

Length = 123', width = 12'

Distress Types

21. Blow-Up	31. Polished
Buckling/Shattering	Aggregate
22. Corner Break	32. Popouts
23. Divided Slab	33. Pumping
24. Durability ("D")	34. Punchout
Cracking	35. Railroad
25. Faulting	Crossing
26. Joint Seal Damage	36. Scaling/Map
27. Lane/Shldr Drop Off	Cracking/Crazing
28. Linear Cracking	37. Shrinkage Cracks
29. Patching, Large &	38. Spalling, Corner
Util Cuts	39. Spalling, U
30. Patching, Small	Joint

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	NA			-
28 L	L	G	100	23
q = 1 TOTAL DEDUCT VALUE				27
CORRECTED DEDUCT VALUE (CDV)				27
PCI = 100 - CDV =				73
RATING =				Very good

26.5x12 L → Transverse crack
 123' L → Longitudinal crack

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 30 SECTION L-1
 DATE SEP 3, '86 SAMPLE UNIT _____
 SURVEYED BY LINDLY AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking * 4. Bumps and Sags 5. Corrugation 6. Depression * 7. Edge Cracking * 8. Jt Reflection Cracking * 9. Lane/Shldr Drop Off	* 10. Long & Trans Cracking * 11. Patching & Util Cut Patching * 12. Polished Aggregate * 13. Potholes * 14. Railroad Crossing * 15. Rutting * 16. Shoving * 17. Slippage Cracking * 18. Swell * 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	10	8				
QUANTITY & SEVERITY	167 = L	15 = L				
TOTAL SEVERITY	L 167	15				
M						
H						

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
10	6.7	L	13
8	0.6	L	1
q = 1	TOTAL DEDUCT VALUE		14
	CORRECTED DEDUCT VALUE (CDV)		14

PCI = 100 - CDV = 86

RATING = EXCELLENT

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH I-65

SECTION L-2

DATE 10/30/86

SAMPLE UNIT _____

SURVEYED BY Lindly

SLAB SIZE _____

Distress Types

21. Blow-Up	31. Polished
Buckling/Shattering	Aggregate
22. Corner Break	32. Popouts
23. Divided Slab	33. Pumping
24. Durability ("D")	34. Punchout
Cracking	35. Railroad
25. Faulting	Crossing
26. Joint Seal Damage	36. Scaling/Map
27. Lane/Shldr Drop Off	Cracking/Crazing
28. Linear Cracking	37. Shrinkage Cracks
29. Patching, Large & Util Cuts	38. Spalling, Corner
30. Patching, Small	39. Spalling, U Joint

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	M			2
28	L	2	100	2
31	L	3	50	7
37	L	3	50	3
q= 2	TOTAL DEDUCT VALUE			37
CORRECTED DEDUCT VALUE (CDV)				29
PCI = 100 - CDV =				<u>71</u>
RATING =				<u>Very good</u>

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

454

BRANCH I-65 SECTION C-2
 DATE OCT 30, '86 SAMPLE UNIT _____
 SURVEYED BY LINDY AREA OF SAMPLE _____

Distress Types				SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling			
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY				
TYPE →				
QUANTITY & SEVERITY				
TOTAL SEVERITY	L			
	M			
	H			
PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	PCI = 100 - CDV = ===== RATING = =====
n =		TOTAL DEDUCT VALUE		===== =====
		CORRECTED DEDUCT VALUE (CDV)		

NOTE:

THIS IS

CRIP

SEE

DISTRESS

BELOW

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

26 = MEDIUM

37 = PRESENT

27 = NONE

23 = 32 x 12' = LOW

31 = NONE (ACTUALLY, THERE IS A LITTLE)

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH I-94

SECTION L-3

DATE 9/4/86

SAMPLE UNIT _____

SURVEYED BY Lindly

SLAB SIZE _____

Distress Types

21. Blow-Up	31. Polished
Buckling/Shattering	Aggregate
22. Corner Break	32. Popouts
23. Divided Slab	33. Pumping
24. Durability ("D")	34. Punchout
Cracking	35. Railroad
25. Faulting	Cracking
26. Joint Seal Damage	36. Scaling/Map
27. Lane/Shldr Drop Off	Cracking/Crazing
28. Linear Cracking	37. Shrinkage Cracks
29. Patching, Large &	38. Spalling, Corner
Util Cuts	39. Spalling, U
30. Patching, Small	Joint

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	M			2
28	L	7	100	23
q = 1	TOTAL DEDUCT VALUE			27
CORRECTED DEDUCT VALUE (CDV)				27
PCI = 100 - CDV =				<u>73</u>
RATING =				<u>Very good</u>

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

456

BRANCH I-94 SECTION L-3
 DATE SEP 4, '86 SAMPLE UNIT _____
 SURVEYED BY LINOLY AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation	14. Railroad Crossing	
6. Depression	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Jt Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shoulder Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	10					
QUANTITY & SEVERITY	54 x 12 = L					
TOTAL SEVERITY	L	M	H			

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
q =	TOTAL DEDUCT VALUE		
CORRECTED DEDUCT VALUE (CDV)			

PCI = 100 - CDV = _____

RATING = _____

* All Distresses Are Measured in Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured in Linear Ft; Distress 13 Is Measured in Number of Potholes.

DA FORM 5146-R, NOV 82

SURFACED

Figure E-2.

