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EVALUATION OF AASHO ROAD TEST SATELLITE AND ENVIRONMENTAL STUDIES

PHASE II

FINAL REPORT

Prepared for

National Cooperative Highway Research Program
Transportation Research Board
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by

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ABSTRACT

This report documents a pilot study of the collection of pavement data that are typical of what is presently available in several States, the development of regional overlay design equations from the data, and an assessment of the quality of the data and the reliability of the design equations that may be developed. Two States were selected to represent different climatic zones: Minnesota, in a wet, hard-freeze zone and Texas, which has four other climatic zones including wet, no-freeze; wet, freeze-thaw cycling; dry, no-freeze; and dry, freeze-thaw cycling. Three levels of overlay design procedure were identified: Level 1, a simple empirical equation with only a few variables; Level 2, a more detailed and reliable empirical equation with many variables; and Level 3, a mechanistic overlay design procedure. Three examples of a Level 1 overlay design equation were developed: overlays on flexible and jointed concrete pavement in Minnesota and overlays on flexible pavement in Texas. One Level 2 design equation was developed from Texas data in the dry, freeze-thaw cycling climate, and proved to be very reliable.

It was concluded that good regional overlay design equations may be developed from the data that are currently available in 11 or more States. It was recommended that more detailed asphalt material properties and non-destructive testing data should be collected and stored in anticipation of the need to develop such equations.

SUMMARY OF FINDINGS

This report covers the findings of a pilot study of the pavement data that are currently available in several States to see whether it is possible to develop realistic and reliable overlay design equations from those data. The first phase of this project circulated a questionnaire to all 50 States and evaluated the 47 responses that were received to determine the quantity and quality of pavement data that had been collected and stored by several States since the AASHO Road Test. The evaluation indicated that there are at least 11 States, and possibly more, that have collected data that are sufficiently detailed to permit the development of pavement design equations that are valid within the climatic region where it was collected. Because the evaluation of the responses to the questionnaire was somewhat subjective, it was desirable to verify the findings of Phase I with a study of the actual data.

Two States were selected to represent a variety of climatic zones. In Minnesota, which is in a wet, hard-freeze climatic zone, data were collected on a total of 86 pavement sections where overlays had been placed on flexible pavements and 47 sections where overlays were placed over jointed reinforced concrete pavements. In Texas, data were available on a total of 45 pavements in which overlays were placed on flexible pavements. Four climatic zones are represented in Texas: wet, no-freeze; wet, freeze-thaw cycling; dry, no-freeze; and dry, freeze-thaw cycling.

Three levels of overlay design procedure were identified: Level 1, a simple empirical equation with only a few variables; Level 2, a more detailed and reliable empirical equation; and Level 3, a mechanistic overlay design procedure. Three examples of Level 1 overlay design equations were developed, two in Minnesota and one in Texas. The coefficient of determination (R^2) of the equations ranged from low to high (0.14 to 1.00), and in general, the equations gave realistic values of overlay thickness and showed correct trends with the important variables.

One example of a Level 2 overlay design equation was developed to permit the design of an overlay to resist reflection cracking. It was developed using Texas data in the dry, freeze-thaw cycling climate and proved to be very reliable.

It was concluded that good regional overlay design equations may be developed from the data that are currently available in 11 or more States. The conclusion lends support to the current efforts by several other States to initiate or continue a long-term pavement monitoring effort. It was recommended that more detailed asphalt materials properties and non-destructive testing data on pavements prior to overlay should be collected and stored so that more reliable design equations may be developed in the future.

CHAPTER ONE

INTRODUCTION AND RESEARCH APPROACH

INTRODUCTION

One of the primary methods of rehabilitating pavements is by placing an overlay on an existing pavement that has become distressed enough to need strengthening. Several highway agencies have developed overlay design procedures for both asphalt and concrete overlays, some of which are based upon a restricted set of field observations (1,2,3, 4,5,6,7,8,9), others are based upon some form of linear elastic layered analysis (10,11,12,13), and still others are based upon extensions of the AASHO Road Test results into designs that were never actually a part of the Road Test experimental program (14). In any case, the design criteria that are used in establishing the thickness of the overlays is selected on an empirical or a subjective basis. For example, the Corps of Engineers overlay design procedure (3) for unbonded rigid overlays over rigid pavements has a pavement condition coefficient, c, that varies between 0.35 and 1.0 depending upon the current "structural condition" of the pavement. Partially bonded rigid overlays have the same set of coefficients but a different power on the layer thicknesses (1.4 instead of 2). It is obvious from this that the empirical observations upon which this design procedure is based considers two major factors to be important to the successful

performance of an overlay:

(a) the "structural condition" of the old surface layer; how badly cracked or deteriorated it is.

(b) the bond, or "friction", that can be developed between the two layers, the new and the old.

The principal objective in computing the thickness of the overlay is to provide a structurally adequate pavement with some provision against reflection cracking, which becomes more likely as the degree of bonding increases.

The Corps of Engineers overlay design procedure is typical of most of the better known and more widely accepted overlay design procedures. The procedure itself is simple and straight forward but it has provisions which recognize implicitly the real problems that must be overcome by overlays, namely, (a) severe structural defects in the old pavement including weak base and subgrade and small load transfer across cracks and joints, (b) an unknown degree of bonding between the overlay and the old pavement beneath it and (c) reflection cracking in which the joints or cracks in the old pavement propagate upward through the overlay.

Although they have a common objective, overlay design procedures approach their task by different means which can be classified into roughly four categories:

1. mechanistic
2. empirical
3. mechanistic-empirical
4. probabilistic

A mechanistic design procedure relies entirely upon computations of stresses, strains, or stress intensity factors and crack lengths to predict the time or the total accumulated traffic that will result in fatigue or reflection cracking of the overlay. Layered elastic and viscoelastic theory and fracture mechanics approaches fall into this category. The advantage of this approach is that it begins with physical fundamentals and the equations that are developed make use of the material properties external loads and stresses that are basic to the processes that cause pavements to deteriorate. The valuable insight that a mechanistic procedure provides into the causes and effects of pavement deterioration and the proper relations between variables is unavailable by any other means. Despite these distinct advantages, mechanistic methods are hampered by being unable to account for all of the localized material, climatic, and geometric peculiarities at the cracks and joints in pavements which are crucial to the successful performance of an overlay. In order to account for these factors it is usually necessary to develop an empirical relation between what can be calculated mechanistically and what can be observed in the field under actual in-service conditions.

An empirical overlay design procedure is one in which field observations of distress on existing overlays are regressed against known historical data such as age and type of construction, traffic and weather variables as well as known layer thickness and material property data in order to find a reliable relation that may be used to compute an overlay thickness that will perform well over a preset period of time. Empirical methods can be very valuable if the proper

variables are known and a proper form of equation is used, but otherwise these methods can be misleading. The selection of the proper variables to use and the most useful form of equation is best made by relying upon the form of equation and the variables that are used in a mechanistic formulation of the same problem. Thus, it is seen that a successful mechanistic or empirical overlay design procedure must make use of both elements, and this suggests the third category of overlay design procedures.

A mechanistic-empirical overlay design procedure is one in which a mechanistically computed pavement response such as stress, strain, deflection, or number of cycles to failure is regressed against observed distress on overlays in the field such as Class 2 cracking to define an equation in which the overlay thickness is a variable. Other variables will usually include observed traffic, weather factors, construction history, layer thicknesses, and assumed or measured material properties. Again the variables that are used and form of the equation that is adopted is best chosen by relying upon a mechanistic form of equation. The mechanistic-empirical procedure is hampered just as the mechanistic method is by an inability to consider localized variables that contribute largely to the success or failure of an overlay. The strengths of the method are that the variables that are used will be the correct ones and the relations between them will be in accord with physical principles. These procedures are usually simple to apply and can be constructed in such a way as to use non-destructive test data in lieu of a mechanistically-computed pavement response such as deflection.

A "probabilistic" overlay design procedure is one in which subjective estimates from experience are made and combined with an assumed probability density function such as the normal distribution to make projections of the age or accumulated traffic levels in the future at which the overlay will need to be repaired or replaced. The weakness of this approach is that it considers no variables and, as a consequence, is good only as a gross estimate of the future performance of a specific overlay. The strength of the approach is that it is or can be based upon a valuable quantity which is nevertheless difficult to define, experience.

Each of these methods is valuable, and each has its own strengths and weaknesses. All methods of overlay design have one feature in common: regardless of its basic approach, it must always make use of observed field data to "calibrate" it to actual field conditions. In the first phase of this task, Task 17 of Project 20-7, it was shown to be practically impossible to develop a pavement design procedure that is capable of representing the performance of all types of asphaltic concrete or Portland cement concrete pavements in all of the climatic regions of the Unites States. This finding was made based upon an argument from experimental design. It was shown that at least 17 variables including traffic, climatic factors, construction history, geometry, and subgrade factors must be included in an all-inclusive design procedure and that there is not a sufficient quantity of field data to form a basis for such a design procedure. However, it was also shown that if pavements were divided into different types of pavements, and a total of eleven were identified, and the climatic

zones of the United States were divided in six reasonably homogeneous areas, the total number of variables that must be represented in any design equation may be reduced to about eight or nine.

In order to determine the availability of such data, a survey was conducted of the data that have been collected and stored in all fifty States. The responses to the survey were evaluated using a utility theory approach to determine whether the quantity and quality of data that are available are sufficiently complete to warrant revisions to the AASHTO Interim design guides for pavements. The study concluded that, due to the fragmented and non-uniform nature of the data that have been collected, the best that can be expected is to develop regional equations for specific types of pavements in specific climatic zones. Table 1 is extracted from the report on the first phase of this task and indicates those States that appear to have enough quality data to allow the development of such pavement design equations. The table lists the eleven different types of pavement that were identified and these include specific types of pavement such as asphaltic concrete on unstabilized base course, jointed reinforced concrete, overlays on flexible pavements and overlays on rigid pavements. Figure 1 shows a map of the United States in which the six climatic zones are outlined. The six zones are described as follows.

TABLE 1. Most Likely Regional Equations

Pavement Type	Climatic Zones I	II	III	IV	V	VI
Flexible						
1. Asphalt on flexible base	California Florida Washington	California Missouri Washington	Minnesota Missouri New York	California	California Washington	Washington
2. Asphalt on stabilized base	Louisiana Washington	Louisiana Washington			Washington	Washington
3. Asphalt on bituminous base	Florida Texas	Missouri Texas	Missouri	Texas	Texas	
4. Full depth asphalt						
5. Surface treated pavement	Texas	Texas		Texas	Texas	
6. Overlaid flexible pavement	Texas Washington	Texas Washington		Texas	Texas Washington	Washington
Rigid						
1. Continuously reinforced concrete	Texas	Texas		Texas	Texas	
2. Jointed plain concrete	Washington	Washington			Washington	Washington
3. Jointed reinforced concrete	Louisiana	Illinois Louisiana	Illinois			
Composite						
1. Asphalt overlays on jointed concrete	California Washington	California Washington		California	California Washington	Washington
2. Concrete overlays on jointed concrete						

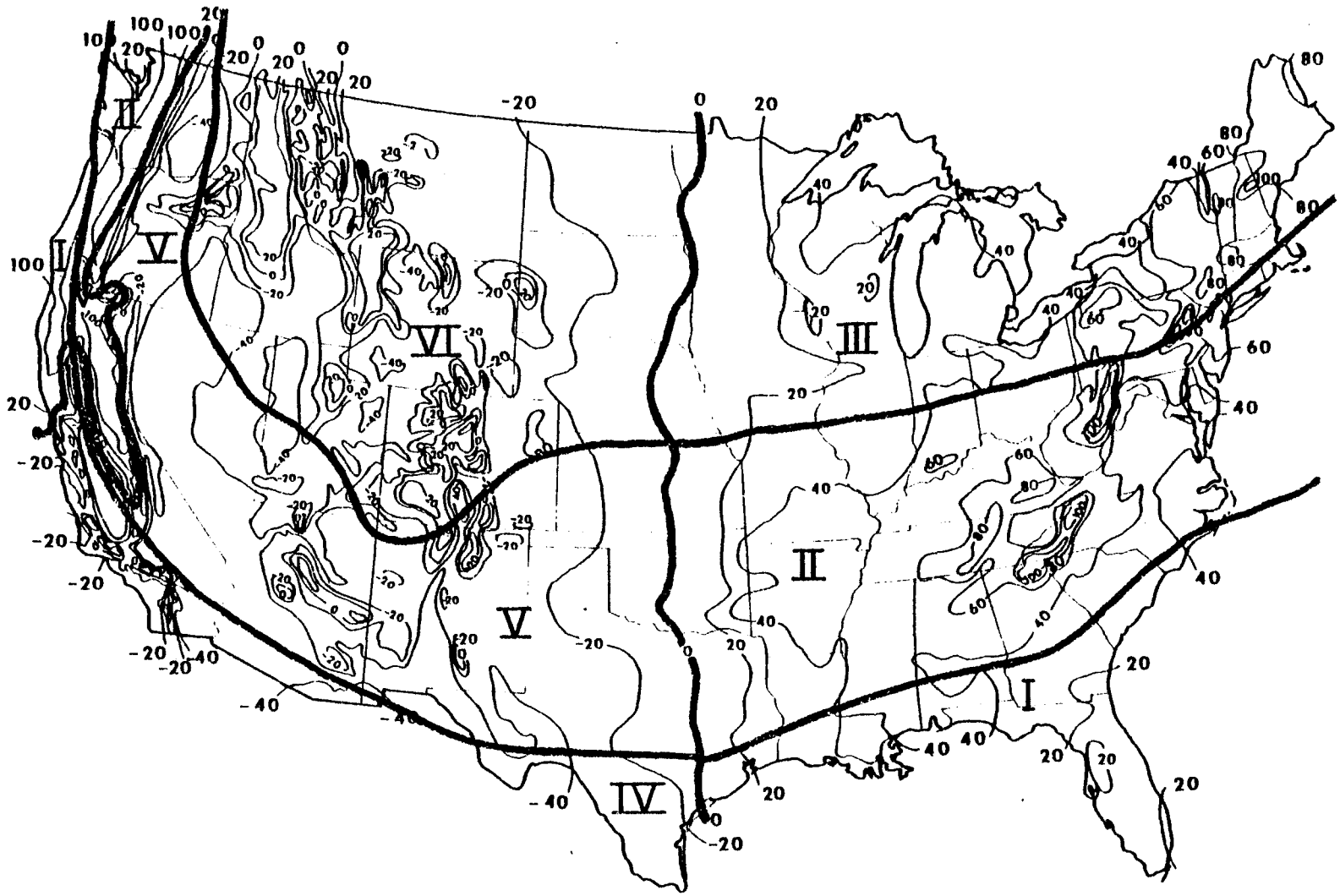

Figure 1. The Six Climatic Regions in the United States (6)

Climatic Zone	Characteristics of the Zone
I	Wet, No-Freeze
II	Wet, Freeze-Thaw Cycling
III	Wet, Hard Freeze, Spring Thaw
IV	Dry, No-Freeze
V	Dry, Freeze-Thaw Cycling
VI	Dry, Hard Freeze, Spring Thaw

The boundary between the wet and dry zone is a Thornthwaite Index contour of 0. The Thornthwaite Index is a measure of annual climatic moisture balance between rainfall (+) and potential evapotranspiration (-) and the contours are taken from the original paper on the subject by Thornthwaite (15). The boundary between the no-freeze and the freeze-thaw cycling zones was taken from Highway Research Board Special Report No. 1 (16) and represents the contour along which freezing temperatures will penetrate the pavement to a depth no greater than five (5) inches (13 cm). The boundary between the freeze-thaw cycling and the hard freeze-spring thaw zones was taken from a map of freezing index that was prepared by the U.S. Army Corps of Engineers (17) and represents the contour along which freezing temperatures persist in the ground for more than 60 days in a row each year.

Because of the findings of the first phase of this task and the current importance of overlay design, the objective of the second phase of this task was to develop overlay design procedures for two climatic zones. The design procedures will be either empirical or

mechanistic-empirical and will rely upon the data that are currently available from State highway agencies.

RESEARCH PROBLEM STATEMENT

There is a need to assemble and make use of the data collected and stored by the States in their AASHO Road Test Satellite and environmental test sections as well as on other sections which were not designated as such. Phase I of NCHRP Project 20-7, Task 17 identified a number of States which have apparently collected sufficient quantities of high quality data to permit the development of regional equations for each of several distinct types of pavement. Because of the importance of overlays in the coming periods in which maintenance and rehabilitation will play a dominant part in the pavement management strategies of the States, it is desirable to have available asphaltic concrete overlay design equations that are based upon these observed filed data, and thus to capitalize upon the long-term monitoring efforts that have been carried forward by the various States.

OBJECTIVES

The objective of Phase II of NCHRP Project 20-7, Task 17 is to develop regional asphaltic concrete overlay design methods based upon data and experience from the satellite, environmental, and other road test sections identified in Phase I. Specific objectives are to:

1. Collect data from at least two different climatic regions.
2. Develop design methods for overlays that are empirical in nature and represent overlays in at least two climatic regions.
3. Work example problems and provide design aids for each method.
4. Prepare a final report including design aids and a summary of the data used in developing the design method.

RESEARCH APPROACH

The successful composition of an empirical equation that can be used for the design of overlays must include as a minimum the same kind of considerations that are either explicitly or implicitly a part of other published and accepted design procedure, namely:

1. A requirement to retard or prevent the reflection of surface or subsurface conditions in the overlay. These conditions include rutting, fatigue cracking, transverse and longitudinal cracking in the surface course, and pumping beneath a crack or joint and voids in the base, subbase, or subgrade.
2. A requirement to include explicitly or implicitly all of the important material properties and layer thicknesses. The deflections of the old and overlaid pavement include implicitly the thickness and elastic modulus of each layer in the pavement.
3. A requirement to include all of the important traffic and climatic variables in the equation.

   The selection of these variables can be guided by considerations

from elastic layered theory and from fracture mechanics. As shown in the Final Report for Phase I of NCHRP Project 20-7, Task 17, (18), the deflection of a pavement is proportional to δ,

$$\delta = \frac{P}{H'E_k} \quad , \tag{1}$$

where

P = the applied load,

E_k = the modulus of the subgrade, and

H' = an "effective thickness" of the pavement overlying the subgrade. Examples of this are the thickness of the concrete pavements, D, and the structural number, SN, in flexible pavements.

The loss of serviceability index was found to be inversely proportional to δ at the AASHO Road Test and was expressed as such in the Interim Guide design equations. It was suggested in the Final Report for Phase I that the term H' could be more useful if it were expressed as

$$H' = \sum_{i=1}^{k} h_i \left(\frac{E_i}{E_0}\right)^n \quad , \tag{2}$$

where

h_i = the thickness of the $i^{\underline{th}}$ layer,

E_i = the elastic modulus of the $i^{\underline{th}}$ layer,

E_0 = the elastic modulus of the datum material, and

n = an exponent which has been shown experimentally and theoretically to vary with the thickness and stiffness of the base course (19,20,21) but was assumed by

Odemark to be 1/3 (22).

An overlay design procedure which is intended to add structural strength to a pavement would do so by increasing H' and thus by reducing δ. The percentage increase in the life of the pavement that is effected by the addition of the overlay thickness is linearly or nearly linearly proportional to (δ_i/δ_f) where δ_i is the deflection of the old pavement and δ_f is the deflection of the overlaid pavement. Alternatively, the percentage increase in pavement life is linearly or nearly linearly proportional to (H'_f/H'_i) where H'_i is the effective thickness of the old pavement and H'_f is the effective thickness of the overlaid pavement. All deflection-based overlay design procedures have the features mentioned above in common, even though they may be expressed somewhat differently from one procedure to the next. The overlay design procedure to be developed in this Phase of Task 17 will have this same feature in common with all of the other methods. The above discussion shows how either the thicknesses and moduli of the layers (H'_i, H'_f) or the measured or predicted deflections (δ_i, δ_f) may be used as a basis for overlay design.

But this type of design does not recognize the importance of localized structural integrity in the vicinity of a crack or joint in the old pavement. At this point, fracture mechanics can offer some assistance in identifying the important variables just as elastic layered theory assisted in identifying them in the deflection-based design.

Reflection of transverse or longitudinal cracks through an

overlay is caused by a combination of traffic and thermal stresses. The important variables for reflection cracking include: overlay thickness, tire pressure, total tire or dual tire loads, aggregate size, modulus of the overlay material, crack spacing in the old pavement, and temperature change in the old pavement. Still more variables can be identified by fracture mechanics considerations in the case where load transfer across a crack or joint has been reduced by poor support conditions as evidenced by pumping, or by a large deflection difference from the loaded to the unloaded side of the crack or joint. This list of variables constitutes a minimum of the number of independent variables that should be included in a regression analysis of the time or traffic required to produce a reflection crack through an overlay. If the regression analysis produces the wrong sign of the variable, that will indicate that the equation is physically unrealistic and that it should be rejected as a possible candidate as an overlay design equation.

A successful design method for overlays must take into account both aspects of overlay performance: deflections and reflection cracking. This may require two equations to be satisfied instead of one and the overlay that is finally chosen is the one that best satisfies both criteria. Although it is unlikely that a sufficient number of overlays will be found with special crack retarding features in them, the overlay design equation should be constructed in such a way that future revisions to the equation can be made easily to incorporate these effects.

This discussion of overlay variables points out the importance of

selecting the correct variables for use in the regression equations to describe the performance of an overlay. The number of variables in the list given above points out the need to select carefully from among the sets of data available in each of the States which had data of sufficient quantity and quality from which to develop a reliable design equation. The questionnaire which was circulated in Phase I of this project suggested that California, Texas, and Washington have sufficient data for overlay design equations. In addition, the field visits that were made as part of this task indicated that Minnesota has similarly excellent sets of data that are stored in decentralized manual files. In order to develop overlay design equations for two different climatic zones, it was necessary to make a careful selection of data sets from among these States which represent all six climatic zones in the United States, as follows

State	Climatic Zone
California	I, II, IV, V
Minnesota	III
Texas	I, II, IV, V
Washington	I, II, V, VI

After a series of telephone contacts with each of the states, it was determined that Minnesota would be able to provide a sufficient quantity of data on pavement distress, serviceability index, traffic, and construction history as well as layer thickness and material identification data to permit the development of overlay design

equations. A total of 133 sections of data were collected and placed in a computerized pavement data base at the Texas Transportation Institute. Of these, 86 sections were overlays over flexible pavement and 47 sections were overlays over jointed concrete pavement. A total of 45 sections of pavements were used to develop overlay design equations from the Texas Flexible Pavement data base which is maintained at the Texas Transportation Institute. The overlay design equations that were developed were either empirical or mechanistic-empirical, and were for overlays on flexible and jointed concrete pavements in Minnesota (Climatic Zone III) and overlays on flexible pavements in Texas (Climatic Zone V).

CHAPTER TWO

FINDINGS

The findings in this task are, in general, that overlay design equations can be developed from the available data, but that the level of complexity and reliability that can be achieved with the design procedure depends largely upon how complete the materials property data are on each of the projects that are represented in the data collection. The discussion of these findings are presented in this chapter in six parts:

1. Objectives of overlay design procedures
2. Non-destructive testing in an overlay design procedure
3. Selection of the form of an overlay design equation
4. Regression analysis and some of its pitfalls
5. Development of "Level 1" overlay design equations
6. Development of "Level 2" overlay design equations

OBJECTIVES OF OVERLAY DESIGN PROCEDURES

The principal objective of an overlay design procedure is to calculate the required thickness of an overlay while taking into account the traffic that is to be served, the effects of the climate in which the pavement is placed, the current structural condition of the existing pavement, and if possible, the effects of different

choices of candidate materials that may be used in the overlay and of the bond between the old pavement and the overlay. In addition, the results of the calculations should reliably reproduce the observed field performance of actual overlays.

The degree to which an overlay design procedure meets these objectives is the measure of its success. It should be noted that a third objective of overlay design procedures has been, until recently, a degree of simplicity so that the entire procedure could be incorporated into a single graph or nomograph. Recent developments in microcomputers and hand-held programmable calculators have made this requirement much less important than formerly.

As noted in Chapter One, there are numerous variables related to loading, temperature, layer thickness and modulus, crack or joint spacing and load transfer which affect the ability of an overlay to resist or retard cracking. The smaller the number of these variables that are represented explicitly in the design procedure, the less capable it is of reliably representing the actual complexity that is involved in the performance of an overlay. There will always be a direct connection between the reliability of an overlay design procedure and the complexity which it is capable of representing. Some examples of this will be given in subsequent sections in this Chapter.

In this project, overlay design procedures were developed on two levels of complexity, which will be called for the sake of convenience, Level 1 and Level 2. The levels of complexity are based upon the degree to which the design procedure approaches a mechanistic

method. Regardless of complexity or of whether they would be classified as empirical or mechanistic, successful overlay design procedures incorporate all of the following elements:

1. Observations
2. Assumptions
3. Theoretical model
4. Correlations
5. Calculated quantities

An overlay design procedure that is classified as a Level 1 procedure will have the following elements.

1. Observations: observed distress, construction history, traffic, climatic factors
2. Assumptions: assumed material properties (not measured), assumed relation between deflections and pavement damage
3. Theoretical Model: usually the formula for a deflection under load or the moment of inertia of a transformed pavement section, as in Eq. (2) or Eq. (9)
4. Correlation: correlations between observed distress and observed number of load applications
5. Calculated Quantities: usually using the theoretical model to calculate a deflection or transformed moment of inertia from the layer thickness and assumed material properties.

An overlay design procedure that is classified as a Level 2 procedure will have the following elements.

1. Observations: distress, construction history, traffic, climatic factors, measured material properties
2. Assumptions: usually a linear relation between stress and

strain, and that

3. Theoretical Model: deflection under load, moment of inertia of a transformed section, beam-on-elastic foundation at a joint, and others
4. Correlation: correlations between observed and predicted number of load applications to reach a specified level of distress.
5. Calculated Quantities: deflections, rotations, fracture properties.

An overlay design procedure that is "mechanistic" is classified as a Level 3 design procedure and will have the following elements.

1. Observations: distress, construction history, traffic, climatic factors, and material properties
2. Assumptions: linear elasticity or linear viscoelasticity, and relations between primary calculated responses such as strains and deflections and limiting responses such as permanent strain and cumulative damage
3. Theoretical Model: layered elastic or viscoelastic theory and finite element analysis
4. Correlation: correlations between calculated strain and number of load applications to reach a specified level of cracking distress, and correlations between observed density and severity of distress and calculated strain. The correlations may take the form of modified material properties or layer thickness
5. Calculated Quantities: stress, strain, deflections.

Since all overlay design procedures require elements of all five

categories, none can be termed purely "empirical" or purely "mechanistic". Examples of two widely known and used pavement design procedures are given below to illustrate these points. Both of these are Level 1 design procedures. The first is the AASHO Road Test Flexible Pavement Design equation and the second is the Corps of Engineers overlay design equation.

AASHO Road Test Flexible Pavement Design Equation

The AASHO Road Test Flexible Pavement design equation is a Level 1 empirical design equation in which pavement damage was assumed to be directly related to deflections (23). This fact is not immediately apparent because the form of the equation obscures the fact. Pavement damage was defined as

$$g = \frac{P_i - P}{P_i - P_t} \tag{1}$$

where

g = the pavement "damage", a number that ranges between 0 and 1,

P_i = the initial serviceability index,

P = the present serviceability index,

P_t = the terminal serviceability index.

The damage equation was assumed to be of the form

$$g = \left(\frac{W}{\rho}\right)^{\beta} \tag{2}$$

where

W = the total number of 18-kip (80 kN) equivalent single axle loads that have caused the damage, g.

ρ = a constant which represents the "strength" of the pavement. When $W=\rho$, the damage, g, is equal to 1.0, and

β = an exponent

The larger ρ is, the longer a pavement will last or the greater the number of standard load applications it will carry.

Using the observed decrease of serviceability index and the number of load applications, N, linear regression analysis was used to determine two constants, a and b, which related the logarithm of g to the logarithm of N.

$$\log_{10} g = a + b \log_{10} N \tag{3}$$

The constants ρ and β were found from the regression constants a and b, as follows

$$\beta = b \tag{4}$$

$$\rho = 10^{-(\frac{a}{b})} \tag{5}$$

The 18-kip (80 kN) load equivalent, L.E., was defined using these derived values of ρ and β with the following formula

$$L.E. = \frac{\rho_{18} \; g^{1/\beta_{18}}}{\rho_i \; g^{1/\beta_i}} \tag{6}$$

At this point, the assumption was made that ρ is inversely related to deflections and a theoretical model of pavement deflections was used to suggest the form of the equation for ρ. Elastic layered theory (24, 25) shows that the deflection of an elastic pavement, δ, is proportional to $(P/E_s H)$ where P is the load, E_s is the elastic modulus of the subgrade and H is an effective thickness of all layers above the subgrade. The subgrade modulus is multiplied by the effective thickness and this is precisely the same form that was adopted by those who constructed the AASHO Road Test flexible pavement design equations. If ρ was assumed to be inversely proportional to deflections, then the equation for ρ should have the form

$$\rho \propto \frac{H\ E_s}{P} \tag{7}$$

In fact, the assumed form of the equation for ρ was

$$\rho = \frac{(SN+1)^d\ 10^S}{(L_1+L_2)^c} \tag{8}$$

where

L_1 = the axle load

L_2 = the axle counter; L_2 = 1 for single axles and L_2 = 2 for tandem axles

SN = the structural number, or "effective thickness" above the subgrade

$= a_1 D_1 + a_2 D_2 + a_3 D_3$

a_1, a_2, a_3 = layer coefficients of layers 1, 2, and 3, respectively

D_1, D_2, D_3 = layer thicknesses of layers 1, 2, and 3, respectively

S = the "soil support" value corresponding to a logarithm of the modulus of the subgrade

c, d = exponents

As a matter of interest, in exponential equations such as Equation 2, the power β is usually found to be inversely proportional to the logarithm of the coefficient, ρ. This was found to be the case with the AASHO Road Test flexible pavement equation.

The material constants a_1, a_2, and a_3 in these equations were determined by linear regression analysis using Equation 8 as a basis for the analysis.

The point of this illustration is that the form of the AASHO design equation is based upon an assumption that deflections control the performance of a pavement. A theoretical relation between load and pavement deflection was used to suggest the form of the equation for the constant, ρ, which represents the strength of the pavement. The selection of the form of the equation was not arbitrary but was guided by a known theoretical relation. The material properties that were measured at the AASHO Road Test were not used in determining the layer coefficients. Instead, they were determined by regression analysis and were assumed to lie in the range between 0 and 1. The assumed form of the structural number (SN) is also based upon a theoretical relation, as will be shown in a subsequent section of this chapter.

Corps of Engineers (FAA) Overlay Design Procedure

This design procedure was selected as another example of a supposedly empirical design method which, nevertheless, has a form that is suggested by theory. The FAA overlay design procedure first requires the calculation of the thickness, h, of a new pavement surface layer that will serve the future anticipated traffic. At this point, beam-on-elastic foundation theory would suggest that if the new pavement and the overlaid pavement are to have the same deflections, they should have the same moment of inertia. The thickness of the overlay on the old pavement may be calculated so as to provide the same moment of inertia as that provided by the new pavement, with the following equation:

$$E_2 h^3 = E_2 h_{2m}^3 (r) + E_1 h_1^3 (s) \qquad (9)$$

in which

E_2 = the elastic modulus of the old pavement

E_1 = the elastic modulus of the new pavement

h_1 = the thickness of the overlay

h_{2m} = the modified thickness of the old pavement surface

r, s = functions which will be defined below.

The thickness of the old pavement is modified by empirically assumed constants between 0.35 and 1.0 based upon the observed cracked condition of the old pavement surface. A more theoretically sound method of modifying the thickness of the old pavement will be

described in a subsequent section of this chapter.

By rearranging Equation (9), it is possible to solve for the thickness of the overlay, as in Equation (10).

$$h_1 = \left(\frac{E_2}{E_1}\right)^{\frac{1}{3}} \left[\left(\frac{1}{s}\right)h^3 - \left(\frac{r}{s}\right)h_{2m}^3\right]^{\frac{1}{3}} \tag{10}$$

where

$$s = 4 - 6\left(\frac{q}{u}\right) + 3\left(\frac{q}{u}\right)^2 \tag{11}$$

$$r = 4 + 6q + 3q^2 \tag{12}$$

$$q = \frac{tu - 1}{t + 1} \tag{13}$$

$$u = \left(\frac{h_1}{h_{2m}}\right) \tag{14}$$

$$t = \left(\frac{E_1}{E_2}\right)\left(\frac{h_1}{h_{2m}}\right) \tag{15}$$

Equation (10) is of the form

$$h_1 = 2.5\left[F\,h^n - C\,h_{2m}^n\right]^{\frac{1}{n}} \tag{16}$$

which is the FAA Overlay Design equation. The major difference between Equation (10) and Equation (16) is the power, n, which is 1.0 for fully bonded overlays, 1.4 for partially bonded overlays, and 2.0 for unbonded overlays. The factor 2.5 is used only with asphaltic overlays and is roughly the cube root of the modulus ratio between

concrete and asphalt as is suggested by Equation (10). The constants, C and F, are judgement factors which are based upon the condition of the old pavement before overlay and are selected by comparison with photographs. By way of contrast, the corresponding terms in Equation (10), (1/s) and (r/s) are explicit functions of the ratio of the overlay modulus to the old pavement modulus and the ratio of the overlay thickness to the modified thickness of the old pavement. Equation (10), which is derived from providing equal moments of inertia shows that the power, n, should not change with bonding condition but that F and C should change. Equation (10) also shows that overlay design should be iterative, that is, that a value of overlay thickness, h_1, must be assumed initially in order to calculate the required overlay thickness and if the assumed and calculated values do not match closely enough, the calculation should be repeated using the most recently calculated value of h_1 as the next assumed value.

If it is desirable to develop an overlay design procedure similar to the FAA method from empirical data, the analysis should take place in four steps, as follows:

1. For each pavement in the data set, determine the thickness of new pavement surface course, h, that will carry the traffic that has covered the pavement up to the present time.
2. By using deflection test results on each pavement section as described subsequently, determine the modified thickness of the old pavement surface, h_{2m}.
3. Define the parameters u, t, and q for each pavement section in

the data set.

4. By linear regression analysis determine the six constants a_1 through a_6 in the following equation:

$$h^3 = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 \tag{17}$$

The six independent variables in the regression analysis are:

$$x_1 = h_1^3 \left(\frac{E_1}{E_2}\right) \tag{18}$$

$$x_2 = \left(\frac{q}{u}\right) h_1^3 \left(\frac{E_1}{E_2}\right) \tag{19}$$

$$x_3 = \left(\frac{q}{u}\right)^2 h_1^3 \left(\frac{E_1}{E_2}\right) \tag{20}$$

$$x_4 = h_{2m}^3 \tag{21}$$

$$x_5 = q\, h_{2m}^3 \tag{22}$$

$$x_6 = q^2\, h_{2m}^3 \tag{23}$$

The design equation that is derived from the regression analysis is

$$h_1 = \left(\frac{E_2}{E_1}\right)^{\frac{1}{3}} \left[F\, h^3 - C\, h_{2m}^3\right]^{\frac{1}{3}} \tag{24}$$

where

$$F = \frac{1}{a_1 + a_2(\frac{q}{u}) + a_3(\frac{q}{u})^2} \tag{25}$$

$$C = \frac{a_4 + a_5(q) + a_6(q)^2}{a_1 + a_2(\frac{q}{u}) + a_3(\frac{q}{u})^2} \tag{26}$$

Plots of F and C as functions of h_1, h_2, and the modulus and thickness ratios can be prepared to aid in the selection of proper values of h_1, F, and C to begin the iterative process. It is possible, in the course of the regression analysis, to change the powers of h, h_1, and h_{2m} from 3 downward to 1 to select the power that produces the best fit of the data. This approach has the advantage of identifying most of the relevant variables and how they should be related in an overlay design procedure.

The Corps of Engineers - FAA overlay design equation has been used successfully for years as the basis of an "empirical" design procedure but this is so because it has a good foundation in the mechanics of layered pavements.

Modified Thickness of Old Pavements by Measured Deflections

The modified thickness of the old pavement surface layer, h_{2m}, can be determined from deflections that are measured on each side of a crack or joint using results from beam-on-elastic foundation

theory. The deflection of such a beam is given by

$$w = A\ e^{-\beta x} \sin\beta x + B\ e^{-\beta x} \cos\beta x \tag{27}$$

where

w = the vertical deflection

x = the distance along the beam measured away from a crack or joint

$$\beta = \left(\frac{3k}{E_2 h_2^3}\right)^{\frac{1}{3}} \tag{28}$$

E_2 = the modulus of the old pavement surface layer

h_2 = the thickness of the old pavement surface layer

k = the modulus of subgrade reaction of the layers beneath the surface layer.

At a crack or joint, three cases can be identified: (a) full moment and shear transfer across the crack, (b) no moment transfer, full shear transfer, and (c) partial moment and shear transfer. Each of these conditions produce different values of the constants A and B in Equation (27). On the loaded side of a crack with only partial moment and shear transfer,

$$A = \frac{3P}{\beta^3 E_2 h_2^3}\ pf \tag{29}$$

and

$$B = \frac{3P}{\beta^3 E_2 h_2^3}\ p(2-f) \tag{30}$$

On the unloaded side of the crack the two constants are

$$A = \frac{3P}{\beta^3 E_2 h_2^3} (1-p)f \tag{31}$$

$$B = \frac{3P}{\beta^3 E_2 h_2^3} (1-p)(2-f) \tag{32}$$

where

P = the applied load

$p = \frac{w_\ell}{w_\ell + w_u}$, the shear transfer efficiency factor, which ranges from $\frac{1}{2}$ (best) to 1 (worst) (33)

$f = 2 - \frac{(w_u + w_\ell)}{2\, w_c}$, the moment transfer efficiency factor, which ranges from 0 (worst) to 1 (best). (34)

w_ℓ = the deflection on the loaded side of the crack or joint

w_u = the deflection on the unloaded side of the crack or joint

w_c = the deflection in the center of an uncracked panel of pavement.

If the cracks are spaced closer together than $\pi/2\beta$ (6-8 feet or 1.8-2.4 m) the surface thickness of the old pavement, h_2, should be modified to h_{2m}, as follows

$$h_{2m} = \frac{h_2}{[2p(2-f)]^{4/3}} \tag{35}$$

This modification will provide the thickness of an intact surface layer that will have the same maximum deflection under a load as the

cracked pavement. As can be seen, the shear and moment transfer efficiency factors, p and f, which can be determined from measured deflections may be used explicitly to determine a modified thickness of the old surface layer such as is used in the Corps of Engineers - FAA overlay design equation. The full range of the correction term is between 0.16 and 1.0, as p and f range from their worst to their best values.

Theoretical Basis for the Structural Number

Earlier in this chapter, reference was made to the fact that the assumed form of the structural number is based upon a theoretical relation. Also, it was stated that elastic layered theory shows that the deflection of an elastic pavement, δ, is proportional to $(P/E_S H')$ where P is the load, E_S is the elastic modulus of the subgrade, and H is the effective thickness of all layers above the subgrade. Vlasov and Leont'ev (24) developed equations for the vertical deflection of multi-layered pavements which rest on a rigid base. The equations are of the form

$$w(r,z) = \frac{c}{\pi} \frac{P}{E_S H'} (1+\nu) \phi (z) \psi (r) \qquad (36)$$

where

$w(r,z)$ = the deflection of a pavement at radius, r, and vertical distance, z, below the surface where a load P is applied

c, π = constants

$\phi(z)$ = a function of depth, z, which describes how the

vertical displacement reduces with increasing depth

$\psi(r)$ = a function of radius, r, which describes how vertical displacements reduce with increasing radius

ν = Poisson's ratio of the subgrade

E_s = elastic modulus of the subgrade

H' = a transformed depth of the pavement above the rigid base.

In Equation (36), the term (P/E_sH') plays a prominent role in determining the deflection at the surface of the pavement. The transformed depth of the pavement, H', is found by converting all of the layers into an equivalent depth of a datum material with an elastic modulus, E_o. The formula for the transformed depth is

$$H' = \sum_{i=1}^{k} h_i \left(\frac{E_i}{E_o}\right)^n \tag{37}$$

where

h_i = the thickness of the $i^{\underline{th}}$ layer

E_i = the elastic modulus of the $i^{\underline{th}}$ layer

E_o = the elastic modulus of the datum material

n = an exponent that was assumed by Odemark (22) to be 1/3 but has been found by a recent empirical study at the Texas Transportation Institute to range between 0.10 and 0.60.

If the datum modulus, E_o, is that of Portland cement concrete, and n is 1/3, the layer coefficient of the asphaltic concrete is approximately 0.44, which is the value of the layer coefficient for

asphaltic concrete which was found at the AASHO Road Test. The form of the equation for the structural number can be taken from Equation (37) to give

$$H' = a_1h_1 + a_2h_2 + a_2h_3 \tag{38}$$

where

h_1, h_2, h_3 = thicknesses of layers 1, 2, and 3.

a_1, a_2, a_3 = layer coefficients of layers 1, 2, and 3.

The equation for the layer coefficient is

$$a_i = \left(\frac{E_i}{E_o}\right)^n \tag{39}$$

Once again, a theoretical relation has suggested the form of equation that was used in a pavement design procedure. In this case, the AASHO Road Test flexible pavement design procedure has been shown to have borrowed its form from the theory of layered elastic pavements.

Enough examples have been shown of the dependence of successful empirical design procedures upon the form and the relations among variables that are given by some theory. The observation is true in general that if it is desired to develop an "empirical" overlay design procedure, one must start with a theory. An "empirical" design procedure is not blindly empirical in any case. Instead, it is, or should be guided by assumptions and relations among variables that are drawn from mechanics and which fit known physical boundary conditions. The major difference between the use of mechanistic layer theory and

the "empirical" approaches described above is the point at which assumptions are made. In an empirical design procedure, a simpler form of mechanistic theory is assumed in order to identify the important variables and how they are related to one another, and then major attention is focused on the form of the equation in which the variables appear, and in the use of the regression analysis to obtain coefficients and exponents in the equation. In a mechanistic design procedure, the assumptions are made concerning material properties and interface conditions since the form of the equation is already dictated by the form of the solution of the governing differential equation(s). Because both of these approaches require approximations and assumptions in order to produce a reasonable correspondence with observed data, it is difficult, if not impossible, to state categorically which of these approaches should prove to be superior. It is likely that some combinations of the two will always produce the most consistent results.