CRCP ROAD

54 TRANSVERSE CRACKS. REASONABLE EVENLY SPACED. NO FAULTING. NONE OF ~~JOINT~~ CRACKS ARE WORKING. LONG. JOINT SEAL CONDITION IS GOOD TO FAIR (LOW TO MED.) BEGINNING OF POLISHING. OVERALL PAVEMENT

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH I-64 SECTION L-4
 DATE SEP 4, '86 SAMPLE UNIT _____
 SURVEYED BY LINDLY AREA OF SAMPLE _____

Distress Types		SKETCH!
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	7	19	8	11	
QUANTITY & SEVERITY	154' = M	6" x 154' = L	24' = M	9 ft ²	
		(AT CENTER LINE, 1 TRUCK			
		1/2 OF TRUCK			
		TOTAL)			
TOTAL SEVERITY	L	924		9	
	M	154	24		
	H				

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
7	8.3	M	22
19	50	L	12
8	1.3	M	9
11	0.5	L	1
n = 3	TOTAL DEDUCT VALUE		44
	CORRECTED DEDUCT VALUE (CDV)		27

PCI = 100 - CDV = 73

RATING = VERY GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION S-1
 DATE 8/11/86 SAMPLE UNIT _____
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types				SKETCH:	
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching *12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling				
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	7	10	15		
QUANTITY & SEVERITY	103 L	12 L (Trans)	2 x 136 L		
TOTAL SEVERITY	L	M	H		
	103	12	272		
PCI CALCULATION					
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <div style="font-size: 1.5em; margin-top: 10px;">67</div>	
7	6.3	L	8		
10	0.7	L	1		
15	16.7	L	33		
			TOTAL DEDUCT VALUE	42	$RATING =$ <u>GOOD</u>
			CORRECTED DEDUCT VALUE (CDV)	33	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION S-2
 DATE 8/11/86 SAMPLE UNIT _____
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types				SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shoulder Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling			
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY				
TYPE	7			
QUANTITY & SEVERITY	14L			
TOTAL SEVERITY	L 14			
M				
H				
PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ $\underline{\underline{97}}$ $RATING = \underline{\underline{EXCELLENT}}$
7	0.9	L	3	
q=0	TOTAL DEDUCT VALUE		3	
CORRECTED DEDUCT VALUE (CDV)			3	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION S-3
 DATE 8/11/86 SAMPLE UNIT _____
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types				SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling			
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY				
TYPE →	15			
QUANTITY & SEVERITY	1 X 105 L			
TOTAL SEVERITY	L 105 M H			
PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <div style="text-align: center; font-size: 1.5em;">81</div> <hr style="border: 1px solid black;"/> <hr style="border: 1px solid black;"/> $RATING =$ <div style="text-align: center; font-size: 1.5em;">VERY GOOD</div> <hr style="border: 1px solid black;"/> <hr style="border: 1px solid black;"/>
15	41	L	19	
q = 1	TOTAL DEDUCT VALUE		19	
CORRECTED DEDUCT VALUE (CDV)			19	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623: the proponent agency is USACE.

BRANCH _____

SECTION S-4DATE 8/12/86

SAMPLE UNIT _____

SURVEYED BY _____

SLAB SIZE ^{C&P} 40', total = 160'

Length = 136'; width = 12'

Distress Types

21. Blow-Up
Buckling/Shattering
22. Corner Break
23. Divided Slab
24. Durability ("D")
Cracking
25. Faulting
26. Joint Seal Damage
27. Lane/Shldr Drop Off
28. Linear Cracking
29. Patching, Large &
Util Cuts
30. Patching, Small | 31. Polished
Aggregate
32. Popouts
33. Pumping
34. Punchout
35. Railroad
Crossing
36. Scaling/Map
Cracking/Crazing
37. Shrinkage Cracks
38. Spalling, Corner
39. Spalling, U
Joint |
|--|--|

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	L			2
28	L	7	100	23
39	L	7	100	12
31	L	7	100	9
q=3 TOTAL DEDUCT VALUE				46
CORRECTED DEDUCT VALUE (CDV)				30
PCI = 100 - CDV =				70
RATING =				good

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

DA FORM 5145-R, NOV 82

28 → ≈ 4-5/slab

Figure E-1.

39L Transverse cracks.
 also 5' of polishing
 along the whole length

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH SR 37 SECTION S-17

DATE 10/30/86 SAMPLE UNIT _____

SURVEYED BY Lindly SLAB SIZE _____

Distress Types

21. Blow-Up	31. Polished
Buckling/Shattering	Aggregate
22. Corner Break	32. Popouts
23. Divided Slab	33. Pumping
24. Durability ("D")	34. Punchout
Cracking	35. Railroad
25. Faulting	Crossing
26. Joint Seal Damage	36. Scaling/Map
27. Lane/Shldr Drop Off	Cracking/Crazing
28. Linear Cracking	37. Shrinkage Cracks
29. Patching, Large &	38. Spalling, Corner
Util Cuts	39. Spalling, U
30. Patching, Smal.	Joint

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	L			2
28	L	7	100	23
31	L	4	59	8
32	L	7	100	14
37	L	3	43	2
q=3	TOTAL DEDUCT VALUE			49
CORRECTED DEDUCT VALUE (CDV)				31
PCI = 100 - CDV =				69
RATING =				good

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

DA FORM 5145-R, NOV 82

Figure E-1.