NON-DESTRUCTIVE TESTING IN OVERLAY DESIGN EQUATIONS

Non-destructive testing of an existing pavement is one of the most useful to do in determining the structural capacity of the pavement. Several overlay design procedures make explicit use of data that are measured by Dynaflect (7,9,11,12) or Falling Weight Deflectometer (26) or other devices (5,13). This is a realistic and practical means of determining the required overlay thickness, and in general the pavement with higher deflections requires a thicker

overlay to carry the same traffic. The selection of a device and the level of load that will be used as a standard is a critical decision for a highway agency that is developing an overlay design procedure, because the deflection response of a pavement varies from one device to another. In addition, all measurements that are made by the device must be corrected for temperature and subgrade moisture content to a standard condition which must be specified and used uniformly in developing the overlay design procedure. All of this seems to indicate that an overlay design procedure cannot be developed unless carefully standardized deflection data are available. However, a reasonable alternative is to use calculated deflections. Unquestionably, it is more desirable to have actual deflection measurements to use in developing a design procedure, but calculated deflections may be substituted in their place.

Calculated deflections have the advantage of a consistency which is rarely observed in raw, uncorrected field deflection data. They also permit the use of assumed material properties in developing a Level 1 overlay design procedure. They also introduce two difficulties into the design procedure as it must be applied in practice. The first difficulty is that the calculated deflections must match as closely as possible the deflections that would be measured on each pavement in the data set by a selected non-destructive testing device. The second difficulty is that the deflections that are subsequently measured by the testing device must be corrected back to the temperature and moisture conditions that were assumed in the original analysis. The degree to which calculated and measured deflections fail to match introduces an unknown, but hopefully systematic, error into the design equation.

One way of reducing the first difficulty is to use linear elastic layered theory or some close approximation to it to represent the deflections that will be measured by a non-destructive testing device that applies a light load such as the Dynaflect. The lighter loads normally induce deflections that closely match calculations made with elastic layered theory because the materials behave more elastically in that range of load.

A reasonable objection to this approach is that the major part of load-related damage to an overlay comes from heavier loads and that it is more practical to use deflections that are representative of heavier loads, taking into account the stress sensitivity of the materials of which pavements are constructed.

Each of these points of view was used in developing the overlay design equations that are reported herein. The Minnesota overlay design equations were developed using deflections that were calculated with the Shell BISTRO computer program, and from assumed elastic moduli of each of the materials. The assumed elastic moduli that were used are presented in a subsequent section of this chapter. The Level 1 overlay design equation that was developed with Texas data made use of deflections calculated with an approximation to elastic layered theory that was developed at the Texas Transportation Institute. The original idea for this approximate elastic theory was suggested by the work of two Russian authors, Vlasov and Leont'ev (24). Both of these methods produce deflections that should closely approximate Dynaflect deflections.

The Level 2 overlay design equation that was developed with Texas data and calculated deflections under a 9000-lb (40 kN) load with the

ILLI-PAVE finite element computer program. The material properties of the layers were based upon moduli that were back-calculated from Dynaflect deflections, but included an assumed stress-sensitivity to higher load levels as well. The deflections that were calculated with this approach should correspond more closely to those that will occur under the dual tire of an 18-kip single axle load or under a similar load applied by the Falling Weight Deflectometer.

Each overlay design equation implies a choice of a non-destructive testing device that will be used to determine the structural adequacy of an existing pavement. The use of a deflection in an overlay design procedure is very efficient; a deflection is a single variable that contains the contributions of the modulus and layer thickness of all of the layers in the pavement, including the subgrade. A deflection depends upon all of the important "structural" variables in a pavement and is inversely proportional to its strength. Because of its efficiency in providing a summary measure of the response of a pavement under load, it is an ideal variable to use in an overlay design equation.

SELECTION OF THE FORM OF AN OVERLAY DESIGN EQUATION

The first section of this report emphasized the importance of a theoretical model as the basis for an "empirical" design procedure and gave several examples. Empirical equations should not be blindly empirical but should be guided by physical principles and boundary conditions. The fact that a regression equation fits data points well

along one part of the curve is not an argument that no other form of equation should be used to describe the same data. In fact, if several different forms of equation can be shown to fit the empirical data equally well, that form of equation should be preferred which is most in accordance with physical principles and boundary conditions. It is usually the case that the more physically realistic the form of equation, the better it is likely to fit the observed data.

An example of this is the AASHO Road Test equation relating the loss of serviceability index to the number of 18-kip (80 kN) equivalent single axle load applications, which has been called the functional performance curve. The form of this equation can be deduced from the definition of the serviceability index which is defined on a scale from 0 to 5. As the pavement becomes rougher, the serviceability index will decrease and will approach, but not drop below a serviceability index of 0, no matter how much traffic passes over the pavement. Thus, the functional performance curve of a pavement starts out horizontally bounded from above by a rating of 5. As load repetitions increase, the curve is bounded from below by a rating of 0, a value which it approaches as an asymptote. These boundary conditions imply that a functional performance curve should be sigmoidal, or S-shaped. On the other hand, an equation that relates the pavement roughness to the number of standard axle load repetitions has only one boundary condition that it must meet. It starts at a low value and is bounded horizontally from below by the zero roughness line. There is no necessary upper limit to the roughness that may develop on a pavement. The curve is not bounded

from above by an asymptote and should not be S-shaped.

The boundary conditions on the area covered by a particular type of pavement distress is bounded from below with zero area and from above with a 100 percent asymptote. The severity of distress is bounded from below by a zero severity rating and from above by a "high" severity rating, and should thus be S-shaped. An actual measurement of severity, such as rut depth or width of crack is bounded from below with zero but not necessarily bounded from above with an upper limit and so is not necessary and S-shaped curve.

Because distress area and severity rating were used to develop the overlay design equations reported herein, an S-shaped form of equation was adopted for all equations. The specific equations that were used are given below. For the Minnesota overlays, the equation was

$$g = e^{-K/N} \tag{40}$$

where

N = the independent variable which was assumed to be the most important.

K = the damage rate constant; a larger number indicates a stronger pavement.

g = the damage rating of the pavement, a number that ranges between 0 and 1.

The variable, N, was the age of the pavement in months for transverse and longitudinal cracking, and was 18-k (80 kN) ESAL for all other

types of distress.

For the Texas Level 1 overlay design equation, the form of the equation was assumed to be

$$g = e^{-(\frac{\rho}{N})^{\beta}} \tag{41}$$

where the variables g and N have the same meaning as before but this equation has two constants, ρ and β. The constant, ρ, has the same meaning as the rate constant, K, in the previous equation. The exponent, β, permits the curve to take on a variety of shapes, as shown in Figure 2. All curves pass thru a common point where $N = \rho$ and $g = 1/e$.

The Level 2 equation which was developed from Texas data used a different concept, that is, to develop an equation for the number of load cycles to reach a specified level of distress as a weighted sum of the number of cycles that will cause that distress by bending, shearing, and thermal stresses. The form of the equation is

$$N_f = \sum_{i=1}^{n} a_i N_{fi} \tag{42}$$

where

N_f = the number of load applications to reach a specified level of distress

N_{fi} = the number of load applications to reach a specified level of distress, due to a specific mode of displacement, i

n = the total number of displacement modes that were considered.

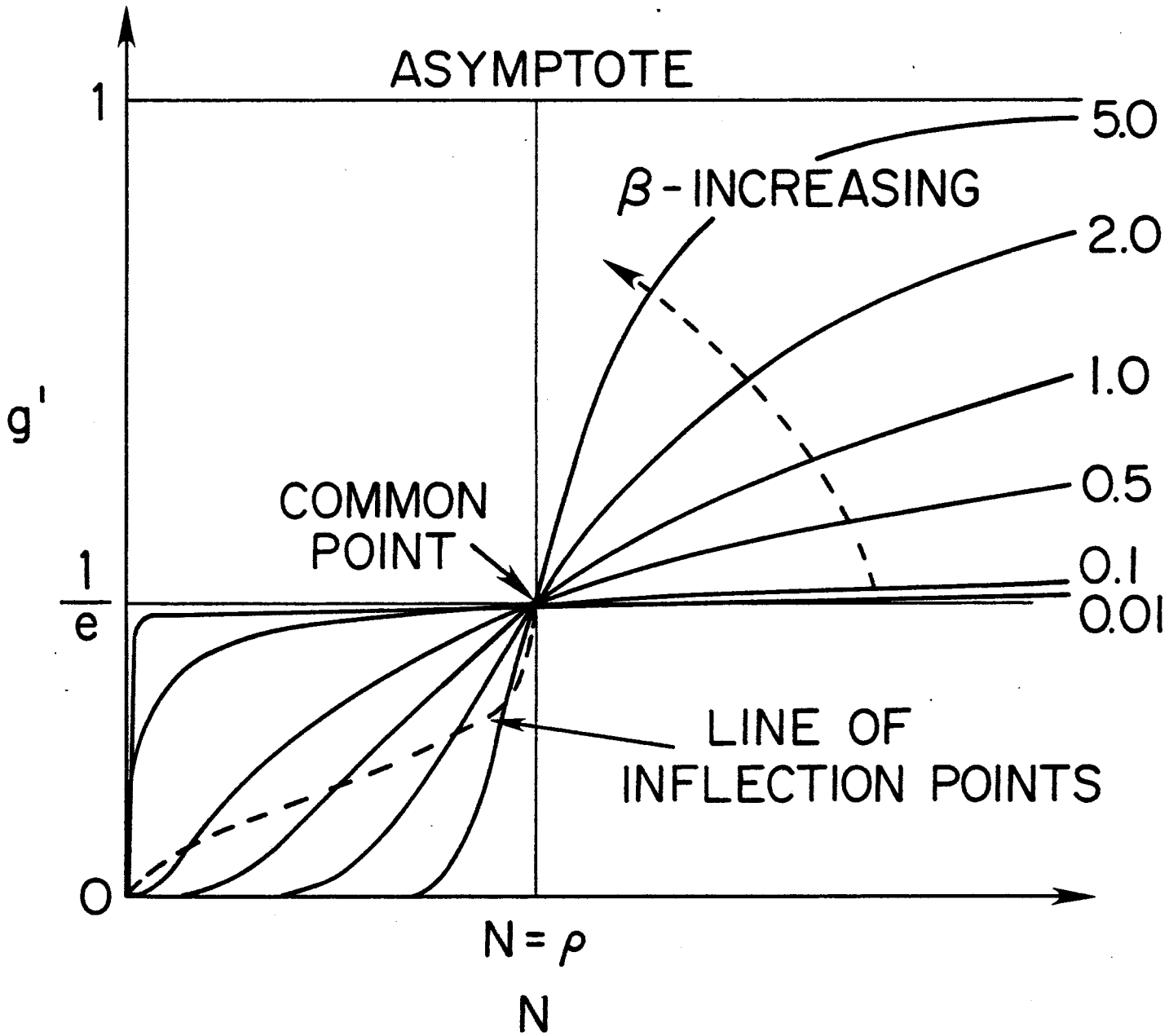

FIGURE 2. Shape of Distress Equations Used in Texas Overlay Design Equations

A total of 27 modes of displacement were considered in the linear regression analysis which produced values of the constants, a_i, in Equation (42). The form of the equation for the number of load cycles to reach a given level of distress due to specific displacement modes was developed from beam-on-elastic foundation theory and from fracture mechanics, as will be explained subsequently.

Regression analysis was used to determine values of K and a_i in Equation (40) and (42), but a special type of analysis was used to determine the values of ρ and β in Equation (41). All of these procedures, and some of the difficulties which must be avoided with each will be described in the following section.

REGRESSION ANALYSIS AND SOME OF ITS PITFALLS

Regression analysis is such an automated procedure in data analysis that it tends to be taken for granted. This section describes not only the methods used to determine the constants in Equations (40), (41), and (42), but also some of the cautions that must be used in interpreting the results and in using the overlay design equation that is developed.

Minnesota Level 1 Overlay Design Equation

In order to find the K-value for a particular section of pavement, a logarithm is taken of the damage equation, Equation (40), to get

$$\ln g = -\frac{K}{N} \tag{43}$$

In order to avoid the difficulties that arise in using ln g as a dependent variable and (1/N) as the independent variable, an average value of the constant, K, is found for each section using Equation (44).

$$K = \frac{1}{n} \sum_{i=1}^{n} N_i \, (-\ln g_i) \tag{44}$$

where there may be n observations of damage on that section of pavement. Because each pavement section has its own value of the constant, K, and a further regression analysis is made to determine the "cause" of the variation of K from one pavement section to another. The independent variables that were used to explain this variation included the age of the overlay in months, the average daily traffic, the total estimated 18-k (80 kN) ESAL at the time of the last distress observation was made, the overlay thickness, and three independent Dynaflect deflection basin parameters called DMD, SCI, and VOL. The DMD is the maximum Dynaflect deflection and SCI is the surface curvature index which is the difference in vertical deflection between Sensor 1 and Sensor 2. The term VOL stands for the volume of the Dynaflect basin but is really only an approximation of that volume, given by Equation (45).

$$VOL = \frac{(DMD)^2}{SCI} \tag{45}$$

A logarithm is taken of the individual values of K and of the corresponding values of all of the variables listed above. The regression equation is of the form

$$y = a_0 x_0 + a_1 x_1 + \ldots + a_n x_n \tag{46}$$

where

y = the dependent variable, the natural logarithm of b

x_i = the natural logarithm of each of the independent variables, z_i.

Taking the antilog of Equation (46) gives an equation for the rate of constant, K.

$$K = e^{a_0} (z_i)^{a_1} \ldots (z_n)^{a_n} \tag{47}$$

and this can be made into an overlay design equation, as will be shown subsequently.

There is a caution that should be noted concerning the results of a regression analysis for the value, K. Because the independent variable in the regression analysis is x (= 1/N), the larger values of x and thus the smaller values of N will control the value of K. The initial part of the curve may not be the best indicator of the life-time trend of distress in that pavement. The K-values that are determined in this way are usually too small, causing an underestimation of the strength of the pavement.

Another problem may arise because two of the independent variables in the regression analysis for K may be closely correlated. The total number of 18-k (80 kN) ESAL (N18) in this analysis was closely correlated with average daily traffic (ADT). The regression analysis procedure was asked to consider as two separate variables what is essentially a single variable. The matrix that must be inverted to determine the values of the constants a_i will be

singular or nearly singular. The coefficients a_i that correspond to N18 and ADT will be larger, nearly equal in magnitude, and of opposite sign. This use of two highly correlated independent variables and the difficulties that arise from the nearly singular matrix is called "multicollinearity". This difficulty can be avoided by using only one of the two highly correlated variables at a time. Several statistical tests are available for determining the degree of multicollinearity of variables (27).

Texas Level 1 Overlay Design Equation

The difficulties that come from the heavy weighting on the initial portion of the curve in the Minnesota overlay design equation are compounded when attempting to find the ρ and β of the two-parameter S-shaped curve. Use of linear regression to determine the two constants results in a reasonably accurate value of β and a value of ρ that is too small. An alternative means of determining ρ and β uses the average change of logarithm of the damage, g, with respect to the change of the logarithm N. The process first determines a mean value of β and then a mean value of ρ, according to the following equations.

$$r_i = \ln g_i \tag{48a}$$

$$\beta = \frac{\sum_{i=2}^{n} [\ln(-r_1) - \ln(-r_i)]}{\sum_{i=2}^{n} [-\ln N_1 + \ln N_i]} \tag{48b}$$

$$\rho^{\beta} = \frac{\sum_{i=2}^{n} [r_1 - r_i]}{\sum_{i=2}^{n} [-(\frac{1}{N_1})^{\beta} + (\frac{1}{N_i})^{\beta}]} \tag{49}$$

All changes are referred to the first measured value of damage, g_1, and the corresponding number of load applications, N_1. By determining ρ and β by the simple rules, curves which fit well through all of the data points are found. This is not regression analysis since no least squares criterion is satisfied by the resulting constants.

As was done with the Minnesota equations, a value of ρ and β was determined for each section of overlaid pavement in the Texas data base. A second analysis was made using linear regression analysis to determine the causes of the variation of ρ and β from one section of pavement to another. In this case, instead of using calculated Dynaflect deflections, the structure of the old pavement was represented by an AASHO Road Test structural number, SN. Several climatic variables were used because of the broad geographical extent from which the overlaid pavement sections were taken. The climatic variables included annual rainfall, annual freeze-thaw cycles of air temperature, and Thornthwaite Index. The plasticity index of the subgrade was included because of the wide variety of that variable represented in the pavement sections. The overlay thickness was included as the final independent variable. Linear regression analysis was used to determine equations for ρ and β. The form of both equations was

$$\rho, \beta = a_0 + a_1x_1 + \dots a_nx_n \quad (50)$$

Multicollinearity was expected and found with some of the variables that were used in this regression analysis. The liquid limit and plasticity index of the subgrade were highly correlated and were found to exhibit multicollinearity. Also, two pavement thickness variables, the effective thickness of the entire pavement and the sum of the thickness of the overlay and the old surface layer were found to be highly correlated and to exhibit multicollinearity. No other variables displayed this characteristic. The final equations will be given in a subsequent section of this report.

Texas Level 2 Overlay Design Equation

The Level 2 overlay design equation was developed from data in one climatic zone, the dry-freeze thaw cycling zone of Climatic Region V. The objective of this equation was to provide a means of designing overlays to prevent or retard reflection cracking. Because of this, the effort was focused on the severity of transverse cracking because the increase of severity is usually considered to be a load-related, phenomenon and it was desirable to develop an overlay design equation that takes into account the effect of traffic upon reflection cracking.

The ρ and β-values that were calculated section by section in developing the Level 1 equations for transverse cracking severity were used to calculate the number of 18-k (80 kN) ESAL applications that were required to bring each section of pavement to a prescribed level of damage. The equation used to calculate the N-values was

$$N_i = \frac{\rho_i}{[-\ln g]^{1/\beta_i}} \tag{51}$$

where the subscript, i, denotes the section for which the N-value is calculated. Three levels of transverse cracking severity damage were used in calculating these values of N_i: 0.33, 0.40, and 0.50 on a scale from 0 to 1.0. Transverse cracking severity was rated as follows.

Severity Level	Severity Rating	Damage
None	0	0
Low	1	0.16
Medium	2	0.33
High	3	0.50

Thus, the calculated values of N_i represented damage levels between medium and high level. Figure 3 illustrates graphically how the values of N_i were calculated one section at a time. The damage level in Figure 3 is 0.4 and the calculated N_i-value is about 1.4 million standard axle loads.

A total of 27 independent variables were used to determine the cause of the variation of the N_i-values from section to section. An approximate fracture mechanics theory was used to determine the number of load cycles to reach failure due to bending, shearing and thermal contraction of the pavement under an overlay. Aggregate interlock and temperature were varied independently to high, medium, and low levels and the number of load cycles to failure for each of

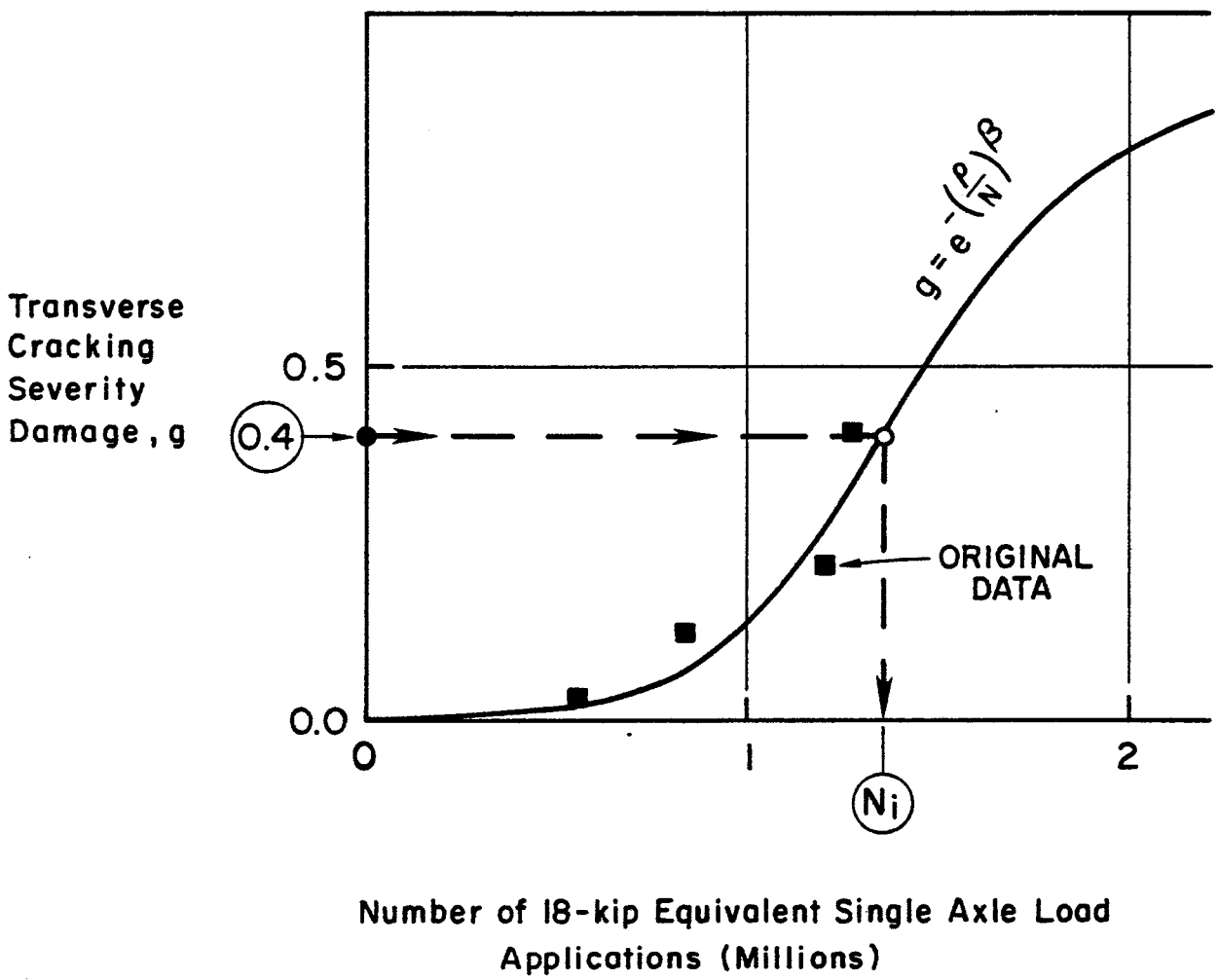

FIGURE 3. Illustration of the Calculation of the N_i for the Texas Level 2 Overlay Design Equation

these combinations was calculated. Three failure modes (bending, shearing, and thermal contraction), three levels of aggregate interlock, and three temperature levels gives a total of 27 combinations that were calculated for each section of pavement in the data base. Linear regression analysis was used to determine which of the 27 independent variables explained the variations that were found in the observed N_i-values from section to section. The form of the equation was

$$N = a_0 + a_1 N_{f1} + \dots + a_{27} N_{f27} \tag{52}$$

where

N = the observed number of load cycles to failure

The regression coefficients, a_i, give the relative weight of each of the calculated number of cycles to failure, N_{f1} through N_{f27}. Separate equations were developed for each level of damage and in each case only three of the 27 independent variables were needed to explain the variations in the N_i-values in a very satisfactory manner. Because each of the independent variables were calculated for distinctly different cases no multicollinearity was expected but it was observed in some cases in which the change of temperature did not significantly alter the value of the calculated number of load cycles to failure.

General Comments on Regression Analysis

Most of the data that are available in State highway agencies were not collected in accordance with a planned experimental design. As a result of this, there will usually be an unknown amount of bias

in the data which will affect the coefficients and powers that are found by regression analysis. If large quantities of data were available then it would be possible to be selective about the sections of pavement that are used in the development of equations, and eliminate much of the bias from the equations that are developed. However, since this is only rarely the case, the equations that are developed should be reviewed carefully to determine whether the trends that are predicted by the equation are reasonable from a physical or engineering point of view. If the resulting equation does not make sense, there should be no hesitation in regarding the equation as invalid. On the other hand, if the equation does make sense, and all of the signs, powers, and relative weights of the variables are reasonable from a physical and engineering point of view and the form of the equation is correct, there should be no reluctance to use the equation that has been developed. The only cautionary note that should accompany the equation is that it can be improved.

DEVELOPMENT OF LEVEL 1 OVERLAY DESIGN EQUATIONS

Three sets of Level 1 overlay design equations were developed: overlays on flexible pavement and on jointed concrete pavement in Minnesota and overlays on flexible pavements in Texas. The techniques that were used in the regression analysis by which these equations were developed were described in the preceding section. The basic data that were used in Minnesota are in Appendix A. The Texas overlaid pavement data are summarized in Appendix B. This section

will describe the principal assumptions and final results of each of the developments.

Overlays on Flexible Pavement in Minnesota

The major assumptions that were made in this development were the material properties of the layers. Minnesota had records of the AASHTO Classification of the subgrade soil, and the type of base course that was used in each pavement. The elastic modulus of each of these was assumed and was used consistently throughout all of the sections of pavement to calculate deflection basins due to a Dynaflect load. The assumed material properties are given in Table 2 (Subgrade Soil Properties) and Table 3 (Base Course and Surface Course Properties). The final selected models of pavement damage are given in Table 4. The value of R^2 for transverse cracking is the smallest of all, indicating a large degree of scatter of the actual data. The damage equations are simple to interpret: terms in the numerator strengthen the pavement and terms in the denominator weaken it. Large powers on variable indicate a high degree of influence whereas powers near zero indicate practically no effect. The appearance of N_{18} in the numerator of the multiple cracking damage equation is probably due to bias in the data. The smaller power indicates that it has negligible influence in any circumstance. The appearance of ADT in the numerator of the rutting model and N_{18} in the denominator, both with roughly the same power is typical of what happens when two highly correlated variables are used together in a regression equation. The same may be said of the patching model. The

TABLE 2. Assumed Subgrade Soil Properties in Minnesota

AASHTO Classification	Assumed Subgrade Modulus, ksi
A-1-a	90
A-1-b	72
A-2-4	45
A-2-5	45
A-2-6	22.5
A-2-7	22.5
A-3	30
A-4	15
A-5	9
A-6	15
A-7-5	9
A-7-6	6

TABLE 3. Assumed Base Course and Surface Course Properties in Minnesota

Material	Modulus, ksi
Base Course	
Crushed Aggregate	150
Granular Base	150
Bituminous Stabilized Base	500
Lightly Stabilized Base	250
Surface Course	
Asphaltic Concrete	500
Portland Cement Concrete	3×10^6

TABLE 4. Distress Models for Overlays on Flexible Pavements in Minnesota

Distress Type	Model for Damage $g = e^{-K/N}$	Coefficient of Determination, R^2
Transverse Cracking	$\exp - \frac{559.6\,(h_1)^{1.268}}{(DMD)^{2.156}(N_{18})^{0.556}(A)^{0.676}}$	0.14
Longitudinal Cracking	$\exp - \frac{24.75\,(h_1)^{0.0748}}{(DMD)^{0.222}(ADT)^{0.144}(TIME)^{0.279}}$	0.62
Multiple Cracking	$\exp - \frac{22.02\,(h_1)^{0.350}(N_{18})^{0.0029}}{(DMD)^{0.302}(A)^{0.518}}$	0.78
Alligator Cracking	$\exp - \frac{20.95\,(h_1)^{0.144}}{(N_{18})^{0.035}(DMD)^{0.165}(A)^{0.156}}$	0.92
Rutting	$\exp - \frac{20.54\,(h_1)^{0.0932}(ADT)^{0.144}}{(N_{18})^{0.196}(DMD)^{0.205}}$	0.91
Patching	$\exp - \frac{6.15\,(ADT)^{0.148}}{(SCI)^{0.784}(N_{18})^{0.240}}$	0.85
Serviceability Loss	$\exp - \frac{9.774\,(DMD)^{0.00318}}{(N_{18})^{0.0029}(A)^{1.007}(h_1)^{0.00652}}$	1.00
Asymptote, P_f	$\frac{1.327\,(N_{18})^{0.0439}(A)^{0.0486}}{(VOL)^{0.0587}}$	0.35

VARIABLES:
N_{18} = 18 k (80 kN) ESAL since last maintenance
A = Age of pavement in months since last maintenance
h_1 = Overlay thickness, inches
ADT = Average daily traffic, vehicles/day
DMD = Dynaflect maximum deflection, mils
SCI = Surface curvature index, mils
VOL = Volume of the basin,

powers of all variables in the serviceability loss model except age are so small as to be negligible, which indicates that serviceability index in Minnesota overlays varies primarily with age. The asymptote value of serviceability is nearly constant at 1.327 since the powers of the other variables are so small. However, the equation indicates that the asymptote value rises slightly with N_{18} and age and decreases with higher deflections.

The damage equations can be turned into design equations by solving for the overlay thickness, h_1. Table 5 gives the equations that are judged to be suitable as design equations. A number of calculations were made with these equations and it was found that the transverse cracking design equation controls the selection of the overlay thickness. Table 6 gives some typical calculated values of overlay thickness. The table shows the dominant influence of transverse cracking and also shows the thickness of overlay that is required by multiple cracking, the next most sensitive design equation. The range of calculated overlay thickness is from 2.0 inches to over 14 inches. The effect of design age on the overlay thickness can be seen by comparing overlay No. 4 with No. 6. With roughly the same traffic, an overlay that must last 10 years (120 months) must be nearly two inches thicker than one that must last only 6 years (72 months). The effect of the deflections of the old pavement can be seen by comparing overlay No. 7 with No. 8. The high deflection pavement (DMD = 1.0 mil) must have 10 inches of overlay more than that required with half of the deflection. The graph in Figure 4 shows how the overlay thickness changes with the design age

TABLE 5. Design Equations for Overlays on Flexible Pavements in Minnesota

Distress Type	Overlay Thickness h_1, inches
Transverse Cracking	$0.00681\ (DMD)^{1.700}(N_{18})^{0.418}(A)^{0.533}(-\ln g)^{0.789}$
Longitudinal Cracking	$0.234 \times 10^{-18}(DMD)^{2.968}(ADT)^{1.925}(A)^{3.730}(-\ln g)^{13.37}$
Multiple Cracking	$\dfrac{0.000146\ (DMD)^{0.863}(A)^{1.480}(-\ln g)^{2.857}}{(N_{18})^{0.0083}}$
Alligator Cracking	$0.669 \times 10^{-9}(DMD)^{1.146}(N_{18})^{0.243}(A)^{1.083}(-\ln g)^{6.944}$
Rutting	$\dfrac{0.825 \times 10^{-14}\ (DMD)^{2.200}(N_{18})^{2.103}(-\ln g)^{10.370}}{(ADT)^{1.545}}$

VARIABLES:
N_{18} = 18 k (80 kN) ESAL since last maintenance
A = Age of pavement in months since last maintenance
h_1 = Overlay thickness, inches
ADT = Average daily traffic, vehicles/day
DMD = Dynaflect maximum deflection, mils
SCI = Surface curvature index, mils
VOL = Volume of the basin,

TABLE 6. Typical Design Values of Overlay Thickness Over Flexible Pavement (Damage Level = 0.5)

Overlay No.	Design Age Months	Design N_{18}	Maximum Dynaflect Deflection, mils	Transverse Cracking (in)	Multiple Cracking (in)
1	72	120,000	0.5	2.04	0.01
2	72	120,000	1.0	6.62	0.03
3	72	240,000	0.5	2.72	0.01
4	72	240,000	1.0	8.84	0.03
5	120	200,000	0.5	3.31	0.03
6	120	200,000	1.0	10.75	0.06
7	120	400,000	0.5	4.42	0.03
8	120	400,000	1.0	14.37	0.05

and the design traffic.

Even though the coefficient of determination (R^2) of the original equation for transverse cracking was low due to a wide scatter of the data points, the equation itself appears to be reasonable and to produce acceptable values of overlay thickness. The range of the independent variables from which the equations were developed are given in Table 7. Any use of the equation outside of these ranges of variables will be an extrapolation of the trend and may or may not be an acceptable value.

Overlays on Jointed Concrete Pavement in Minnesota.

The same procedure that was used with the design equations for overlays on flexible pavements was employed with overlays over jointed concrete pavement including the assumed moduli in Tables 2 and 3. The models that were finally selected are given in Table 8. The interpretation of these damage equations is, as before, that the terms in the numerator strengthen the pavement and those in the denominator weaken it. Thus, in transverse cracking a higher deflection and greater age of an overlay results in greater damage while a thicker overlay and greater daily traffic tends to reduce the amount of damage. The daily traffic term in the numerator may reveal a bias in the data which is created by having thicker overlays and thus a lower time rate of damage under heavy traffic conditions. The same comment applies to the equation for longitudinal cracking, in which higher deflections and a greater number of 18-k (80 kN) ESAL results in less damage. Thicker overlays may be placed under those conditions,

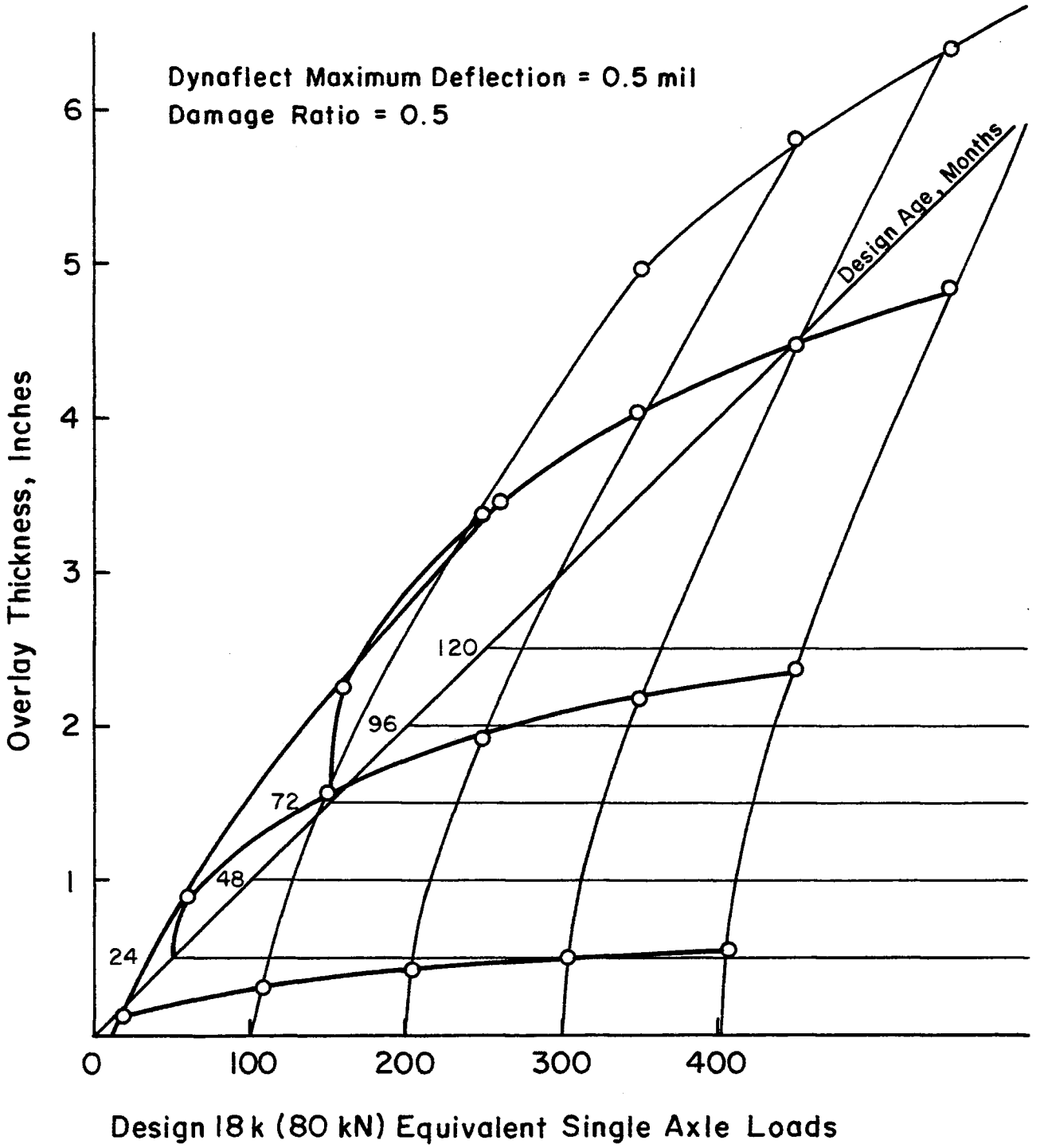

FIGURE 4. Variation of Overlay Thickness with Design Age and Traffic Loading for Overlays on Flexible Pavement

TABLE 7. Ranges of Variables in Minnesota Design Equation for Overlays on Flexible Pavements

Variable	Units	Range
Dynaflect Maximum Deflection, DMD	mil (0.001 in)	0.25 - 1.56
18-k (80 kN) Equivalent Single Axle Load		6×10^3 - 4.4×10^6
Age	months	10 - 250
Average Daily Traffic	vehicles/day	950 - 36,000

TABLE 8. Damage Equations for Overlays on Jointed Concrete Pavement in Minnesota

Damage	Damage Model $g = e^{-K/N}$	Coefficient of Determination, R^2
Transverse Cracking	$\exp -[\frac{3.29\,(h_1)^{3.616}(ADT)^{0.225}}{(VOL)^{0.381}(A)^{1.546}}]$	0.41
Longitudinal Cracking	$\exp -[\frac{0.615\,(h_1)^{0.312}(VOL)^{0.189}(N_{18})^{0.299}}{(A)^{0.759}}]$	0.21
Multiple Cracking	$\exp -[\frac{71.4\,(h_1)^{0.554}}{(VOL)^{0.093}(A)^{0.387}(N_{18})^{0.090}}]$	0.76
Patching	$\exp -[\frac{101.3\,(h_1)^{0.0523}(N_{18})^{0.042}}{(A)^{0.350}(ADT)^{0.225}(DMD)^{0.258}}]$	0.80
Serviceability Loss	$\exp -[\frac{1160\,(A)^{0.044}}{(h_1)^{0.033}(VOL)^{0.012}(N_{18})^{1.013}}]$	0.67
Asymptote Serviceability Index, P_f	$1.473\,\frac{(A)^{0.008}(N_{18})^{0.041}(VOL)^{0.039}}{(h_1)^{0.014}}$	0.42

VARIABLES:
N_{18} = Number of 18-k (80 kN) equivalent single axle loads
ADT = Average daily traffic in vehicles per day
VOL = Volume of the Dynaflect basin
DMD = Maximum Dynaflect deflection, mils (0.001 in)
h_1 = Thickness of overlay, in.
A = Age, months

resulting in lower damage rates. The equation has a low coefficient of determination (R^2) due to the scatter of the data and also due to possible bias in the data. This is not judged to be a reliable equation. The multiple cracking model has a high R^2-value and has the variables where they are expected to be. The patching model has 18-k (80 kN) ESAL in the numerator but with a very small power indicating negligible influence on the damage. Instead, patching damage appears to be more directly related to average daily traffic. In the equation for serviceability index loss, the low powers on age, overlay thickness, and volume of the Dynaflect basin indicate that they have a negligible effect and that serviceability loss is due primarily to the number of 18-k (80 kN) ESAL. The asymptote value of serviceability index, P_f, is about 1.473 with only minor modifications due to the variables in the equation.

The overlay design equations are developed from the damage equations by solving for the overlay thickness. The design equations are given in Table 9, and include only the transverse cracking and multiple cracking equations, since the longitudinal cracking equation produced unreliable results. In the transverse cracking design equation, the average daily traffic has a smaller power and thus only a slight influence on the design thickness. Typical results of calculated overlay thicknesses are shown in Table 10, demonstrating that the transverse cracking equation always controls the design thickness which ranges between 2.5 and 3.5 inches in thickness for design lives between 6 and 10 years. The variation of the design overlay thickness with age and average daily traffic is shown in

TABLE 9. Design Equations for Overlays over Jointed Concrete Pavement

Damage	Overlay Thickness, h_1, inches
Transverse Cracking	$0.720 \frac{(VOL)^{0.105}(A)^{0.428}(-lng)^{0.277}}{(ADT)^{0.062}}$
Multiple Cracking	$0.450 \times 10^{-3}(VOL)^{0.168}(N_{18})^{0.162}(A)^{0.699}(-lng)^{1.805}$

VARIABLES:
N_{18} = Number of 18-k (80 kN) equivalent single axle loads
ADT = Average daily traffic in vehicles per day
VOL = Volume of the Dynaflect basin
DMD = Maximum Dynaflect deflection, mils (0.001 in)
h_1 = Thickness of overlay, in.
A = Age, months

TABLE 10. Typical Design Values of Overlay Thickness Over Jointed Concrete Pavement (Damage Level=0.5)

Overlay No.	Design Age Months	Design N_{18} $x10^6$	Average Daily Traffic	Volume of the Dynaflect Basin	Overlay Thickness: Transverse Cracking (in)	Overlay Thickness: Multiple Cracking (in)
1	72	0.72	15,000	3.0	2.50	0.05
2	72	0.72	60,000	3.0	2.30	0.05
3	72	0.72	15,000	10.0	2.84	0.06
4	72	0.72	60,000	10.0	2.60	0.06
5	120	1.6	15,000	3.0	3.12	0.08
6	120	1.6	60,000	3.0	2.86	0.08
7	120	1.6	15,000	10.0	3.53	0.10
8	120	1.6	60,000	10.0	3.24	0.10

Figure 5. It is apparent in this figure that the design traffic has very little effect upon the required thickness.

The range of variables from which the overlay design equation was developed is given in Table 11. Any use of the equations beyond these ranges is an extrapolation and may or may not be of value for design.

Overlays on Flexible Pavement in Texas.

A total of 45 sections of overlaid pavement were available in the Texas Flexible Pavement data base from which to develop overlay design equations. A summary of the data on these overlays is given in Appendix B. Whereas the data from Minnesota were collected in an area that was confined geographically to two adjacent districts, by way of contrast, the Texas data were taken from locations all over the State in a wide variety of climatic conditions and an equally broad spectrum of subgrade types. For this reason, climatic and subgrade variables were used as independent variables in the overlay design equations that were developed. Table 12 gives the range of variables that were represented among these data. The effective thickness of the pavement, H', is expressed as equivalent inches of subgrade material. The fact that the overlay thickness ranges from about 1 to 6 inches with an average around 2 inches shows that a predominant number of overlays are in the 1.5 to 2.5 inch range. The distribution of overlay thicknesses is skewed toward the low side and this can introduce bias into the equations that are developed. Damage equations were developed for both the area and the severity of several types of distress and of serviceability index loss. Table 13

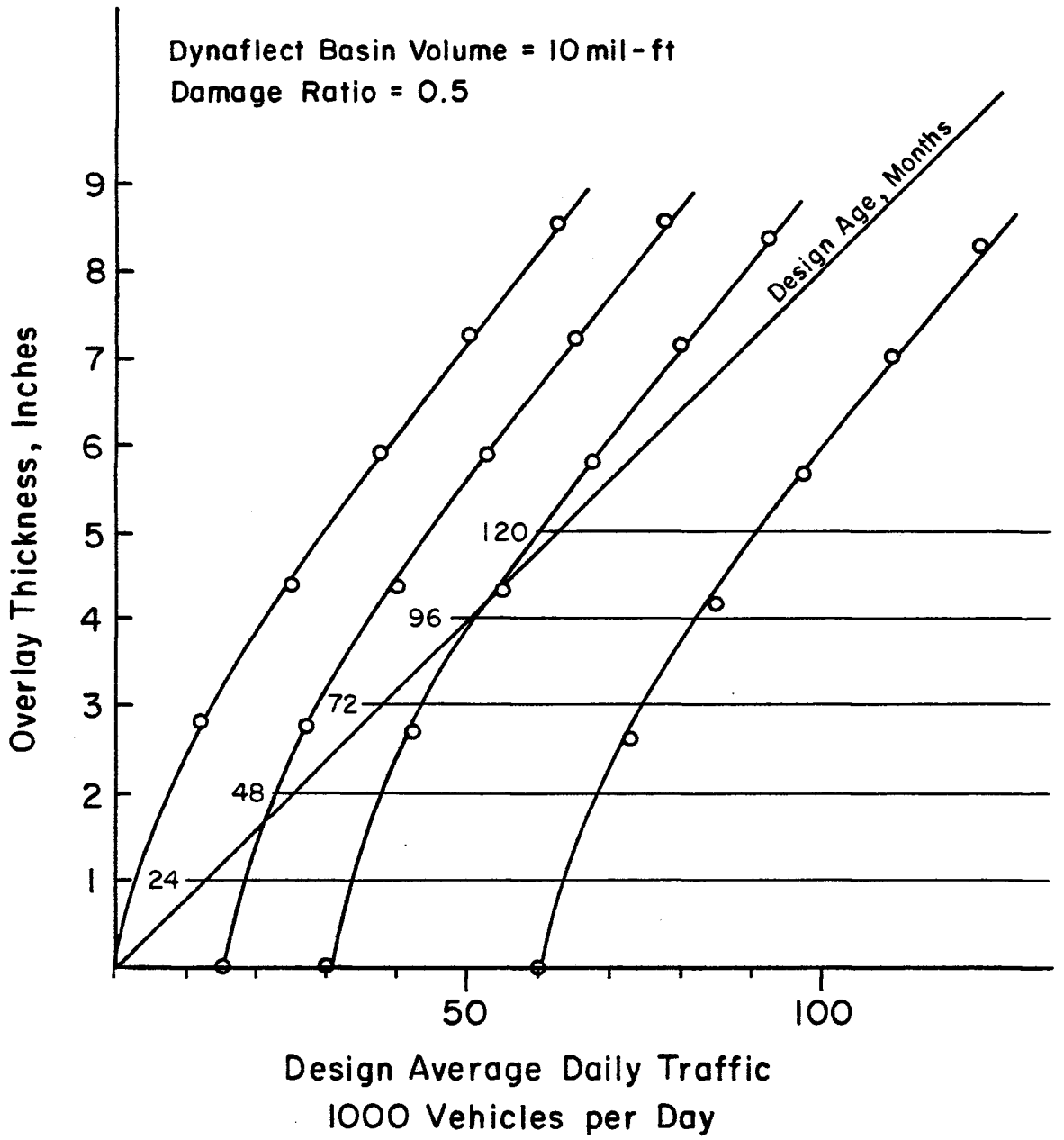

FIGURE 5. Variation of Overlay Thickness with Design Age and Average Daily Traffic for Overlays on Jointed Concrete Pavement

TABLE 11. Ranges of Variables in Design Equations for Overlays on Jointed Concrete Pavement in Minnesota

Variable	Unit	Range
Dynaflect Maximum Deflection, DMD	mil (0.001 in)	0.17 - 0.99
Volume of Dynaflect Basin, VOL	mil-ft.	0.9 - 16.2
Average Daily Traffic	vehicles/day	1500 - 81,000
18-k (80 kN) Equivalent Single Axle Load	---	27×10^3 - 1.7×10^6
Age	months	10 - 190

TABLE 12. Ranges of Variables in Design Equations for Overlays Over Flexible Pavement in Texas

Variable	Unit	Range Low	Range High	Mean
Effective Thickness of the pavement, H'	in.	65.8	170	96.5
Thickness of Overlay	in.	0.6	5.9	1.9
Thickness of Old Surface and Overlay	in.	1.5	9.1	3.7
Plasticity Index	%	3.0	53.0	24.0
Liquid Limit	%	19.0	76.1	44.5
Freeze-Thaw Cycle	cycles/yr	1.3	108	42.4
Mean Average Monthly Temperature	°F	55.4	73.7	64.3
Thornthwaite Index	---	-46	+42	-12

TABLE 13. Damage Equations for Overlays Over Flexible Pavements in Texas

DAMAGE	VARIABLE	EQUATION	COEFFICIENT OF DETERMINATION, R^2
Transverse Cracking Area	ρ	$28.67\frac{(PI)^{0.190}(AVT)^{0.400}(h_1)^{0.799}}{(h_1+h_2)^{0.449}}$	0.22
	β	$1.261\frac{(TI)^{0.371}(FTC)^{0.063}}{(AVT)^{0.340}(h_1+h_2)^{0.639}}$	0.18
Transverse Cracking Severity	ρ	$235.4\frac{(h_1)^{0.431}}{(FTC)^{0.182}(h_1+h_2)^{0.544}}$	0.23
	β	$1.554\times10^{-6}\frac{(TI)^{0.130}(H')^{3.438}}{(h_1+h_2)^{2.024}}$	0.14
Rutting Area	ρ	$1.564\times10^{-6}\frac{(AVT)^{0.779}(TI)^{0.403}(H')^{3.078}}{(LL)^{1.109}}$	0.39
	β	$0.6642\frac{(AVT)^{0.301}(TI)^{0.0944}}{(h_1+h_2)^{0.394}}$	0.22
Rutting Severity	ρ	$1.316\times10^{-7}\frac{(AVT)^{0.861}(TI)^{0.419}(H')^{3.086}}{(PI)^{0.683}}$	0.41
	β	$0.2953\frac{(TI)^{0.200}(FTC)^{0.128}(LL)^{2.413}}{(H')^{1.043}(PI)^{1.309}}$	0.23
Alligator Cracking Area	ρ	$2910\frac{(TI)^{0.488}(H')^{2.758}}{(FTC)^{0.774}(AVT)^{1.386}}$	0.37
	β	$0.8337\frac{(AVT)^{0.347}(TI)^{0.208}}{(PI)^{0.245}(h_1+h_2)^{0.460}}$	0.40
Alligator Cracking Severity	ρ	$2.486\times10^{-7}\frac{(TI)^{0.687}(H')^{3.175}}{(LL)^{0.453}(h_1)^{0.896}}$	0.42
	β	$0.3992\frac{(TI)^{0.499}(FTC)^{0.180}}{(h_1+h_2)^{0.838}}$	0.42

summarizes the final results for several of the more important types of damage to an overlay. The form of each equation is

$$g = e^{-(\frac{\rho}{N})^{\beta}} \tag{53}$$

in which N is the number of millions of 18-k (80 kN) ESAL. A separate equation was developed for ρ and β, and each equation is given in Table 13. The equation for loss of serviceability index is

$$\frac{P_i - P}{P_i - P_f} = e^{-(\frac{\rho}{N})^{\beta}} \tag{54}$$

Measurements of the initial serviceability index, P_i, of overlays in Texas gave a mean value of 4.81. The exponent, β, was assumed to be 1.0, and the asymptote value of serviceability index ranged between 0.61 and 3.95, with a mean of 2.72.

The coefficients of determination (R^2) of all of the equations are, in general, lower than the Minnesota damage equations. This is due to the wide range of climatic and subgrade soil conditions that are represented in the data and to the consequent scatter of the data. The contrast between these equations and the Minnesota equations re-emphasizes the point that was made in the report for Phase I of this task, that pavement design equations should be developed on a regional basis within a reasonably homogenous climatic zone. In developing the Level 2 overlay design equation from the Texas data, only those overlays in the dry-freeze-thaw cycling zone were selected for the development.

The interpretation of the damage equations is reasonably simple:

TABLE 13 (continued)

DAMAGE	VARIABLE	EQUATION	COEFFICIENT OF DETERMINATION, R^2
Longitudinal Cracking Area	ρ	$709.4 \frac{(TI)^{0.181}(h_1)^{0.665}}{(PI)^{0.209}(h_1+h_2)^{0.501}(FTC)^{0.417}}$	0.27
	β	$1.330\times10^{-3} \frac{(FTC)^{0.216}(TI)^{0.354}(LL)^{2.958}}{(h_1+h_2)^{0.713}(PI)^{1.750}}$	0.29
Longitudinal Cracking Severity	ρ	$1248 \frac{(h_1)^{0.220}(AVT)^{0.541}}{(H')^{0.917}}$	0.31
	β	$2.704\times10^{-2} \frac{(TI)^{0.255}(LL)^{1.958}}{(PI)^{1.314}(h_1+h_2)^{0.279}}$	0.16
Serviceability Index Loss	ρ	$2.248\times10^{-9} \frac{(AVT)^{2.008}(TI)^{0.774}(H')^{2.830}}{(PI)^{0.955}}$	0.33
	β	1.0	
	ρ_f	$4.441 \frac{(PI)^{0.150}(h_1+h_2)^{0.235}}{(AVT)^{0.311}(TI)^{0.101}}$	0.28

H' = Effective thickness of the pavement including the overlay, inches

h_1 = Thickness of the overlay, inches

h_2 = Thickness of the old surface layer, inches

PI = Plasticity index of the subgrade, %

LL = Liquid limit of the subgrade, %

AVT = Mean average monthly temperature, °F-50

FTC = Annual freeze-thaw cycles

TI = Thornthwaite Index + 50

any factor that increases ρ strengthens the pavement and the pavement is weakened when ρ is decreased. Thus, transverse cracking area is reduced in higher temperature areas which have subgrades with higher plasticity indices. There is a certain amount of correlation between the overlay thickness, h_1, and the sum of h_1 and h_2, the thickness of the old surface layer, and this results in a mild multicollinearity effect in which h_1 appears in the numerator and (h_1+h_2) appears in the denominator. The power of h_1 in the numerator is higher and this indicates that transverse cracking area is reduced when overlays become thicker. Transverse cracking severity is reduced by a thicker overlay and increased by an increased number of annual freeze-thaw cycles. Rutting area and severity are reduced by a larger effective thickness of the pavement, H', and increased by a more highly plastic subgrade. The equations for ρ also indicate that rutting area and severity are reduced in those areas of the State that are wetter and warmer, which is contrary to normal expectations. However, this indicates a bias in the data that stronger pavements with stabilized subbases are built where the climatic conditions are wetter and warmer. Alligator cracking area and severity are both reduced by stronger pavements with larger values of H', the effective thickness. The area of cracking is increased in areas of high temperature and larger numbers of annual freeze-thaw cycles. The severity of alligator cracking is increased by highly plastic subgrades. The appearance of overlay thickness, h_1, in the denominator of the equation for alligator cracking severity is evidence of correlation between h_1 and H'. The rate of loss of

serviceability index is reduced by stronger pavements in the wet and warm areas of the State and become rougher over highly plastic subgrades.

The damage equations in Table 13 were converted into design equations by solving for the overlay thickness, h_1. All of the resulting design equations require iteration to arrive at an overlay thickness. The four design equations that proved to give consistently reasonable results are given in Table 14.

Typical results of the calculations of overlay thickness are given in Table 15 for a damage ratio of 0.5. Several interesting patterns can be seen in the tabulated results. Overlays 1 through 5 show the effect of the Thornthwaite Index on the design overlay thickness. Transverse cracking area requires a thicker overlay in the wetter parts of the State, whereas the overlay thickness required by longitudinal cracking area may be reduced in the wetter areas. The overlay thickness that is required by alligator cracking severity peaks around a Thornthwaite Index of -25. Overlay designs 6, 7, and 8 show how sensitive the overlay thickness is to the design number of 18 k (80 kN) ESAL at a Thornthwaite Index of -25. The required overlay design thickness is much less sensitive to the design traffic in the wetter areas where the Thornthwaite Index is +20, as shown with overlays 9, 10, and 11.

Figure 6 shows how the required overlay thickness changes as the effective thickness of the old pavement changes. The effective thickness of a pavement is increased by thicker layers of high modulus materials and is reduced by the cracking of those layers. As is

TABLE 14. Design Equations for Overlays Over Flexible Pavements in Texas

DAMAGE	EQUATION FOR OVERLAY THICKNESS, inches	EQUATION FOR DAMAGE EXPONENT, c
Transverse Cracking Area	$0.01501\frac{(h_1+h_2)^{0.562}(N)^{1.252}}{(PI)^{0.238}(AVT)^{0.501}}[-\ln g]^c$	$0.9927\frac{(h_1+h_2)^{0.639}(AVT)^{0.340}}{(TI)^{0.371}(FTC)^{0.0629}}$
Transverse Cracking Severity	$\frac{(FTC)^{0.422}(h_1+h_2)^{1.262}(N)^{2.320}}{3.184\times10^5}[-\ln g]^c$	$1.493\times10^6\frac{(h_1+h_2)^{2.024}}{(TI)^{0.130}(H')^{3.438}}$
Longitudinal Cracking Area	$5.164\times10^{-5}\frac{(FTC)^{0.627}(PI)^{0.314}(h_1+h_2)^{0.753}(N)^{1.504}}{(TI)^{0.272}}[-\ln g]^c$	$1.131\times10^3\frac{(PI)^{1.750}(h_1+h_2)^{0.713}}{(LL)^{2.958}(FTC)^{0.216}(TI)^{0.354}}$
Alligator Cracking Severity	$4.255\times10^{-8}\frac{(TI)^{0.767}(H')^{3.544}}{(LL)^{0.506}(N_{18})^{1.116}}[-\ln g]^c$	$2.796\frac{(h_1+h_2)^{0.838}}{(TI)^{0.499}(FTC)^{0.180}}$

VARIABLES:
- N = Design age in months
- N_{18} = Design traffic, millions of 18k (80kN) ESAL
- H' = Effective thickness of the pavement including the overlay, inches
- h_1 = Thickness of the overlay, inches
- h_2 = Thickness of the old surface layer, inches
- PI = Plasticity index of the subgrade, %
- LL = Liquid limit of the subgrade, %
- AVT = Mean average monthly temperature, °F-50
- FTC = Annual freeze-thaw cycles
- TI = Thornthwaite Index + 50

TABLE 15. Typical Design Values of Overlay Thickness Over Flexible Pavement

Overlay No.	Design Age Months	Design N_{18} x10^6	Design Thornthwaite Index	Overlay Thickness, Inches: Transverse Cracking Area	Longitudinal Cracking Area	Alligator Cracking Severity
1	120	1.0	-40	1.0	2.1	2.0
2	120	1.0	-25	1.2	1.9	7.0
3	120	1.0	-10	1.3	1.8	2.6
4	120	1.0	+ 5	1.4	1.7	2.3
5	120	1.0	+20	1.5	1.6	1.8
6	120	0.2	-25	1.2	1.9	1.1
7	120	0.6	-25	1.2	1.9	3.5
8	120	1.0	-25	1.2	1.9	7.0
9	120	0.2	+20	1.5	1.6	0.7
10	120	0.6	+20	1.5	1.6	1.3
11	120	1.0	+20	1.5	1.6	1.8

Constants in the design equation were:

H' of the old pavement = 65 inches

h_2 = 3.0 inches

PI = 25%

LL = 50%

FTC = 50 cycles/year

Average Monthly Temperature = 60 F

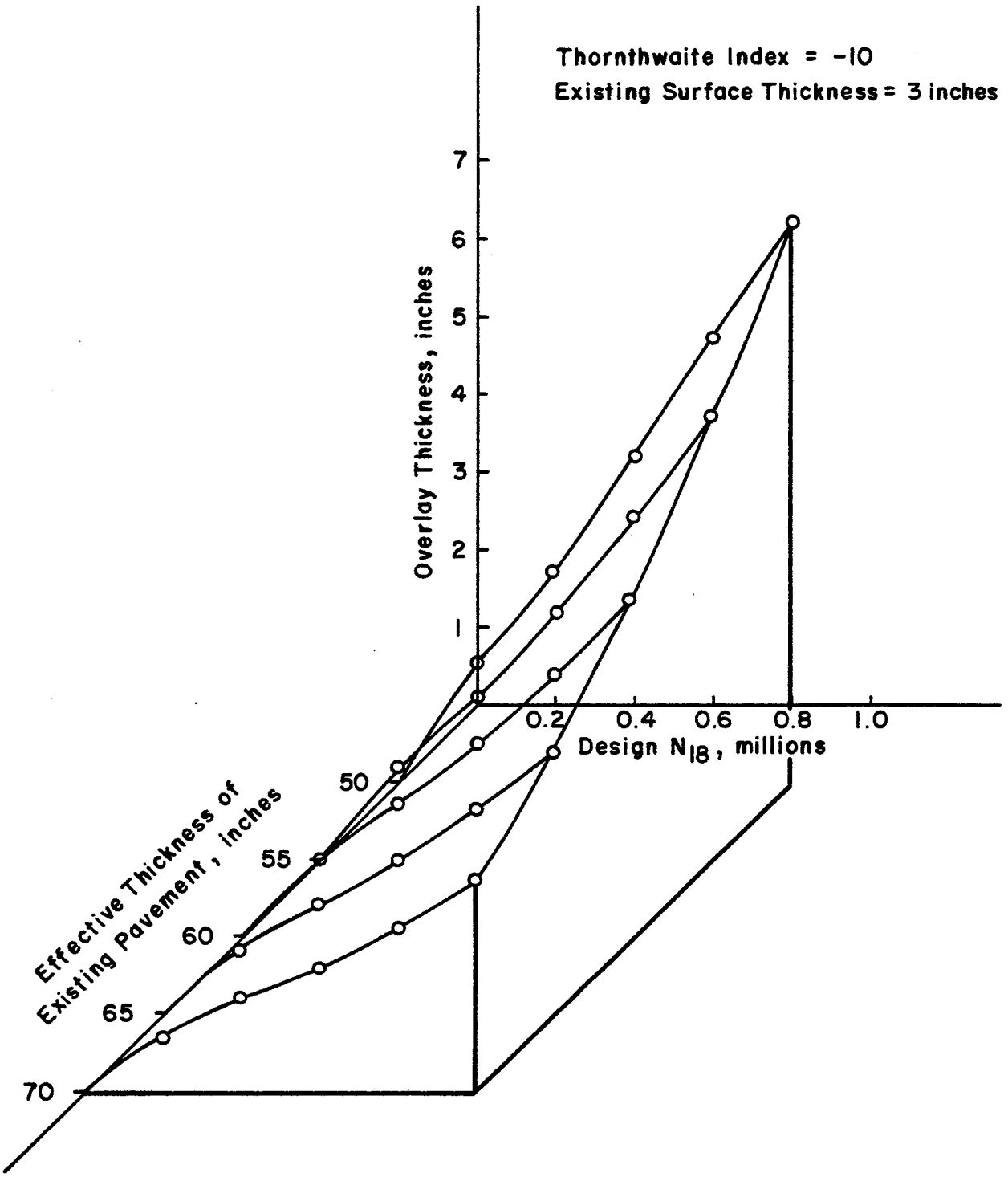

FIGURE 6. Variations in Overlay Thickness Requirements for Alligator Cracking Severity Due To Changes in 18k (80 kN) ESAL and Effective Thickness of the Existing Pavement

expected, the required overlay thickness increases with the design number of 18 k (80 kN) ESAL and with lower effective thickness of the old pavement.

DEVELOPMENT OF A LEVEL 2 OVERLAY DESIGN EQUATION

The Level 2 design equation that was developed with Texas data was constructed so as to provide a means of designing an overlay to retard reflection cracking, while considering the properties of the overlay materials and the physical mechanism of crack propagation through the overlay.

The regression analysis procedures that were used has been described in a previous section of this chapter on Regression Analysis. This section summarizes the development of an overlay design procedure for reflection cracking which is based upon the principles of fracture mechanics, gives the final design equations, and presents the results of design calculations. Several appendices give more details of the steps in the development.

The first step in the analysis was to select the overlaid pavements from one climatic zone. A total of 18 sections of pavement were available in Climatic Zone V, as shown in Figure 7. The second step was to assemble the detailed materials properties and climatic data that were needed in order to use a fracture mechanics approach. The third step involved a series of calculations of deflections under a design load of 9000 lb. (40 kN) and of the crack opening of the old pavement surface under the local daily temperature changes. The

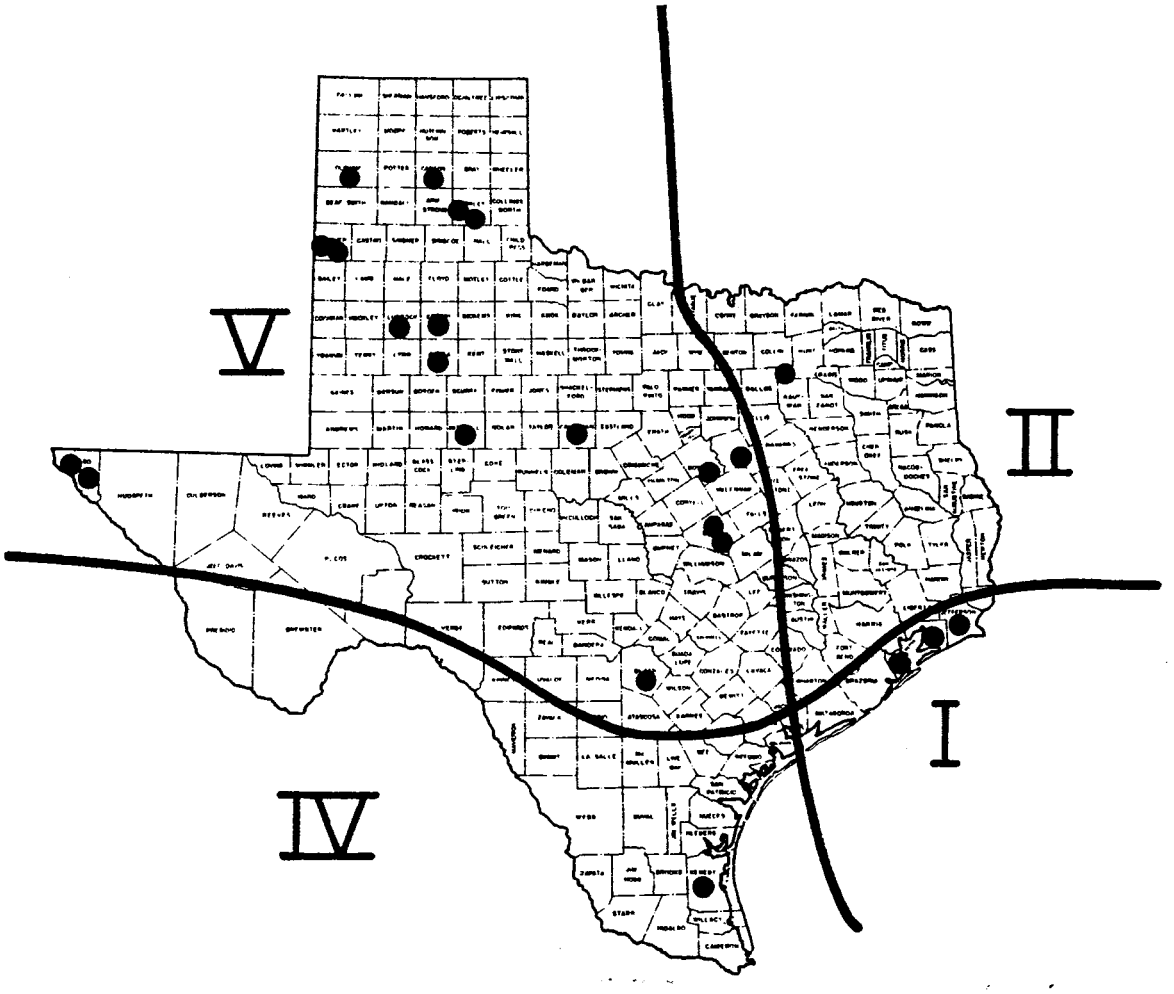

FIGURE 7. Location of the Four Climatic Zones in Texas

fourth step used the results of these calculations in regression analysis to arrive at the final design equations.

Fracture Mechanics Approach to Overlay Design

Most overlay design procedures strive to limit the deflection of the overlaid pavement or to extend the fatigue life of the asphaltic concrete surface layer to an acceptable number of applications of a design load. Until the present, no overlay design procedure has been proposed which uses the propagation of reflection cracks as the design criterion. In order to design an overlay for adequacy against reflection cracking, the principles of fracture mechanics must be applied.

A fracture mechanics approach utilizes the fatigue-crack-growth characteristics of a particular asphalt concrete mix in order to predict its ability to resist reflection cracking. Paris and Erdogan (28) related fatigue crack propagation in metals by:

$$\frac{dc}{dN} = A(\Delta K)^n \tag{55}$$

where

- c = crack length,
- N = number of load cycles,
- K = stress-intensity factor amplitude, and
- A, n = material fracture parameters obtained from experimental tests.

The number of load cycles, N_f, that will cause the crack to propagate from its original flaw size, c_o, to its final length, h_1, which is the depth of the overlay, is obtained by integrating Equation 55 to get Equation 56.

$$N_f = \int_{c_o}^{h_1} \frac{dc}{A(\Delta K)^n} + 1 \tag{56}$$

Although the direct measurement of the fracture properties, A and n, of an asphaltic concrete mixture is not a standard laboratory test, several useful correlations to simpler tests have been found. The most fundamental property in all of these relations is the slope, m, of the log mix stiffness versus log loading time curve that is shown in Figure 8. The entire curve can be generated using a step-by-step calculation procedure that is outlined in Appendix C. The procedure requires that the penetration at 77 F (AASHTO T-49), the Ring and Ball Softening Point (AASHTO T-53), and the percent asphalt in the mix must be known.

The next step is to calculate the thermal and fatigue fracture properties of the mixture using the following empirically determined relations (29).

$$n_T = 2b(1+\frac{1}{m}) \tag{57}$$

$$\log_{10} A_T = - \frac{(n_T + 0.033)}{1.023} \tag{58}$$

$$n_F = 0.912 + 3.631(n_T) - 0.866(n_T)^2 \tag{59}$$

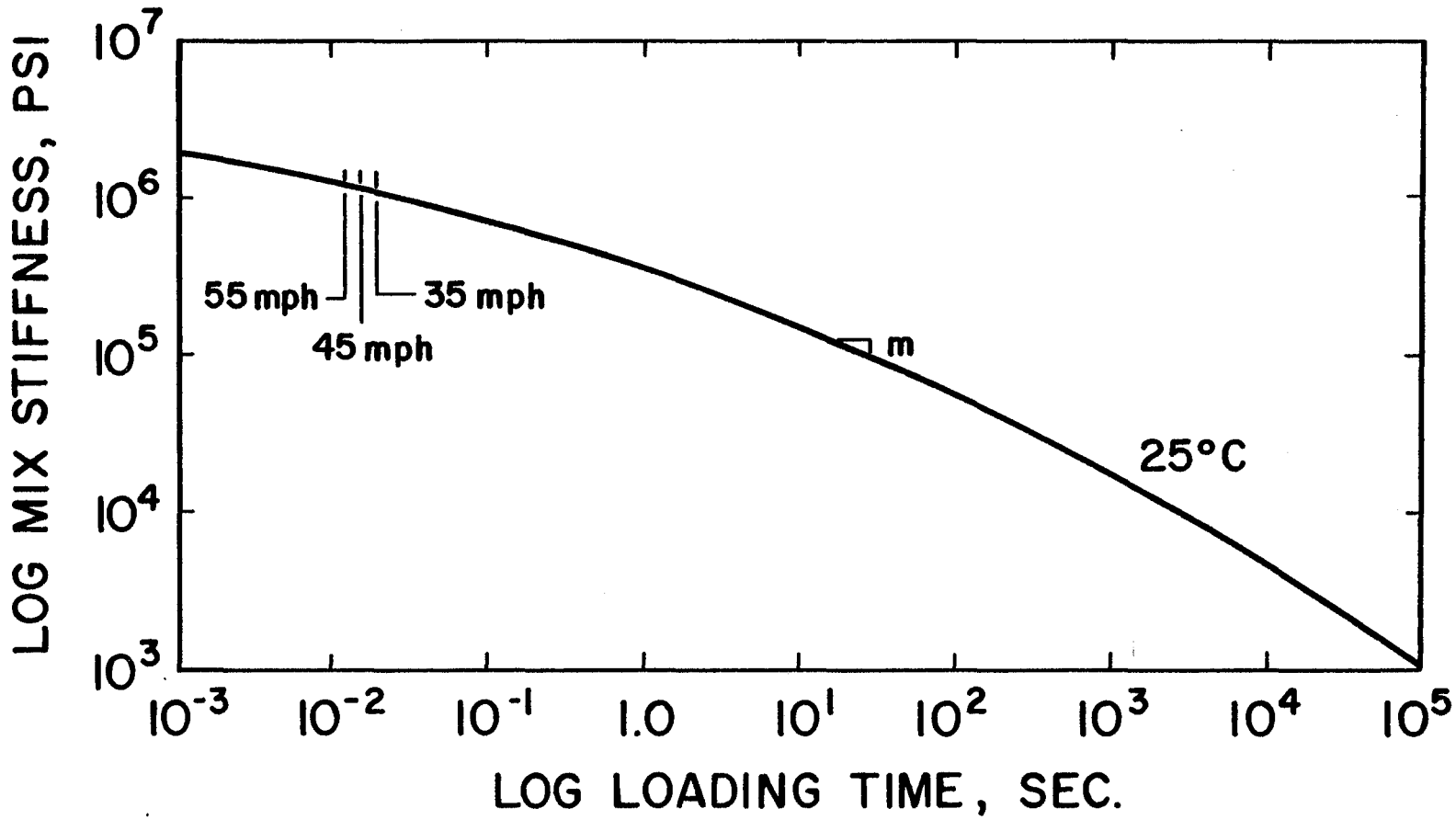

FIGURE 8. Graph of Asphaltic Concrete Mix Stiffness versus Loading Time

$$\log_{10} A_F = - \frac{(n_F + 4.985)}{0.492} \tag{60}$$

where

b = a correlation factor for stress conditions at the tip of the crack. A value of 0.5 is a good average figure.

A_F, n_F = fracture properties due to load-associated stresses.

A_T, n_T = fracture properties due to thermal stresses.

Schapery (30) has derived Equation (57) from theory and has developed equations for the correction factor b which show that it should vary between 0.20 and 1. He has also derived an explicit expression for the fracture property, A, which shows that it, in turn depends upon the temperature, rate of loading, the slope m, the tensile strength of the mix, and several other fundamental properties of the asphaltic concrete mixture. Schapery's theoretical relations have been tested in two independent laboratory test series (31, 32) and found to be generally reliable in predicting the fracture properties of asphaltic concrete mixtures. The theoretical basis for the fracture properties, A and n, is mentioned as a caution that Equations (57) through (60) should not be taken as final and immutable relations, but as being subject to changes according to known physical principles.

At a crack or joint, an overlay must strengthen a pavement against three types of displacements: bending and shearing due to load, and stretching due to thermal contraction of the underlying cracked pavement. These three modes of displacement are illustrated in Figures 9, 10, and 11. Each time a load passes over a crack or joint, the overlay above it must withstand two pulses of maximum

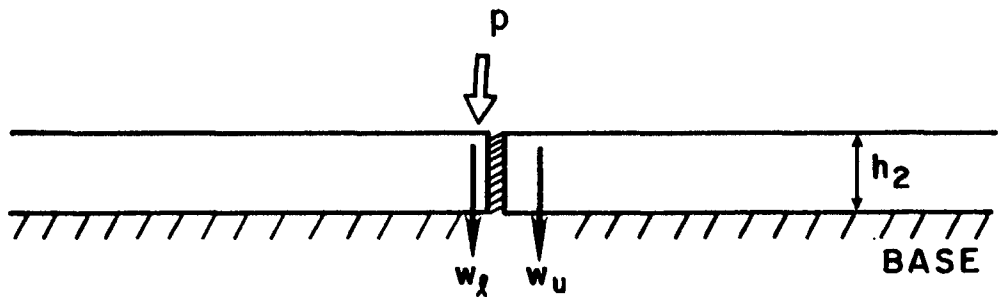

FIGURE 10. Shearing Displacement in an Overlay

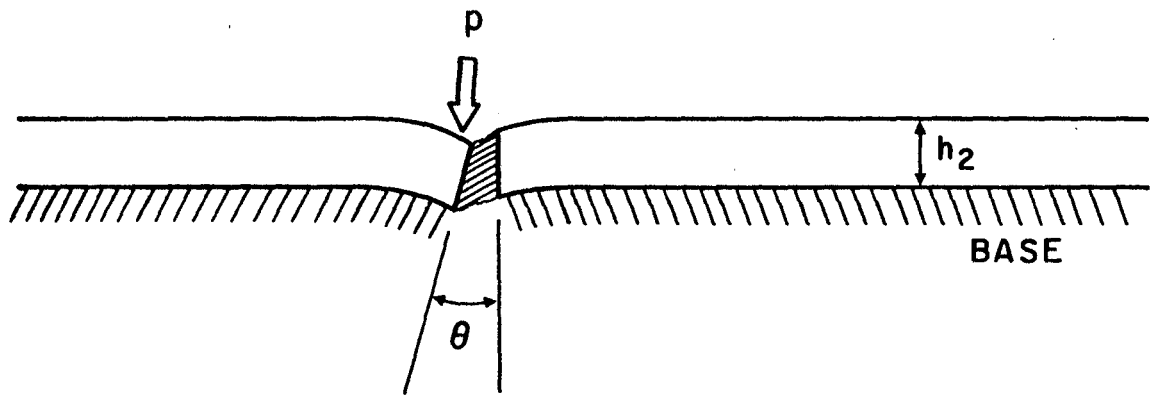

FIGURE 9. Bending Displacement in an Overlay

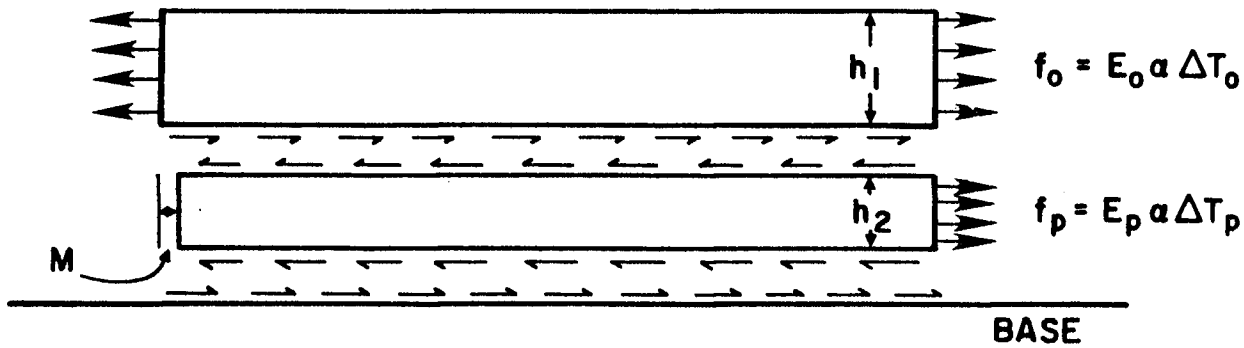

FIGURE 11. Thermal Contraction Displacement in an Overlay

shearing stress and one pulse of bending stress. Thus, each load causes three spurts of crack growth. Using fracture mechanics concepts as a starting point it is possible to develop equations for the number of cycles to reach failure for each of the three modes of displacement. These three equations will then define the form of the overlay design equation. It is assumed that a linear combination of these three equations will be able to predict the actual number of load cycles that are required to cause an overlay to reach a prescribed level of damage.

A difference in deflection across a crack is caused by shearing and is given by beam-on-elastic foundation theory as

$$w_{\ell} - w_u = \frac{3P}{\beta^3 E_1 I'}(2-f_1)(2p_1-1) \tag{61}$$

The rotation of one side of the crack relative to the other is , caused by bending, and is given by

$$\theta = \frac{P}{2(\beta')^3 E_1 I'}(1-f_1) \tag{62}$$

where

P = the total load on one tire or a set of dual tires

E_1 = the modulus of the overlay

I' = the moment of inertia per unit width of the old surface layer and the overlay combined

$$\beta' = \left[\frac{3k'}{E_1(h')^3}\right] \tag{63}$$

$$(h')^3 = h_1^3 + \left(\frac{E_2}{E_1}\right)(h_{2m})^3 \qquad (64)$$

k' = the "subgrade modulus" of the existing pavement before the overlay is placed

E_1, E_2 = the elastic moduli of the overlay and the old pavement surface, respectively

h_{2m} = the modified thickness of the old surface layer

$$h_{2m} = \frac{h_2}{[2p_2(2-f_2)]^{4/3}} \qquad (65)$$

f_1, f_2 = the bending efficiency factor of the crack after the overlay (f_1) and before the overlay (f_2) respectively

p_1, p_2 = the shear efficiency factor of the crack after and before the overlay, respectively.

The bending and shearing efficiency factors before the overlay, f_2 and p_2, and the "subgrade modulus" of the existing pavement, k', can be determined by a deflection survey of the old pavement prior to overlay. The bending efficiency factor, f_2, can be taken from the graph in Figure 12. The graph was drawn from analyses that were done with the ILLI-SLAB program (33), as described in Appendix F. The stress intensity factor for bending in dimensionless form is $\frac{K_I}{\sigma\ \theta\ \sqrt{h_1}}$

and for shear in dimensionless form is $\frac{K_{II}}{\sigma\ \sqrt{w_\ell - w_u}}$

where

θ = angular displacement at a joint,

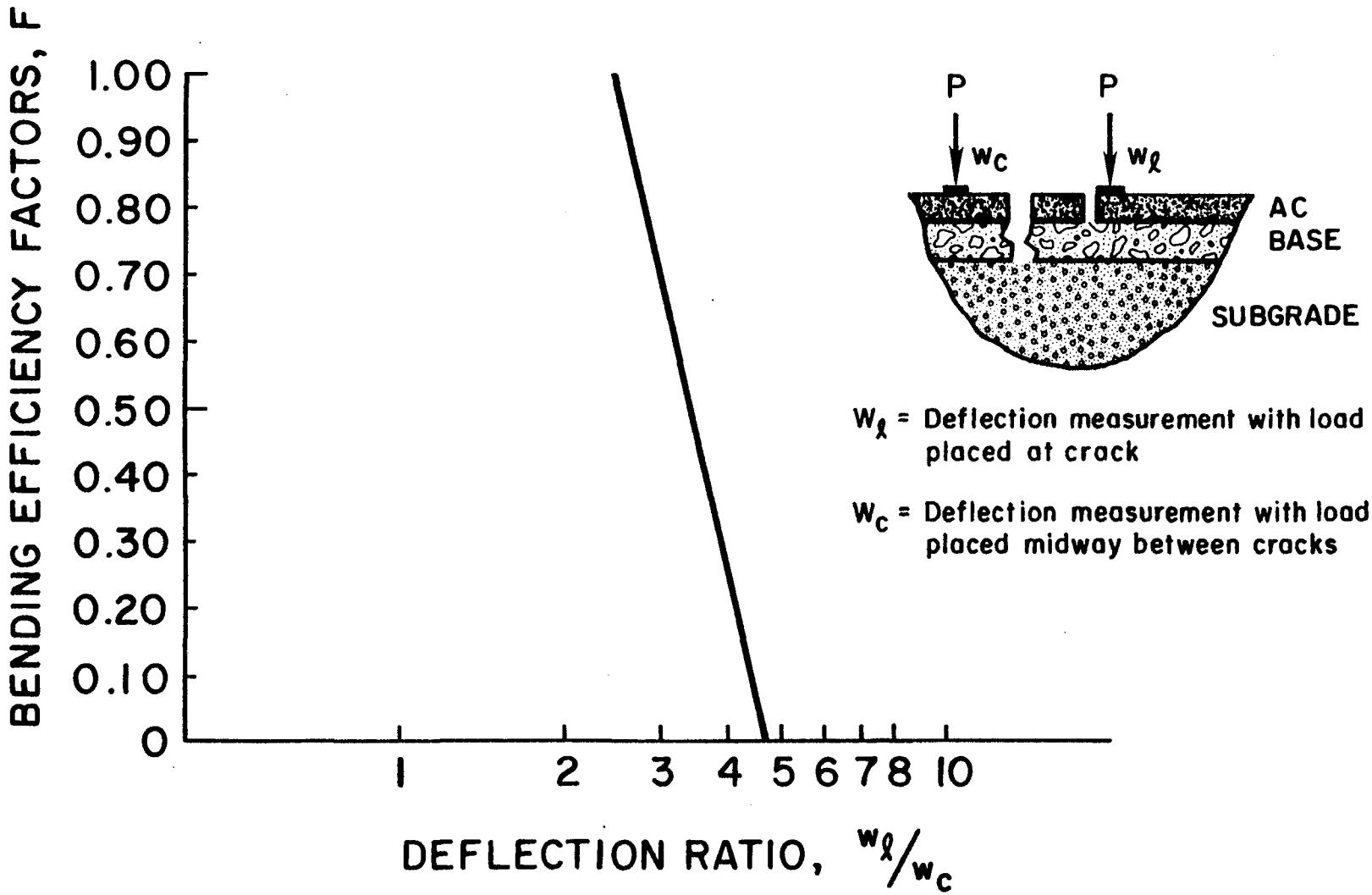

FIGURE 12. Bending Efficiency Factor for a Crack in an Existing Pavement

σ = tire pressure,

h_1 = overlay thickness,

w_ℓ = deflection of the old pavement on the loaded side of the joint,

w_u = deflection of the old pavement on the unloaded side of the joint,

K_I = an "opening mode" or mode I stress intensity factor, and

K_{II} = a "shearing mode" or mode II stress intensity factor.