28 → ≈ 7/slab

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH 37 SECTION 5-17
 DATE Oct 30, '86 SAMPLE UNIT _____
 SURVEYED BY LINDA AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation	14. Railroad Crossing	
6. Depression	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Jt Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shldr Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE						
QUANTITY & SEVERITY						
TOTAL SEVERITY	L					
	M					
	H					

C RCP

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
q =	TOTAL DEDUCT VALUE		
CORRECTED DEDUCT VALUE (CDV)			

PCI = 100 - CDV = _____

RATING = _____

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

26 = L

27 = NOISE

28 = 43 x 12 = L

32 = YES

31 - NO (BUT THERE IS SOME)

37 - YES

JRC Pavement

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION C-3
 DATE 8/13/86 SAMPLE UNIT _____
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types				SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling			
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY				
TYPE	→	#	TYPE	QUANTITY
QUANTITY & SEVERITY	{	10	L	89
		4L	L	4
		4M	M	4
		13	L	1
		10L	L	1
		12L	L	1
		10L	L	1
		10L	L	1
21L	L	1		
TOTAL SEVERITY	L	89		
M	4			
H				
PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	PCI = 100 - CDV = <u>88</u> RATING = <u>EXCELLENT</u>
10	5.4	L	11	
10	0.24	M	1	
q = 1	TOTAL DEDUCT VALUE		12	
CORRECTED DEDUCT VALUE (CDV)			12	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION C-4
 DATE 8/13/86 SAMPLE UNIT _____
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types						SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shaving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling					
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	8	10	7	15	12	
QUANTITY & SEVERITY	11M	11L (T)	140M	2X140L	8X140	
	11L	39L (L)				
	11M	140L (L)				
	11M					
	11L					
	11M					
	11M					
	11M					
TOTAL SEVERITY	L	22	190		280	1120
	M	66		140		
	H					
PCI CALCULATION						
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <u>41</u> <hr style="border: none; border-top: 3px double black;"/> RATING = <u>FAIR</u> <hr style="border: none; border-top: 3px double black;"/>		
8	1.4	L	3			
8	4.3	M	21			
10	12.3	L	18			
7	9.1	M	23			
15	18.2	L	33			
12	72.7	L	16			
n = 5 TOTAL DEDUCT VALUE			114			
CORRECTED DEDUCT VALUE (CDV)			59			

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION C-5
 DATE 8/12/86 SAMPLE UNIT 384
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types					SKETCH:		
1. Alligator Cracking	*10. Long & Trans Cracking						
2. Bleeding	11. Patching & Util Cut Patching						
3. Block Cracking	12. Polished Aggregate						
*4. Bumps and Sags	*13. Potholes						
5. Corrugation	14. Railroad Crossing						
6. Depression	15. Rutting						
*7. Edge Cracking	16. Shoving						
*8. Jt Reflection Cracking	17. Slippage Cracking						
*9. Lane/Shldr Drop Off	18. Swell						
	19. Weathering and Raveling						
EXISTING DISTRESS TYPE QUANTITY & SEVERITY							
TYPE	7				10	8/46	4.15
QUANTITY & SEVERITY	33M				199L (100%)	12M	1 1/2 x 199M
	33L				12L (100%)	4L	1 1/2 x 199L
	34M				12L (100%)	24L	
	6L						
	4L						
	51M						
TOTAL SEVERITY	L				23	223	28
	M	98		12	298.5		
	H						
PCI CALCULATION							
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	PCI = 100 - CDV = <u>33</u> RATING = <u>POOR</u>			
7	0.96	L	3				
7	4.1	M	17				
10	9.3	L	16				
8	1.2	L	3				
8	0.5	M	4				
15	12.5	L	29				
15	12.5	M	47				
n=4	TOTAL DEDUCT VALUE		119				
CORRECTED DEDUCT VALUE (CDV)			67				

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 41 SECTION C-6

DATE Oct 30, '86 SAMPLE UNIT _____

SURVEYED BY Lindly SLAB SIZE _____

10	•	•	•	•	•
	•	•	•	•	•
9	•	•	•	•	•
	•	•	•	•	•
8	•	•	•	•	•
	•	•	•	•	•
7	•	•	•	•	•
	•	•	•	•	•
6	•	•	•	•	•
	•	•	•	•	•
5	•	•	•	•	•
	•	•	•	•	•
4	•	•	•	•	•
	•	•	•	•	•
3	•	•	•	•	•
	•	•	•	•	•
2	•	•	•	•	•
	•	•	•	•	•
1	•	•	•	•	•
	•	•	•	•	•
15	•	•	•	•	•

39 = H
27 = L
31

39 = H
27 = L
31 37

39 = H
27 = L
31 23 = M

39 = L
27 = L
31

Distress Types

21. Blow-Up
22. Buckling/Shattering
23. Corner Break
24. Divided Slab
25. Durability ("D")
26. Cracking
27. Faulting
28. Joint Seal Damage
29. Lane/Shldr Drop Off
30. Linear Cracking
31. Patching, Large & Util Cuts
32. Patching, Small | 33. Polished Aggregate
34. Popouts
35. Pumping
36. Punchout
37. Railroad Crossing
38. Scaling/Map
39. Cracking/Crazing
40. Shrinkage Cracks
41. Spalling, Corner
42. Spalling, U Joint |
|---|---|

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	M			4
27	L	4	100	5
28	M	1	25	17
31		4	100	9
37		1	25	0
39	H	4	100	56
q= 3	TOTAL DEDUCT VALUE			91
CORRECTED DEDUCT VALUE (CDV)				57
PCI = 100 - CDV =				43
RATING =				FAIR

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH UJ-41 SECTION C-6
 DATE OCT 30 1986 SAMPLE UNIT _____
 SURVEYED BY LINDA AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	→					
QUANTITY & SEVERITY						
TOTAL SEVERITY	L					
	M					
	H					

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
q = TOTAL DEDUCT VALUE CORRECTED DEDUCT VALUE (CDV)			PCI = 100 - CDV = _____ _____ _____ RATING = _____ _____ _____

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 41 SECTION C-7
 DATE OCT 30, '36 SAMPLE UNIT _____
 SURVEYED BY LINDLEY AREA OF SAMPLE 1540