Although it is known that stress intensity factors vary as the crack length varies, the simplest assumption concerning the variation of a stress intensity factor with crack length is that it is a constant. This gives the following equations:

For bending,

$$K \alpha c_1 \sigma \theta \sqrt{h_1} \tag{66}$$

and for shearing

$$K \alpha c_2 \sigma (w_\ell - w_u)^{\frac{1}{2}} \tag{67}$$

By substituting Equation 62 into Equation 66, the stress-intensity factor for the bending of a pavement at a crack is found.

$$K_{Bending} \alpha \frac{6P\sigma h_1^{1/2}(1-f_1)}{(3k')^{3/4}(E_1)^{1/4}[h_1^3+\frac{E_2}{E_1}(h_{2m})^3]^{1/4}} \tag{68}$$

Substituting Equation 68 into Equation 56 and integrating, gives the number of load repetitions to cause a crack to propagate through an overlay due to bending:

$$N_{FB} \alpha \frac{(h_1-c_o)(3k')^{3n_F/4} E_1^{n_F/4} [h_1^3+\frac{E_2}{E_1}(h_{2m})^3]^{n_F/4}}{A_F[P\sigma(1-f_1)]^{n_F}} \tag{69}$$

The number of load repetitions to cause a crack to propagate through an overlay due to shearing of the pavement can likewise be developed:

$$N_{FS} \alpha \frac{(h_1-c_o)(3k')^{3n_F/8} E_1^{n_F/8} [h_1^3+\frac{E_2}{E_1}(h_{2m})^3]^{n_F/8}}{A_F\sigma^{n_F}[P(2-f_1)(2p_1-1)]^{n_F/2}} \tag{70}$$

The number of thermal stress cycles to cause a crack to propagate through an overlay is

$$N_{FT} \alpha \frac{h_1^{\frac{n_T}{2}}(h_1-c_o)}{A_T(E_1M)^{n_T}} \tag{71}$$

where

M = the opening of the crack in the old pavement when it is being restrained from below by the base course and from above by the overlay, as is shown in Figure 11.

Assuming that the tack coat between the overlay and the old surface layer and between the base and old surface layer obeys a linear shear stress-versus-shear displacement relation, the opening of the crack in the old pavement is

$$M = \frac{\alpha \Delta T}{\beta \sinh (\beta\frac{S}{2})} \tag{72}$$

where

α = the thermal coefficient of expansions of the old

surface layer

ΔT = the change of temperature in the old surface layer

S = the crack spacing

$$\beta = \left[\frac{k_1+k_2}{E_2 h_2}\right]^{\frac{1}{2}} \tag{73}$$

k_1, k_2 = the slope of the shear stress-versus-shear displacement relation for the overlay-old surface interface (k_1) and the old surface-base interface (k_2).

As can be seen by the preceding discussion, there is a large number of variables that are included in this Level 2 overlay design procedure, and there is a combined use of beam-on-elastic foundation theory and fracture mechanics to arrive at the form of the design equation. All of the material properties were estimated from data that were obtained from the Texas State Department of Highways and Public Transportation Materials and Tests Division. Most of the asphalt properties and mixture proportions were taken from microfilm records that were available through the Materials and Tests Division. The stiffness of the overlay and old pavement mixes were calculated at high, medium, and low temperatures using the detailed procedures given in Appendix F. The deflections before and after overlay were calculated using the ILLI-PAVE and ILLI-SLAB (34, 35) programs, as were the crack efficiency factors for bending and shearing for high, medium, and low levels of load transfer. After calculating points on the log mix stiffness-versus-log loading time curve, the slope of the curve, m, was found and the fracture properties of each overlay

mixture were calculated using Equations (57) through (60). Weather data was obtained on magnetic tape and daily temperature changes were calculated for each pavement section, and this permitted the calculation of the thermal crack opening in the old pavement at three different temperature levels, while being restrained at high, medium, and low levels of restraint by the overlay and the base course.

Thus, the number of load cycles to failure for each of three fracture modes (bending, shearing, thermal contraction) calculated at three different temperatures (0°C, 25°C, 60°C), and at three different levels of crack load transfer efficiency or aggregate interlock (high, medium, and low) results in a total of 27 different calculated values of the number of load cycles to failure, each of which may be treated as an independent variable in linear regression.

The details of the analysis that was done to determine the deflection, load transfer characteristics, and response to thermal stress of each pavement section are given in Appendix F. Also given in that appendix are the details of the regression analysis that was performed to arrive at the final design equations.

Level 2 Overlay Design Equations

Three design equations were developed, each representing a different level of damage. The damage levels were 0.33, 0.40, and 0.50. In each case, the equation was of the form

$$N_F = a_0 - a_1(N_{FB})_{23} + a_2(N_{FB})_{33} + a_3(N_{FS})_{23} \qquad (74)$$

where

N_{FB} = the number of load cycles to cause failure due to

bending

N_{FS} = the number of load cycles to cause failure due to shearing

The subscripts refer to temperature level and aggregate interlock. Thus the low, medium, and high temperatures are subscripted as 1, 2, and 3, respectively. Aggregate interlock is the second subscript, with low, medium, and high levels denoted by the subscripts 1, 2, and 3 respectively. The regression analysis results show that loads are the primary cause of the increase of severity of transverse cracking, and that this occurs at higher temperatures with high levels of aggregate interlock.

The constants a_0, a_1, a_2, and a_3 vary with the damage level as shown in Figure 13. The coefficients of determination (R^2) of all of these regression methods was 0.94 or above. It is a significant finding that when an attempt was made to develop a similar equation to include all of the overlaid pavement sections in Texas, no satisfactory regression model could be found. The details of the analysis and the resulting regression coefficients are given in Appendix F.

The following section shows some of the characteristics of the design equations that were developed by using a limited sensitivity analysis.

Sensitivity Analysis

The dependence of the number of load cycles to failure upon each of the input variables in the model can be shown with a sensitivity

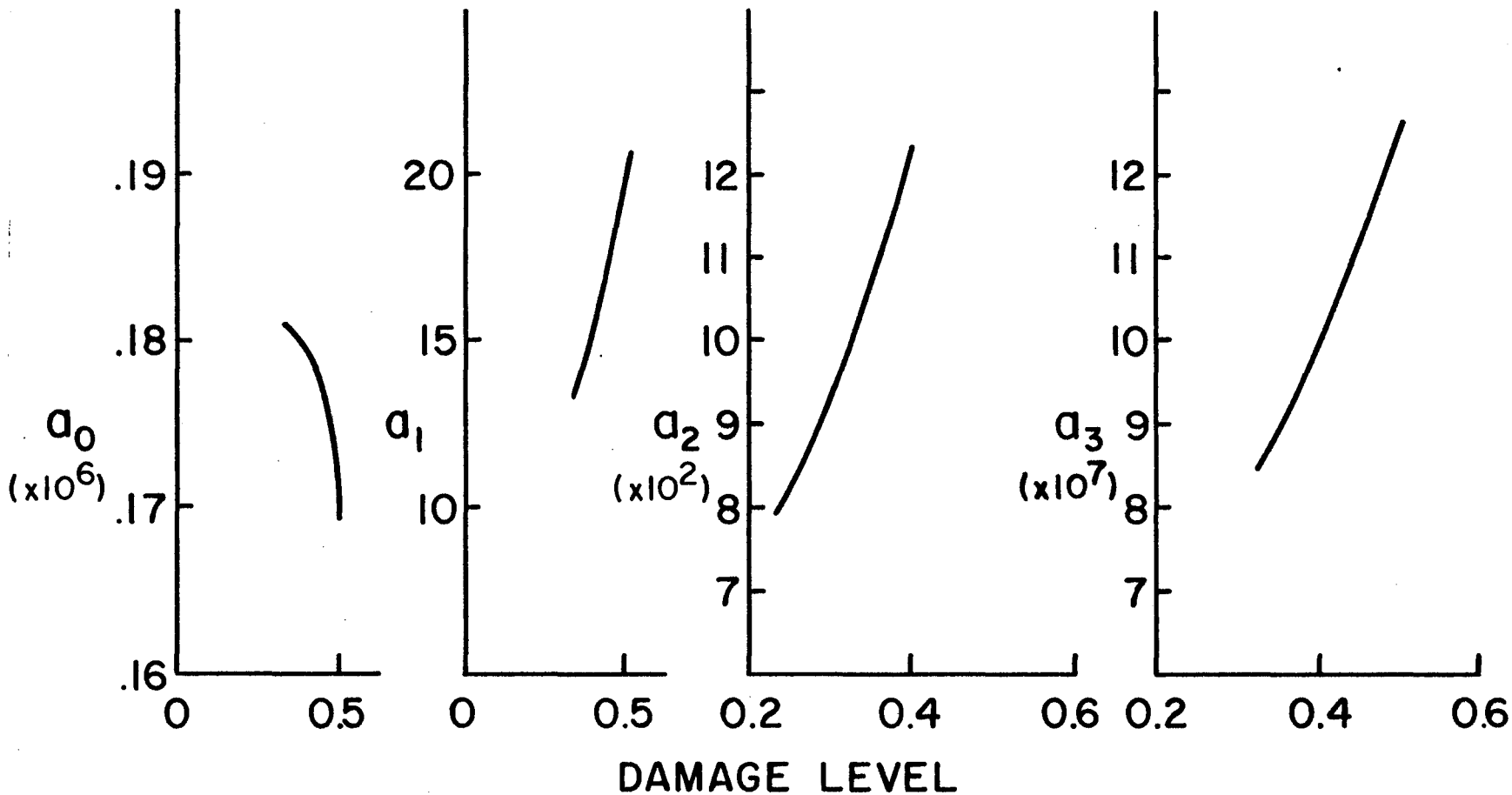

FIGURE 13. Variation of Regression Coefficients with Level of Damage

analysis. This analysis uses the calculated mean value of each variable except the variable under study. The full range of computed values for the selected variable is used to compute the number of load cycles to failure. The complete equation is given below.

$$N_F = a_0 - a_1 \left\{ \frac{(3k')^{3n_F/4} (E_1)^{n_F/4} [h_1^3 + \frac{E_2}{E_1}(h_{2m})^3]^{n_F/4} (h_1)^{1-(n_F/2)}}{[P\sigma(1-f_1)]^{n_F}} \right\}_{23}$$

$$+ a_2 \left\{ \frac{(3k')^{3n_F/4} (E_1)^{n_F/4} [h_1^3 + \frac{E_2}{E_1}(h_{2m})^3]^{n_F/4} (h_1)^{1-(n_F/2)}}{[P\sigma(1-f_1)]^{n_F}} \right\}_{33}$$

$$+ a_3 \left\{ \frac{(3k')^{3n_F/8} (E_1)^{n_F/8} [h_1^3 + \frac{E_2}{E_1}(h_{2m})^3]^{n_F/8} (h_1)}{[P(2-f_1)(2p_1-1)]^{n_F/2} (\sigma)^{n_F}} \right\}_{23} \tag{75}$$

Values for a_0, a_1, a_2, and a_3 were selected at a damage level of 0.50.

Sensitivity Analysis - Modified Modulus of Subgrade Reaction, k'

As previous defined, the modified modulus of subgrade reaction is not the conventional modulus of subgrade reaction but rather is a modulus of the existing pavement structure. Since a uniform load exerted over a uniform area should be used in each test, this modulus can be compared from one section to another in order to predict a

measure of the strength of each existing pavement structure.

Thus, as the modified modulus of subgrade reaction increases, as in Figure 14, an increase in the number of load cycles to reach some level of severity will occur. Other variables which influence the modified modulus of subgrade reaction are:

1. Thickness of the existing layer of asphalt concrete, as shown in Figure 15.
2. Thickness of the base layer, also shown in Figure 15.
3. Resilient modulus of the base layer, as shown in Figure 16.

Since this analysis was done within one climatic region, the climatic variables would not signficantly influence the overall trend as depicted in Figure 14.

Sensitivity Analysis - Existing Surface Layer Thickness, h

The load cycles to failure linearly increase with the thickness of the existing layer, Figure 17. The thickness of the existing layer is closely related to the modified modulus of subgrade reaction.

Sensitivity Analysis - Existing Surface Layer Stiffness, E

As reported elsewhere in the literature (36, 37) asphalt concrete undergoes an aging process by which the mix becomes stiffer and more brittle. With this increase in brittleness, the susceptibility to an increase in the severity of reflection cracking increases; thus, the negative slope of the line depicted in Figure 18. It can be concluded that as a pavement ages, its susceptibility to more severe reflection cracking increases as well.

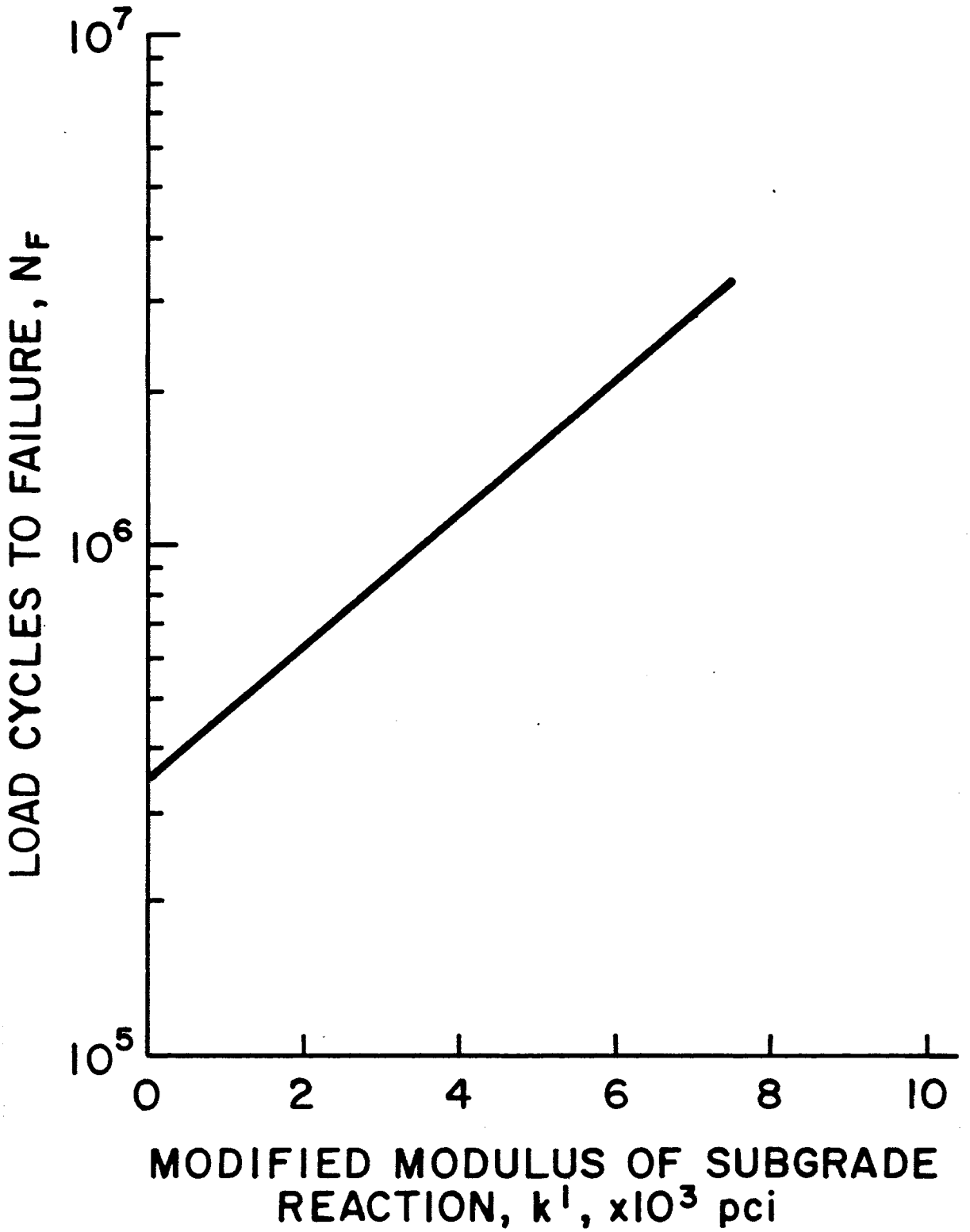

FIGURE 14. Sensitivity Analysis--Load Cycles to Failure vs Modified Modulus of Subgrade Reaction

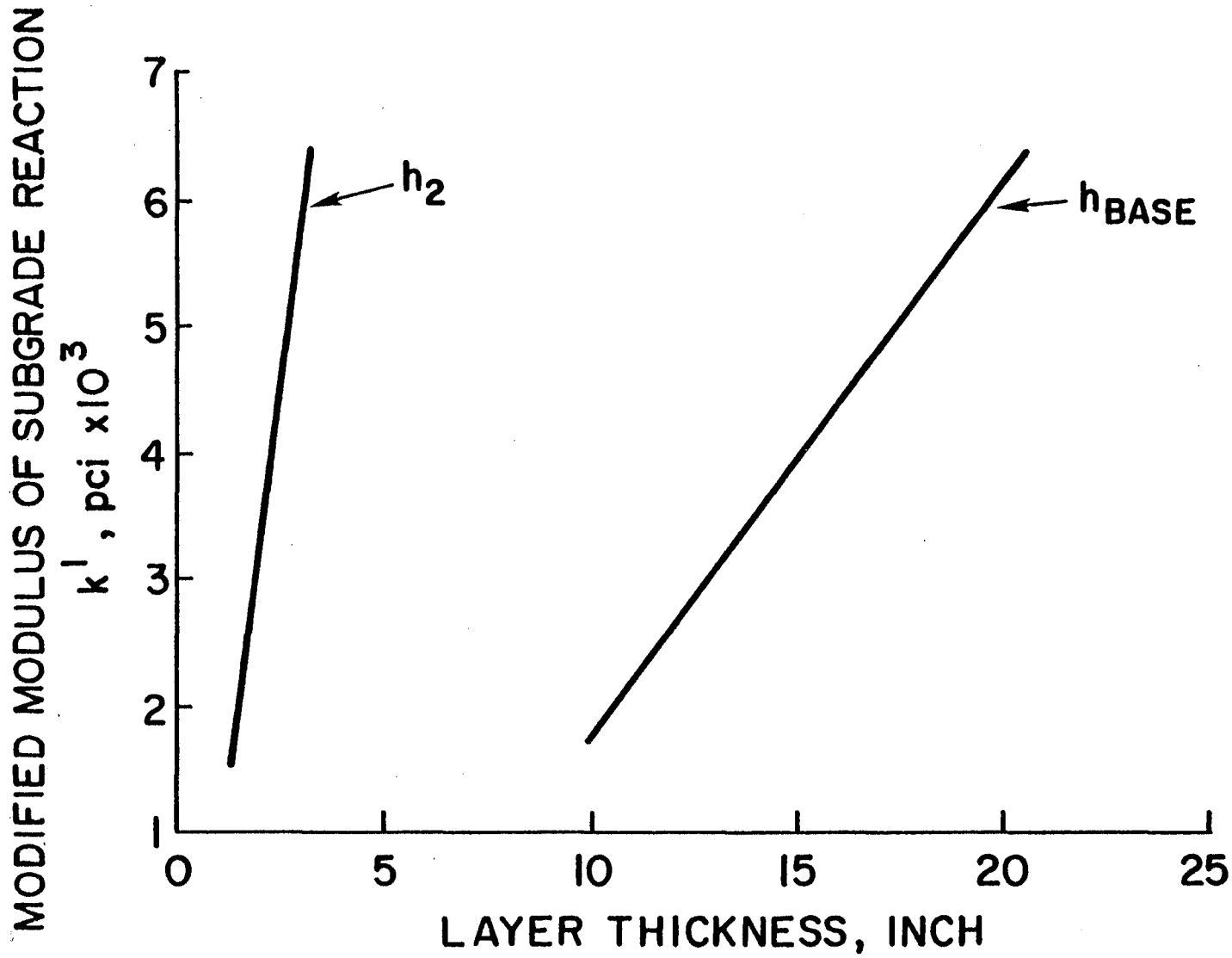

FIGURE 15. Dependence of Modified Modulus of Subgrade Reaction upon Surface Thickness (h_2) and Base Thickness

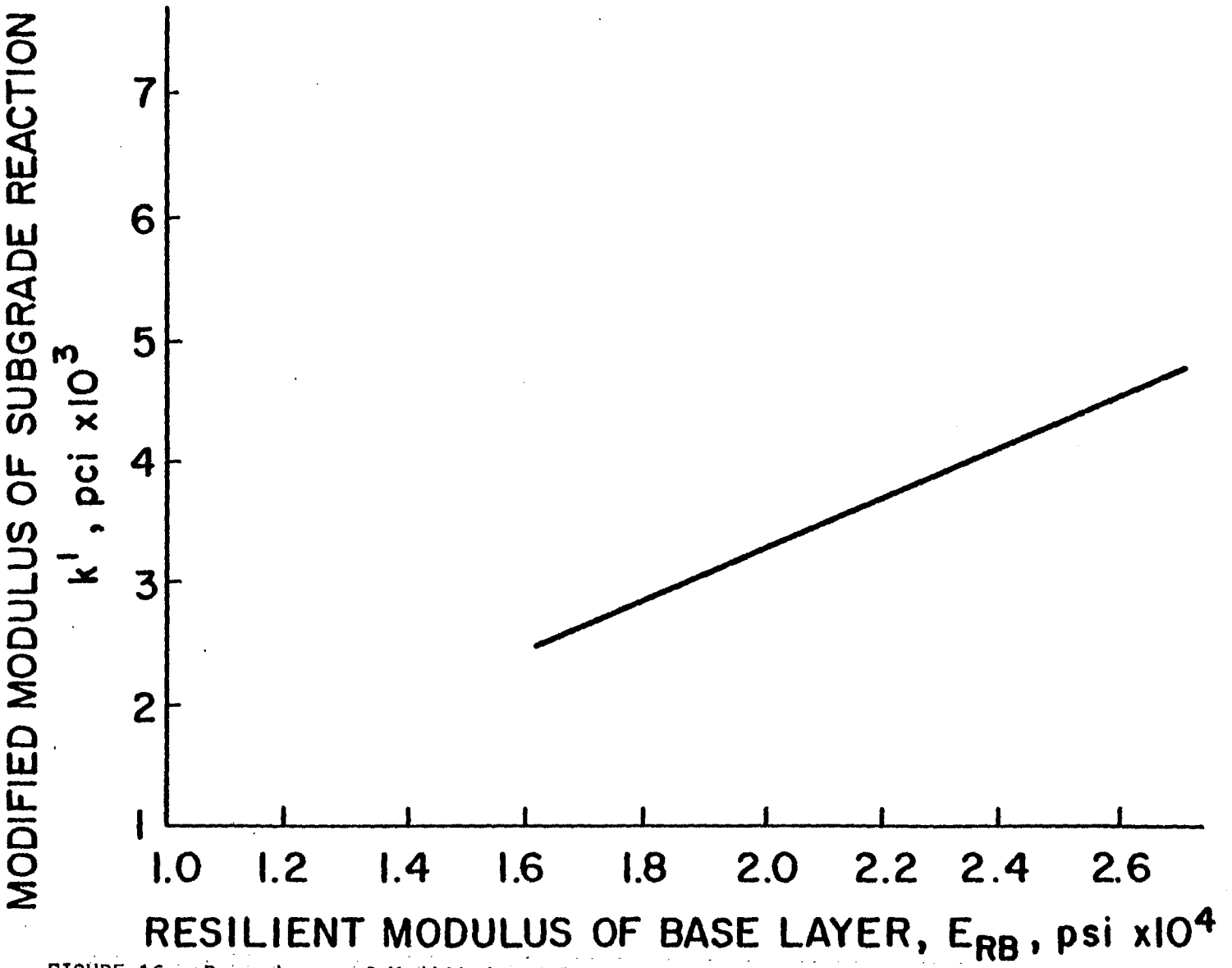

FIGURE 16. Dependence of Modified Modulus of Subgrade Reaction upon Resilient Modulus of Base Course Layer

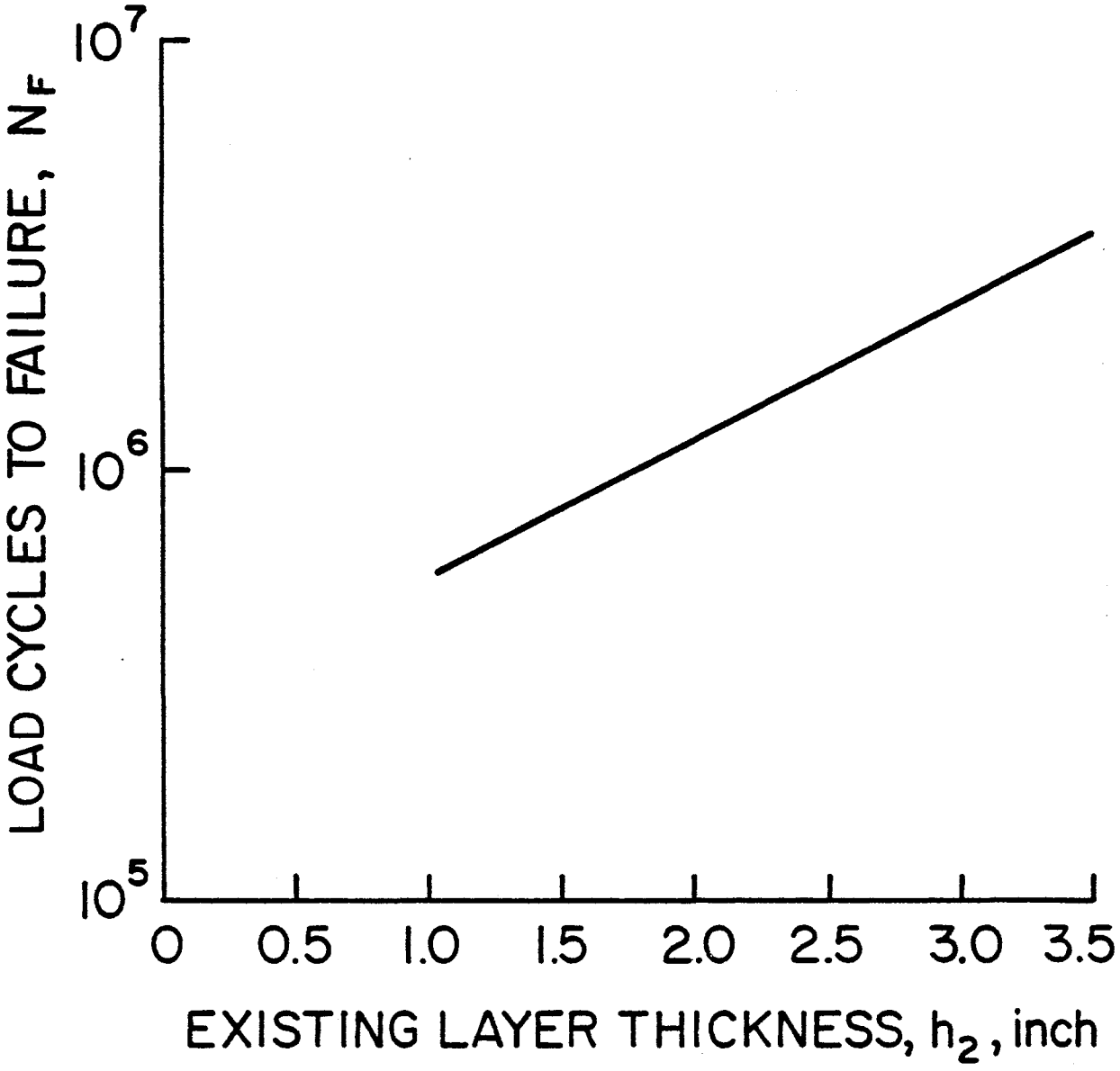

FIGURE 17. Sensitivity Analysis--Load Cycles to Failure vs Existing Surface Layer Thickness

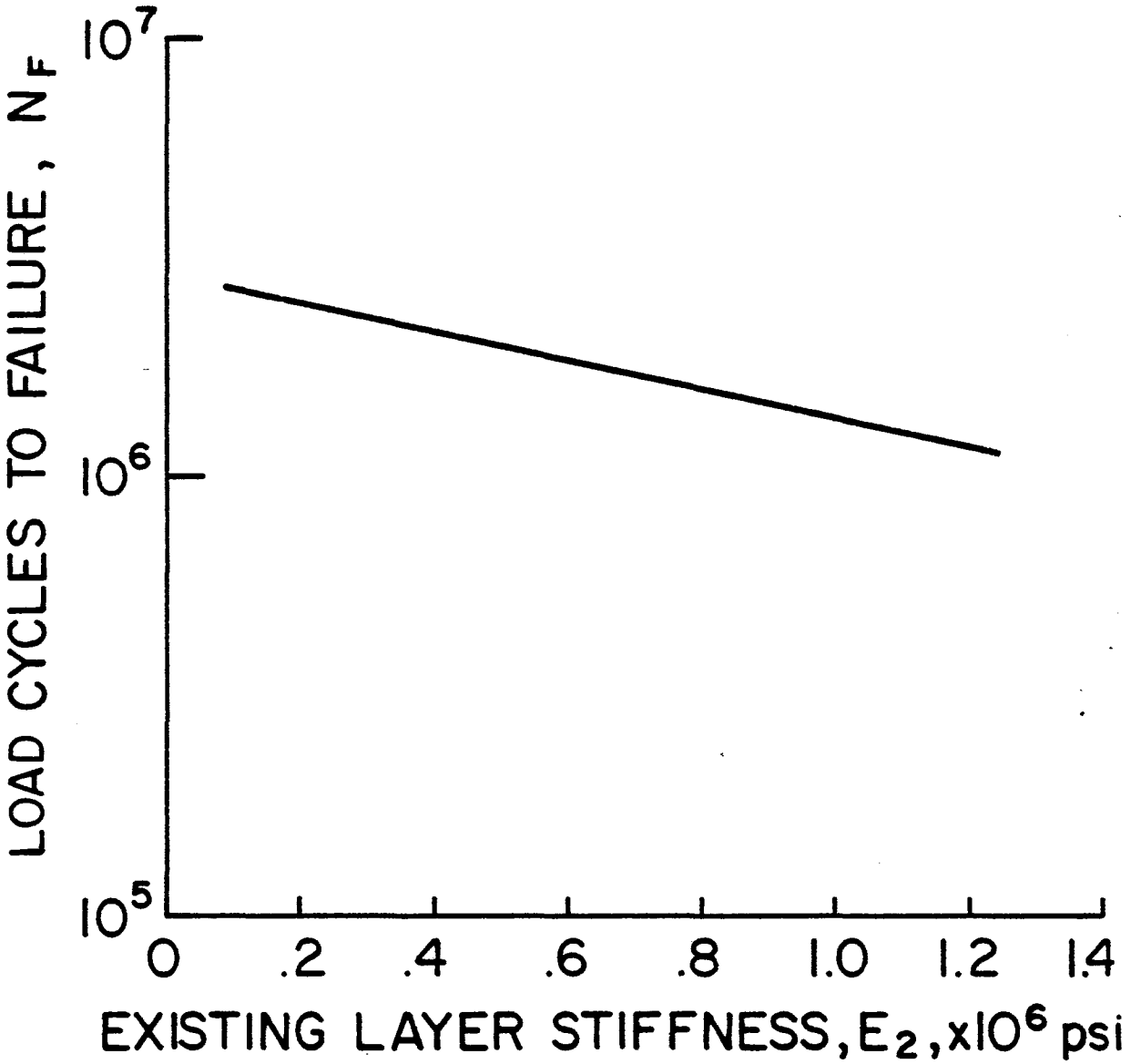

FIGURE 18. Sensitivity Analysis--Load Cycles to Failure vs Existing Surface Layer Thickness

Sensitivity Analysis - Overlay Thickness, h

The overlay thickness displays a curvilinear increase with the load cycles to failure (Figure 19). The curve is shaped in such a way that with additional thickness of overlay, there is a decreasing rate of change in the number of load cycles to failure. Thus, there is an overlay thickness beyond which a point of diminishing returns is reached and adding more thickness is not cost effective.

Sensitivity Analysis - Overlay Stiffness, E

The stiffness of the mix in the overlay seems to insignificantly affect the number of load cycles to achieve a given level of severity, as is shown in Figure 19. The range of computed values of stiffness for the various pavement sections at 77°F varies from 0.26×10^6 to 1.22×10^6 psi with an average stiffness of 0.59×10^6 psi. The complete set of computed stiffness values are in Appendix G. Even though the mix stiffness of the overlay does not significantly alter the reflection cracking life of the overlay and is not an important design variable for reflection cracking, it is important in other respects, such as stability and resistance to rutting and fatigue cracking. This same conclusion had been previously reached by Chang et al (38).

Sensitivity Analysis - Fracture Parameter, n

The fatigue fracture parameter n_F has been related to the slope of the logarithm of mix stiffness curve by Schapery (30) and Germann and Lytton (31). By examination of Figure 8 and Equation 57,

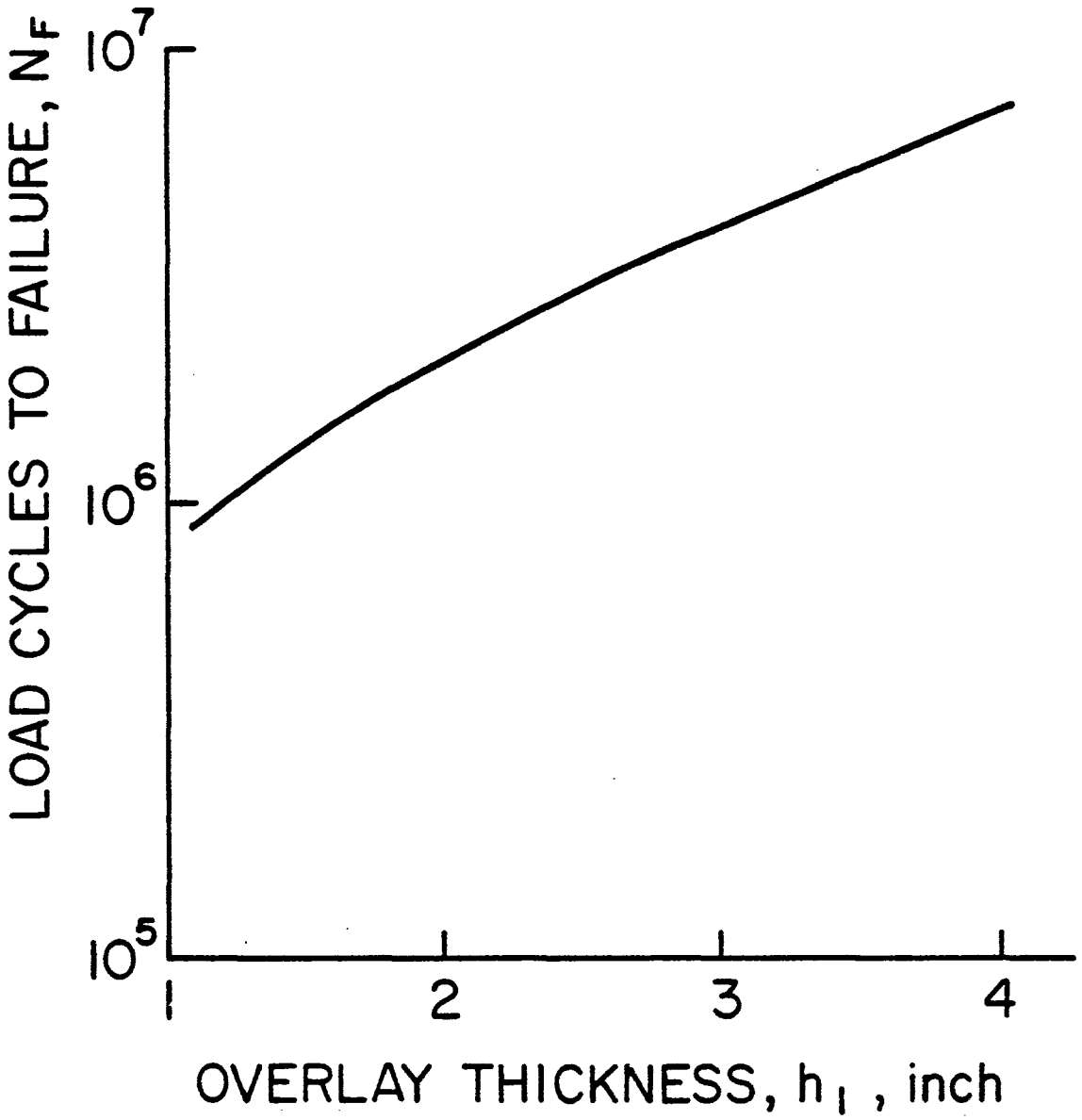

FIGURE 19. Sensitivity Analysis--Load Cycles to Failure vs Overlay Thickness

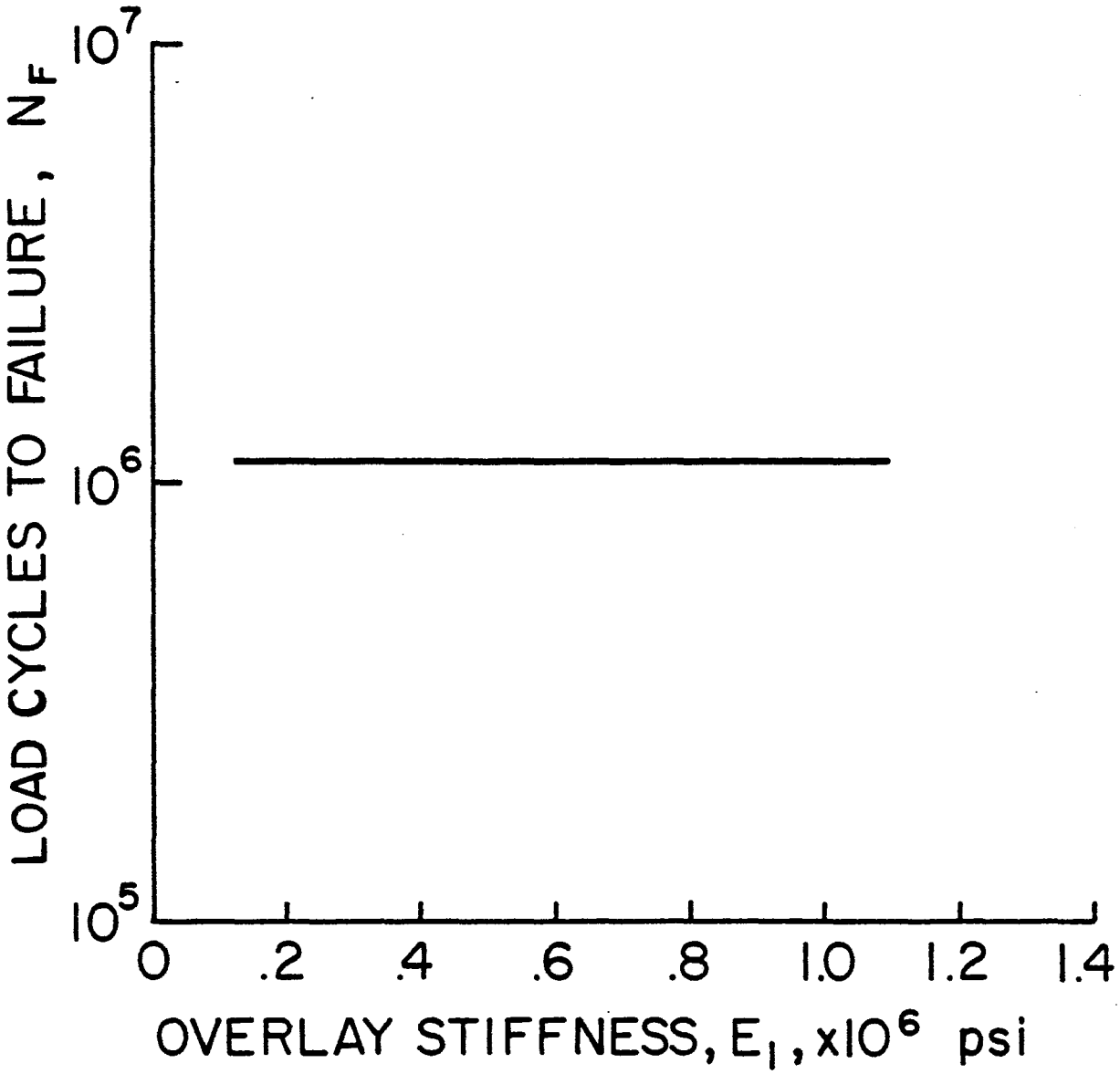

FIGURE 20. Sensitivity Analysis--Load Cycles to Failure vs Overlay Stiffness

the following observations can be made.

1. As the slope, m, of the mix stiffness curve approaches zero, the asphalt will become more elastic and brittle. At the point where: $m = 0$, then $n_F \rightarrow \infty$
2. As the slope, m, of the mix stiffness curve approaches infinity, the asphalt will become less viscous and more ductile. At the point where: $m \rightarrow \infty$, then, $n_F \rightarrow 1$.

In summarizing the above two points, as n_F increases, the asphalt becomes more brittle and thus, a reflection crack will reach a high level of severity after a very few load cycles. This is substantiated by the results of the sensitivity analysis shown in Figure 21.

Design Example

In order to illustrate the use of the design equation, Equation 74, the following example is presented.

An asphalt concrete pavement section located in West Texas, climatic region V, is to receive an asphaltic concrete overlay. The following parameters are found in the construction records of this pavement.

Existing Asphalt Concrete Pavement:

AC-10

Viscosity, 275°F = 430 cSt (aged for 8 years)

Penetration, 77°F = 35 (aged for 8 years)

Asphalt content = 5.3%

Age - 8 years old

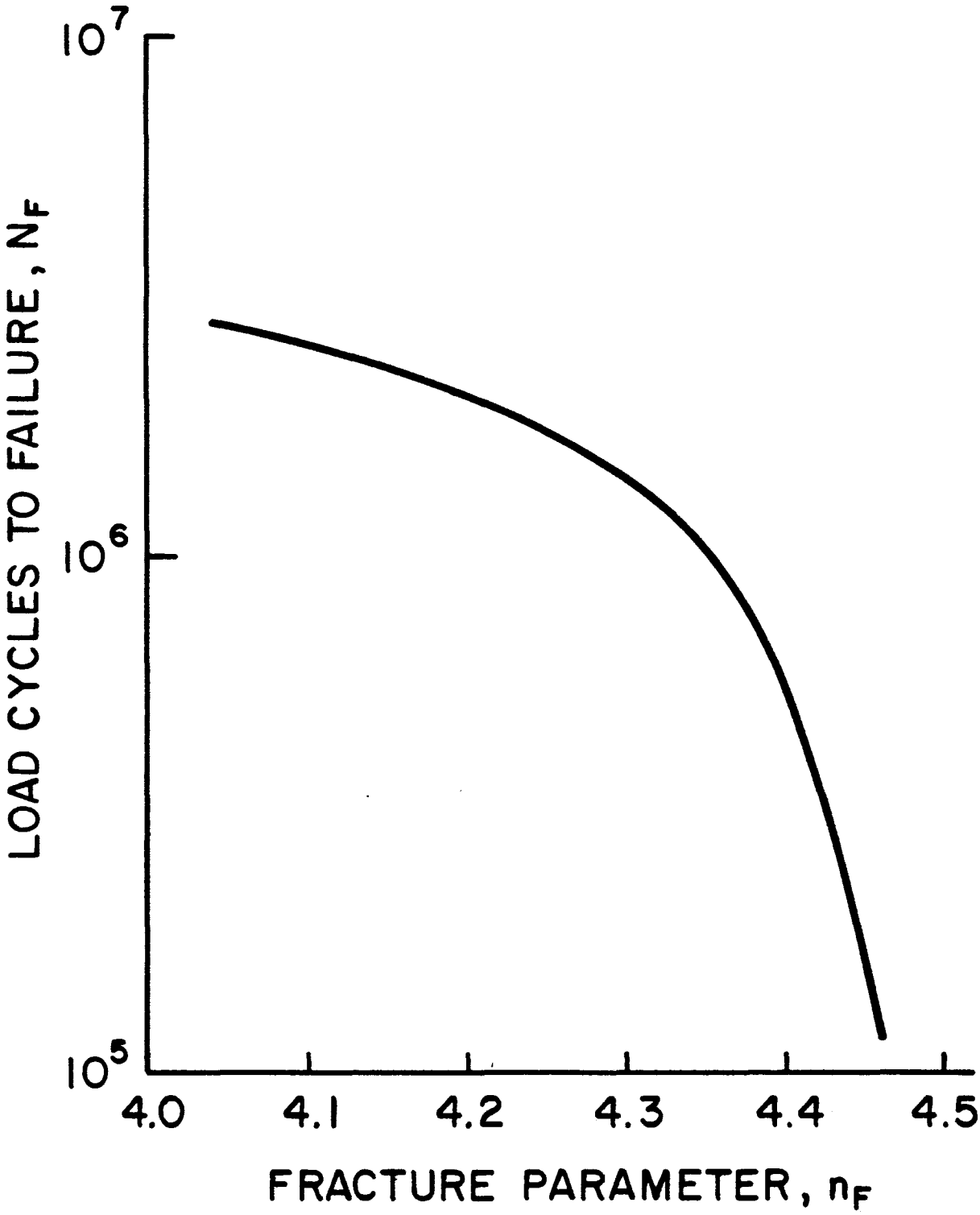

FIGURE 21. Sensitivity Analysis--Load Cycles to Failure vs Fracture Parameter, n_F

McLeod's method, Appendix C, must be used in order to compute the mix stiffness at 25°C and at 60°C. The results of McLeod's methods yields the following:

Time of Loading, Seconds	Mix Stiffness, psi	Service Temperature, °C
0.015	7.0×10^5	25
0.015	2.1×10^4	60

It will be assumed that the overlay asphalt concrete mix will contain AC-10. The following parameters are given for this mix.

Viscosity, 275°F = 330 cSt

Penetration, 77°F = 70

Asphalt content = 5.2%

Using McLeod's method, the following variables are computed:

Time of Loading, Section	Mix Stiffness, psi	Service Temperature, °C	Fracture Parameter, n_F
0.015	4.1×10^5	25	4.25
1.0	4.2×10^4		
0.015	1.05×10^4	60	4.50
1.0	7.0×10^2		

From use of deflection measurements and McLeod's method, the following table is developed:

Temperature	25°C	60°C
w_ℓ, inch	3.8709×10^{-2}	6.2435×10^{-2}
w_u, inch	2.8645×10^{-2}	4.6202×10^{-2}
w_c, inch	1.4896×10^{-2}	2.3101×10^{-2}
h_2, inch	2.0	2.0
E_1, psi	4.1×10^5	1.05×10^4
E_2, psi	7.0×10^5	2.1×10^4
P, lb	9000	9000
σ, psi	80	80
p_2	0.575	0.575
f_2	0.93	0.98
p_1	0.505	0.505
f_1	0.995	0.995
k', pci	1099	808
h_{2m}, inch	1.52	1.62

It is desired to design the pavement such that it will have a damage ratio of 0.50. Thus, the appropriate constants for the design equation are chosen from Figure 13. They are as follows:

$a_0 = 0.17 \times 10^6$

$a_1 = 21$

$a_2 = 1200$

$a_3 = 130 \times 10^6$

Exact values of the constants for damage levels 0.33, 0.40, and 0.50 may be taken from Appendix F.

The design number of 18-k (80 kN) equivalent single axle loads is

selected to be 750,000 when the damage ratio, g, reaches 0.50. Through an iterative process, the overlay thickness is calculated to be 3.10 inches. For this particular example, Figure 22 illustrates the variation of the overlay design thickness with the number of applications of the standard axle load. The development of such a chart is very simple with the use of a micro-computer.

SUMMARY

An overlay design procedure may be classified by the degree to which it approaches a mechanistic method, and incorporates, in some way, the major variables that affect the life of an overlay. All successful overlay design procedures, whether they are called empirical or mechanistic, have a basis in mechanics and some of these were illustrated in this chapter. All overlay design procedures incorporate five elements: observations, assumptions, theoretical model, correlations, and calculated quantities, and are differentiated principally by the level of complexity which they are capable of representing. Level 1 and Level 2 empirical overlay design equations were developed and described in this chapter using data from Minnesota and Texas. The thickness of the overlays calculated with these procedures is reasonable and the major variables that were included enter into the equations in ways that are physically realistic.

Greater reliability of the design equation may be expected as more variables are included using the proper form of the equation and a physically realistic model of the mechanical behavior of the overlaid pavement. This was illustrated with the Level 2 design equation that was developed from detailed Texas data.

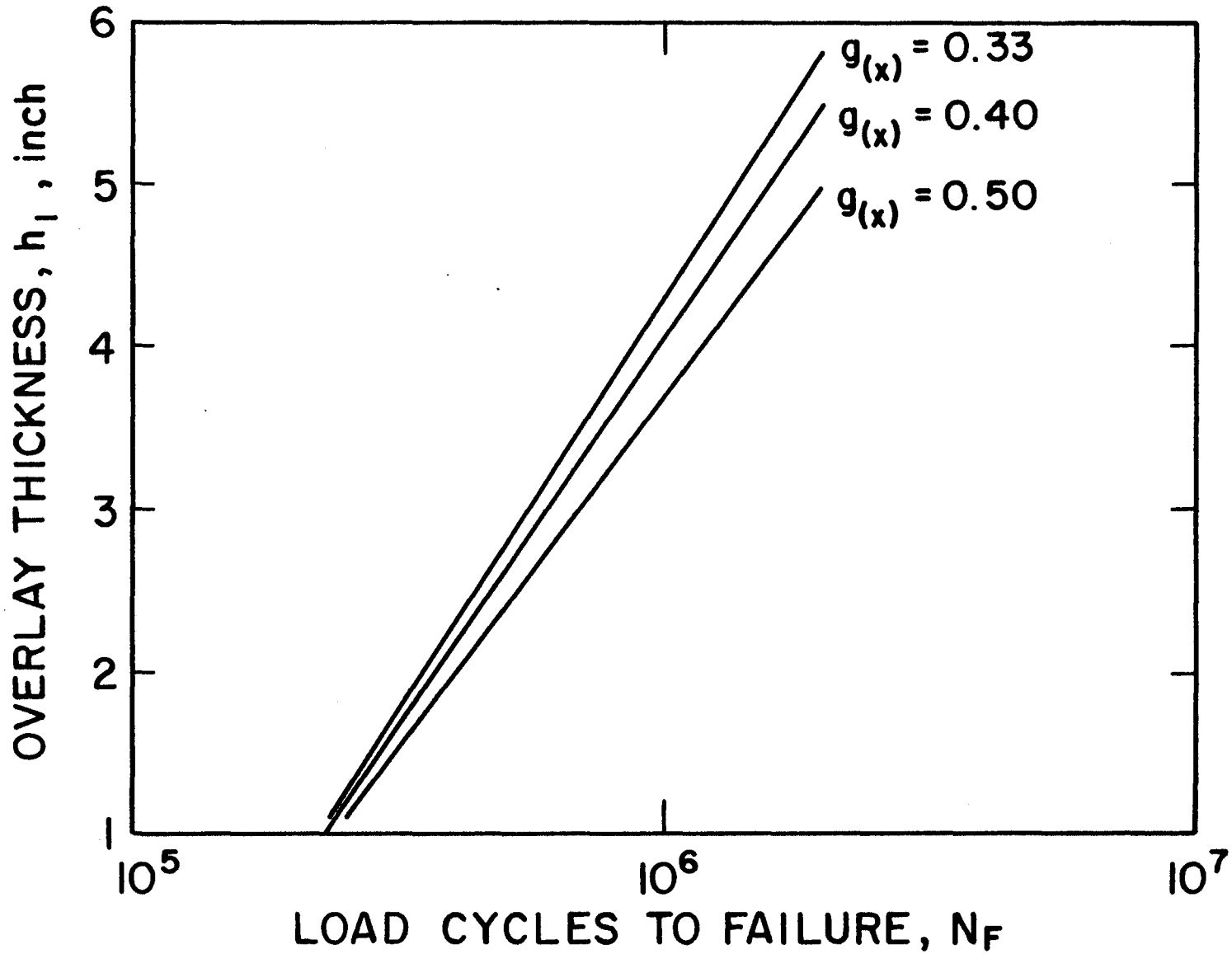

FIGURE 22. Design Overlay Thickness versus Design Number of 18-k (80 kN) Equivalent Single Axle Loads

CHAPTER THREE

INTERPRETATION, APPRAISAL, AND APPLICATION

Overlay design equations may have several levels of complexity, differentiated by how closely they approach a mechanistic method of design. Three levels of complexity were identified. Level 1 and Level 2 equations are normally regarded as empirical and a Level 3 equation is mechanistic. The differentiation may be somewhat artificial since all of the design procedures incorporate five elements in common: observations, assumptions, theoretical model, correlations, and calculated quantities. Examples of each of these levels of overlay design were given in Chapter 2. The AASHO Road Test flexible pavement design procedure and the Corps of Engineers - Federal Aviation Administration overlay design procedure were identified as Level 1 empirical equations. An example of a Level 2 overlay design equation was developed from Texas data and described in some detail in Chapter 2. Level 3 design procedures include the two Federal Highway Administration methods developed by Austin Research Engineers (11,12) and by Resource International (13). Because Level 2 and Level 3 procedures include material properties that may be measured in the laboratory, they are useful for project level design. The Level 1 design procedure is simple and is based upon easily accessible data and is thus useful for network level design studies. It may also be used for the design of an overlay on a specific project

provided that all of the variables are within the range from which the equation was originally developed. In fact, all overlay design procedures will work well if they are properly "calibrated" to local conditions. This may be done by using some form of regression analysis to correlate observed distress histories with the major overlay variables such as traffic, age, climatic variables, and pavement structure. The structure of the pavement may be represented in several ways including measured or calculated deflections, or an "effective thickness" such as the AASHO Road Test Structural Number, or Odemark's transformed thickness.

LEVEL 1 DESIGN EQUATIONS

The coefficient of determination (R^2) of the Level 1 equations that were developed from Minnesota and Texas data were low (0.14 to 0.41) indicating a large degree of scatter in the data and probably some bias as well. The data scatter is due partly to inconsistency in observing and recording pavement condition data, and partly to the fact that there is a wide degree of variability of the factors that cause the principal kinds of distress that affect overlays. Thus, unless some kind of "smoothing" is done to the original data it is unlikely that <u>any</u> level of overlay design equation will be able to fit the data much better than the Level 1 equations that were developed in Chapter 2. It is true, nevertheless, that the equations that were developed revealed physically realistic trends and gave calculated values of overlay thickness that are

within normally acceptable ranges. Despite their low values of coefficient of determination (R^2) in fitting the data, the Level 1 improvements can and should be made.

The difficulty that was encountered in fitting the data from Minnesota and Texas would have been compounded if an attempt had been made to develop a single equation to design overlays in all five of the climatic regions represented in those two States. This emphasizes the need to develop design equations or procedures that are "calibrated" to local or regional climatic conditions.

The Level 1 design equations were controlled by the transverse cracking equations both in Minnesota and Texas, indicating the importance of reflection cracking to the long term performance of overlays in both regions. Some of the variables that entered these equations and the exponents to which they are raised are given in Table 16. The relative size of the exponents in each equation is a rough measure of the relative importance of the variable. The age variable in the Minnesota equations is a substitute variable for the climatic variables and is found to be relatively less important for overlays over jointed concrete pavement than for overlays over flexible pavements. The structural condition of the old pavement as measured either by deflections or by the "effective thickness" of the pavement is found to be relatively more important for overlays over flexible pavements than for overlays over jointed concrete pavements. This is somewhat misleading, however. Because there is relatively little variation in the layer thickness or in the deflections between

TABLE 16. Exponents of Variables in the Level 1 Overlay Design Equations

Variable	Exponent in Overlay Design Equation: Minnesota overlays on Flexible Pavement	Minnesota overlays on Jointed Concrete Pavement	Texas overlays on Flexible Pavement
Dynaflect Maximum Deflection	1.700	---	---
Volume of Dynaflect Basin	---	0.105	---
Effective Depth of Old Pavement	---	---	3.544
Average Daily Traffic	---	-0.062	---
18-k (80 kN) ESAL	0.418	---	-1.116
Age	0.533	0.428	1.252
Logarithm of Damage	0.789	0.277	varies

the joints in concrete pavements, these "structural condition" variables are virtually constant, and will not be important variables in a regression equation that attempts to explain variations from section to section. The correct interpretation of the small exponent on deflections in the equation for overlays on jointed concrete pavement is that they will continue to have small influence on the design thickness of the overlays as long as there is no substantial change in the design thickness of jointed concrete pavements.

The exponent on the logarithm of damage shows that the thickness of overlays over flexible pavements are more sensitive to the design damage level at the end of the service life of the overlay than are overlays over jointed concrete pavements.

LEVEL 2 DESIGN EQUATION

A considerable improvement in the coefficient of determination (R^2) of a design equation can be made by "smoothing" the data and by including more variables that relate to the properties of the overlay materials and to the structural condition of the old pavement before it was overlaid. Data smoothing is done by finding a curve that fits the trend of the data and then taking data points from the curve for further analysis. This process was followed in developing the AASHO Road Test design equations and in developing the Level 2 overlay design equation from Texas data.

The form of the curve that was assumed to fit the data was sigmoidal or S-shaped, with the following equation

$$g = e^{-\left(\frac{\rho}{N}\right)^{\beta}} \tag{76}$$

A method of determining values of the constants ρ and β was developed which does not use linear regression analysis and which usually fits the observed data much better than does linear regression analysis. The method is described in Chapter 2. The number of design load applications, N, that was required to produce a selected value of damage ratio, g, was calculated section by section using the individual values of ρ and β corresponding to each section in turn. These values of N were then used as the dependent variables in developing the final overlay design equation.

The theoretical models that were employed in developing the design equation included beam-on-elastic foundation theory and fracture mechanics. When the two theories were combined to give the desired form of the design equation, it produced three independent expressions for the number of load applications to failure, one each for bending, shearing, and thermal contraction cracking. The expressions include the elastic moduli of the layers, the modified thickness of the old pavement surface layer, the stiffness of the old pavement, and the bending and shearing load transfer efficiency factors for a crack or joint which may be determined from deflections that are measured on the old pavement prior to overlay. The expressions also include the fracture properties of the overlay materials.

A simple method for determining approximate values of the fracture properties from the viscosity, penetration, and asphalt content of the asphaltic concrete mixture that is used in the overlay

were presented and an example overlay design problem was worked.

The resulting design equation fit the smoothed values of the number of load applications to reach a specified level of damage ratio very well with coefficients of determination (R^2) above 0.94. The sensitivity of the design equation to a variety of variables such as the design number of load applications, thickness and stiffness of the old pavement, and fracture properties of the overlay were shown to be reasonable.

The overlay design procedure is iterative since it requires an overlay thickness to be assumed and then the expected number of load cycles to failure to be calculated. If the calculated number of load cycles is not equal to the desired number of load applications, a new value of overlay thickness is assumed, and the calculation is repeated until the desired number of load cycles to failure is reached.

The Level 2 overlay design procedure includes several important variables that were not found in the Level 1 equations including the shear and bending efficiency factors at a crack and the fracture properties of the overlay. If it is desired to develop such a design procedure in another climatic region, it is essential to have the asphalt properties and mix design of the old surface layer and of the overlay and it is desirable to have measured deflections at and between cracks in the old pavement prior to overlay. Normally, these data are either unavailable because they have not been measured or they are not easily accessible. But when they are available and can be included in a Level 2 overlay design procedure, the result is likely to be as satisfactory as this one is.

REGIONAL DESIGN EQUATIONS

When an attempt was made to construct a Level 2 overlay design equation that was applicable to all climatic regions in Texas, using the same approach as described above, no satisfactory equation could be found. This unsuccessful attempt emphasizes the need to "calibrate" overlay design procedures by climatic regions. Of course, this requires the systematic collection of field condition data as well as construction and traffic histories, material property and climatic data in order to have the data available to develop such a "calibration". The same may be said of Level 3, or mechanistic, overlay design procedures, since they must also rely upon correlations with observed distress histories in order to make successful predictions of distress in determining the adequacy of an assumed overlay thickness.

As demonstrated in this report, the "calibration" of a Level 1 or a Level 2 overlay design equation cannot be done by changing a single multiplicative factor, such as the regional factor in the AASHO Road Test flexible pavement design equation. Instead, the variables themselves and the relations among the variables will change from one climatic region to the next.

The expectation that was expressed in the first phase of this project that data were available for constructing regional overlay design equations appears to be borne out by this study. The major distinction that must be made is in the level of overlay design equation that may be developed from the existing data. A Level 1

overlay design equation can be developed with the data that are available in all of those states that were rated highly in the first phase report. As the example of Minnesota shows, it is also possible to develop a Level 1 overlay design equation from a State that may not have been as highly rated primarily because of the relative inaccessibility of the data.

It is much less likely that a Level 2 overlay design equation can be developed from the available data. The major problem with such a development is the accessibility of the detailed material property and structural condition data that are required for a Level 2 design equation.

It is desirable to have data from at least 30 different pavement sections in order to develop a regional overlay design equation, and 40 to 50 sections is preferable. If possible the sections should be selected carefully to include combinations of high and low levels of traffic, climatic, age, and pavement structural variables so as to eliminate as much bias as is possible. Smoothing of the distress data is also desirable so that the trends in the data can be more reliably determined and predicted by regression analysis. Several methods of data smoothing were discussed in Chapter 2.

The final result will be a regional overlay design equation that is calibrated to local conditions and is likely to be very useful in selecting thickness of overlays that will perform as expected within the specified design criteria.

CHAPTER FOUR

CONCLUSIONS AND SUGGESTED RESEARCH

CONCLUSIONS

The major conclusion of this report is that realistic overlay design procedures can be developed from data that are presently available in several State highway agencies. Depending upon the quality of the data and particularly upon the detailed materials properties data that are available, three levels of overlay design procedure may be developed. The level of an overlay design procedure is determined by the number of variables it incorporates, its reliability, and the degree to which it relies upon mechanistic concepts. The Level 1 and Level 2 procedures are empirical equations and Level 3 is a mechanistic overlay design procedure. Because of its relative simplicity and the accessibility of the data which it uses, the Level 1 overlay design equation is suitable for network level projections but can also be used to select the design thickness of an overlay for specific projects. The Level 2 overlay design equation incorporates more detailed data on materials properties and on the results of a non-destructive testing deflection survey of the pavement prior to overlay. Because of this, it is usually a more reliable design equation than the Level 1 equation, and is more appropriate to use for project level design.

Examples of Level 1 and Level 2 overlay design equations are developed from data obtained in Minnesota and Texas. Level 1 overlay design equations were developed from Minnesota data collected on 86 overlaid flexible pavements and 47 overlaid jointed concrete pavements, and from Texas data on 45 overlaid flexible pavements. A Level 2 equation was developed from 23 overlaid flexible pavements in the dry, freeze-thaw cycling zone of west Texas. The equation for transverse cracking controlled the design of overlays in each case, emphasizing the gravity of the reflection cracking problem in the successful performance of overlays. The Level 2 design equation was developed explicitly to allow the design of an overlay to resist or retard reflection cracking. Beam-on-elastic foundation theory and fracture mechanics were used to give the form of the equation and the relations among the variables that appear in the design equation. Data smoothing was used to determine the number of load cycles to reach "failure" as it is defined by a selected level of damage ratio, and the resulting regression equation fit the data with a very high coefficient of determination (R^2).

In Chapter 2, it was shown that all successful overlay design procedures, regardless of level, share five elements in common: (1) observations, (2) assumptions, (3) theoretical model, (4) correlations and (5) calculated quantities, and this includes the mechanistic overlay design procedures which must rely upon correlations between laboratory and field observations in order to produce realistic designs. Thus, regardless of the level of the design procedure, there is a need for field observations and for historical traffic,

construction, and climatic data to "calibrate" the design procedure to local or regional conditions. The difference in the design equations that were developed in Minnesota, in a wet, hard-freeze climatic zone, and in Texas, which has four of the other five climatic zones in the United States, shows that the climate plays a major role in controlling the performance of an overlay. This emphasizes the need to develop regional design equations that have been calibrated to the regional climatic conditions.

The way that the climate affects an empirical design equation is to change the importance of the variables, to delete some and insert others, and to modify the exponents of each of the variables. Thus, it is not possible to represent the effect of the climate by a single multiplicative factor such as the regional factor in the AASHO Road Test flexible pavement design equation. The results that have been found in this project with Level 1 and Level 2 design procedures also suggest the need for regional "calibrations" of the materials properties of pavement layers such as the fatigue and permanent deformation properties that are used in mechanistic (Level 3) overlay design procedures.

SUGGESTED RESEARCH

The development of regional overlay design equations that is reported here is considered to be successful as judged primarily by the results of the calculations of overlay thickness by the four overlay design equations that were developed: three Level 1 design

equations and one Level 2 design equation. This is encouraging both to those highway agencies which have already collected pavement data and to those that are considering a decision to begin a long-term monitoring effort.

It is suggested that such efforts should be initiated where it is possible and between 40 and 50 pavement sections should be selected for data collection efforts. The minimum data that should be collected include construction histories, layer thickness and moduli, pavement condition data including distress area and severity and riding quality, weather data such as rainfall, temperature, and evapotranspiration statistics, subgrade soil properties and traffic data including average daily traffic, percent trucks, and 18-k (80 kN) equivalent single axle load estimates. It will also be very useful if distress and deflection surveys are conducted prior to overlaying an existing pavement and if the asphalt properties and mix design quantities that were used in the overlay materials are recorded in an easily accessible location. The pavement sections should be selected carefully to include high and low combinations of traffic, climatic, age, and pavement structure variables in order to reduce the bias in the overlay design equation that will eventually be developed from the data that are collected.

It is also suggested that the overlay design equation that is finally developed should use one of the forms of equation that was described in detail in Chapter 2. The overlay design equation that is developed will then be "calibrated" to the local conditions within its own climatic region.

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APPENDIX A

Data Collection in Minnesota

INTRODUCTION

This Appendix describes the visits made by the project staff to the Highway Department of Minnesota. The purpose of these visits was to collect pavement data for model building purposes; the minimum data requirement of any section being:

Pavement Construction Data (Layer types, thicknesses, etc.),

Pavement Maintenance Data (Type, thicknesses),

Pavement Condition Survey Data (for several years, and

Climatic Data

For completeness, a comprehensive description is given of the data availability and pavement rating procedure that is used. As will be described, the State of Minnesota was found to be an excellent source for the required data.

ACCESSIBILITY OF DATA WITHIN THE MINNESOTA D.O.T.

The Minnesota Department of Transportation is responsible for the 13,000 miles of trunk route within the state, these being primarily Interstate, U.S. and State highway type roads. For administrative purposes, the state is broken up into 9 districts, each of which controls an approximately equal length of road.

Since 1966, the Department has been using a pavement rating

system which is described in (39). Early, during the visit to Minnesota, it was discovered that the minimum data required for model building purposes could be obtained by combining the data collected in their rating system with the data available from other sources within the department. These sources include:

a) The departments construction and maintenance logs

b) The computerized traffic logs

c) The soils records maintained in each district office.

The sources will be described in detail in the following sections.

The above mentioned data were collected in 2 of Minnesota's nine Districts. These data were returned to TTI where they were coded and stored on computer prior to data processing. In all, data have been collected fo 133 pavement sections in Minnesota and the coding and storage of these data is described in a later section.

Maintenance and Construction Road Logs

Each district's network is divided into a number of control-sections which are typically 2 to 12 miles in length. The department maintains construction logs which contain construction and maintenance history for each control section.

The log record for Trunk Highway 35W, Control Section 0280, is shown in Figure A-1. This control section is shown to have the following three subsections:

1. From the County Line to Trunk Highway 49, was constructed in 1968 with an 8 inch thick concrete surfacing over a 3 inch gravel base.

FORM RL-7 REV 4-50

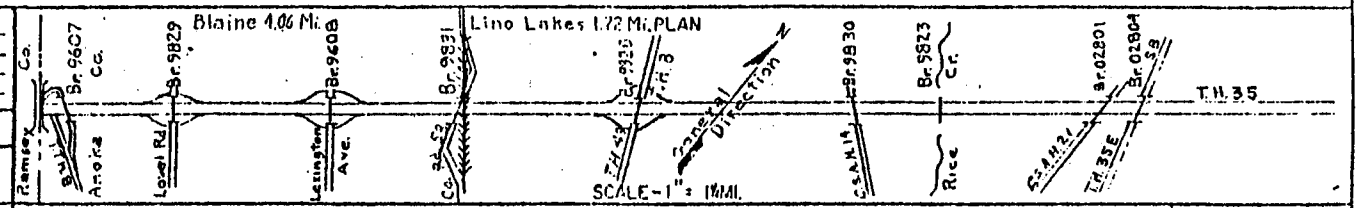
PREPARED BY
TRAFFIC AND PLANNING DIVISION
IN COOPERATION WITH
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
ROAD LIFE STUDIES
CONSTRUCTION PROJECT LOG RECORD

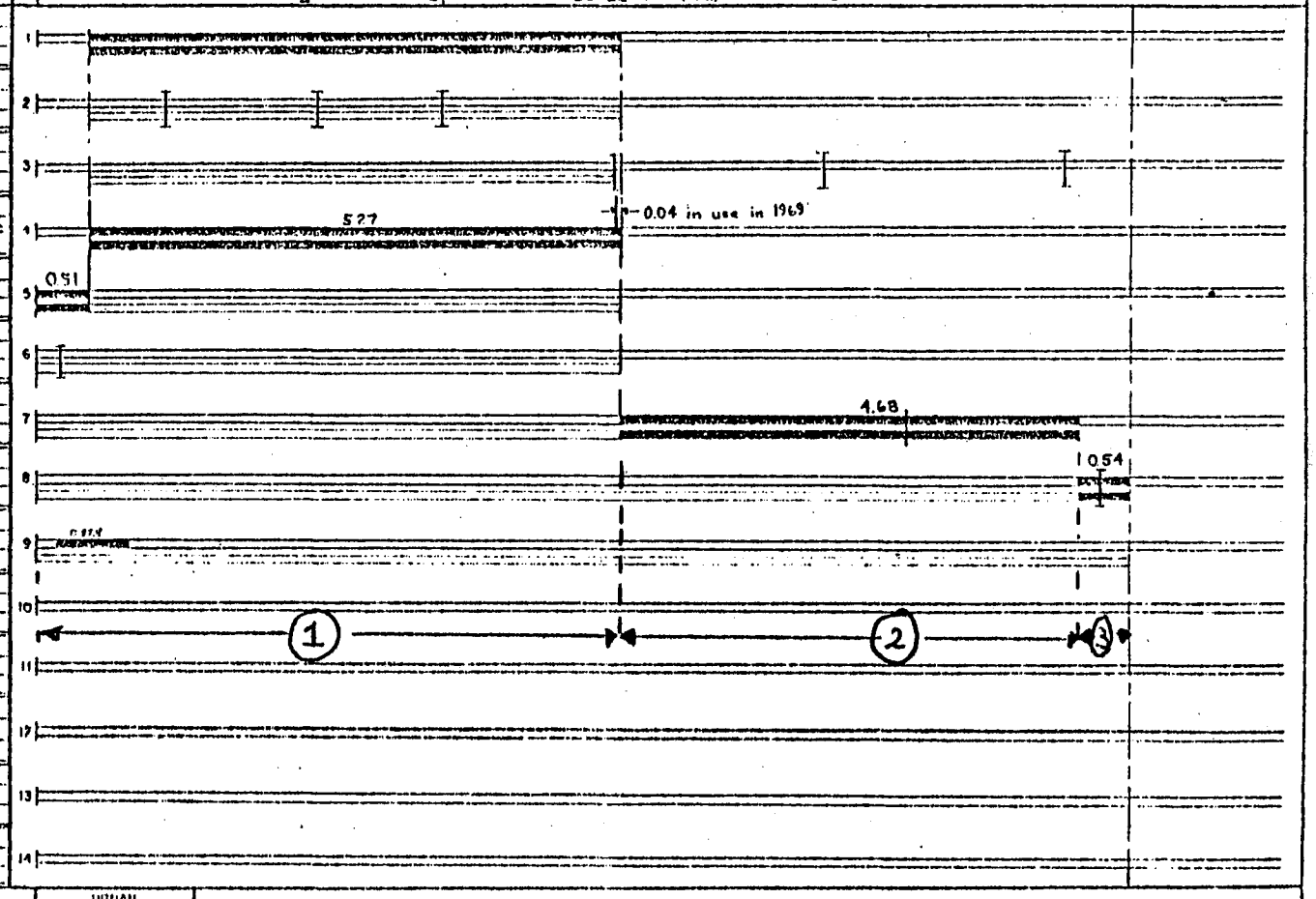
SHEET 1 OF 1

Interstate
CONTROL SECTION 0280
TRUNK HIGHWAY 35 W
COUNTY Anoka
DISTRICT 9A

LIMITS: S. Co. Line (Anoka-Ramsey Co. Line) - N. Jct. T.H. 35 and T.H. 35 E.



YEAR BUILT	PROJECT NO	DESCRIPTION: TYPE	WIDTH	THICKNESS	REMARKS
C 1967	0280-03	Grading Gravel Sub-base	2@46'	12"	Divided Highway
C 1967	0280-9829 0280-9608 0280-9831	Br. 9829 Br. 9608 Br. 9831			212' P.P.G.-U.P. 291' P.P.G.-U.P. 232' P.P.G.-U.P.
C 1967	0280-9820 0280-02801 0280-9830	Br. 9820 Br. 02801 Br. 9830			201' P.P.G.-U.P. 226' P.P.G.-U.P. 179' P.P.G.-U.P.
C 1968	0280-06	Gravel Base P.C. Concrete	2@24' 2@24'	3" 8"	Divided Highway 0.24 Mi Two-Way Traffic on S.B. Rdwy.
C 1968	0280-11 0280-12	Grading, Grav. Sub-base Gravel Base P.C. Concrete	2@57' 2@45' 2@24'	12" 3" 8"	Plant Mix. Bit. Shoulders 3' in. & 10' Out.
C 1968	0280-11	Br. 9607			321' P.P.G.-U.P.
C 1969	0280-07 0280-08	Grading Br. 9823 Base, P.C. Concrete	2@24'	8"	Divided Highway C 106 T
C 1969	0283-03 0283-07	Grading Br. 02804 Base, P.C. Concrete	2@24'	8"	Divided Highway 306' Box Girder
C 1979	0280-34 TR 35W:3(in-)m	Conc. Resurf. (Experimental) Resurface Shoulders	24'	2"	NB Roadway only AC 2361 3' in & 10' out



YEARS FROM	YEARS TO	TOTAL MILES	UNINCORPORATED ROWY. MI.	UNINCORPORATED BR. MI.	INCORPORATED ROWY. MI.	INCORPORATED BR. MI.	RURAL ROWY. MI.	RURAL BR. MI.	URBAN ROWY. MI.	URBAN BR. MI.
1968	1968	5.70	0.00	0.00	5.70	0.00	0.00	0.00	5.70	0.00
1969		11.04	0.38	0.06	10.60	0.00	0.30	0.06	10.60	0.00

REMARKS Layout is to scale as of 1960

4-11-79

Figure A-1. A Typical Record From Minnesota Construction Log

Minnesota's Pavement Inspection Procedure

The rating system is extensively covered in (39). In summary it is composed of two parts, a Present Serviceability Rating (PSR) and a Structural Rating (SR). The PSR and SR values are averaged to obtain the final Condition Rating (C.R.)

The PSR was initially determined by a 3 man panel using the equation developed at the AASHO Road Test. However, it was found that this was not an accurate indicator of rideability because it could not be determined uniformly on a state-wide basis. Therefore since 1967 the department has measured PSI using a PCA road meter.

The structural rating is calculated from the visual inspection of pavement distress. During this visual inspection, the following distress types are monitored.

a) Flexible Pavements

- transverse cracking - The number of cracks in a 1/4 mile section is converted to a percentage value as shown below:

No. cracks per 1/4 mile	Percentage
150+	100
100-150	75-100
50-100	25-75
0-50	0-25

- longitudinal cracking
- multiple cracking
- alligator cracking
- rutting (greater than 1/2")
- patching

b) Bituminous Overlaid Concrete (Composite) Pavements

- slight transverse
- severe transverse
- slight longitudinal
- severe longitudinal
- multiple
- patching

c) Concrete Pavements

- spalled joints
- faulted joints
- cracked panels
- broken panels
- faulted panels
- Patches
- Overlay
- Scaling

The appropriate forms are shown in Figure A-2, A-3, and A-4 respectively. The structural rating is calculated by multiplying the average percentage of each distress type present by the relevant weighting factors which are shown below.

Flexible Pavements

Transverse	Longitudinal	Multiple	Alligator	Rutting	Patching
.02	.02	.15	.35	.15	.30

BITUMINOUS PAVEMENT STRUCTURAL RATING FORM

Trunk Highway _____ Control Section _____ Raters _____, _____, _____ Date _____

Begin Survey _____ End Survey _____ Total Length _____

Shoulder Type: Bituminous ☐, Gravel or Earth ☐, None ☐ Divided ☐ Not Divided

No. of Lanes (Including parking lanes): 2 ☐, 3 or more ☐ District No. ____

MILE	LANE	CRACKING								RUTTING		PATCHING		S.R.	NOTES
		(A) transverse		(B) longitudinal		(C) multiple		(D) alligatoring		(E)		(F)			
		No.	%	Ft.	%	Ft.	%	Ft.	%	Ft.	%	Ft.	%		
0 – 1															
1 – 2															
2 – 3															
3 – 4															
4 – 5															
5 – 6															
6 – 7															
7 – 8															
8 – 9															
9 – 10															
10 – 11															
11 – 12															
12 – 13															
13 – 14															
14 – 15															
PSR =						Average Structural Rating =									Condition Rating =

Figure A-2. Minnesota's Visual Rating Form of Bituminous Pavements

CONCRETE PAVEMENT STRUCTURAL RATING FORM

Trunk Highway _____ Control Section _____ Raters _____, _____, _____ Date _____

Begin Survey _____ End Survey _____ Total Length _____

Shoulder Type: Bituminous ☐, Gravel or Earth ☐, None ☐ Divided ☐ Not Divided

No. of Lanes (Including parking lanes): 2 ☐, 3 or more ☐ District No. _____

ILE	LANE	JOINTS					PANELS							PATCHING				SCALE		S.R.	NOTES
		(A)	(B)	B/A	(C)	C/A	(D)	(E)	E/D	(F)	F/D	(G)	G/D	(H)	H/(D+H)	(I)	I/D	(J)	J/D		
		TOTAL VISIBLE	SPALLED	%	FAULTED	%	TOTAL VISIBLE	NUMBER CRACKED	%	NUMBER BROKEN	%	NUMBER FAULTED	%	100 % OVERLAY	%	5 Sq.Ft	%	5 Sq.Ft.	%		
-1																					
1-2																					
2-3																					
3-4																					
4-5																					
5-6																					
6-7																					
7-8																					
8-9																					
9-10																					
0-11																					
1-12																					
2-13																					
3-14																					
4-15																					

PSR = Average Structural Rating = Condition Rating =

Figure A-3. Minnesota's Visual Rating Form For Concrete Pavements

BITUMINOUS OVERLAID PAVEMENT STRUCTURAL RATING FORM

Trunk Highway _____ Control Section _____ Raters _____, _____, _____ Date _____

Begin Survey _____ End Survey _____ Total Length _____

Shoulder Type: Bituminous ☐, Gravel or Earth ☐, None ☐ Divided ☐ Not Divided

No. of Lanes (including parking lanes): 2 ☐, 3 or more ☐ District No. _____

MILE	LANE	CRACKING										PATCHING		S.R.	NOTES
		(A) slight transverse		(B) severe transverse		(C) slight longitudinal		(D) severe longitudinal		(E) multiple		(F)			
		No.	%	No.	%	Ft.	%	Ft.	%	Ft.	%	Ft.	%		
0–1															
1–2															
2–3															
3–4															
4–5															
5–6															
6–7															
7–8															
8–9															
9–10															
10–11															
11–12															
12–13															
13–14															
14–15															
PSR =								Average Structural Rating =							Condition Rating =

Figure A-4 Minnesota's Visual Rating Form For Bituminous Overlaid Concrete Pavements

The values of PSI, SR, and CR of each length of road in the network are stored on computer at the Head Office in St. Paul. The individual rating forms showing the percentages of each distress type are stored in manual files in the district offices. Because it was desirable to study changes in each distress type, it was necessary to visit some district offices.

The following two district offices were visited.

- District Office 5 at Golden Valley, Minneapolis, which controls the metropolitan highway routes to the west of the Mississippi River.
- District Office 9 in North East St. Paul which controls the metropolitan highway routes to the east of the Mississippi River.

District 5 has kept its complete set of inspection records back to 1966 when the rating system was started. After a preliminary inspection of this district's road logs 55 control sections were found to have construction/maintenance histories suitable for inclusion in the TTI studies. Complete historical visual rating data were collected for each of these sections, this typically consisting of 3 or 4 visual ratings (i.e., in 1969, 1972, 1974, 1976). This involved xeroxing the original visual inspection form, an example of which is shown in Figure A-5, this being for Trunk Highway 7, Control Section 1003 between West County Line and East County Line, a distance of 11.15 miles. This inspection was conducted on July 7, 1970.

District 9 however has only kept previous inspection records back to 1976. In this district, 30 control sections were selected and the

available visual rating data were xeroxed and returned to TTI.

Traffic Data - Minnesota

The department has computerized its traffic data for each section of pavement which is inspected. The department produces a computer listing containing the sections:

a) Present Serviceability Index,

b) Structural Rating,

c) Condition Rating,

d) Average Daily Traffic, and

e) % Trucks.

The complete listings for Districts 5 and 9 were made available to TTI; a portion of this listing is shown in Figure A-6, in which the indicated subsection is on Trunk Highway 8, control section 8213 between the junction with Trunk Highway 61 and the north end of the divided highway. The total ADT in both directions is 8000 with 4.7% trucks.

The department undertakes frequent truck classification counts on its network. The counts enable the calculation of 18-K ESAL values for each highway segment. These data are made available upon request.

Coding the Collected Data for Computer Input

As previously discussed, the Minnesota Department of Transportation made the following data available.