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Reflection Cracking *9. Lane/Shoulder Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	8	9	10	12		
QUANTITY & SEVERITY	3 = M	30' = L	143 = L	4' x 140		
	62 = L		140 = L			
	6 = L		20 = M			
			20 = M			
TOTAL SEVERITY	L 63	30	233	560		
	M 3		40			
	H					

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
8	0.19	M	2
9	4.42	L	8
9	5.19	L	7
10	2.60	M	15
10	14.88	L	23
12	36.36		9
$\eta = 5$ TOTAL DEDUCT VALUE			63
CORRECTED DEDUCT VALUE (CDV)			31

PCI = 100 - CDV = 69

=====

RATING = GOOD

=====

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH SR 6 SECTION F-3
 DATE 3/27/96 SAMPLE UNIT _____
 SURVEYED BY LINDL AREA OF SAMPLE _____

Distress Types	SKETCH:
1. Alligator Cracking *10. Long & Trans Cracking 2. Bleeding 11. Patching & Util Cut Patching 3. Block Cracking 12. Polished Aggregate *4. Bumps and Sags *13. Potholes 5. Corrugation 14. Railroad Crossing 6. Depression 15. Rutting *7. Edge Cracking 16. Shoving *8. Jt Reflection Cracking 17. Slippage Cracking *9. Lane/Shldr Drop Off 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	7	10	8	15	19	
QUANTITY & SEVERITY	12' = L	11' = L	13 = L	2 x 130 = L	27' x 3" = L	
	169' = M	41' = L	18 = L			
	169' = M	30' = M	13 = L			
		70' = L	13 = L			
		12 = L	17 = L			
		13 = L	13 = M			
		7 = L				
		8 = L				
		13 = L				
TOTAL SEVERITY	L (12)	359 130 = L	(83)	360	(216)	
	M (169)	(30)	30' SPALL			
	H					

PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	
7	0.5	L	2	$PCI = 100 - CDV =$ <div style="text-align: center; border-bottom: 3px double black; width: 100px; margin: 0 auto;">51</div> $RATING =$ <u>FAIR</u>
7	7.2	M	21	
10	13.0	L	19	
10	1.3	M	10	
8	3.5	L	7	
15	15.4	L	31	
19	9.2	L	4	
q = 5	TOTAL DEDUCT VALUE		94	
CORRECTED DEDUCT VALUE (CDV)			49	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH SE 19

SECTION F-4

DATE 9/29/90

SAMPLE UNIT

SURVEYED BY LK'OLY

AREA OF SAMPLE

Distress Types		SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation	14. Railroad Crossing	
6. Depression	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Jt Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shldr Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	7	10	3	8	1	10
QUANTITY & SEVERITY	16 = L	43 = L	10' x 5' = M	8 = L	7 1/2 ft = L	55 = L
	21 = M	24 = M	1 x 4' = L	13 = M	7.5 = M	11 = L
	12 = L	43 = L	2 x 4' = L	11 = M	3 = 1	5 = L
	6 = M	21 = M	5 x 1.5 = M			7 = M
		42 = L	2 = L			6 = L
		9 = L	9 = L			19 = L
		25 = M				17 = L
		25 = L				
		37 = L				
TOTAL SEVERITY	L 28	322	21	8	10.5	
	M 27	77	50	24	7.5	
	H					

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
7	2.1	L	4
7	2.0	M	12
10	23.8	L	26
10	5.7	M	24
3	1.6	L	1
3	3.7	M	9
8	0.6	L	1
8	1.8	M	1
* 9 = 9 TOTAL DEDUCT VALUE			159
CORRECTED DEDUCT VALUE (CDV)			74

PCI = 100 - CDV = 26

RATING = POOR

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

(*)

1	0.8	L	9
1	0.6	M	17
15	23	L	36
12	38.5	L	9

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 224 SECTION F-5
 DATE 8/23/36 SAMPLE UNIT _____
 SURVEYED BY LINDL AREA OF SAMPLE _____

Distress Types						SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling					
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	10	1	8	9	15	
QUANTITY & SEVERITY	43 = L	67 x 2' = L	12 = L	127' = L	50' x 1' = L	
	13 = L	15 x 4' = L	12 = L		66 x 2' = L	
	27 = L	5 x 3' = L	12 = L		21' x 2' = L	
	10 = M				21 x 1 = H	
	39 = L				21 x 2 1/2 = M	
TOTAL SEVERITY	L 182	209	36	137	203	
	M 10				14	
	H				21	
PCI CALCULATION						
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	<div style="margin-bottom: 20px;"> $PCI = 100 - CDV =$ <div style="text-align: center; border-bottom: 3px double black;">29</div> </div> <div> $RATING =$ POOR </div>		
10	11	L	18			
10	0.6	M	6			
1	12.7	L	36			
8	2.2	L	5			
9	8.3	L	10			
15	12.3	L	30			
15	0.8	H	18			
15	1.3	H	30			
q=8	TOTAL DEDUCT VALUE		151			
CORRECTED DEDUCT VALUE (CDV)			71			

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH SR 3SECTION F-6DATE 8/27/86

SAMPLE UNIT _____

SURVEYED BY LINDLY

AREA OF SAMPLE _____

Distress Types		SKETCH:
<ul style="list-style-type: none"> ☒ 1. Alligator Cracking ☒ 2. Bleeding ☒ 3. Block Cracking ☒ 4. Bumps and Sags ☒ 5. Corrugation ☒ 6. Depression ☒ 7. Edge Cracking ☒ 8. Jt Reflection Cracking ☒ 9. Lane/Shldr Drop Off 	<ul style="list-style-type: none"> ☒ 10. Long & Trans Cracking ☒ 11. Patching & Util Cut Patching ☒ 12. Polished Aggregate ☒ 13. Potholes ☒ 14. Railroad Crossing ☒ 15. Rutting ☒ 16. Shoving ☒ 17. Slippage Cracking ☒ 18. Swell ☒ 19. Weathering and Raveling 	<p style="text-align: center;">12'</p> <p style="text-align: center;"># 4</p> <p style="text-align: center;"># 3</p>