1. A complete set of road logs for Districts 5 and 9.
2. Xerox copies of inspection data from 85 control sections (Each

BITUMINOUS PAVEMENT STRUCTURAL RATING FORM

Trunk Highway 7 Control Section 1003 Raters R Schally, D Wallgren, _____ Date 7-6-70

Begin Survey W. Co. Line End Survey E. Co Line Total Length 11.15

Shoulder Type: Bituminous ☐, Gravel or Earth ☒, None ☐ Divided ☐ Not Divided ☒

No. of Lanes (Including parking lanes): 2 ☒, 3 or more ☐ District No. 5

MILE	LANE	CRACKING								RUTTING		PATCHING		S.R.	NOTES
		(A)		(B)		(C)		(D)		(E)		(F)			
		transverse		longitudinal		multiple		alligatoring							
		No.	%	Ft.	%	Ft.	%	Ft.	%	Ft.	%	Ft.	%		
0 - 1		380	100	40	3	270	21	90	7	140	11	60	5	2.4	
1 - 2															
2 - 3		244	100	170	13	390	30	30	2	110	8	140	11	2.3	
3 - 4															
4 - 5		319	100	200	15	400	31	40	3	200	15	610	47	1.4	
5 - 6															
6 - 7		217	100	90	7	250	19	10	1	110	8	100	7	2.6	
7 - 8															
8 - 9		294	100	40	3	90	7	0	0	940	70	1210	93	.8	
9 - 10															
10 - 11		142	96	50	4	0	0	0	0	50	4	0	0	3.5	
11 - 12															
12 - 13															
13 - 14															
14 - 15															

PSR = 2.90 Average Structural Rating = 2.17 Condition Rating = 2.53

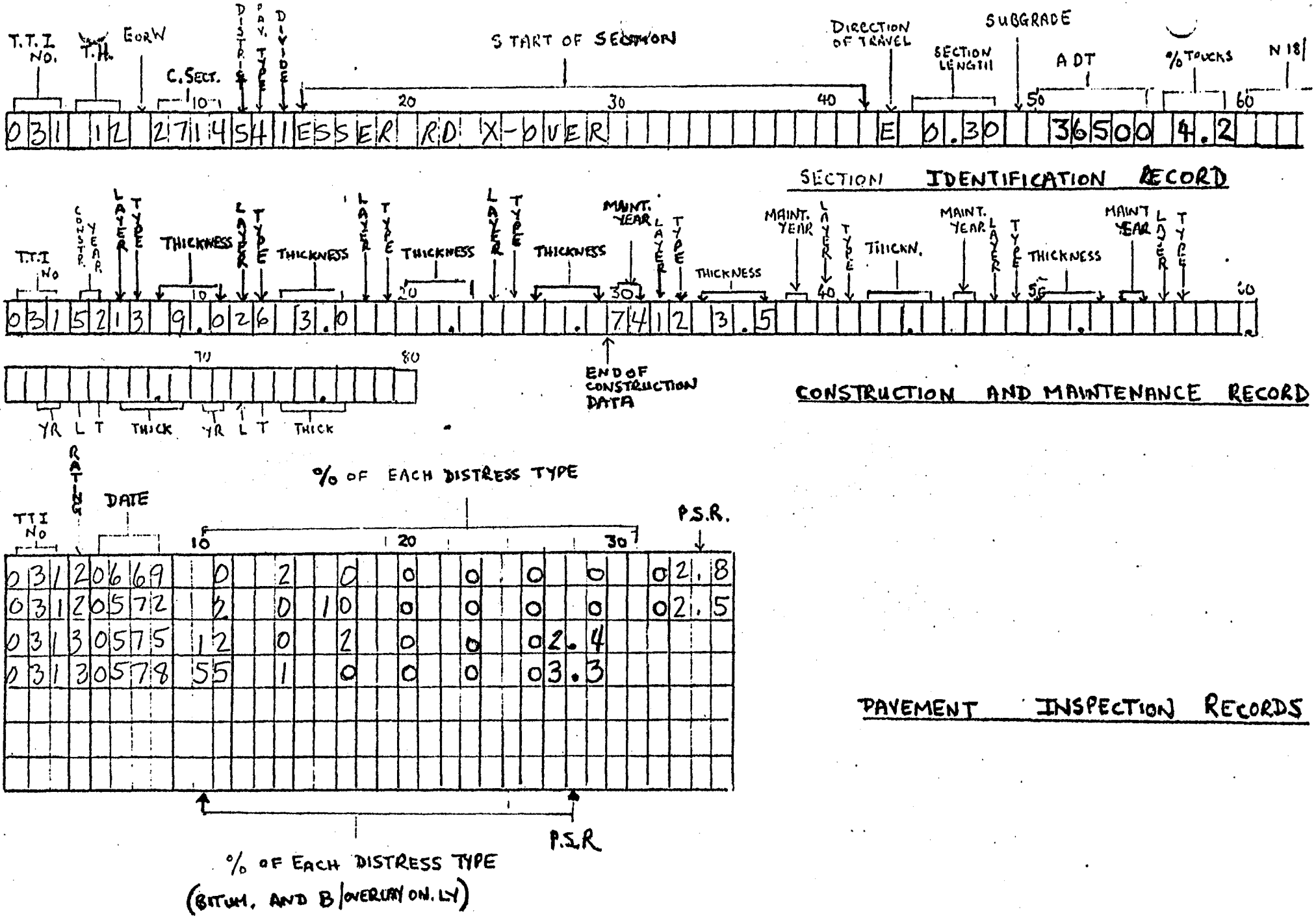


Figure A-7. TTI coding sheet for Minnesota Data

Site Identification File

The data in the Site Identification File is listed in columns with the following column headings.

Column Heading	Description
SITE	This is the TTI supplied section number - it is common to all 5 data files.
TRUNK	Trunk Highway Number
CONTROL	Control Section Number
DIST	District
PTYPE	Pavement Type Code: 1 = Flexible with granular base 2 = Black Base 3 = Concrete 4 = Composite 5 = Concrete + Widening + HMAC overlay
START	Starting point of section
LENGTH	Length of section in miles
SUB	AASHTO group classification of subgrade material (e.g., 6 = A-6 material)
ADT	Average Daily Traffic (both directions)
PTRK	Percentage of trucks in the traffic stream
N_{18}	The number of 18 kip (80 kN) Equivalent Single axle loads in the design lane per day

The table on the following pages shows the entire contents of the Site Identification File.

MINNESOTA DATA

SITE IDENTIFICATION RECORDS

OBS	SITE	TRUNK	CONTROL	DIST	PTYPE	START	LENGTH	SUB	ADT	PTRK	N18
1	1	5	2701	5	1	.2M E OF W CO LINE	0.80	6	18000	6.1	175
2	2	5	2701	5	1	2M E OF W CO LINE	1.00	6	18000	6.1	175
3	3	5	2701	5	3	JCT I 494	0.45	6	25400	4.3	190
4	4	5	2701	5	3	0.45M W OF JCT 494	0.45	6	25400	4.3	190
5	5	5	2732	5	3	JCT 494	0.61	6	55000	6.4	500
6	6	5	2732	5	4	0.61M E OF JCT 494	1.00	6	55000	6.4	500
7	7	5	2732	5	4	1.6M E OF JCT 494	1.00	6	55000	6.4	500
8	8	7	2706	5	1	0.2M W OF JCT 494	1.00	6	34000	3.8	150
9	9	7	2706	5	1	2.2M W OF JCT 494	0.43	6	34000	3.8	150
10	10	7	1003	5	1	W CO LINE	1.00	6	4500	15.5	275
11	11	7	1003	5	1	2M E OF W CO LINE	1.00	6	4500	15.5	275
12	12	7	1003	5	1	4M E OF W CO LINE	1.00	6	4700	14.9	275
13	13	8	2712	9	3	CO LINE	0.42	5	13450	3.9	60
14	14	10	215	5	1	0.5M E OF 242	1.00	3	24000	4.4	190
15	15	10	215	5	1	0.5M W OF 242	1.00	3	24000	4.4	190
16	16	10	215	5	1	1.5M W OF 242	1.00	3	24000	4.4	190
17	17	10	215	5	1	3.5M W OF 242	0.40	3	24000	4.4	190
18	18	12	2713	5	3	2.26M W OF 101	1.00	5	13800	5.4	140
19	19	12	2713	5	3	1.26M W OF 101	1.00	6	12000	4.6	140
20	20	12	2713	5	3	0.26M W OF 101	0.59	6	12000	4.6	140
21	21	12	2713	5	5	CO LINE	1.00	6	7300	8.9	130
22	22	12	2713	5	5	2M E CO LINE	1.00	6	7300	8.9	130
23	23	12	2713	5	5	4M E CO LINE	0.50	6	7300	8.9	130
24	24	12	8601	5	5	JCT 25	1.00	6	4375	8.6	130
25	25	12	8602	5	5	0.04M E OF E LIMIT OF DELANO	1.10	6	6725	7.1	130
26	26	13	1901	5	1	JCT 35W	0.82	6	32000	11.4	765
27	28	13	1901	5	1	DAKOTA CSAH5	0.82	6	32000	11.4	765
28	29	12	2714	5	4	MPLS CITY LIMITS	1.00	1	76500	4.0	360
29	30	12	2714	5	4	2.0M W OF MPLS CITY LIMITS	0.62	5	47500	4.1	320
30	31	12	2714	5	4	ESSER RD X-OVER	0.30	4	36500	4.2	300
31	32	19	4003	5	4	JCT 13 AND 21	0.90	7	7000	6.7	35
32	33	25	1007	5	1	1.0M N OF WATERTOWN LIMITS	1.00	6	1800	5.5	20
33	34	25	1007	5	1	JCT 7	1.00	5	1340	7.5	20
34	35	13	7001	5	1	1M S OF JCT 101	1.00	6	8800	8.0	120
35	36	13	7001	5	1	SCOTT CO LINE	1.00	1	23800	15.3	765
36	37	35	2783	5	3	E CO LINE	1.00	2	59800	8.0	470
37	38	36	2758	5	3	0.18M N OF 86TH STREET	1.00	2	21300	1.1	65
38	39	36	2758	5	3	2.18M N OF 86TH STREET	1.00	2	24500	1.7	65
39	40	35	2782	5	4	3.3M N OF MINN RIVER	1.00	1	79700	5.9	730
40	41	35	2782	5	4	1.2M N OF 76 ST	0.60	1	80800	7.3	975
41	42	35	2782	5	3	1.53M N OF BRIDGE 9611	1.00	1	117500	5.6	810
42	43	35	2782	5	4	2.1M S OF 76 ST	1.00	1	79700	5.9	730
43	44	41	1008	5	1	JCT TH 212	1.00	6	7000	10.0	90
44	45	41	1008	5	1	1M N OF JCT TH 212	1.00	6	6300	11.1	90
45	46	41	1008	5	1	JCT TH 7	1.00	6	5600	10.7	90
46	47	41	1008	5	1	1M S OF JCT TH 7	1.00	6	5600	10.7	90
47	48	52	2721	5	3	1M S OF CSAH 18	1.00	6	15500	4.8	75
48	50	47	205	5	1	73 AVE	0.76	3	25600	2.3	125
49	51	47	205	5	1	JCT 10	0.81	6	15600	3.2	115

MINNESOTA DATA

SITE IDENTIFICATION RECORDS

OBS	SITE	TRUNK	CONTROL	DIST	PTYPE	START	LENGTH	SUB	ADT	PTRK	N18
50	52	47	205	5	1	ST ANTHONY BLVD	1.00	6	21000	3.1	125
51	54	55	2725	5	3	0.29 SE OF CSAH62	0.72	1	35800	7.3	485
52	55	55	2752	5	1	0.28M E JCT 100	0.50	4	21100	6.2	205
53	56	55	2752	5	1	0.75M E OF JCT 100	0.77	5	21100	6.2	205
54	57	55	2752	5	1	W LIMITS OF MPLS	0.77	6	21100	6.2	205
55	58	55	2752	5	1	0.75M E OF JCT 100	0.50	5	21100	6.2	205
56	59	94	2786	5	3	2M E OF JCT 52	1.00	1	53500	7.3	785
57	60	65	208	5	5	ANDOVER ST	1.00	3	18900	3.2	90
58	61	65	208	5	5	6M S OF ANDOVER ST	1.00	3	20900	3.3	90
59	62	65	208	5	.	89TH STREET	1.00	3	20900	3.3	90
60	63	65	208	5	.	6M N OF 89TH STREET	1.00	3	18900	3.2	90
61	64	100	2755	5	1	0.61M N OF JCT 152	1.00	1	36000	3.6	170
62	65	100	2755	5	1	0.39M S OF JCT 152	1.00	1	36000	3.6	170
63	66	100	2755	5	1	JCT 94	1.00	1	36000	3.6	170
64	67	101	2736	5	1	W CO LINE	0.92	6	5500	5.4	60
65	68	101	7005	5	1	1M W OF JCT 13	1.00	3	16600	18.1	585
66	69	101	7005	5	1	3M W OF JCT 13	1.00	2	16600	18.1	585
67	70	152	2742	5	1	0.19M S OF JCT 100	1.00	1	17400	3.4	85
68	71	169	1011	5	5	0.3M N OF SCOTT CO LINE	0.31	4	17800	11.2	200
69	72	169	2746	5	5	0.11M E OF N JCT 100	1.15	1	17560	5.7	110
70	73	169	2763	5	3	JCT TH 100	1.00	1	43800	5.0	425
71	74	169	7007	5	3	JCT 19	1.00	6	9600	17.2	480
72	75	169	7007	5	3	2M N OF JCT 19	1.00	6	9600	17.2	480
73	76	212	1012	5	4	JCT 5	1.00	6	7000	22.8	375
74	77	212	1012	5	4	1M E OF JCT 5	1.00	6	6600	24.2	375
75	78	212	1012	5	4	2M E OF JCT 5	0.40	6	6600	24.2	375
76	79	242	212	5	1	JCT 65	1.00	3	8500	4.1	70
77	80	242	212	5	1	2M W OF JCT 65	1.00	3	7700	4.5	70
78	81	242	212	5	1	4M W OF JCT 65	1.00	3	7400	4.7	70
79	82	282	7011	5	1	JCT TH 13	1.00	6	1300	7.7	25
80	83	282	7011	5	1	2M W OF JCT TH 13	1.00	6	1300	7.7	25
81	84	282	7011	5	1	4M W OF JCT TH 13	1.00	6	1300	7.7	25
82	85	494	2785	5	3	1.4M W OF JCT TH 5	1.00	1	40800	8.3	780
83	86	494	2785	5	3	3.4M W OF JCT TH 5	1.00	1	40800	8.3	780
84	87	494	2785	5	3	5.4M W OF JCT TH 5	1.00	1	40800	8.3	780
85	88	694	2787	5	3	JCT TH 94	0.51	1	78200	7.0	960
86	89	694	2787	5	3	W END MISS R BR	0.51	1	78200	7.0	960
87	90	694	285	5	3	W CO LINE	1.00	2	76500	7.0	960
88	91	694	285	5	3	1M E OF W CO LINE	1.00	2	68900	7.0	900
89	92	694	285	5	3	2M E OF W CO LINE	0.60	2	64800	7.4	850
90	93	3	1921	9	4	JCT TH 55	1.00	1	5050	4.0	40
91	94	3	1921	9	4	1M S OF JCT 55	0.90	1	5050	4.0	40
92	95	8	1301	9	4	1.6M W OF E LMT CENTER CITY	1.00	2	9000	4.7	90
93	96	8	1301	9	4	3.6M W OF E LMT CENTRE CITY	1.00	2	9000	4.7	90
94	97	12	8203	9	3	JCT TH 94	1.00	2	29800	14.1	1250
95	98	20	1903	9	4	JCT TH 61	1.00	4	950	10.0	20
96	99	20	1903	9	4	2M S OF JCT TH 61	1.00	4	1025	9.7	20
97	100	20	1903	9	4	4M S OF JCT TH 61	1.00	4	1025	9.7	20
98	101	35	6284	9	3	2M N OF E JCT TH 36	1.00	2	69000	6.9	57

MINNESOTA DATA

SITE IDENTIFICATION RECORDS

OBS	SITE	TRUNK	CONTROL	DIST	PTYPE	START	LENGTH	SUB	ADT	PTRK	N18
99	102	35	6284	9	3	E JCT TH 36	0.82	2	69000	6.9	575
100	103	35	7080	9	3	SCOTT CO LINE	1.00	2	15700	13.7	490
101	104	36	6212	9	3	2M E OF JCT TH 35W	1.00	2	47000	3.4	235
102	105	36	6211	9	1	1M W OF JCT TH 120	1.00	2	13900	3.2	220
103	106	36	6219	9	1	2M W OF JCT TH 120	1.00	3	19900	4.8	220
104	107	50	1904	9	4	JCT TH 52	1.00	4	1700	11.8	25
105	108	50	1904	9	4	6M W OF JCT TH 52	1.00	4	1700	11.7	25
106	109	56	1911	9	1	RANDOLPH ST	1.00	4	950	18.9	30
107	110	56	1911	9	1	1M N OF RANDOLPH ST	1.00	4	950	18.9	30
108	111	56	1911	9	1	2M N OF RANDOLPH ST	1.00	4	950	18.9	30
109	112	56	1911	9	1	3M N OF RANDOLPH ST	1.00	4	950	18.9	30
110	113	56	1911	9	1	4M N OF RANDOLPH ST	1.00	4	950	18.9	30
111	114	56	1912	9	5	N JCT TH 52	1.00	1	5600	19.6	270
112	115	56	1912	9	5	1M N OF JCT TH 52	1.00	1	5600	19.6	270
113	116	56	1912	9	5	2M N OF JCT TH 52	1.00	1	5600	19.6	270
114	117	95	1305	9	1	JCT TH 8	1.00	2	1000	6.0	20
115	118	95	8210	9	1	N CO LINE	1.00	1	2000	3.5	20
116	119	95	1306	9	1	18M E OF JCT TH 61	1.00	1	1200	6.7	35
117	120	95	1306	9	1	16M E OF JCT TH 61	1.00	2	1200	6.7	35
118	121	95	1306	9	1	14M W OF JCT TH 61	1.00	2	1200	6.7	35
119	122	97	8201	9	4	W CO LINE	1.00	3	5350	3.7	40
120	123	97	8201	9	4	1M E OF W CO LINE	0.71	3	5350	3.7	40
121	124	98	1312	9	4	JCT TH 61	0.61	1	1500	3.7	15
122	125	280	6241	9	4	JCT TH 35W	1.00	2	30700	8.5	480
123	126	35	1980	9	3	2M N OF SCOTT CO LINE	1.00	2	17800	12.1	490
124	127	35	1981	9	3	S JCT 35	1.00	2	39500	6.3	520
125	128	47	205	5	1	2M N OF ST ANTHONY BLVD	0.40	2	30100	2.0	125

Construction and Maintenance File

The Construction and Maintenance File records the entire construction and maintenance history of each pavement section, as well as the thickness and material type of each layer in the pavement. The column headings for the table that appear on the following pages are described below.

Column Heading	Description
SITE	Section Number
CY	Construction Year
CL1	Construction Layer Number
	Code: 1 = Surface
	2 = Base
	3 = Subbase
	4 = Widening
CT1	Layer Type as constructed
	Code: 1. Seal Coat
	2. Hot Mix
	3. PCC
	4. Black Base
	5. Bituminous Stabilized Base
	6. Flexible Base
CTK1	Thickness of Layer 1 in inches
(CLi, CTi, CTKi)	is repeated for each layer in the original pavement ($i \leq 4$)

MY1	The year when the first maintenance treatment was applied to the section
ML1	Which layer was maintained Code: same as CL1
MT1	Type of Maintenance Code: same as CT1
MTH1	Thickness of maintenance treatment 1 in inches

(MYi, MLi, MTi, MTHi) is repeated for each maintenance treatment applied to the pavement ($i \leq 6$)

The table on the following pages gives the entire contents of the Construction and Maintenance File of Minnesota pavement data.

MINNESOTA DATA

CONSTRUCTION AND MAINTENANCE RECORDS

OBS	SITE	CY	CL1	CT1	CTK1	CL2	CT2	CTK2	CL3	CT3	CTK3	CL4	CT4	CTK4	MY1	ML1	MT1	MTH1	MY2	ML2	MT2	MTH2	MY3	ML3	MT3	MTH3	MY4	ML4	MT4	MTH4	MY5	ML5	MT5	MTH5	MY6	ML6	MT6	MTH6
1	1	51	1	2	1.5	2	6	5.0	3	6	8.0	.	.	.	54	1	1	0.5	66	1	1	0.5	70	1	2	2.5	76	1	2	2.7	.	.	.	.	.	.	.	.
2	2	51	1	2	1.5	2	6	5.0	3	6	8.0	.	.	.	54	1	1	0.5	58	1	1	0.5	66	1	1	0.5	70	1	2	2.5	76	1	2	2.7	.	.	.	.
3	3	71	1	3	8.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	4	71	1	3	8.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	5	59	1	3	8.0	2	6	6.0	.	.	.	.	.	.	78	1	7	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	6	59	1	3	8.0	2	6	6.0	.	.	.	.	.	.	74	1	2	1.5	78	1	7	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	7	59	1	3	8.0	2	6	6.0	.	.	.	.	.	.	74	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	8	51	1	2	2.5	2	6	6.5	.	.	.	.	.	.	57	1	1	0.5	68	1	2	1.5	76	1	2	1.7	.	.	.	.	.	.	.	.	.	.	.	.
9	9	51	1	2	2.5	2	6	6.5	.	.	.	.	.	.	57	1	1	0.5	68	1	2	1.5	76	1	2	1.7	.	.	.	.	.	.	.	.	.	.	.	.
10	10	53	1	1	0.5	1	2	2.0	2	4	1.0	2	6	6	57	1	1	0.5	63	1	2	1.5	73	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.
11	11	53	1	1	0.5	1	2	2.0	2	4	1.0	2	6	6	57	1	1	0.5	63	1	2	1.5	73	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.
12	12	53	1	1	0.5	1	2	2.0	2	4	1.0	2	6	6	57	1	1	0.5	63	1	2	1.5	73	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.
13	13	65	1	3	8.0	2	6	3.0	3	6	3.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
14	14	66	1	2	4.0	2	4	3.0	2	6	6.0	3	6	18	78	1	2	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15	15	66	1	2	4.0	2	4	3.0	2	6	6.0	3	6	18	78	1	2	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
16	16	66	1	2	4.0	2	4	3.0	2	6	6.0	3	6	18	78	1	2	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
17	17	66	1	2	4.0	2	4	3.0	2	6	6.0	3	6	18	78	1	2	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
18	18	74	1	3	8.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
19	19	74	1	3	8.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
20	20	74	1	3	8.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
21	21	30	1	3	8.0	2	6	2.0	.	.	.	.	.	.	67	4	6	9.0	67	1	2	4.0	78	1	2	1.7	.	.	.	.	.	.	.	.	.	.	.	.
22	22	30	1	3	8.0	2	6	2.0	.	.	.	.	.	.	67	4	6	9.0	67	1	2	4.0	78	1	2	1.7	.	.	.	.	.	.	.	.	.	.	.	.
23	23	30	1	3	8.0	2	6	2.0	.	.	.	.	.	.	67	4	6	9.0	67	1	2	4.0	78	1	2	1.7	.	.	.	.	.	.	.	.	.	.	.	.
24	24	30	1	3	8.0	2	6	6.0	.	.	.	.	.	.	66	4	6	12.0	66	1	2	4.0	66	1	1	0.5	.	.	.	.	.	.	.	.	.	.	.	.
25	25	30	1	3	8.0	2	6	6.0	.	.	.	.	.	.	58	4	6	12.0	66	4	5	6.0	58	1	2	3.0	69	1	2	0.5	75	1	2	1.5	.	.	.	.
26	26	60	1	2	4.0	2	4	4.0	2	6	4.5	.	.	.	77	1	2	2.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
27	28	60	1	2	4.0	2	4	4.0	2	6	4.5	.	.	.	77	1	2	2.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28	29	52	1	3	9.0	2	6	3.0	.	.	.	.	.	.	76	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
29	30	52	1	3	9.0	2	6	3.0	.	.	.	.	.	.	76	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
30	31	52	1	3	9.0	2	6	3.0	.	.	.	.	.	.	74	1	2	3.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
31	32	31	1	3	8.0	2	6	6.0	.	.	.	.	.	.	74	1	2	1.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
32	33	42	1	2	1.5	2	6	6.0	.	.	.	.	.	.	47	1	2	1.0	53	1	2	1.0	58	1	1	0.5	62	1	1	0.5	65	1	1	0.5	70	1	2	2.5
33	34	42	1	2	1.0	2	5	5.0	.	.	.	.	.	.	47	1	2	1.0	53	1	2	1.0	58	1	1	0.5	62	1	1	0.5	65	1	1	0.5	69	1	2	2.5
34	35	61	1	2	1.5	2	6	5.0	3	6	12.0	.	.	.	63	1	2	3.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
35	36	73	1	2	2.0	2	4	1.0	2	6	17.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
36	37	73	1	3	9.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
37	38	60	1	3	9.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
38	39	60	1	3	9.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
39	40	60	1	3	10.0	2	6	6.0	.	.	.	.	.	.	75	1	2	1.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
40	41	60	1	3	10.0	2	6	6.0	.	.	.	.	.	.	73	1	2	1.0	79	1	2	2.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
41	42	67	1	3	10.0	2	6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
42	43	60	1	3	10.0	2	6	6.0	.	.	.	.	.	.	78	1	2	1.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
43	44	52	1	2	1.5	2	6	5.0	.	.	.	.	.	.	55	1	1	0.5	61	1	1	0.5	65	1	1	0.5	68	1	2	1.5	77	1	2	3.2	.	.	.	.
44	45	52	1	2	1.5	2	6	5.0	.	.	.	.	.	.	55	1	1	0.5	61	1	1	0.5	65	1	1	0.5	68	1	2	1.5	77	1	2	3.2	.	.	.	.
45	46	54	1	2	3.0	2	4	4.0	3	6	11.0	.	.	.	69	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
46	47	54	1	2	3.0	2	4	4.0	3	6	11.0	.	.	.	69	1	2	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

MINNESOTA DATA

CONSTRUCTION AND MAINTENANCE RECORDS

OBS	SITE	CY	CL1	CT1	CTK1	CLT2	CTK2	CLT3	CTK3	CLT4	CTK4	MYLT1	MTH1	MYLT2	MTH2	MYLT3	MTH3	MYLT4	MTH4	MYLT5	MTH5	MYLT6	MTH6
47	48	49	1	3	8.0	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
48	50	66	1	2	4.0	2 4	3.0	3 6	18	. .	.	72 1	2 0.7	. .	.	. .	.	. .	.	. .	.	. .	.
49	51	66	1	2	3.5	2 4	3.5	2 6	4	. .	.	72 1	2 0.7	. .	.	. .	.	. .	.	. .	.	. .	.
50	52	66	1	2	4.0	2 4	3.5	3 6	18	. .	.	72 1	2 0.7	. .	.	. .	.	. .	.	. .	.	. .	.
51	54	60	1	3	9.0	2 6	6.0	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
52	55	54	1	2	4.0	2 5	6.0	3 6	12	. .	.	72 1	2 0.6	76 1	2 0.7	. .	.	. .	.	. .	.	. .	.
53	56	54	1	2	4.0	2 5	6.0	3 6	12	. .	.	72 1	2 0.6	. .	.	. .	.	. .	.	. .	.	. .	.
54	57	54	1	2	4.0	2 5	6.0	3 6	12	. .	.	72 1	2 0.6	. .	.	. .	.	. .	.	. .	.	. .	.
55	58	54	1	2	4.0	2 5	6.0	3 6	12	. .	.	72 1	2 0.6	76 1	2 0.7	. .	.	. .	.	. .	.	. .	.
56	59	65	1	3	10.0	2 6	14.0	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
57	60	24	1	3	7.5	. .	.	. .	.	. .	.	52 4	3 8.0	52 1	2 3.0	69 1	2 3.0	. .	.	. .	.	. .	.
58	61	24	1	3	7.5	. .	.	. .	.	. .	.	52 4	3 8.0	52 1	2 3.0	69 1	2 3.0	. .	.	. .	.	. .	.
59	62	59	1	2	3.0	2 6	7.5	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
60	63	59	1	2	3.0	2 6	7.5	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
61	64	67	1	2	3.0	2 6	8.5	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
62	65	65	1	2	4.0	2 4	4.0	2 6	4	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
63	66	65	1	2	4.0	2 5	3.0	2 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
64	67	54	1	2	1.0	2 4	3.0	2 6	6	. .	.	56 1	1 0.5	69 1	2 1.5	. .	.	. .	.	. .	.	. .	.
65	68	57	1	2	3.0	2 4	3.0	2 6	8	. .	.	69 1	2 3.0	. .	.	. .	.	. .	.	. .	.	. .	.
66	69	57	1	2	3.0	2 4	3.0	2 6	8	. .	.	69 1	2 3.0	. .	.	. .	.	. .	.	. .	.	. .	.
67	70	65	1	2	4.0	2 2	4.0	2 6	4	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
68	71	28	1	3	8.0	. .	.	. .	.	. .	.	58 1	2 3.5	70 4	6 11.5	70 1	2 1.4	77 1	2 1.7	. .	.	. .	.
69	72	30	1	3	8.0	. .	.	. .	.	. .	.	65 4	6 3.0	65 4	3 8.0	65 1	2 3.0	. .	.	. .	.	. .	.
70	73	67	1	3	8.0	2 6	6.0	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
71	74	56	1	3	8.0	2 6	3.0	3 6	10	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
72	75	56	1	3	8.0	2 6	3.0	3 6	10	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
73	76	59	1	3	8.0	2 6	5.0	. .	.	. .	.	76 1	2 1.7	. .	.	. .	.	. .	.	. .	.	. .	.
74	77	59	1	3	8.0	2 6	5.0	. .	.	. .	.	76 1	2 1.7	. .	.	. .	.	. .	.	. .	.	. .	.
75	78	59	1	3	8.0	2 6	5.0	. .	.	. .	.	76 1	2 1.7	. .	.	. .	.	. .	.	. .	.	. .	.
76	79	58	1	2	3.0	2 5	7.0	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
77	80	58	1	2	3.0	2 5	7.0	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
78	81	58	1	2	3.0	2 5	7.0	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
79	82	63	1	2	2.0	2 4	1.0	2 6	5	3 6	9	65 1	1 0.5	67 1	1 0.5	78 1	2 2.5	. .	.	. .	.	. .	.
80	83	63	1	2	2.0	2 4	1.0	2 6	5	3 6	9	65 1	1 0.5	67 1	1 0.5	78 1	2 2.5	. .	.	. .	.	. .	.
81	84	63	1	2	2.0	2 4	1.0	2 6	5	3 6	9	65 1	1 0.5	67 1	1 0.5	78 1	2 2.5	. .	.	. .	.	. .	.
82	85	59	1	3	10.0	2 6	3.0	3 6	12	. .	.	78 1	7 0.0	. .	.	. .	.	. .	.	. .	.	. .	.
83	86	59	1	3	10.0	2 6	3.0	3 6	12	. .	.	78 1	7 0.0	. .	.	. .	.	. .	.	. .	.	. .	.
84	87	59	1	3	10.0	2 6	3.0	3 6	12	. .	.	78 1	7 0.0	. .	.	. .	.	. .	.	. .	.	. .	.
85	88	65	1	3	10.0	2 6	2.2	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
86	89	65	1	3	10.0	2 6	2.2	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
87	90	65	1	3	9.0	2 6	2.2	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
88	91	65	1	3	9.0	2 6	2.2	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
89	92	65	1	3	9.0	2 6	2.2	3 6	12	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.	. .	.
90	93	34	1	3	8.0	2 6	2.5	. .	.	. .	.	64 1	2 2.5	79 1	2 1.7	. .	.	. .	.	. .	.	. .	.
91	94	34	1	3	8.0	2 6	2.5	. .	.	. .	.	64 1	2 2.5	79 1	2 1.7	. .	.	. .	.	. .	.	. .	.
92	95	54	1	3	8.0	2 6	6.0	. .	.	. .	.	78 1	2 1.0	. .	.	. .	.	. .	.	. .	.	. .	.

MINNESOTA DATA

CONSTRUCTION AND MAINTENANCE RECORDS

OBS	SITE	CY	CL1	CT1	CTK1	CL2	CT2	CTK2	CL3	CT3	CTK3	CL4	CT4	CTK4	MY1	MLT1	MTH1	MY2	MLT2	MTH2	MY3	MLT3	MTH3	MY4	MLT4	MTH4	MY5	MLT5	MTH5	MY6	MLT6	MTH6
93	96	54	1	3	8.0	2	6	6.0	.	.	.	.	.	.	78	1	2 1.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
94	97	54	1	3	9.0	2	6	7.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
95	98	31	1	3	8.0	.	.	.	.	.	.	.	.	.	69	1	2 2.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
96	99	31	1	3	8.0	.	.	.	.	.	.	.	.	.	69	1	2 2.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
97	100	31	1	3	8.0	.	.	.	.	.	.	.	.	.	69	1	2 2.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
98	101	64	1	3	10.0	2	6	3.0	3	6	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
99	102	64	1	3	10.0	2	6	3.0	3	6	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
100	103	66	1	3	9.0	2	6	2.2	3	6	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
101	104	58	1	3	9.0	2	6	3.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
102	105	55	1	2	3.0	2	5	6.0	3	6	12	.	.	.	77	1	2 1.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
103	106	55	1	2	3.0	2	5	6.0	3	6	12	.	.	.	77	1	2 1.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
104	107	28	1	3	8.0	.	.	.	.	.	.	.	.	.	67	1	2 2.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
105	108	28	1	3	8.0	.	.	.	.	.	.	.	.	.	67	1	2 2.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
106	109	50	1	2	1.0	2	5	5.0	3	6	3	.	.	.	51	1	1 0.5	56	1	2 2.5	59	1	1 0.5	70	1	1 0.5	72	1	1 0.5	79	1	2 1.5
107	110	50	1	2	1.0	2	5	5.0	3	6	3	.	.	.	51	1	1 0.5	56	1	2 2.5	59	1	1 0.5	70	1	1 0.5	72	1	1 0.5	79	1	2 1.5
108	111	50	1	2	1.0	2	5	5.0	3	6	3	.	.	.	51	1	1 0.5	56	1	2 2.5	59	1	1 0.5	70	1	1 0.5	72	1	1 0.5	79	1	2 1.5
109	112	50	1	2	1.0	2	5	5.0	3	6	3	.	.	.	51	1	1 0.5	56	1	2 2.5	59	1	1 0.5	70	1	1 0.5	72	1	1 0.5	79	1	2 1.5
110	113	50	1	2	1.0	2	5	5.0	3	6	3	.	.	.	51	1	1 0.5	56	1	2 2.5	59	1	1 0.5	70	1	1 0.5	72	1	1 0.5	79	1	2 1.5
111	114	33	1	3	8.0	2	6	3.5	.	.	.	.	.	.	69	4	6 6.0	69	1	2 2.5	77	4	4 8.0	77	1	2 1.5	.	.	.	.	.	.
112	115	33	1	3	8.0	2	6	3.5	.	.	.	.	.	.	69	4	6 6.0	69	1	2 2.5	77	4	4 8.0	77	1	2 1.5	.	.	.	.	.	.
113	116	33	1	3	8.0	2	6	3.5	.	.	.	.	.	.	69	4	6 6.0	69	1	2 2.5	77	4	4 8.0	77	1	2 1.5	.	.	.	.	.	.
114	117	46	1	2	1.5	2	5	3.0	3	6	12	.	.	.	56	1	2 4.0	64	1	1 0.5	78	1	2 1.5	.	.	.	.	.	.	.	.	.
115	118	46	1	2	1.5	2	5	3.0	3	6	12	.	.	.	56	1	2 3.0	64	1	1 0.5	78	1	2 1.5	.	.	.	.	.	.	.	.	.
116	119	50	1	2	1.7	2	5	6.5	3	6	4	.	.	.	56	1	2 3.5	58	1	1 0.5	64	1	1 0.5	.	.	.	.	.	.	.	.	.
117	120	50	1	2	1.7	2	5	6.5	3	6	4	.	.	.	56	1	2 3.5	58	1	1 0.5	64	1	1 0.5	.	.	.	.	.	.	.	.	.
118	121	50	1	2	1.7	2	5	6.5	3	6	4	.	.	.	56	1	2 3.5	58	1	1 0.5	64	1	1 0.5	.	.	.	.	.	.	.	.	.
119	122	28	1	3	8.0	.	.	.	.	.	.	.	.	.	72	1	2 2.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
120	123	28	1	3	8.0	.	.	.	.	.	.	.	.	.	72	1	2 2.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
121	124	26	1	3	8.0	.	.	.	.	.	.	.	.	.	69	1	2 2.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
122	125	57	1	3	9.0	.	.	.	.	.	.	.	.	.	74	1	2 1.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
123	126	66	1	3	9.0	2	6	2.7	3	6	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
124	127	66	1	3	9.0	2	6	2.7	3	6	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
125	128	65	1	2	4.0	2	4	3.0	2	6	6	.	.	.	72	1	1 0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Flexible Pavement Inspection Data File

The Flexible Pavement Inspection Data File records the observed distress and riding quality of all of the flexible sections and the date upon which they were observed. The distress types that are recorded are typical of flexible pavement distress. The column headings for the table on the following pages are described below.

Column Heading	Description
SITE	Section Number
KEY	Identifies what type of inspection Code: 1 = Flexible 2 = Concrete 3 = Composite
DATE	Month and Year of Inspection
TRANSCR	Percentage of section with Transverse Cracking
LONGCR	Percentage of section with Longitudinal Cracking
MULTCR	Percentage of section with Multiple Cracking
ALLIG	Percentage of section with Alligator Cracking
RUT	Percentage of section with greater than 1/2 inch Ruts
PATCH	Percentage of Patched pavement
PSR	The Present Serviceability Rating obtained using the PCA Roadmeter and Minnesota PSR correlation curves

The table on the following pages gives the entire contents of the Flexible Pavement Inspection Data file for all of the Minnesota data on flexible pavements that were collected in this project.

MINNESOTA DATA

FLEXIBLE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	TRANSCR	LONGCR	MULTCR	ALLIGCR	RUT	PATCH	PSR
1	1	1	671	7	0	0	0	0	0	3.2
2	1	1	675	88	7	14	1	0	0	2.7
3	1	1	679	83	45	8	0	0	0	3.1
4	2	1	671	10	0	0	0	0	0	3.2
5	2	1	675	52	5	6	0	0	0	2.7
6	2	1	679	38	14	2	0	0	0	3.1
7	8	1	669	19	2	0	0	0	0	3.2
8	8	1	675	29	1	5	0	2	0	2.6
9	8	1	676	52	2	2	0	2	0	2.8
10	8	1	578	33	15	2	0	0	0	3.3
11	9	1	669	12	6	0	0	0	0	3.2
12	9	1	675	22	3	6	0	14	2	2.6
13	9	1	676	56	7	2	0	12	2	2.8
14	9	1	578	33	8	0	0	0	0	3.3
15	10	1	770	100	3	21	7	11	5	2.9
16	10	1	677	64	4	1	0	0	0	3.4
17	10	1	679	84	16	3	0	0	0	2.9
18	11	1	770	100	13	30	2	8	11	2.9
19	11	1	677	56	10	2	0	0	2	3.4
20	11	1	679	93	18	11	0	0	1	2.9
21	12	1	770	100	15	31	3	15	47	2.9
22	12	1	677	70	14	2	0	0	0	3.4
23	12	1	679	82	54	2	0	2	2	2.9
24	14	1	472	70	22	14	0	10	0	3.4
25	14	1	675	77	13	18	9	0	0	3.2
26	14	1	676	100	42	18	2	0	2	3.2
27	14	1	679	77	0	0	0	0	0	3.4
28	15	1	472	100	10	7	0	0	0	3.4
29	15	1	675	88	5	23	2	0	0	3.2
30	15	1	676	100	12	4	1	0	0	3.2
31	15	1	679	87	2	0	0	0	0	3.4
32	16	1	472	85	2	0	0	0	0	3.4
33	16	1	675	84	4	14	0	0	0	3.2
34	16	1	676	89	2	2	0	0	0	3.2
35	16	1	679	85	1	0	0	0	0	3.4
36	17	1	472	45	34	0	0	0	0	3.4
37	17	1	675	35	40	15	0	0	0	3.2
38	17	1	676	100	66	6	0	0	5	3.2
39	17	1	679	36	12	0	0	0	0	3.4
40	26	1	573	100	100	61	0	1	0	3.0
41	26	1	675	100	53	24	2	3	22	3.1
42	26	1	676	100	16	5	0	5	63	2.6
43	26	1	578	21	16	0	0	0	0	3.4
44	28	1	675	100	41	39	2	0	18	2.6
45	28	1	676	100	35	18	0	0	33	2.7
46	28	1	679	50	5	2	0	0	0	2.8
47	33	1	770	53	24	2	0	5	5	2.7
48	33	1	571	15	6	0	0	0	0	3.3
49	33	1	675	33	5	10	0	0	0	3.0

MINNESOTA DATA

FLEXIBLE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	TRANSCR	LONGCR	MULTCR	ALLIGCR	RUT	PATCH	PSR
50	33	1	679	84	31	12	0	1	0	2.7
51	34	1	770	19	0	0	0	0	0	3.2
52	34	1	675	45	3	3	0	0	2	3.0
53	34	1	679	67	8	3	2	0	2	2.7
54	35	1	473	100	7	2	0	0	0	3.2
55	35	1	677	100	16	2	0	0	0	3.2
56	36	1	675	0	0	0	0	0	0	2.9
57	36	1	579	13	0	0	0	0	0	2.9
58	44	1	571	15	3	0	0	1	2	2.9
59	44	1	573	27	17	0	9	0	1	2.3
60	44	1	675	33	8	7	5	0	12	2.2
61	44	1	578	46	25	2	0	0	0	3.2
62	45	1	571	17	1	0	0	0	1	2.9
63	45	1	573	45	12	1	0	6	1	2.3
64	45	1	675	56	12	8	2	9	3	2.2
65	45	1	578	21	0	0	0	0	0	3.2
66	46	1	770	54	2	0	0	0	0	3.0
67	46	1	578	100	41	18	0	0	7	2.8
68	47	1	770	48	0	0	0	0	0	3.0
69	47	1	578	87	7	0	0	0	3	2.8
70	50	1	473	60	6	1	0	0	0	3.0
71	50	1	677	99	12	4	0	0	1	3.3
72	50	1	679	100	27	3	0	0	1	2.8
73	51	1	569	7	42	12	0	0	0	3.7
74	51	1	677	100	32	30	1	0	0	3.4
75	51	1	679	100	52	28	1	0	0	3.3
76	52	1	473	15	3	3	0	0	0	2.9
77	52	1	677	100	35	65	0	0	0	2.8
78	55	1	770	22	2	0	0	0	13	2.9
79	55	1	573	25	2	0	0	0	0	2.7
80	55	1	677	18	7	0	0	0	0	3.4
81	56	1	770	47	3	0	0	1	1	2.9
82	56	1	573	20	2	0	0	0	0	2.7
83	56	1	677	77	18	6	2	0	1	3.1
84	57	1	573	26	2	0	0	0	0	3.2
85	57	1	677	58	25	5	1	0	0	3.3
86	58	1	573	22	2	0	0	0	0	3.2
87	58	1	677	12	0	0	0	0	0	3.1
88	62	1	472	12	0	0	0	0	2	3.2
89	62	1	573	17	0	0	0	1	0	2.8
90	62	1	677	22	2	2	0	0	2	2.8
91	63	1	472	18	2	0	0	0	3	3.2
92	63	1	573	23	4	1	0	2	1	2.8
93	63	1	677	32	4	1	0	0	2	2.8
94	64	1	573	16	2	1	0	0	0	3.0
95	64	1	675	15	0	1	0	0	0	2.9
96	64	1	679	64	2	2	0	0	0	2.9
97	65	1	573	23	2	2	0	0	0	3.0
98	65	1	675	23	1	1	0	4	0	2.9

MINNESOTA DATA

FLEXIBLE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	TRANSCR	LONGCR	MULTCR	ALLIGCR	RUT	PATCH	PSR
99	65	1	679	39	0	0	0	0	0	2.9
100	66	1	675	16	10	21	1	0	0	2.8
101	66	1	679	100	15	15	0	0	0	2.9
102	67	1	671	12	2	0	0	0	0	2.8
103	67	1	573	21	5	1	0	0	0	2.5
104	67	1	677	75	24	4	0	2	1	2.6
105	68	1	675	25	1	2	0	0	0	2.9
106	68	1	679	62	18	1	0	0	0	2.9
107	69	1	675	22	2	2	0	0	0	2.9
108	69	1	679	36	5	1	0	0	0	2.9
109	70	1	677	33	15	2	0	0	0	3.2
110	70	1	679	88	24	12	0	0	0	2.9
111	79	1	569	14	6	1	0	0	1	3.0
112	79	1	1172	16	1	0	0	9	1	2.9
113	79	1	675	23	5	10	0	0	0	2.6
114	79	1	679	81	12	2	0	4	3	2.6
115	80	1	569	24	38	8	0	0	0	3.0
116	80	1	1172	40	19	0	0	0	0	2.9
117	80	1	675	55	7	18	0	0	0	2.6
118	81	1	569	18	5	2	0	0	0	3.0
119	81	1	1172	20	1	0	0	2	0	2.9
120	81	1	675	39	4	13	0	0	0	2.6
121	81	1	679	72	17	2	0	7	5	2.6
122	82	1	669	58	8	9	0	1	1	3.1
123	82	1	676	100	5	5	1	0	0	2.8
124	82	1	679	17	1	0	0	0	0	2.9
125	83	1	669	49	0	0	0	0	2	3.1
126	83	1	676	90	2	2	0	0	3	2.8
127	83	1	679	34	1	0	0	0	0	2.9
128	84	1	669	15	2	2	0	0	0	3.1
129	84	1	676	77	9	4	0	0	2	2.8
130	84	1	679	33	6	0	0	0	0	2.9
131	105	1	578	59	9	0	0	0	0	3.3
132	106	1	578	49	12	0	0	0	2	3.3
133	109	1	767	100	1	22	0	0	0	3.3
134	109	1	577	100	0	96	2	4	0	2.4
135	109	1	578	100	0	77	21	0	2	2.4
136	110	1	767	53	2	9	0	0	0	3.3
137	110	1	577	100	16	76	0	6	0	2.4
138	110	1	578	100	0	65	13	2	0	2.4
139	111	1	767	78	2	8	0	0	0	3.3
140	111	1	577	100	12	75	1	3	0	2.4
141	111	1	578	100	0	45	52	0	0	2.4
142	112	1	767	32	0	2	0	0	0	3.3
143	112	1	577	100	10	31	0	2	0	2.4
144	112	1	578	100	8	22	3	2	0	2.4
145	113	1	767	22	5	2	0	0	0	3.3
146	113	1	577	93	43	36	0	3	0	2.4
147	113	1	578	100	26	35	0	5	0	2.4

MINNESOTA DATA

FLEXIBLE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	TRANSCR	LONGCR	MULTCR	ALLIGCR	RUT	PATCH	PSR.
148	117	1	667	34	2	8	0	0	0	3.3
149	117	1	579	25	0	0	0	0	0	3.4
150	118	1	667	23	1	4	0	1	0	3.3
151	118	1	577	83	35	2	0	0	0	2.8
152	118	1	579	27	0	0	0	0	0	3.4
153	119	1	667	39	16	2	0	0	2	3.1
154	119	1	577	52	19	2	1	3	0	2.5
155	119	1	578	72	55	2	0	0	0	2.5
156	119	1	779	68	19	2	1	3	3	2.4
157	120	1	667	26	0	1	0	0	0	3.1
158	120	1	577	60	21	3	0	3	4	2.5
159	120	1	578	56	12	2	0	0	2	2.5
160	120	1	779	64	24	3	1	3	4	2.4
161	121	1	667	25	5	0	0	0	0	3.1
162	121	1	577	63	15	4	0	3	0	2.5
163	121	1	578	52	32	2	0	0	0	2.5
164	121	1	779	69	28	3	5	4	3	2.4
165	128	1	473	14	8	23	0	0	0	2.9
166	128	1	677	100	22	32	0	0	0	2.8

Concrete Pavement Inspection Data File

The Concrete Pavement Inspection Data File records the observed distress and riding quality of the concrete pavement sections and the date on which they were observed. The column headings for the table on the following pages are defined below.