EXISTING DISTRESS TYPE QUANTITY & SEVERITY						
TYPE	10	8	10	10		
QUANTITY & SEVERITY	7' = M	12 = L	12 = L			
	25' = L	8 = L	8 = L			
	22 = M	9 = L	9 = L			
	10 = L	12 = L	9 = L			
	5 = L	9 = L	9 = L			
	6 = M	12 = L	9 = M	150 = L		
	10 = M	8 = L	12 = L	42 = L		
	60 = L		6 = L	16 = L		
TOTAL SEVERITY	L	100	70	45	224	
	M	45		9		
	H					

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
10	16.7	L	22
10	2.5	M	16
8	3.2	L	7
q=3	TOTAL DEDUCT VALUE		45
CORRECTED DEDUCT VALUE (CDV)			28

PCI = 100 - CDV =

72

RATING = VERY GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

474

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 33 SECTION F-7
 DATE SEP 1, '86 SAMPLE UNIT _____
 SURVEYED BY LINDY AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation	14. Railroad Crossing	
6. Depression	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Jt Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shldr Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	8	9	1	10	15
QUANTITY & SEVERITY	13' = L	2 Ft ² = L	73 x 1 = L	23' = L	2.5 x 113 = L
	13 = M		10 x 1 = L	140 = L	
	7 = M		17 x 1 = L	15' = L	
	7 = M				
	5 = L				
TOTAL SEVERITY	L	18	2	105	178
	M	27			282.5
	H				

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
8	1.2	L	3
8	1.8	M	11
6	0.14	L	4
1	7.1	L	29
10	12.1	L	18
15	19.2	L	34
TOTAL DEDUCT VALUE			99
CORRECTED DEDUCT VALUE (CDV)			57

PCI = 100 - CDV = 43

RATING = FAIR

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

#7 & #9 NOT APPLICABLE
 BECAUSE WE TESTED IN
 AN INSIDE LANE OF
 A 5-LANE ST

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH SR 15 SECTION F-3
 DATE 3/29/86 SAMPLE UNIT _____
 SURVEYED BY LINDLY AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	7	10	8			
QUANTITY & SEVERITY	28=M	104=M	12=M			
	33=L	77=L	4=M			
	42=L	6=L	9=L			
		12=L	9=M			
		8=L	8=L			
		12=L				
		10=L				
		4=L				
TOTAL SEVERITY	L 75	129	16			
	M 28	104	21			
	H					

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
7	6	L	8
7	2.2	M	12
10	10.3	L	17
10	8.3	M	28
8	1.3	L	3
8	1.7	M	11
q = 5 TOTAL DEDUCT VALUE			79
CORRECTED DEDUCT VALUE (CDV)			41

PCI = 100 - CDV =

59

RATING = GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH I-69 SECTION F-9
 DATE 8/27/30 SAMPLE UNIT _____
 SURVEYED BY LINDLY AREA OF SAMPLE _____

Distress Types					SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling				
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	8	7	10	11	19
QUANTITY & SEVERITY		25' = L	30 = L	154 = 11	146 x 2 = L
			70 = M		25 x 2 = L
			110 = L		
			53 = L		
			12 = L		
	40 SPACING				
TOTAL SEVERITY	L	25	255	154	342
	M		20		
	H				
PCI CALCULATION					
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	PCI = 100 - CDV = <u><u>79</u></u>	
7	0.9	L	3		
10	9.7	L	16		
10	0.8	M	7		
11	5.8	L	11		
19	12.9	L	6		
				RATING = <u><u>VERY GOOD</u></u>	
q = 4	TOTAL DEDUCT VALUE		43		
CORRECTED DEDUCT VALUE (CDV)			21		

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH 15 30 SECTION F-10
 DATE 3/26/86 SAMPLE UNIT _____
 SURVEYED BY LINDLEY AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	→ 7	10	1	15	
QUANTITY & SEVERITY	1" = L	138 = -	15 F-2.5	1.5 x 138 = L	
	32" = L	6" = -		1 x 138 = M	
	12" = M	23 = -			
	4" = L	18 = L			
		20 = L			
		JOINTS			
TOTAL SEVERITY	L	80	353	15	207
	M	31			138
	H				

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
7	4.5	L	6
7	1.7	M	11
10	19.7	L	24
1	0.8	L	9
15	11.5	L	29
15	7.7	M	40
q = 6	TOTAL DEDUCT VALUE		119
CORRECTED DEDUCT VALUE (CDV)			58

PCI = 100 - CDV = 42

RATING = FAIR

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

478

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION F-11
 DATE 3/29/86 SAMPLE UNIT _____
 SURVEYED BY LINDLEY AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation	14. Railroad Crossing	
6. Depression	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Jt Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shldr Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	10	8	2	15		
QUANTITY & SEVERITY	120 = L	12 = L	143' x 2	143' x 10" = L		
	3 = L	12 = L				
	12 = L	12 = L				
	5 = L	12 = L				
	4 = L	12 = L	12 = E			
	12 = L	12 = L	12 = W			
			20' x 12' = L			
			12 = W			
TOTAL SEVERITY	L	161	72	286	1430	
	M					
	H					

PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	
10	9.4	L	16	PCI = 100 - CDV = <u>51</u>
8	4.2	L	8	
2	16.7	L	4	
15	83.3	L	49	
n = 3	TOTAL DEDUCT VALUE		77	RATING = <u>FAIR</u>
	CORRECTED DEDUCT VALUE (CDV)		49	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