Column Heading	Description
SITE	Section Number
KEY	Type of Inspection (2 = Concrete)
DATE	Month and Year of Inspection
SPALJTS	Percentage of Spalled Jointed in section
FALTJTS	Percentage of Joints Faulted more than 3/8 inch
CRACPNL	Percentage of Panels with cracks larger than 1/16 inch
FALTPNL	Percentage of Faulted Panels in Section
OVERL	Percentage of Panels which have been overlaid
PATCH	Percentage of Panels having at least 5 square foot of patch
SCALING	Percentage of Panels with significant scaling
PSR	Present Serviceability Rating

The table on the following pages gives the entire contents of the Concrete Pavement Inspection Data file for all of the Minnesota data on concrete pavements that were collected in this project.

MINNESOTA DATA

CONCRETE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	SPALJTS	FALTJTS	CRACPNL	BROKPNL	FALTPNL	OVERL	PATCH	SCALE	PSR
1	3	2	679	32	0	27	0	0	0	0	0	2.8
2	4	2	679	9	0	21	0	3	0	0	0	3.0
3	5	2	572	32	3	42	0	0	0	6	0	3.0
4	5	2	578	32	0	21	0	0	0	0	0	3.2
5	6	2	572	40	3	28	0	0	0	14	0	3.0
6	7	2	572	19	0	23	0	0	0	3	0	3.0
7	13	2	675	9	0	39	0	0	0	0	0	2.7
8	18	2	675	0	0	0	0	0	0	0	0	3.1
9	18	2	679	6	0	0	0	0	0	0	0	3.2
10	19	2	675	0	0	0	0	0	0	0	0	3.1
11	19	2	679	0	0	10	0	0	0	0	0	3.2
12	20	2	675	0	0	0	0	0	0	0	0	3.1
13	20	2	679	28	0	0	0	0	0	0	0	3.2
14	29	2	572	1	0	2	0	0	0	0	0	2.4
15	29	2	575	3	0	1	0	0	0	0	0	2.2
16	30	2	572	1	1	1	1	0	0	0	0	2.4
17	30	2	575	1	1	23	13	13	0	0	0	2.1
18	31	2	669	0	2	0	0	0	0	0	0	2.8
19	31	2	572	2	0	10	0	0	0	0	0	2.5
20	32	2	669	43	26	49	5	5	0	3	12	2.4
21	32	2	571	30	13	70	70	30	0	20	0	2.5
22	32	2	473	68	40	73	23	5	2	3	0	1.9
23	37	2	676	0	0	0	0	0	0	0	0	3.0
24	38	2	573	36	0	6	0	0	0	0	0	3.2
25	38	2	677	50	0	9	0	0	0	0	0	3.1
26	39	2	573	17	0	20	0	0	0	0	0	3.2
27	39	2	677	25	0	14	0	0	0	0	0	3.1
28	41	2	573	9	0	17	0	0	0	0	0	3.1
29	42	2	573	0	0	6	0	0	0	0	0	3.1
30	42	2	677	3	0	88	0	0	0	0	0	3.2
31	43	2	573	34	0	11	0	0	0	6	0	3.2
32	48	2	573	32	0	5	0	0	0	2	0	2.6
33	48	2	775	27	0	2	0	0	0	0	0	2.7
34	54	2	775	40	3	14	0	0	0	0	0	2.6
35	54	2	578	50	0	15	0	3	0	3	0	2.7
36	59	2	573	0	0	0	0	0	0	0	0	3.7
37	59	2	677	11	0	0	0	0	0	0	0	3.7
38	73	2	768	0	0	14	0	0	0	0	0	3.4
39	73	2	573	12	0	53	0	0	0	0	0	2.7
40	74	2	768	3	4	39	3	6	0	0	0	2.7
41	74	2	473	18	26	44	4	0	0	0	0	2.6
42	74	2	677	40	16	42	5	2	0	3	0	2.7
43	74	2	679	30	45	41	3	9	0	2	0	2.6
44	75	2	768	1	4	22	0	10	0	0	0	2.7
45	75	2	675	15	3	8	0	0	0	0	0	2.5
46	75	2	677	20	1	19	3	1	0	6	0	2.7
47	75	2	679	24	9	20	2	2	0	6	0	2.6
48	76	2	572	29	40	88	33	9	0	3	0	2.5
49	76	2	674	45	30	85	57	36	0	6	0	2.1

MINNESOTA DATA

CONCRETE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	SPALJTS	FALTJTS	CRACPNL	BROKPNL	FALTPNL	OVERL	PATCH	SCALE	PSR
50	77	2	572	5	16	91	11	6	0	0	0	2.5
51	77	2	674	37	11	94	51	11	0	8	0	2.1
52	78	2	572	2	22	53	0	0	0	0	0	2.5
53	78	2	674	77	6	46	23	14	0	0	0	2.1
54	85	2	768	0	0	3	0	0	0	0	0	3.5
55	85	2	473	47	0	15	0	0	0	0	0	3.0
56	85	2	677	80	0	26	0	0	0	0	0	3.0
57	86	2	768	0	0	22	0	0	0	0	0	3.5
58	86	2	473	50	0	18	0	0	0	0	0	3.0
59	86	2	677	67	0	46	0	0	0	0	0	3.0
60	87	2	768	0	0	20	0	0	0	0	0	3.5
61	87	2	473	41	0	6	0	0	0	0	0	3.0
62	87	2	677	50	0	24	0	0	0	0	0	3.0
63	88	2	677	44	0	15	0	0	0	0	0	3.4
64	89	2	677	43	0	14	0	0	0	0	0	3.1
65	90	2	573	9	0	14	0	0	0	0	0	3.4
66	90	2	677	33	0	25	0	0	0	0	0	3.5
67	91	2	573	26	3	6	0	0	0	0	0	3.4
68	91	2	677	42	0	9	0	0	0	0	0	3.5
69	92	2	573	35	0	0	0	0	0	0	0	3.4
70	92	2	677	61	0	0	0	0	0	0	0	3.5
71	95	2	576	18	1	25	6	3	0	0	0	2.9
72	96	2	576	38	3	29	7	3	0	2	0	2.9
73	97	2	577	11	8	16	3	5	0	0	5	2.7
74	101	2	578	18	0	26	0	0	0	0	0	3.1
75	102	2	579	14	0	73	3	0	0	0	0	2.6
76	103	2	578	3	0	97	0	0	0	0	0	3.2
77	104	2	578	17	7	19	4	0	0	4	8	3.0
78	126	2	578	3	0	68	0	0	0	0	0	3.3
79	127	2	578	3	0	73	0	0	0	0	0	3.3

Composite Pavement Inspection Data File

The Composite Pavement Inspection Data File records all of the observed distress and riding quality of pavements in which asphaltic concrete overlays have been placed over jointed concrete pavements, and the date upon which they were observed. The distress types are typical of those which occur on composite pavements. The column headings for the table on the following pages are defined below.

Column Heading	Description
SITE	Section Number
KEY	Inspection Type (3 = Concrete)
DATE	Month and Year of Inspection
SLTRAN	Percentage of Section with Slight Transverse Cracking of less than 1 inch width
SEVTRAN	Percentage of Section with Severe Transverse Cracking of greater than 1 inch with
SLLONG	Percentage of Section with Slight Longitudinal Cracking of less than 1 inch width
SEVLONG	Percentage of Section with Severe Longitudinal Cracking of greater than 1 inch width
MULTCR	Percentage of section with Multiple Cracking
PATCH	Percentage of Patched pavement
PSR	Present Serviceability Rating

The table on the following pages gives the entire set of data that were stored in the Composite Pavement Inspection Data file for all of the Minnesota data on composite pavements that were collected on this project.

MINNESOTA DATA

COMPOSITE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	SLTRAN	SEVTRAN	SLLONG	SEVLONG	MULTCR	PATCH	PSR
1	6	3	775	11	4	0	0	0	0	2.9
2	6	3	578	58	15	22	6	12	0	3.0
3	7	3	775	8	0	0	0	0	0	2.9
4	7	3	578	41	14	15	3	5	0	3.0
5	21	3	669	17	1	2	0	0	0	3.3
6	21	3	675	38	51	3	6	8	18	3.2
7	21	3	679	63	4	5	0	0	0	3.3
8	22	3	669	17	0	2	0	0	0	3.3
9	22	3	675	15	78	1	2	12	18	3.2
10	22	3	679	23	2	22	0	0	0	3.3
11	23	3	669	14	0	0	0	0	0	3.3
12	23	3	675	2	24	1	1	1	5	3.2
13	23	3	679	18	2	2	0	0	0	3.3
14	24	3	572	22	2	11	0	0	1	3.1
15	24	3	573	12	34	11	33	0	0	3.0
16	25	3	572	100	100	22	6	9	3	2.9
17	25	3	674	100	73	18	22	41	1	2.8
18	25	3	578	51	10	5	0	0	0	3.1
19	29	3	677	26	0	0	0	0	0	3.3
20	30	3	677	10	0	0	0	0	0	3.3
21	31	3	575	12	0	2	0	0	0	2.4
22	31	3	578	55	1	0	0	0	0	3.3
23	32	3	675	17	4	2	0	0	0	3.3
24	32	3	578	16	20	2	2	2	1	2.8
25	40	3	677	16	12	0	0	0	0	3.2
26	40	3	679	14	17	2	0	2	0	3.0
27	41	3	677	8	24	0	0	0	0	3.1
28	41	3	578	3	36	4	0	3	2	3.0
29	43	3	677	10	15	0	0	0	0	3.1
30	43	3	679	13	12	2	0	0	1	3.0
31	60	3	768	86	12	29	0	7	2	2.4
32	60	3	770	19	0	1	0	0	1	3.2
33	60	3	573	17	2	1	0	0	1	2.7
34	60	3	677	24	3	0	0	0	1	2.8
35	61	3	768	55	9	82	0	2	2	2.4
36	61	3	770	11	0	0	0	0	0	3.2
37	61	3	573	26	2	8	0	0	1	2.7
38	61	3	577	41	2	0	0	0	0	2.8
39	71	3	770	19	0	2	0	0	0	3.2
40	71	3	676	59	51	47	26	2	2	2.7
41	71	3	578	14	5	0	0	0	0	3.6
42	72	3	573	37	0	48	0	1	1	3.3
43	72	3	675	7	31	18	2	0	1	2.2
44	72	3	676	14	40	38	15	12	2	2.6
45	76	3	477	13	7	15	1	0	0	3.5
46	77	3	477	20	6	0	0	0	0	3.5
47	78	3	477	15	10	0	0	0	0	3.5
48	93	3	578	36	29	25	17	18	2	2.3
49	94	3	578	53	44	50	46	4	0	2.3

MINNESOTA DATA

COMPOSITE PAVEMENT INSPECTION DATA

OBS	SITE	KEY	DATE	SLTRAN	SEVTRAN	SLLONG	SEVLONG	MULTCR	PATCH	PSR
50	95	3	579	42	0	0	0	0	0	2.8
51	96	3	579	44	0	0	0	0	0	2.8
52	98	3	576	11	13	0	0	0	0	2.6
53	98	3	578	18	19	8	0	0	0	2.7
54	99	3	576	10	6	2	0	0	0	2.6
55	99	3	578	15	16	20	4	0	0	2.7
56	100	3	576	9	9	0	0	0	0	2.6
57	100	3	578	4	16	16	4	0	0	2.7
58	107	3	576	9	16	12	8	0	0	2.7
59	107	3	578	9	23	5	14	0	1	2.7
60	108	3	576	7	11	2	0	0	0	2.7
61	108	3	578	9	15	5	0	0	0	2.7
62	114	3	577	8	18	8	18	0	0	2.8
63	114	3	579	56	22	74	10	17	0	3.1
64	115	3	577	10	18	0	0	0	0	2.8
65	115	3	579	16	19	42	0	0	0	3.1
66	116	3	577	6	15	0	0	0	0	2.8
67	116	3	579	23	6	35	2	0	0	3.1
68	122	3	577	30	11	74	7	5	0	2.7
69	122	3	579	35	18	37	54	1	0	2.6
70	123	3	577	24	10	85	12	0	0	2.7
71	123	3	579	35	20	34	62	0	0	2.6
72	124	3	578	2	100	12	0	2	0	2.9
73	125	3	578	9	11	0	0	0	1	2.9
74	125	3	579	5	18	2	0	0	7	2.7

APPENDIX B

OVERLAID PAVEMENT DATA COLLECTED IN TEXAS

This appendix contains two sets of data. The first set is on pages B-4 through B-94, and contains computerized data summary sheets for each of the overlaid pavement sections in the Texas flexible pavement data base which is maintained at the Texas Transportation Institute. These data were used to develop the Level 1 overlay design equations for overlays over flexible pavements in Texas. The second set of data is supplementary information which gives detailed properties of the asphaltic concrete mixtures for each of the 23 sections that were used to develop the Level 2 overlay design equation. These supplementary data are on pages B-95 through B-117. The data were stored in microfilm files with the Materials and Tests Division, D-9, in Austin and were found by locating the laboratory identification numbers that were furnished by the District office in which each pavement section exists. The data includes the penetration, viscosity, ring and ball softening point, and percent asphalt in the mix.

The data summary sheets on pages B-4 through B-94 are nearly self explanatory, but some code numbers and abbreviations must be explained. The section identification number in the Location box includes all numbers but the last, which is a check digit. Thus, the section identified as number 335 is, in fact, section number 33. The

abbreviations that are used in the Pavement Condition Survey box include codes for both the area and severity of each of the types of distress that have been observed. The area codes are numbers indicating the following ranges of area covered by a particular type of distress: 0 - none; 1 - 1 to 15%; 2 - 16 to 30%; and 3 - greater than 30%. Severity levels are indicated as SL - slight; MO - moderate; and SE - severe. The pavement urgency rating is an overall rating of the need for immediate maintenance or rehabilitation action. It ranges between 1 (not urgent) to 9 (very urgent within the next 1 to 2 years). The Dynaflect Deflection Basin box gives a few summary statistics of the Dynaflect measurements that were made on each pavement. The measurements are recorded in mils or 0.001 inch units. The "stiffness coefficients" in the Dynaflect box have asphaltic concrete as their datum material. Thus, a material with a "stiffness coefficient" of 2.0 is roughly twice as stiff as asphaltic concrete. In the Structural Section box, the dates of major maintenance, rehabilitation, or reconstruction are recorded along with the thickness and materials in each layer. Subgrade properties include the Atterberg Limits and the Texas Triaxial Class (TTC).

The supplementary data sheets on pages B-95 through B-117 are self explanatory.

L

SECTION ID NO: 13
DISTRICT NO: 1
COUNTY NO/NAME: 92/GRAYSON
CONTROL-SECTION: 45- 4
HIGHWAY: US 82
MILE POINTS: 22.000 - 24.000
LANE: R

FROM POST 22 TO POST 24

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	46.3
MEAN TEMPERATURE:	41	46	53	63	71	78	83	82	75	65	53	45	63.4
PRECIPITATION:	1.6	2.1	2.9	4.4	4.7	3.8	2.3	2.6	6.1	3.3	2.5	2.2	38.5
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	12	8	2	0	0	0	0	0	0	0	2	9	35
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	23.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	70	65	65	65	97
RUTT	1 SL	1 SL				
FLUSH	1 MO	1 SL	1 SL			
CORR						
RAVEL	1 SL	2 SL				
ALLG CR						
LONG CR	1 SL	1 MO	2 SE	3 SE	3 SE	
TRANS CR	1 MO	2 MO	3 MO	2 SE	2 SE	1 SL
CRACKS	SEAL	PS	PS	PS	PS	PS
PATCHING				1 G	1 G	1 G
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	80	69	50	50	57	66
ROADSIDE	85	77	82	72	77	82
DRAINAGE	87	77	83	70	80	87
TRAFFIC SER	72	86	88	66	78	80
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	4	4	6	5	4

TRAFFIC

1980 ADT: 3813
1980 PERCENT TRUCKS: 17.7
6/31-12/82 VEHICLES: 26125232
6/31-12/82 18K AXLES: 5066350
EXTRAPOLATED FOR OVER 3 YEARS.

SKID NUMBER

DATE	AVG	LOW	HIGH
7/74	33	23	39
7/74	39	27	49
4/71	35	30	41
4/71	38	32	42

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.18	.381	8	12.0	2.50	3.60
77	3.50	.294	10	8.4	3.00	3.80
76	3.36	.357	10	10.6	2.70	3.90
75	3.42	.282	10	8.2	2.90	3.80
74	3.38	.266	10	7.9	3.00	3.80
73	3.35	.324	10	9.7	2.60	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/10/76	.475	.141	.024	.005

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	2.006	.206

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	29	MAINT	8/79		316	B	B	3(	75	AC-10		.4		.4			
2	S HMAC	22	MAINT	1/63	LIMESTONE/CALICHE	340		D			AC	5.4		1.3	1.3			
3	S HMAC	15	MAINT	7/47		SP		D			AC	5.7		2.0	2.0			
4	S PCC	11	WIDEN	8/46		SP								.0	10.0			
5	S PCC	7	NEW CON	6/31		69								6.0	9.0			
6	SG CLAY	7	NEW CON	6/31	CH,CL											5.3	64.5	40.4

LOCATION

SECTION ID NO: 39
DISTRICT NO: 1
COUNTY NO/NAME: 117/HUNT
CONTROL-SECTION: 9-13
HIGHWAY: IH 30
MILE POINTS: 27.800 - 29.800
LANE: R

POST 107 TO H-H CO.LINE

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	41.6
MEAN TEMPERATURE:	41	45	52	63	71	78	82	82	75	65	53	45	63.1
PRECIPITATION:	2.2	2.7	3.3	5.1	5.2	3.5	3.0	2.2	5.3	4.1	2.9	3.0	42.6
WET F-T CYCLES:	2	1	0	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	13	9	3	0	0	0	0	0	0	0	3	10	40
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	22.8
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	74
PRS	63	69	76	76
RUTT	2 MO	2 SL	2 SL	2 SL
FLUSH		2 MO		
CORR				
RAVEL			1 SL	
ALLG CR				
LONG CR	1 SE	1 MO	1 SL	1 SL
TRANS CR	2 SE	1 MO	2 MO	2 MO
CRACKS	NS	NS	NS	NS
PATCHING				1 F
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	81	71	57	77
ROADSIDE	77	80	75	85
DRAINAGE	90	83	63	80
TRAFFIC SER	74	86	90	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	4	4	5	4

TRAFFIC

1980 ADT: 11600
1980 PERCENT TRUCKS: 19.0
9/52-12/82 VEHICLES: 38398928
9/52-12/82 18K AXLES: 8079809

SKID NUMBER

DATE	AVG	LOW	HIGH
3/75	25	22	29
7/74	33	30	36

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.66	.320	10	12.0	2.10	3.20
77	3.30	.356	10	10.8	2.70	3.80
76	3.45	.584	10	16.9	2.10	4.00
74	3.44	.230	9	6.7	2.90	3.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/ 9/76	.563	.093	.031	.006

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.381	.168

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	28	MAINT	8/67	SILICEOUS	340		B			AC	4.7		2.5	2.5			
2	S HMAC	28	MAINT	8/67	SILICEOUS	340		D			AC	4.9		1.5	1.5			
3	S PCC	4	NEW CON	9/52		320								10.0	10.0			
4	SB FLEX	4	NEW CON	9/52		SP		B						6.0	.0			10.0
5	SG CLAY	4	NEW CON	9/52	CL,CH											5.6	61.3	39.1

LOCATION

SECTION ID NO: 71
DISTRICT NO: 1
COUNTY NO/NAME: 139/LAMAR
CONTROL-SECTION: 136- 8
HIGHWAY: US 271
MILE POINTS: 5.620 - 7.560
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	48.0
MEAN TEMPERATURE:	40	45	53	63	72	78	83	81	75	65	53	44	63.2
PRECIPITATION:	2.3	3.2	3.7	5.1	5.2	3.9	3.3	3.4	5.7	4.5	3.6	3.5	47.3
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	5
TOTAL F-T CYCLES:	13	9	2	0	0	0	0	0	0	0	3	9	38
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	22.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	55	83	78	70	92	100
RUTT	1 SL	1 SL				
FLUSH		1 SL				
CORR						
RAVEL		1 SL				
ALLG CR	1 MO					
LONG CR	2 SE		2 SL	2 MO	1 SL	
TRANS CR	2 SE	2 SL	2 MO	3 MO	1 SL	
CRACKS	NS	NS	NS	NS	NS	
PATCHING					1 G	
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	74	79	71	73	70	83
ROADSIDE	87	75	80	72	82	75
DRAINAGE	83	87	93	73	80	83
TRAFFIC SER	78	88	90	82	84	92

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	5	3	2	5	2	2

TRAFFIC

1980 ADT:	7173
1980 PERCENT TRUCKS:	18.0
4/55-12/82 VEHICLES:	24500096
4/55-12/82 18K AXLES:	4848726

SKID NUMBER

DATE	AVG	LOW	HIGH
7/74	35	32	39

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.07	.519	10	16.9	1.90	3.90
77	3.62	.290	10	8.0	3.00	4.10
76	3.59	.302	9	8.4	2.90	3.90
75	3.60	.250	9	6.9	3.20	3.90
74	3.58	.176	9	4.9	3.20	3.80
73	3.56	.207	10	5.8	3.40	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/11/76	.569	.133	.029	.013

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.266	.180

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	24	MAINT	9/71	SILICEOUS	340		C			AC	5.0		2.0	2.0			
2	S HMAC	24	MAINT	9/71	SILICEOUS	340		D			AC	4.6		1.5	1.5			
3	S PCC	16	NEW CON	4/55		320								9.0	9.0			
4	SB FLEX	16	NEW CON	4/55		SP		B						6.0	.0			
5	SG CLAY	16	NEW CON	4/55	CH,CL,SC											4.2	36.6	26.7

LOCATION

SECTION ID NO: 160
DISTRICT NO: 2
COUNTY NO/NAME: 127/JOHNSON
CONTROL-SECTION: 259- 4
HIGHWAY: US 67
MILE POINTS: 2.790 - 4.790
LANE: R

FROM POST 28 TO POST 30

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-10.5
MEAN TEMPERATURE:	45	49	57	66	73	80	84	83	77	67	55	48	65.9
PRECIPITATION:	1.9	2.0	2.0	4.3	4.6	3.3	1.7	2.6	3.4	3.9	2.1	2.0	33.9
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	10	6	2	0	0	0	0	0	0	0	2	6	29
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	27.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	66	74	75	77	100	87
RUTT	1 SL		2 SL			
FLUSH		1 SL	1 SL	1 SL		
CORR						
RAVEL	1 SL	2 SL	2 SL	2 SL		
ALLG CR	1 SL					1 SL
LONG CR	2 MO	2 MO	1 MO	2 SL		1 SL
TRANS CR	1 MO	1 MO	1 MO			1 SL
CRACKS	PS	SEAL	SEAL	NS		NS
PATCHING	1 F			1 G		
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	73	74	80	73	81	76
ROADSIDE	65	90	90	77	75	75
DRAINAGE	83	80	87	73	80	83
TRAFFIC SER	80	80	88	82	82	86
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	4	0	1	2	2	3

TRAFFIC

1980 ADT:	3000
1980 PERCENT TRUCKS:	18.0
5/41-12/82 VEHICLES:	12968131
5/41-12/82 18K AXLES:	2566303

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	28	25	31
11/74	36	32	42

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.83	.241	10	6.3	3.30	4.10
77	4.02	.220	10	5.5	3.70	4.50
76	4.01	.376	10	9.4	3.60	4.50
75	3.84	.427	10	11.1	3.20	4.40
74	4.00	.332	9	8.3	3.70	4.50
73	3.95	.240	10	6.0	3.60	4.40

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 1/76	1.135	.296	.423	.132

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.607	.268

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	25	MAINT	9/80		316		PB	4	110	AC-5		.3		.3			
2	S HMCL	19	WID-STR	8/68	LIMESTONE/CALICHE	350		FFF			AC	5.4		1.3	1.3			
3	B FLEX	19	WID-STR	8/68	LIMESTONE/CALICHE	248		A	4					.0	9.0			
4	S ST	4	NEW CON	5/41		305				100	OA-230		.3	.3	.3			
5	S ST	4	NEW CON	5/41		305				180	OA-230		.3	.2	.2			
6	B FLEX	4	NEW CON	5/41		215								8.0	8.0			
7	SG CLAY	4	NEW CON	5/41	CH,MH,CL											4.8	55.5	32.4

LOCATION

SECTION ID NO: 186
DISTRICT NO: 2
COUNTY NO/NAME: 220/TARRANT
CONTROL-SECTION: 80- 7
HIGHWAY: US 377
MILE POINTS: 8.591 - 10.589
LANE: R

FROM POST 0 TO POST 2

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-3.8
MEAN TEMPERATURE:	43	48	54	63	73	80	86	84	76	66	53	46	64.8
PRECIPITATION:	1.6	2.4	1.7	5.1	6.8	3.2	1.2	2.0	3.2	2.9	2.4	1.5	34.0
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	4
TOTAL F-T CYCLES:	10	5	3	0	0	0	0	0	0	0	3	6	28
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY ✓

PVMT RATING	80	77	76
PRS	88	53	84
RUTT	2 SL	2 SL	
FLUSH	1 SL		
CORR			
RAVEL	1 SL		
ALLG CR		1 MO	
LONG CR		2 SE	2 MO
TRANS CR		3 SE	2 MO
CRACKS		PS	SEAL
PATCHING			
FAIL/MI	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	83	69	67
ROADSIDE	85	75	67
DRAINAGE	83	70	80
TRAFFIC SER	76	80	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	4	2

TRAFFIC

1980 ADT:	9265
1980 PERCENT TRUCKS:	18.0
7/47-12/82 VEHICLES:	32919344
7/47-12/82 18K AXLES:	6514944

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	30	19	44
11/74	33	29	36

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.20	.627	10	19.6	2.10	3.90
77	4.27	.166	9	3.9	4.00	4.50
76	4.06	.213	9	5.2	3.80	4.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 3/76	.906	.245	.361	.147

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.458	.283

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	38	MAINT	8/70	LIGHTWEIGHT	340		DL			AC	5.0		1.5	1.5			
2	S SC	31	MAINT	10/66	PRECOATED AGGREGATE	316		PB	4	100	AC-10		.3	.3	.3			
3	S CMLRA	22	MAINT	6/59	ROCK ASPHALT	314		B						.8	.8			
4	S HMAC	14	MAINT	8/50		SP		D			AC	4.8		1.7	1.7			
5	S ST	12	NEW CON	7/47		305				90	OA-230		.3	.3	.3			
6	S ST	12	NEW CON	7/47		305				160	OA-230		.3	.2	.2			
7	B FLEX	12	NEW CON	7/47	CRUSHED STONE	215								10.0	6.5			
8	SG CLAY	12	NEW CON	7/47	CH,MH,CL											4.9	56.5	34.7

LOCATION

SECTION ID NO: 199
DISTRICT NO: 2
COUNTY NO/NAME: 220/TARRANT
CONTROL-SECTION: 2208- 1
HIGHWAY: SP 303
MILE POINTS: 12.144 - 14.144
LANE: L

PK SPRGS BLVD TO 2 MI.W

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-3.8
MEAN TEMPERATURE:	43	48	54	63	73	80	86	84	76	66	53	46	64.8
PRECIPITATION:	1.6	2.4	1.7	5.1	6.8	3.2	1.2	2.0	3.2	2.9	2.4	1.5	34.0
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	4
TOTAL F-T CYCLES:	10	5	3	0	0	0	0	0	0	0	3	6	28
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76
PRS	100	59	95
RUTT		2 SL	
FLUSH			
CORR			
RAVEL		2 SL	1 SL
ALLG CR		1 MO	
LONG CR		2 MO	
TRANS CR		2 MO	
CRACKS		SEAL	
PATCHING		1 F	
FAIL/MI	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	70	59	57
ROADSIDE	62	70	72
DRAINAGE	90	80	80
TRAFFIC SER	74	80	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	7	1

TRAFFIC

1980 ADT:	14994
1980 PERCENT TRUCKS:	8.0
9/60-12/82 VEHICLES:	70907408
9/60-12/82 18K AXLES:	5616264

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	15	12	17
11/74	22	17	25

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.12	.391	10	9.5	3.50	4.70
77	4.07	.406	10	10.0	3.00	4.50
76	4.20	.368	10	8.8	3.30	4.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 2/76	1.181	.281	.424	.146

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.531	.257

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S FC	19	MAINT	6/76	LIGHTWEIGHT						AC			1.0	1.0			
2	S SC	17	MAINT	1/75										.3	.3			
3	S HMAC	16	MAINT	7/72	LIGHTWEIGHT	340		G			AC	4.8		1.3	1.3			
4	S HMAC	12	MAINT	12/68		340		F			AC	5.0		1.3	1.3			
5	S SC	7	MAINT	9/65	PRECOATED AGGREGATE	316		PB	4	100	AC-10		.3	.3	.3			
6	S ST	3	NEW CON	9/60		305		B	2	80	OA-135		.3	.4	.4			
7	S ST	3	NEW CON	9/60		305		A	7	110	OA-135		.3	.3	.3			
8	B FLEX	3	NEW CON	9/60		SP								8.0	5.1			
9	SG CLAY	3	NEW CON	9/60	CH,CL,SC											4.1	43.1	21.3

LOCATION

SECTION ID NO: 220
DISTRICT NO: 3
COUNTY NO/NAME: 39/CLAY
CONTROL-SECTION: 282- 2
HIGHWAY: SH 79
MILE POINTS: 3.940 - 6.330
LANE: L

FROM POST 6 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-.2
MEAN TEMPERATURE:	40	44	53	63	71	79	84	83	75	65	52	44	63.2
PRECIPITATION:	1.4	1.4	2.0	3.0	4.2	3.8	2.2	2.7	4.4	3.2	1.7	1.5	31.8
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	4
TOTAL F-T CYCLES:	16	11	4	0	0	0	0	0	0	0	4	12	49
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	21.9
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	81	83	61	83	95	95
RUTT	1 SL		2 SL		1 SL	
FLUSH	2 MO	3 SL	2 SE	1 MO	1 SL	1 SL
CORR						
RAVEL						
ALLG CR			1 SL			
LONG CR			1 MO			
TRANS CR	1 MO	1 MO	1 MO	2 SL		
CRACKS	PS	NS	PS	NS		
PATCHING			1 G	1 G	1 G	
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	90	75	80	65	85	70
ROADSIDE	82	72	90	70	85	90
DRAINAGE	70	67	77	63	90	73
TRAFFIC SER	78	76	82	82	78	88
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	0	2	0	3	2

TRAFFIC

1980 ADT: 1350
1980 PERCENT TRUCKS: 18.0
11/41-12/82 VEHICLES: 10185550
11/41-12/82 18K AXLES: 2014475

SKID NUMBER

DATE	AVG	LOW	HIGH
4/76	40	27	52
10/75	45	41	50
10/75	43	37	50
7/75	41	24	59
7/75	42	25	60

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.02	.294	10	7.3	3.30	4.30
77	4.16	.200	8	4.8	3.90	4.50
76	3.96	.536	10	13.5	2.70	4.60
75	3.97	.308	9	7.8	3.30	4.40
74	4.01	.481	9	12.0	2.90	4.50
73	4.05	.158	10	3.9	3.70	4.20

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/17/75	1.953	.430	.863	.173

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.414	.253

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	9	MAINT	9/68	LIGHTWEIGHT	316		LT WT	3	100	AC-5		.3	.3	.3			
2	S HMAC	7	MAINT	8/58		309		K			RC-2	4.4		1.4	1.4			
3	S SC	7	MAINT	8/58		303		B	4	90	OA-175		.4	.3	.3			
4	S SC	6	MAINT	6/54										.3	.3			
5	S SC	5	MAINT	6/50		303A				135	OA-230		.3	.2	.2			
6	S SC	4	MAINT	10/45		303A				145	OA-230		.3	.2	.2			
7	S ST	3	NEW CON	11/41		305A				60	OA-230		.3	.5	.5			
8	S ST	3	NEW CON	11/41		305A				120	OA-230		.4	.2	.2			
9	B FLEX	3	NEW CON	11/41	SANDSTONE	SP								7.0	7.0			
10	B AS	3	NEW CON	11/41	SANDSTONE	SP					RC-2	6.2		2.0	2.0			
11	SG CLAY	3	NEW CON	11/41	CL,SC,SM											4.1	28.6	10.2

LOCATION

SECTION ID NO: 233
DISTRICT NO: 3
COUNTY NO/NAME: 39/CLAY
CONTROL-SECTION: 1350- 1
HIGHWAY: FM 1197
MILE POINTS: 9.960 - 11.940
LANE: R

FROM POST 10 TO POST 12

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-.2
MEAN TEMPERATURE:	40	44	53	63	71	79	84	83	75	65	52	44	63.2
PRECIPITATION:	1.4	1.4	2.0	3.0	4.2	3.8	2.2	2.7	4.4	3.2	1.7	1.5	31.8
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	4
TOTAL F-T CYCLES:	16	11	4	0	0	0	0	0	0	0	4	12	49
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	21.9
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	95	83	55	83	85	72
RUTT	1 SL	2 SL	2 SL		1 SL	
FLUSH	1 SL	1 SL	2 SL	1 SL	1 SL	2 SL
CORR			1 SL			
RAVEL			1 MO		1 SL	1 SL
ALLG CR		1 SL				1 SL
LONG CR						
TRANS CR				1 MO		
CRACKS				NS		
PATCHING		3 G	3 G	3 G	3 G	3 F
FAIL/MI	0	0	1	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	90	60	60	65	65	65
ROADSIDE	85	75	87	75	87	82
DRAINAGE	90	70	70	80	90	63
TRAFFIC SER	92	82	76	74	84	86
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	2	0	7	7	3	4

TRAFFIC

1980 ADT: 200
1980 PERCENT TRUCKS: 18.0
5/52-12/82 VEHICLES: 1730741
5/52-12/82 18K AXLES: 340201

SKID NUMBER

DATE	AVG	LOW	HIGH
12/75	35	28	42
7/75	34	20	51
7/75	37	20	57

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.90	.485	10	16.7	2.30	3.70
77	2.80	.485	10	17.3	2.00	3.40
76	2.16	.786	9	36.5	.80	3.40
75	2.79	.515	10	18.5	2.00	3.50
74	2.78	.784	9	28.2	1.60	4.00
73	2.02	.817	8	40.5	.80	3.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/17/75	1.761	.319	.792	.166

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.577	.261

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	10	MAINT	9/68		316		B	4	100	AC-5		.3	.3	.3			
2	S SC	7	MAINT	5/61										.3	.3			
3	S HMAC	5	MAINT	3/56										.7	.7			
4	S ST	1	NEW CON	5/52		304		A	4	70	OA-175		.4	.4	.4			
5	B FLEX	1	NEW CON	5/52	SANDSTONE	218								6.0	6.0			
6	SG CLAY	1	NEW CON	5/52	CL,CH,MH											4.2	48.6	28.7

LOCATION

SECTION ID NO: 246
DISTRICT NO: 3
COUNTY NO/NAME: 169/MONTAGUE
CONTROL-SECTION: 239- 2
HIGHWAY: SH 59
MILE POINTS: 16.950 - 18.950
LANE: L

FROM POST 22 TO POST 20

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	.2
MEAN TEMPERATURE:	42	47	55	65	73	79	84	83	76	66	54	46	64.8
PRECIPITATION:	1.6	1.6	2.1	3.2	4.2	3.0	2.3	2.3	4.2	3.3	2.4	1.9	32.0
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	4
TOTAL F-T CYCLES:	11	7	3	0	0	0	0	0	0	0	2	7	32
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	68	75	78	90	93	83
RUTT	1 SL	3 SL	1 SL		1 SL	
FLUSH	2 MO	3 MO	2 MO	2 SL	1 SL	1 SL
CORR			1 SL			
RAVEL		1 SL				1 SL
ALLG CR						1 SL
LONG CR			1 MO			1 SL
TRANS CR			1 MO	1 SL		
CRACKS	PS		SEAL	SEAL		SEAL
PATCHING			1 G	1 G	2 G	1 G
FAIL/MI	1	0	0	0	0	0
*** *** ***	***	***	***	***	***	*** ***
RATING SCORES						
SHOULDER	60	65	65	45	65	60
ROADSIDE	72	80	80	72	75	77
DRAINAGE	80	80	87	80	87	77
TRAFFIC SER	72	76	84	84	72	90
*** *** ***	***	***	***	***	***	*** ***
PVMT URGENCY	4	0	1	4	4	3

TRAFFIC

1980 ADT: 3597
1980 PERCENT TRUCKS: 18.0
5/42-12/82 VEHICLES: 18135152
5/42-12/82 18K AXLES: 3588565

SKID NUMBER

DATE	AVG	LOW	HIGH
5/76	15	12	19
8/74	16	13	19
8/74	18	12	22

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.92	.595	9	15.2	2.50	4.50
77	3.87	.450	9	11.6	2.90	4.30
76	4.09	.555	9	13.6	2.80	4.70
75	4.05	.438	8	10.8	3.10	4.40
74	4.03	.250	7	6.2	3.60	4.40
73	3.98	.050	4	1.3	3.90	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/17/75	1.040	.188	.418	.096

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.439	.277

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S ST	16	WIDEN	11/79		322	B	B	3	90	AC		.3		.4			
2	S ST	16	WIDEN	6/79		322	B	B	4	130	AC		.3		.4			
3	B FLEX	16	WIDEN	11/79		242		B	3				1.0		6.0			
4	S SC	15	MAINT	8/76	LIGHTWEIGHT	316		LT WT	4	120	AC-5		.3		.3			
5	S HMAC	14	MAINT	4/71										.6	.6			
6	S SC	13	MAINT	9/69	LIGHTWEIGHT	316		LT WT	3	90	AC-5		.3	.3	.3			
7	S HMAC	11	MAINT	8/66										1.0	1.0			
8	S HMAC	9	MAINT	8/55										1.0	1.0			
9	S SC	7	MAINT	8/48		303A				135	OA-230		.3	.2	.2			
10	S ST	4	RECONST	5/42		305				90	OA-230		.3	.3	.3			
11	S ST	4	RECONST	5/42		305				190	OA-230		.3	.2	.2			
12	B FLEX	4	RECONST	5/42										5.5	5.5			
13	B FLEX	4	RECONST	5/42	SANDSTONE	215A								6.0	6.0			
14	SG CLAY	4	RECONST	5/42	CL,CH,SC											3.8	40.3	23.9