RECENTLY SAND SEALED, BUT
 SURVEY IS O.K. CRACKS
 WERE NOT OBLITERATED

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 30 SECTION F-12 F-12
 DATE 2/2/30 SAMPLE UNIT _____
 SURVEYED BY 10267 AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shoulder Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	8	11	10	15		
QUANTITY & SEVERITY	6' = L	1' x 39' = M	39' = L	1.5' x 5.5' =		
	6' = H		12' = L			
	8' = L		12' = L			
	4' = M		12' = L			
	12' = L		12' = L			
	NOTE:	NEW	SHOULD BE	(ALL SEAL ?)		
		CONCRETE	UP ROAD	DISTRESS (IE ANT)		
TOTAL SEVERITY	L	26		137	231	
	M	4	89			
	H	6				

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
8	1.3	L	3
8	0.2	M	2
8	0.3	H	7
11	4.7	M	21
10	7.2	L	14
15	12.5	L	29
q = 4	TOTAL DEDUCT VALUE		76
CORRECTED DEDUCT VALUE (CDV)			43

PCI = 100 - CDV =

57

RATING = GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION G-2
 DATE Aug 14 '36 SAMPLE UNIT _____
 SURVEYED BY LINDLEY BARBOUR AREA OF SAMPLE _____

Distress Types				SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling			
EXISTING DISTRESS TYPE QUANTITY & SEVERITY				
TYPE	15	8		
QUANTITY & SEVERITY	390 x 2' = L	36' = L		
	390 x 1' = L			
TOTAL SEVERITY	L 390	36		
M				
H				
PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <div style="text-align: center; font-size: 1.5em;">63</div> <hr style="border: 1px solid black;"/> <hr style="border: 1px solid black;"/> $RATING = \text{GOOD}$ <hr style="border: 1px solid black;"/> <hr style="border: 1px solid black;"/>
15	16.7	L	33	
8	1.5	L	4	
q=1	TOTAL DEDUCT VALUE		37	
CORRECTED DEDUCT VALUE (CDV)			37	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

481

For use of this form, see TM 5-623: the proponent agency is USACE.

BRANCH _____ SECTION G-3
 DATE _____ SAMPLE UNIT _____
 SURVEYED BY LINCOLN, BARBORN AREA OF SAMPLE _____

Distress Types		SKETCH: 15'
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation	14. Railroad Crossing	
6. Depression	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shoulder Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	10	7	10	8	9	12
QUANTITY & SEVERITY	L=20	M=128	L=22	M=22	L=60	5 x 151=L
	L=20		M=22	L=23	M=18	
	M=23		M=20		L=18	
	L=46		L=10			
	M=56		L=45			
	L=20		M=60			
	M=56		L=30			
	M=20		L=40			
	L=20					
TOTAL SEVERITY	L 66		147	23	78	755
	M 135	128	102	22	18	
	H					

PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	
10	9.4	L	16	PCI = 100 - CDV = <u>37</u>
10	10.5	M	31	
7	5.7	M	20	
8	1.0	L	2	
8	0.9	M	7	
9	3.4	L	5	
12	3.3	L	28	
q=7	TOTAL DEDUCT VALUE		127	RATING = <u>POOR</u>
	CORRECTED DEDUCT VALUE (CDV)		63	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

COMMENTS:
 ASPHALT ROAD HAD 15' WIDE, BUT ONLY 13' 2' OF THAT WAS OUTSIDE WITH LINE. THEN, IT WAS A GOOD SHOULDER.

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 20 SECTION L-5
 DATE SEP 1 1980 SAMPLE UNIT _____
 SURVEYED BY LINOL AREA OF SAMPLE _____

Distress Types	SKETCH:
1. Alligator Cracking * 10. Long & Trans Cracking 2. Bleeding * 11. Patching & Util Cut Patching 3. Block Cracking * 12. Polished Aggregate * 4. Bumps and Sags * 13. Potholes 5. Corrugation * 14. Railroad Crossing 6. Depression * 15. Rutting * 7. Edge Cracking * 16. Shoving * 8. Jt Reflection Cracking * 17. Slippage Cracking * 9. Lane/Shldr Drop Off * 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE.QUANTITY & SEVERITY						
TYPE	7	10	1	9	8	10
QUANTITY & SEVERITY	34=M	25=M	29 x 2 = L	25 = L	7=L	11=L
	15 = L	25=M	6x1 = L		2=M	2=M
	26=M	6=M	2x1 = L		7=L	6=M
	18=L	51=L	3x1 = L		3=M	5=L
		27=L	3x1 = L		6 =M	3=M
		69=L			1 = L	5=L
		45=L				7=L
		18=L				2=M
		19=L				2=L
TOTAL SEVERITY	L	33	259	77	25	15
	M	60	69		16	
	H					

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
7	1.6	L	4
7	2.8	M	14
10	12.4	L	18
10	3.3	M	18
1	3.7	L	22
9	1.2	L	3
20	2.8	M	6
q = 5	TOTAL DEDUCT VALUE		86
CORRECTED DEDUCT VALUE (CDV)			44

PCI = 100 - CDV = 56

RATING = GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH SR 23 SECTION L-6
 DATE SEP 1, '36 SAMPLE UNIT _____
 SURVEYED BY LINDLY AREA OF SAMPLE _____

Distress Types					SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling				
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	7	10	3	10	9
QUANTITY & SEVERITY	5' = L	154' = M	11 = L	28 = L	129 = L
		4 = L	3 = M		
		11 = L	2 = M		
		25 = L	12 = L		
		54 = L	14 = L		
		4 = M			
		6 = L			
		48 = L			
TOTAL SEVERITY	L	5	193	37	129
	M		158	5	
	H				
PCI CALCULATION					
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	<div style="text-align: right;"> PCI = 100 - CDV = <div style="text-align: center;">63</div> </div> <div style="text-align: right; margin-top: 20px;"> RATING = <u>GOOD</u> </div>	
7	0.23	L	1		
10	9.0	L	16		
10	7.3	M	27		
8	1.7	L	4		
8	0.23	M	2		
9	6.0	L	8		
q = 3	TOTAL DEDUCT VALUE		58		
CORRECTED DEDUCT VALUE (CDV)			37		

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

484

BRANCH US 20

SECTION L-7

DATE SEP 1, '86

SAMPLE UNIT _____

SURVEYED BY LINDLY

AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation	14. Railroad Crossing	
6. Depression	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Jt Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shldr Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE					
QUANTITY & SEVERITY					
TOTAL SEVERITY	L				
	M				
	H				

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
$\eta = \frac{\text{TOTAL DEDUCT VALUE}}{\text{CORRECTED DEDUCT VALUE (CDV)}}$			PCI = 100 - CDV = <u>100</u> RATING = <u>EXCELLENT</u>

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

OVERLAP 1 MONTH AGO.

NO DEDUCTIONS

(WHITE LINE IS 1' OUTSIDE THE 13' WIDE MAIN PAVE. IT IS ON THE SHOULDER.)

CONCRETE PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 30SECTION L-8DATE SEP 3, 196

SAMPLE UNIT _____

SURVEYED BY LINDLYSLAB SIZE 40' x 12'

Distress Types

21. Blow-Up
22. Buckling/Shattering
23. Corner Break
24. Divided Slab
25. Durability ("D")
26. Cracking
27. Faulting
28. Joint Seal Damage
29. Lane/Shldr Drop Off
30. Linear Cracking
31. Patching, Large & Util Cuts
32. Patching, Small | 33. Polished Aggregate
34. Papouts
35. Pumping
36. Punchout
37. Railroad Crossing
38. Scaling/Map
39. Cracking/Crazing
40. Shrinkage Cracks
41. Spalling, Corner
42. Spalling, U Joint |
|---|---|

DIST. TYPE	SEV.	NO. SLABS	% SLABS	DEDUCT VALUE
26*	H			8
28	H	1	33	33
28	M	2	67	32
27	M	2	67	17
31		3	100	9
37			100	6
38	L	2	67	12
38	m	1	33	11
q = 8 TOTAL DEDUCT VALUE				133
CORRECTED DEDUCT VALUE (CDV)				60
PCI = 100 - CDV =				40
RATING =				POOR

#3

* All Distresses Are Counted On A Slab-By-Slab Basis Except Distress 26, Which Is Rated For the Entire Sample Unit.

↑
E

DA FORM 5145-R, NOV 82

Figure E-1.

* 31 IS 6' WIDE OF ENTIRE SLAB

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH US 30 SECTION L-9
 DATE SEP 3 '86 SAMPLE UNIT _____
 SURVEYED BY LINOLY AREA OF SAMPLE _____

Distress Types				SKETCH:	
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling				
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	7	10			
QUANTITY & SEVERITY	25 = L	133 = L			
TOTAL SEVERITY	L 25	133			
M					
H					
PCI CALCULATION					
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	PCI = 100 - CDV = <u>82</u>	
7	1.6	L	4		
10	8.3	L	15		
q = 1	TOTAL DEDUCT VALUE		19	RATING = <u>VERY GOOD</u>	
CORRECTED DEDUCT VALUE (CDV)			18		

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION S-5
 DATE _____ SAMPLE UNIT _____
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	9	12	15			
5L	5L	X141	X70L			
TOTAL SEVERITY	L	5	987	70		
	M					
	H					

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
9	0.3	L	0
12	63.6	L	12
15	4.5	L	20
q = 2	TOTAL DEDUCT VALUE		32
CORRECTED DEDUCT VALUE (CDV)			23

PCI = 100 - CDV = 77

RATING = VERY GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION S-6
 DATE 8/7/86 SAMPLE UNIT site 3 & 4.
 SURVEYED BY _____ AREA OF SAMPLE _____

Distress Types				SKETCH:		
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling					
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	7	8	10	15		
QUANTITY & SEVERITY	7L	6L	3L (30)	2X177L		
		12L	177L (12)			
		12L				
		12L				
		12L				
		12L				
		12L				
TOTAL SEVERITY	L	7	78	180	354	
	M					
	H					
PCI CALCULATION						
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <div style="text-align: center; margin-top: 10px;"> <u>65</u> </div> $RATING =$ <u>GOOD</u>		
7	0.3	L	2			
8	3.7	L	7			
10	8.5	L	15			
15	16.7	L	32			
q=3	TOTAL DEDUCT VALUE		56			
	CORRECTED DEDUCT VALUE (CDV)		35			

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____

SECTION S-7DATE 8/8/85SAMPLE UNIT Site 3 & 4SURVEYED BY Gupta, Lindy

AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE.QUANTITY & SEVERITY						
TYPE		8	10	15	12	
QUANTITY & SEVERITY	{	11L	42L	2X199L	5X199	
		9L	16M			
		12L	10L (G)			
		11M	18L			
		14L	25L			
		7L				
		4L				
		12L				
TOTAL SEVERITY	L	69	261	398	995	
	M	11	16			
	H					

PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	
8	3.1	L	6	PCI = 100 - CDV = <div style="text-align: right; font-size: 1.5em;">60</div>
8	0.5	M	4	
10	11.9	L	18	
10	0.7	M	6	
15	18.2	L	33	
12	45.5	L	11	
q= 5 TOTAL DEDUCT VALUE			78	RATING = <div style="text-align: right; font-size: 1.5em;">GOOD</div>
CORRECTED DEDUCT VALUE (CDV)			40	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-823; the proponent agency is USACE.

BRANCH _____ SECTION V1
 DATE 8/6/86 SAMPLE UNIT _____
 SURVEYED BY Gupta, Lindy AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling	

EXISTING DISTRESS TYPE.QUANTITY & SEVERITY						
TYPE	7	11	8	10		
QUANTITY & SEVERITY	67M	37.1 M	5L	60M		
	17L		10L	26L		
	35L		8L			
			10L			
TOTAL SEVERITY	L 52	1	33	36		
	M 67	7.1		60		
	H					

PCI CALCULATION				
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	
7	2.7	L	5	$PCI = 100 - CDV =$ <div style="text-align: center; margin-top: 10px;"> <u><u>74</u></u> </div>
7	3.5	M	15	
11	0.4	M	5	
8	1.7	L	4	
10	1.9	L	4	
10	3.1	M	17	
q = 4	TOTAL DEDUCT. VALUE		50	$RATING =$ <u><u>VERY GOOD</u></u>
CORRECTED DEDUCT VALUE (CDV)			26	

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____

SECTION V-2DATE 8/6/86SAMPLE UNIT Site 2 & 3SURVEYED BY Gupta, Lindy

AREA OF SAMPLE _____

Distress Types						SKETCH:
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shldr Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling					
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY						
TYPE	7	10	8	12	15	
QUANTITY & SEVERITY	4M	51 (10)	10L	8x188	1x188	
		16M (10)	10L		1x188	
		5L (10)	10L			
		5L (10)	10L			
		5L (10)				
		5L (10)				
		5L (10)				
TOTAL SEVERITY	L	90	40	1504	376	
	M	4				
	H					
PCI CALCULATION						
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	$PCI = 100 - CDV =$ <div style="text-align: center; margin-top: 10px;"> 60 </div> $RATING =$ <u><u>GOOD</u></u>		
7	0.2	M	4			
10	4.8	L	10			
10	0.9	M	8			
8	2.1	L	5			
12	80	L	17			
15	20	L	35			
q=5	TOTAL DEDUCT VALUE		79			
CORRECTED DEDUCT VALUE (CDV)		40				

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH _____ SECTION V-3
 DATE 8/6/86 SAMPLE UNIT Site 425
 SURVEYED BY Gupta, Lindy AREA OF SAMPLE _____

Distress Types				SKETCH:	
1. Alligator Cracking 2. Bleeding 3. Block Cracking *4. Bumps and Sags 5. Corrugation 6. Depression *7. Edge Cracking *8. Jt Reflection Cracking *9. Lane/Shoulder Drop Off	*10. Long & Trans Cracking 11. Patching & Util Cut Patching 12. Polished Aggregate *13. Potholes 14. Railroad Crossing 15. Rutting 16. Shoving 17. Slippage Cracking 18. Swell 19. Weathering and Raveling			<p>⊕</p> <p>could not proceed for over 1/2 mile because the surface was covered in mud.</p>	
EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	→ 8 (40')	10	7		
QUANTITY & SEVERITY	7L	73L (long)	63L (long)		
	12L				
	12L				
	12L				
TOTAL SEVERITY	L	43	73	63	
	M				
	H				
PCI CALCULATION					
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE	PCI = 100 - CDV = <u>91</u>	
8	2.3	L	5		
10	3.8	L	9		
7	3.3	L	5		
q = 3 TOTAL DEDUCT VALUE			19	RATING = <u>EXCELLENT</u>	
CORRECTED DEDUCT VALUE (CDV)			9		

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.

DA FORM 5146-R, NOV 82

Figure E-2.

ASPHALT PAVEMENT INSPECTION SHEET

For use of this form, see TM 5-623; the proponent agency is USACE.

BRANCH U.S. 41

SECTION V-4

DATE 8/5/86

SAMPLE UNIT Between sk 4 & 5, N. Bound

SURVEYED BY Gupta, Lindly

AREA OF SAMPLE _____

Distress Types		SKETCH:
1. Alligator Cracking	*10. Long & Trans Cracking	
2. Bleeding ✓	11. Patching & Util Cut Patching	
3. Block Cracking	12. Polished Aggregate	
*4. Bumps and Sags	*13. Potholes	
5. Corrugation ✓	14. Railroad Crossing	
6. Depression ✓	15. Rutting	
*7. Edge Cracking	16. Shoving	
*8. Jt Reflection Cracking	17. Slippage Cracking	
*9. Lane/Shldr Drop Off	18. Swell	
	19. Weathering and Raveling	

EXISTING DISTRESS TYPE, QUANTITY & SEVERITY					
TYPE	7	8 (40' per ft)	10	15	
QUANTITY & SEVERITY	194 L	40 L	7 L (trans) 40 L (long)	3 x 200 L	
TOTAL SEVERITY	L	L	L	L	
	M				
	H				

PCI CALCULATION			
DISTRESS TYPE	DENSITY	SEVERITY	DEDUCT VALUE
7	8.8	L	10
8	1.8	L	4
10	2.1	L	5
15	27.3	L	38
q = 3	TOTAL DEDUCT VALUE		57
	CORRECTED DEDUCT VALUE (CDV)		37

PCI = 100 - CDV =

63

RATING = GOOD

* All Distresses Are Measured In Square Feet Except Distresses 4,7,8,9 and 10 Which Are Measured In Linear Ft; Distress 13 Is Measured In Number of Potholes.