LOCATION

SECTION ID NO: 259
DISTRICT NO: 3
COUNTY NO/NAME: 169/MONTAGUE
CONTROL-SECTION: 845- 1
HIGHWAY: FM 455
MILE POINTS: 4.010 - 5.970
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	.2
MEAN TEMPERATURE:	42	47	55	65	73	79	84	83	76	66	54	46	64.8
PRECIPITATION:	1.6	1.6	2.1	3.2	4.2	3.0	2.3	2.3	4.2	3.3	2.4	1.9	32.0
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	4
TOTAL F-T CYCLES:	11	7	3	0	0	0	0	0	0	0	2	7	32
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	73	62	75	85	82
RUTT		1 SL	2 SL		1 SL	
FLUSH	1 MO	1 SL	2 MO	1 SL	1 SL	1 SL
CORR						
RAVEL	1 SL	1 SL				1 SL
ALLG CR	1 SL	1 SL	2 SL	1 SL		1 SL
LONG CR		1 MO	1 MO	1 SL	1 SL	1 SL
TRANS CR		1 MO	1 MO	2 SL		
CRACKS	PS	SEAL	PS	PS	PS	PS
PATCHING	2 G	2 G	1 G	3 G	2 F	1 G
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	75	60	70	60	85	60
ROADSIDE	80	82	80	70	80	77
DRAINAGE	60	80	77	77	83	77
TRAFFIC SER	84	74	84	82	82	90
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	0	2	4	3	3

TRAFFIC

1980 ADT: 280
1980 PERCENT TRUCKS: 18.0
6/49-12/82 VEHICLES: 1747193
6/49-12/82 18K AXLES: 343641

SKID NUMBER

DATE	AVG	LOW	HIGH
12/75	30	21	42

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.31	.461	10	13.9	2.50	4.10
77	3.54	.267	10	7.6	3.20	3.90
76	3.32	.498	10	15.0	2.60	4.00
75	3.14	.410	9	13.0	2.50	3.60
74	3.30	.245	4	7.4	3.00	3.60
73	3.48	.260	10	7.5	3.10	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/17/75	1.473	.513	.522	.221

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.739	.252

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM CL	TYPE GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	6	MAINT	11/69								1.0	1.0			
2	S SC	4	MAINT	4/61								.3	.3			
3	S ST	1	NEW CON	6/49		305		90	OA-175		.3	.3	.3			
4	S ST	1	NEW CON	6/49		305		160	OA-175		.3	.2	.2			
5	B FLEX	1	NEW CON	6/49	LIMESTONE/CALICHE	215						6.0	6.0			
6	SG CLAY	1	NEW CON	6/49	CL,CH,SC									3.8	40.3	23.9

LOCATION

SECTION ID NO: 288
DISTRICT NO: 3
COUNTY NO/NAME: 244/WILBARGER
CONTROL-SECTION: 147- 1
HIGHWAY: US 183
MILE POINTS: 4.170 - 5.570
LANE: L

FROM POST29.4 TO POST 28

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-21.5
MEAN TEMPERATURE:	41	45	54	64	73	80	85	84	76	65	53	44	64.1
PRECIPITATION:	.9	1.1	1.7	2.5	3.9	3.0	2.4	1.7	3.6	3.2	1.4	1.0	26.3
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	3
TOTAL F-T CYCLES:	14	9	3	0	0	0	0	0	0	0	3	10	41
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	23.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	95	59	78	55	95
RUTT	1 SL	2 SL	2 SL	1 SL	
FLUSH	1 SL	1 SL	1 SL		
CORR					
RAVEL		2 MO	2 SL	3 MO	1 SL
ALLG CR		1 MO			
LONG CR				2 MO	
TRANS CR		2 MO	2 SL	2 SE	
CRACKS		NS	NS	NS	
PATCHING				1 G	
FAIL/MI	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***					
RATING SCORES					
SHOULDER	84	79	81	77	80
ROADSIDE	77	87	87	67	85
DRAINAGE	93	77	87	70	90
TRAFFIC SER	92	86	92	84	88
*** *** *** *** *** *** *** *** *** *** ***					
PVMT URGENCY	2	7	6	5	2

TRAFFIC

1980 ADT: 1196
1980 PERCENT TRUCKS: 18.0
6/28-12/82 VEHICLES: 8353824
6/28-12/82 18K AXLES: 1652582

SKID NUMBER

DATE	AVG	LOW	HIGH
5/76	58	55	64

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.03	.439	7	14.5	2.40	3.50
77	3.24	.443	7	13.7	2.60	3.90
76	3.00	.757	7	25.2	2.00	3.90
75	2.91	.467	7	16.0	2.30	3.50
74	3.14	.412	7	13.1	2.70	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/18/75	1.145	.252	.201	.110

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.623	.196

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	14	MAINT	10/80	LIGHTWEIGHT	316	B	LT WT	4	110	AC-5		.3		.3			
2	S SC	13	MAINT	7/74	LIGHTWEIGHT	316		LT WT	4	130	AC-5		.3	.2	.2			
3	S HMAC	8	WID-STR	1/58		317		C MOD			AC			2.1	2.1			
4	B LST	8	WID-STR	1/58	SILICEOUS	218					LIME			.0	10.0			
5	S PCC	2	NEW CON	6/28		69								6.0	9.0			
6	SG SAND	2	NEW CON	6/28	SC,CL											3.9	24.9	8.4

LOCATION

SECTION ID NO: 291
DISTRICT NO: 3
COUNTY NO/NAME: 244/WILBARGER
CONTROL-SECTION: 702- 1
HIGHWAY: FM 91
MILE POINTS: 9.940 - 11.930
LANE: R

FROM POST 10 TO POST11.8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-21.5
MEAN TEMPERATURE:	41	45	54	64	73	80	85	84	76	65	53	44	64.1
PRECIPITATION:	.9	1.1	1.7	2.5	3.9	3.0	2.4	1.7	3.6	3.2	1.4	1.0	26.3
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	3
TOTAL F-T CYCLES:	14	9	3	0	0	0	0	0	0	0	3	10	41
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	23.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	92	61	93	83	87
RUTT					
FLUSH		1 SL			
CORR					
RAVEL	1 SL	1 SL			
ALLG CR		1 MO			
LONG CR	1 SL	2 MO	1 MO	2 SL	2 SL
TRANS CR		1 MO		2 SL	1 SL
CRACKS	PS	PS	PS	NS	NS
PATCHING			1 G	1 G	1 G
FAIL/MI	0	0	0	0	0
*** *** ***	***	***	***	***	***
RATING SCORES					
SHOULDER	65	80	85	60	85
ROADSIDE	80	82	82	77	82
DRAINAGE	83	87	80	50	87
TRAFFIC SER	86	84	94	78	86
*** *** ***	***	***	***	***	***
PVMT URGENCY	2	6	4	4	3

TRAFFIC

1980 ADT:	130
1980 PERCENT TRUCKS:	18.0
8/48-12/82 VEHICLES:	980518
8/48-12/82 18K AXLES:	192797

SKID NUMBER

DATE	AVG	LOW	HIGH
5/76	33	20	43

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.59	.597	9	16.6	2.30	4.10
77	3.66	.350	9	9.6	2.80	4.00
76	4.02	.502	9	12.5	2.90	4.50
75	3.74	.416	9	11.1	3.00	4.20
74	3.84	.328	9	8.5	3.30	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/18/75	1.404	.068	.523	.044

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.779	.251

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM CL	TYPE GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	6	MAINT	10/68								1.0	1.0			
2	S SC	5	MAINT	6/63								.3	.3			
3	S SC	3	MAINT	8/49		303A		135	OA-175		.3	.2	.2			
4	S ST	2	NEW CON	8/48								.3	.3			
5	B FLEX	2	NEW CON	8/48								6.0	6.0			
6	SG SAND	2	NEW CON	8/48	SC,CL									3.9	24.9	8.4

LOCATION

SECTION ID NO: 319
DISTRICT NO: 4
COUNTY NO/NAME: 33/CARSON
CONTROL-SECTION: 169- 5
HIGHWAY: US 60
MILE POINTS: 7.100 - 8.860
LANE: L

FROM WHITE DEER CL TO POST 26

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-18.7
MEAN TEMPERATURE:	36	40	47	58	67	74	78	76	69	59	47	39	58.2
PRECIPITATION:	.5	.7	1.2	1.0	2.4	3.6	3.2	3.1	2.0	1.6	.7	.7	20.5
WET F-T CYCLES:	1	2	1	0	0	0	0	0	0	0	1	1	9
TOTAL F-T CYCLES:	21	17	10	1	0	0	0	0	0	0	10	20	82
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	15.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	74
PRS	79	62	78	90
RUTT	1 SL	2 SL	2 SL	2 SL
FLUSH	2 SL	2 SL	1 SL	2 SL
CORR				
RAVEL	1 SL	1 SL		
ALLG CR		1 MD	1 SL	
LONG CR	1 SL	2 SL	2 SL	
TRANS CR	1 SL	1 SL		
CRACKS	NS	NS	NS	
PATCHING		1 G	1 G	
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	74	73	76	70
ROADSIDE	82	75	87	82
DRAINAGE	93	80	80	90
TRAFFIC SER	92	90	90	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	6	5	2

TRAFFIC

1980 ADT:	4417
1980 PERCENT TRUCKS:	25.0
8/54-12/82 VEHICLES:	14687537
8/54-12/82 18K AXLES:	4242309

SKID NUMBER

DATE	AVG	LOW	HIGH
6/76	44	24	54

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.06	.222	10	5.5	3.70	4.30
77	4.26	.142	9	3.3	4.00	4.40
76	4.64	.181	9	3.9	4.20	4.80
74	4.48	.249	8	5.6	3.90	4.70

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/29/75	1.023	.254	.368	.132

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.597	.230

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	29	MAINT	9/79									1.0					
2	S HMAC	26	MAINT	9/72		340		D			AC	5.3		1.7	1.7			
3	S HMAC	15	NEW CON	8/54							AC			1.5	1.5			
4	B FLEX	15	NEW CON	8/54										14.0	14.0			
5	SG CLAY	15	NEW CON	8/54	CL,CH											4.5	47.5	27.5

LOCATION

SECTION ID NO: 335
DISTRICT NO: 4
COUNTY NO/NAME: 104/HARTLEY
CONTROL-SECTION: 41- 1
HIGHWAY: US 87
MILE POINTS: 5.070 - 7.010
LANE: L

FROM POST 6 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-22.0
MEAN TEMPERATURE:	36	37	43	54	64	72	77	75	67	56	43	36	55.4
PRECIPITATION:	.3	.4	.8	.9	2.4	2.4	3.4	2.4	1.6	1.2	.6	.5	16.7
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	1	1	7
TOTAL F-T CYCLES:	24	21	15	3	0	0	0	0	0	1	16	24	108
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	11.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	79	100	58	58	55
RUTT		1 SL		2 MO	1 SL	3 SL
FLUSH		2 SL		2 SE	3 MO	3 SL
CORR				2 SL		
RAVEL		1 SL				
ALLG CR	1 SL					
LONG CR	1 SL	1 SL		2 SL	2 MO	3 MO
TRANS CR	3 SL	1 SL		3 SL	3 MO	3 MO
CRACKS	NS	NS		PS	PS	PS
PATCHING				1 G		
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	70	70	79	70	67	81
ROADSIDE	77	87	92	82	85	80
DRAINAGE	50	77	90	80	90	90
TRAFFIC SER	88	90	94	70	76	90
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	4	2	5	4	5

TRAFFIC

1980 ADT: 3300
1980 PERCENT TRUCKS: 25.0
6/34-12/82 VEHICLES: 16558197
6/34-12/82 18K AXLES: 4781855

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	48	46	49
8/76	46	42	53

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.07	.211	10	5.2	3.80	4.40
77	4.29	.223	10	5.2	4.00	4.80
76	4.61	.137	10	3.0	4.30	4.80
75	3.43	.427	9	12.4	2.70	3.90
74	3.59	.488	9	13.6	2.70	4.30
73	3.42	.338	9	9.9	2.90	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/28/75	1.596	.355	.585	.201

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.437	.249

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	23	MAINT	6/76		340		F			AC	7.0		.7	.7			
2	S SC	22	MAINT	9/74		316	B	PB	4	110	AC		.3	.3	.3			
3	S SC	21	MAINT	8/71	PRECOATED AGGREGATE	316		PB	4	118	AC-5		.3	.2	.2			
4	S SC	20	MAINT	9/66		316		B	4	110	AC		.3	.3	.3			
5	S SC	18	MAINT	5/61		303		B	7	120	OA-135		.3	.2	.2			
6	S HMAC	13	WID-STR	5/53		317		D			AC	5.5		2.0	2.0			
7	B FLEX	13	WID-STR	5/53	LIMESTONE/CALICHE	211								.0	11.0			
8	S SC	11	MAINT	7/50		303A				120	OA-230		.3	.2	.2			
9	S SC	8	MAINT	8/40		303A				200	OA-230		.2	.2	.2			
10	S ST	5	NEW CON	6/34		SP								.3	.3			
11	S ST	5	NEW CON	6/34		SP								.3	.3			
12	B FLEX	3	NEW CON	6/34	LIMESTONE/CALICHE	SP								10.0	10.0			
13	SG CLAY	3	NEW CON	6/34	CL,SC,SM											3.9	28.8	12.8

LOCATION

SECTION ID NO: 351
DISTRICT NO: 4
COUNTY NO/NAME: 118/HUTCHINSON
CONTROL-SECTION: 557- 2
HIGHWAY: SH 152
MILE POINTS: 6.023 - 7.870
LANE: L

FROM POST 8 TO POST 6

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-23.4
MEAN TEMPERATURE:	37	41	48	59	68	75	80	78	71	61	47	40	59.1
PRECIPITATION:	.4	.8	1.1	1.2	2.9	3.1	3.4	2.4	1.6	1.4	.7	.6	19.6
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	7
TOTAL F-T CYCLES:	18	15	9	1	0	0	0	0	0	0	8	17	71
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	16.7
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	90	90	90	100	70	57
RUTT		1 SL	1 SL			
FLUSH		1 SL	1 SL			2 SL
CORR						
RAVEL	1 SL	1 SL	1 SL			2 SL
ALLG CR						
LONG CR	1 SL				2 MO	2 MO
TRANS CR					3 MO	2 MO
CRACKS	NS				NS	NS
PATCHING					1 G	
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	79	76	80	67	71	89
ROADSIDE	90	77	82	75	77	65
DRAINAGE	90	87	87	70	70	90
TRAFFIC SER	76	82	84	80	80	88

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	2	1	1	4	4

TRAFFIC

1980 ADT: 1350
1980 PERCENT TRUCKS: 21.0
9/59-12/82 VEHICLES: 5726444
9/59-12/82 18K AXLES: 1344994

SKID NUMBER

DATE	AVG	LOW	HIGH
7/76	43	31	48
7/76	40	34	46

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.00	.245	10	6.1	3.60	4.30
77	3.99	.183	9	4.6	3.70	4.30
76	4.36	.230	9	5.3	4.00	4.60
75	4.06	.207	10	5.1	3.60	4.30
74	3.86	.283	8	7.3	3.30	4.10
73	3.67	.231	10	6.3	3.10	3.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/29/75	.909	.051	.372	.032

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.600	.280

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	12	MAINT	5/75		340					AC	6.3		1.4	1.4			
2	S SC	11	MAINT	9/65		316		B	4	110	OA-175		.3	.3	.3			
3	S ST	8	WID-REC	9/59		305		B	4	80	OA-175		.3	.4	.4			
4	S ST	8	WID-REC	9/59		305		B	4	120	OA-175		.3	.2	.2			
5	B FLEX	8	WID-REC	9/59	SILICEOUS	213A								8.0	8.0			
6	SG CLAY	8	WID-REC	9/59	CL,ML,GM											3.8	26.9	9.1

LOCATION

SECTION ID NO: 393
DISTRICT NO: 4
COUNTY NO/NAME: 180/OLDHAM
CONTROL-SECTION: 90- 3
HIGHWAY: IH 40
MILE POINTS: 5.430 - 7.430
LANE: R

FROM POST 20 TO POST 22

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-18.2
MEAN TEMPERATURE:	35	37	44	53	64	72	76	74	67	57	44	37	55.4
PRECIPITATION:	.4	.6	.9	.9	2.1	3.0	3.1	2.5	1.9	1.3	.7	.6	18.1
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	1	1	8
TOTAL F-T CYCLES:	22	20	15	3	0	0	0	0	0	1	13	23	99
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	11.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	95	74	78	78	100
RUTT	1 SL	2 SL	1 SL		
FLUSH	1 SL	1 SL			
CORR					
RAVEL		1 SL	1 SL		
ALLG CR					
LONG CR		1 MO	1 MO	3 SL	
TRANS CR		1 MO	2 MO	3 SL	
CRACKS	SEAL	PS	PS	PS	
PATCHING					
FAIL/MI	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	80	67	67	61	74
ROADSIDE	77	85	87	80	77
DRAINAGE	97	80	87	80	87
TRAFFIC SER	90	88	90	80	80

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	4	4	4	2

TRAFFIC

1980 ADT:	6650
1980 PERCENT TRUCKS:	23.0
2/69-12/82 VEHICLES:	14559666
2/69-12/82 18K AXLES:	3842609

SKID NUMBER

DATE	AVG	LOW	HIGH
6/76	41	36	43

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.72	.294	10	7.9	3.20	4.10
77	3.79	.300	10	7.9	3.10	4.00
76	3.96	.334	10	8.4	3.20	4.40
75	4.02	.113	10	2.8	3.90	4.20
74	4.23	.142	10	3.4	4.00	4.40
73	3.15	.260	10	8.4	2.60	3.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/28/75	.800	.213	.202	.078

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.516	.235

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	31	MAINT	10/79							AC	6.0	1.0		2.0			
2	SB FSRL	31	MAINT	10/79									1.0					
3	S SC	29	MAINT	9/78		316	B		3	84	AC		.4		.4			
4	S HMAC	26	MAINT	9/73		340		D			AC	5.3		1.5	1.5			
5	S HMAC	14	NEW CON	2/69		340					AC	5.0		1.7	1.7			
6	S HMAC	14	NEW CON	2/69		340		D			AC	5.5		1.4	1.4			
7	B FLEX	14	NEW CON	2/69	LIMESTONE/CALICHE	248		A	4					8.0	.0			
8	B LST	14	NEW CON	2/69	LIMESTONE/CALICHE	232		B	2		LIME	1.0		10.0	.0			
9	SB LSS	14	NEW CON	2/69		260					LIME	2.0		6.0	6.0			
10	SG CLAY	14	NEW CON	2/69	CL,CH											4.5	47.5	27.5

LOCATION

SECTION ID NO: 424
DISTRICT NO: 4
COUNTY NO/NAME: 104/HARTLEY
CONTROL-SECTION: 238- 2
HIGHWAY: US 54
MILE POINTS: 14.640 - 16.580
LANE: R

FROM POST 34 TO POST 36

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-22.0
MEAN TEMPERATURE:	36	37	43	54	64	72	77	75	67	56	43	36	55.4
PRECIPITATION:	.3	.4	.8	.9	2.4	2.4	3.4	2.4	1.6	1.2	.6	.5	16.7
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	1	1	7
TOTAL F-T CYCLES:	24	21	15	3	0	0	0	0	0	1	16	24	108
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	11.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	74
PRS	82	73	83	95
RUTT		1 SL	1 SL	1 SL
FLUSH	1 MO	1 SL	1 SL	1 SL
CORR				
RAVEL		1 SL	1 SL	
ALLG CR	1 SL	1 MO		
LONG CR		1 MO	1 MO	
TRANS CR	1 SL			
CRACKS	NS	PS	PS	
PATCHING				
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	74	81	80	74
ROADSIDE	77	82	85	82
DRAINAGE	73	87	83	80
TRAFFIC SER	94	90	90	88

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	4	4	3

TRAFFIC

1980 ADT:	2384
1980 PERCENT TRUCKS:	25.0
8/45-12/82 VEHICLES:	9193115
8/45-12/82 18K AXLES:	2654332

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	51	45	58
8/76	47	45	50

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.31	.223	10	5.2	3.90	4.60
77	4.23	.258	10	6.1	3.80	4.60
76	4.50	.308	9	6.8	4.00	4.80
74	4.57	.173	9	3.8	4.20	4.70
73	4.36	.120	9	2.5	4.20	4.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/28/75	.768	.069	.219	.049

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.600	.257

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	19	WID-STR	8/72		340		D			AC	5.0		1.3	.0			
2	B FLEX	19	WID-STR	8/72	LIMESTONE/CALICHE	232		B	2					.0	10.5			
3	B AS	19	WID-STR	8/72	LIMESTONE/CALICHE	2043			4		AC	6.8		3.0	3.0			
4	S HMAC	5	NEW CON	8/45		SP					AC	5.2		1.5	.0			
5	B FLEX	5	NEW CON	8/45	LIMESTONE/CALICHE	211								9.0	3.0			
6	SG CLAY	5	NEW CON	8/45	CL,SC,SM											3.9	28.8	12.8

LOCATION

SECTION ID NO: 555
DISTRICT NO: 5
COUNTY NO/NAME: 219/SWISHER
CONTROL-SECTION: 67- 3
HIGHWAY: US 87
MILE POINTS: 24.040 - 26.040
LANE: R

FROM POST 24 TO POST 26

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-22.7
MEAN TEMPERATURE:	36	39	46	56	66	74	77	75	68	58	46	39	57.2
PRECIPITATION:	.4	.4	.9	1.0	2.2	4.0	2.3	2.1	2.2	1.7	.6	.5	18.2
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	1	1	6
TOTAL F-T CYCLES:	21	19	12	2	0	0	0	0	0	0	11	21	89
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	14.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	65	61	88	30	41	19
RUTT	1 SL	2 SL	2 SL		2 MO	2 SL
FLUSH	2 MO	2 MO		3 SE	3 SE	2 MO
CORR						
RAVEL	1 SL	1 SL				
ALLG CR	3 SL	2 SL	2 SL	2 SL		2 SE
LONG CR		1 SL		2 MO	1 SL	3 SE
TRANS CR	1 SL	2 SL		3 SE	3 SE	2 SE
CRACKS	NS	PS		NS	NS	NS
PATCHING				3 G	2 F	2 F
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	57	60	74	70	71	79
ROADSIDE	65	82	92	77	85	85
DRAINAGE	50	77	83	63	80	90
TRAFFIC SER	94	76	78	78	84	86
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	5	7	7	5	4	7

TRAFFIC

1980 ADT: 5100
1980 PERCENT TRUCKS: 18.0
9/53-12/82 VEHICLES: 21921680
9/53-12/82 18K AXLES: 4337509

SKID NUMBER

DATE	AVG	LOW	HIGH
1/76	16	9	31
5/73	25	15	52

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.76	.474	10	17.2	2.10	3.70
77	2.94	.288	10	9.8	2.50	3.50
76	2.26	.540	10	23.9	1.50	3.30
75	2.48	.461	10	18.6	1.80	3.10
74	2.48	.343	10	13.8	2.10	3.10
73	2.33	.430	10	18.4	1.80	3.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 3/75	1.566	.338	.583	.181

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.523	.251

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	32	MAINT	9/69	PRECOATED AGGREGATE	316		PB	SP	100	AC-5		.3	.3	.3			
2	S HMAC	28	MAINT	9/62		880		D			AC	5.4		1.3	1.3			
3	S ST	16	NEW CON	9/53		306		A	1	60	OA-230		.3	.5	.5			
4	S ST	16	NEW CON	9/53		306		A	2	110	OA-230		.4	.3	.3			
5	S ST	16	NEW CON	9/53		306		A	10	150	OA-230		.3	.2	.2			
6	B FLEX	16	NEW CON	9/53	LIMESTONE/CALICHE	211								10.0	10.0			
7	SG CLAY	16	NEW CON	9/53	CL,CH											4.5	47.5	27.5

LOCATION

SECTION ID NO: 602
DISTRICT NO: 6
COUNTY NO/NAME: 69/ECTOR
CONTROL-SECTION: 4- 7
HIGHWAY: IH 20
MILE POINTS: 25.990 - 27.990
LANE: L

FROM POST 110 TO POST 108

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-38.7
MEAN TEMPERATURE:	43	47	55	64	73	79	81	80	74	64	52	45	63.6
PRECIPITATION:	.4	.6	.5	.7	1.7	1.6	2.1	1.8	2.3	1.4	.5	.4	14.1
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	14	9	3	0	0	0	0	0	0	0	3	10	41
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	24.7
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	81	100	75	86	95	100
RUTT	2 SL	1 SL	1 MO	2 SL	1 SL	
FLUSH	1 SL		3 MO	2 MO	1 SL	
CORR			1 MO			
RAVEL	1 SL		1 SL			
ALLG CR						
LONG CR	1 MO					
TRANS CR						
CRACKS	PS					
PATCHING			1 G			
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	84	80	80	69	71	86
ROADSIDE	80	70	85	72	70	90
DRAINAGE	97	83	87	80	90	90
TRAFFIC SER	88	90	92	74	78	92
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	0	6	3	4	1

TRAFFIC

1980 ADT: 9204
1980 PERCENT TRUCKS: 40.0
11/70-12/82 VEHICLES: 18526112
11/70-12/82 18K AXLES: 8946283

SKID NUMBER

DATE	AVG	LOW	HIGH
11/76	25	12	45

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.42	.148	10	3.3	4.10	4.60
77	4.48	.123	10	2.7	4.30	4.60
76	4.22	.339	10	8.0	3.50	4.60
75	4.05	.395	10	9.8	3.30	4.60
74	4.38	.266	10	6.1	3.90	4.70
73	4.40	.133	10	3.0	4.30	4.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
6/28/76	.232	.095	.071	.047

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.672	.281

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	49	MAINT	3/73		340		C			AC	5.4		2.1	2.1			
2	S HMAC	49	MAINT	3/73		340		D			AC	5.4		1.3	1.3			
3	S ST	39	NEW CON	11/70		322		A	3	90	AC		.3	.3	.3			
4	S ST	39	NEW CON	11/70		322		A	5	120	AC		.3	.2	.2			
5	B FLEX	39	NEW CON	11/70	LIMESTONE/CALICHE	232		A	2					9.0	.0			
6	B FLEX	39	NEW CON	11/70		1415		A	1					10.0	.0			
7	SG SAND	39	NEW CON	11/70	SM,CL,GM											3.1	33.3	13.0

LOCATION

SECTION ID NO: 657
DISTRICT NO: 6
COUNTY NO/NAME: 186/PECOS
CONTROL-SECTION: 441- 7
HIGHWAY: IH 10
MILE POINTS: 22.540 - 23.550
LANE: L

FROM POST 251 TO POST 250

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-42.4
MEAN TEMPERATURE:	45	48	55	65	72	79	81	79	74	64	54	47	64.1
PRECIPITATION:	.4	.7	.4	.5	1.6	1.2	1.3	1.3	2.1	1.3	.8	.4	12.0
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	1	3
TOTAL F-T CYCLES:	13	9	4	0	0	0	0	0	0	0	4	10	42
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.0
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	98	95	95	100	100	84
RUTT	2 SL	1 SL				
FLUSH						2 SL
CORR				2 SL		
RAVEL		1 SL	1 SL			
ALLG CR						
LONG CR						1 SL
TRANS CR						1 SL
CRACKS	SEAL					NS
PATCHING		1 G				
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***

RATING SCORES

SHOULDER	90	80	80	67	74	79
ROADSIDE	80	85	82	77	72	77
DRAINAGE	90	87	83	80	90	90
TRAFFIC SER	80	88	92	82	88	88
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	1	2	1	2	2	5

TRAFFIC

1980 ADT:	0
1980 PERCENT TRUCKS:	.0
8/71-12/82 VEHICLES:	0
8/71-12/82 18K AXLES:	0

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.03	.195	10	4.8	3.60	4.20
77	4.30	.187	5	4.4	4.10	4.50
76	4.48	.130	5	2.9	4.30	4.60
75	4.18	.192	5	4.6	3.90	4.40
74	4.26	.114	5	2.7	4.10	4.40
73	4.18	.096	4	2.3	4.10	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
12/ 8/75	.176	.049	.044	.016

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.681	.309

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	35	MAINT	10/73		340		C			AC	5.3		2.1	2.1			
2	S HMAC	35	MAINT	10/73		340		D			AC	5.3		1.3	1.3			
3	S ST	30	NEW CON	8/71		322		A	3	95	AC		.3	.3	.3			
4	S ST	30	NEW CON	8/71		322		A	5	125	AC		.3	.2	.2			
5	B FLEX	30	NEW CON	8/71		1415		A	4					7.0	7.0			
6	B FLEX	30	NEW CON	8/71		1415		A	1					10.0	.0			
7	SG CLAY	30	NEW CON	8/71	CL,CH,ML												43.4	24.2

LOCATION

SECTION ID NO: 660
DISTRICT NO: 6
COUNTY NO/NAME: 186/PECOS
CONTROL-SECTION: 292- 6
HIGHWAY: SH 18
MILE POINTS: 21.670 - 23.670
LANE: L

FROM POST 24 TO POST 22

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-42.4
MEAN TEMPERATURE:	45	48	55	65	72	79	81	79	74	64	54	47	64.1
PRECIPITATION:	.4	.7	.4	.5	1.6	1.2	1.3	1.3	2.1	1.3	.8	.4	12.0
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	1	3
TOTAL F-T CYCLES:	13	9	4	0	0	0	0	0	0	0	4	10	42
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.0
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	63	90	78	90	92	88
RUTT	1 SL	2 SL			1 SL	
FLUSH	2 SL	2 SL	2 MO	3 SL	2 SL	2 MO
CORR						
RAVEL			1 SL			
ALLG CR	1 MO					
LONG CR	2 MO		1 SL			1 SL
TRANS CR	1 MO					
CRACKS	PS		NS			
PATCHING						
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	79	77	64	64	66	80
ROADSIDE	85	87	82	72	82	77
DRAINAGE	90	87	83	80	90	90
TRAFFIC SER	92	86	82	76	88	92

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	4	2	3	3	2	5

TRAFFIC

1980 ADT: 1085
1980 PERCENT TRUCKS: 18.0
9/64-12/82 VEHICLES: 3570819
9/64-12/82 18K AXLES: .706297

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.57	.106	10	2.3	4.40	4.70
77	4.49	.228	10	5.1	4.00	4.70
76	4.79	.185	10	3.9	4.30	4.90
75	4.60	.283	9	6.1	4.00	4.90
74	4.58	.228	9	5.0	4.20	4.80
73	4.50	.112	9	2.5	4.30	4.70

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
12/ 8/75	.741	.263	.293	.125

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.523	.296

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	13	MAINT	7/69		340		D			AC	6.8		1.5	1.5			
2	S ST	10	NEW CON	9/64		322		A	3	95	AC-5		.3	.3	.3			
3	S ST	10	NEW CON	9/64		322		A	4	125	AC-5		.3	.2	.2			
4	B FLEX	10	NEW CON	9/64	LIMESTONE/CALICHE	232		A	2					7.5	.0			
5	B FLEX	10	NEW CON	9/64	LIMESTONE/CALICHE	252								2.5	.0			
6		10	NEW CON	9/64														

LOCATION

SECTION ID NO: 759
DISTRICT NO: 7
COUNTY NO/NAME: 119/IRION
CONTROL-SECTION: 77- 2
HIGHWAY: US 67
MILE POINTS: 5.120 - 7.120
LANE: L

FROM POST 38 TO POST 36

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-30.6
MEAN TEMPERATURE:	43	47	56	66	73	79	82	81	75	65	54	46	64.4
PRECIPITATION:	.8	1.0	.7	1.7	2.4	2.0	1.1	3.1	2.9	2.3	1.1	.7	19.8
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	13	8	3	0	0	0	0	0	0	0	3	10	40
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.4
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	73
PRS	95	88	77	90	78
RUTT	1 SL	2 SL	2 SL		
FLUSH	1 SL		1 MO	1 MO	1 MO
CORR					
RAVEL		1 MO	1 SL		
ALLG CR					
LONG CR			1 SL		1 SL
TRANS CR			1 SL		2 SL
CRACKS			PS		NS
PATCHING				1 G	
FAIL/MI	0	0	0	0	0
*** *** ***	***	***	***	***	***
RATING SCORES					
SHOULDER	79	81	77	69	67
ROADSIDE	77	77	80	77	80
DRAINAGE	90	73	83	67	83
TRAFFIC SER	86	90	92	80	84
*** *** ***	***	***	***	***	***
PVMT URGENCY	2	1	4	3	5

TRAFFIC

1980 ADT: 1200
1980 PERCENT TRUCKS: 18.0
2/37-12/82 VEHICLES: 7271662
2/37-12/82 18K AXLES: 1438732

SKID NUMBER

DATE	AVG	LOW	HIGH
2/75	33	11	41

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.12	.308	10	9.9	2.70	3.70
77	3.45	.381	10	11.0	2.90	4.20
76	3.35	.621	10	18.5	2.50	4.50
75	3.29	.376	10	11.4	2.90	4.10
73	3.23	.173	9	5.4	3.00	3.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
12/11/75	1.695	.452	.792	.270

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.415	.283

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	21	MAINT	8/77		316		PB	3	85	AC-5		.4		.3			
2	S SC	19	MAINT	11/73										.3	.3			
3	S SC	17	MAINT	9/68	PRECOATED AGGREGATE	316		PB	4	95	AC-10		.3	.3	.3			
4	S SC	11	MAINT	8/60	PRECOATED AGGREGATE	303		PRECO	2P	95	OA-175		.3	.3	.3			
5	S HMCL	6	MAINT	7/55		SP					MC-3			1.5	1.5			
6	S ST	3	NEW CON	2/37		60	MO			40	OA-230		.3	.7	.7			
7	S ST	3	NEW CON	2/37		60	MO			80	OA-230		.5	.4	.4			
8	B FLEX	3	NEW CON	2/37	LIMESTONE/CALICHE	35	MO							5.0	5.0			
9	SG CLAY	3	NEW CON	2/37	CL,CH,MH											4.2	47.9	26.7

LOCATION

SECTION ID NO: 848
DISTRICT NO: 8
COUNTY NO/NAME: 30/CALLAHAN
CONTROL-SECTION: 7- 1
HIGHWAY: IH 20
MILE POINTS: 17.670 - 19.670
LANE: R

FROM POST 311 TO POST 313

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-19.7
MEAN TEMPERATURE:	43	47	55	65	73	79	83	82	75	66	54	46	64.5
PRECIPITATION:	1.5	1.5	1.2	2.8	3.2	2.9	2.0	2.2	4.1	2.6	1.6	1.1	26.8
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	4
TOTAL F-T CYCLES:	13	8	4	0	0	0	0	0	0	0	3	9	40
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.4
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	90	78	88	100	100
RUTT	2 SL	2 SL	2 SL		
FLUSH	2 SL	1 SL	1 SL		
CORR					
RAVEL		2 SL	1 SL		
ALLG CR					
LONG CR		1 MO			
TRANS CR					
CRACKS		PS			
PATCHING					
FAIL/MI	0	0	0	0	0
*** *** ***	***	***	***	***	***

RATING SCORES

SHOULDER	84	74	84	67	77
ROADSIDE	87	75	82	67	72
DRAINAGE	90	67	83	70	90
TRAFFIC SER	90	82	92	80	82
*** *** ***	***	***	***	***	***
PVMT URGENCY	2	4	1	2	2

TRAFFIC

1980 ADT:	9200
1980 PERCENT TRUCKS:	33.0
10/66-12/82 VEHICLES:	22352768
10/66-12/82 18K AXLES:	8727867

SKID NUMBER

DATE	AVG	LOW	HIGH
9/76	22	20	25
9/75	27	22	31
12/74	25	21	33

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.76	.587	10	15.6	2.20	4.10
77	4.34	.135	10	3.1	4.10	4.50
76	4.81	.074	10	1.5	4.70	4.90
75	4.40	.100	3	2.3	4.30	4.50
74	4.50	.173	3	3.9	4.30	4.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/20/75	.228	.044	.032	.011

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.686	.238

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	37	MAINT	6/80	LIGHTWEIGHT	316		LT WT	4	120	AC		.3		.3			
2	S HMAC	33	MAINT	10/73	LIMESTONE/CALICHE	340		D			AC	6.0		1.2	1.2			
3	S ASB	33	MAINT	10/73	LIMESTONE/CALICHE	292			4		AC	6.0		4.7	.0			
4	S SC	31	MAINT	10/71	PRECOATED AGGREGATE	316		PB	4	90	ASPHAL		.3	.3	.3			
5	S HMAC	21	NEW CON	10/66							AC			3.0	3.0			
6	B FLEX	21	NEW CON	10/66										23.0	23.0			
7	SG CLAY	21	NEW CON	10/66	CL,CH,ML											5.4	48.6	24.4

LOCATION

SECTION ID NO: 877
DISTRICT NO: 8
COUNTY NO/NAME: 77/FISHER
CONTROL-SECTION: 296- 3
HIGHWAY: US 180
MILE POINTS: 11.720 - 13.670
LANE: R

FROM POST 28 TO POST 30

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-26.9
MEAN TEMPERATURE:	42	46	54	65	72	80	83	81	74	64	52	45	63.8
PRECIPITATION:	.8	.8	.9	1.7	3.4	2.8	1.9	2.7	3.2	2.6	1.0	.7	22.5
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	4
TOTAL F-T CYCLES:	16	10	5	0	0	0	0	0	0	0	4	12	49
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	24.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	85	92	60	48	68	97
RUTT		1 SL	1 SL			
FLUSH	1 SL	1 SL				
CORR						
RAVEL	1 SL		2 SL			
ALLG CR			1 MO	2 MO		
LONG CR			1 MO	3 MO	2 MO	1 SL
TRANS CR	1 MO	1 SL	2 MO	3 MO	3 SE	
CRACKS	SEAL	NS	PS	PS	PS	PS
PATCHING	1 G		3 G	2 F	1 G	
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	71	77	70	69	60	84
ROADSIDE	70	82	87	77	72	87
DRAINAGE	63	77	80	80	90	90
TRAFFIC SER	78	90	90	62	78	88
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	2	4	6	4	2

TRAFFIC

1980 ADT:	1000
1980 PERCENT TRUCKS:	23.0
6/33-12/82 VEHICLES:	9732975
6/33-12/82 18K AXLES:	2567028

SKID NUMBER

DATE	AVG	LOW	HIGH
9/75	45	36	57
9/75	50	42	58
1/75	50	35	63
1/75	48	39	60

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.97	.437	10	14.7	2.40	3.70
77	3.63	.362	10	10.0	3.20	4.30
76	3.66	.553	9	15.1	3.10	4.60
75	3.31	.592	9	17.9	2.60	4.20
74	3.40	.680	9	20.0	2.50	4.40

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/20/75	.882	.313	.296	.121

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.510	.263

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	25	MAINT	8/77		316	B	PB	3	95	AC		.3		.3			
2	S HMAC	22	WID-STR	10/68	LIMESTONE/CALICHE	340		D			AC	5.6		2.3	2.3			
3	S ST	22	WID-STR	10/68		322		A	3	80	AC		.3	.4	.4			
4	S ST	22	WID-STR	10/68		322		A	4	100	AC		.4	.3	.3			
5	B FLEX	22	WID-STR	10/68	LIMESTONE/CALICHE	232		A	2					.0	4.0			
6	B FLEX	22	WID-STR	10/68	CRUSHED STONE	242		B	2					.0	8.0			
7	S SC	14	MAINT	9/58										.3	.3			
8	S HMAC	10	MAINT	9/49										1.5	1.5			
9	S ST	4	NEW CON	6/33										1.0	1.0			
10	B FLEX	4	NEW CON	6/33										10.0	10.0			
11	SG CLAY	4	NEW CON	6/33	CL,SC,SM												35.1	17.7

LOCATION

SECTION ID NO: 893
DISTRICT NO: 8
COUNTY NO/NAME: 168/MITCHELL
CONTROL-SECTION: 5- 8
HIGHWAY: IH 20
MILE POINTS: 12.180 - 14.170
LANE: R

FROM POST 208 TO POST 210

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-25.4
MEAN TEMPERATURE:	44	48	56	67	74	81	83	82	75	66	54	47	65.3
PRECIPITATION:	2.6	.8	.9	1.8	3.1	2.5	1.7	2.8	3.2	2.1	1.1	.7	23.3
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	14	9	3	0	0	0	0	0	0	0	3	11	43
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	75	65	25	78	97	100
RUTT	1 SL	2 SL	2 SL	2 SL	1 SL	
FLUSH	1 MO	2 SL	2 SE	2 MO		
CORR						
RAVEL	1 SL	1 SL	1 SL			
ALLG CR	1 MO	2 MO				
LONG CR			1 SE	1 SL	1 SL	
TRANS CR			2 SE	1 SL		
CRACKS	SEAL	NS	NS	PS	PS	
PATCHING		1 F	3 P	2 G		
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	81	79	77	70	73	86
ROADSIDE	67	80	77	72	75	87
DRAINAGE	83	87	90	70	90	90
TRAFFIC SER	78	76	88	72	90	94

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	4	7	7	4	2	1

TRAFFIC

1980 ADT:	7200
1980 PERCENT TRUCKS:	33.0
11/57-12/82 VEHICLES:	25833904
11/57-12/82 18K AXLES:	10087439

SKID NUMBER

DATE	AVG	LOW	HIGH
9/76	40	26	48
9/75	44	39	51
7/75	51	46	54
12/74	34	28	38

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.74	.769	10	28.1	1.00	3.60
77	3.94	.190	10	4.8	3.60	4.20
76	4.47	.267	10	6.0	4.00	4.80
75	4.32	.132	10	3.0	4.10	4.60
74	4.60	.189	10	4.1	4.30	4.90
73	4.42	.130	10	3.0	4.20	4.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/20/75	1.192	.351	.354	.184

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.460	.244

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	53	MAINT	10/73		340		D			AC	6.0		1.3	2.0			
2	S SC	57	MAINT	10/69	LIGHTWEIGHT	316		F	4	90	AC		.3	.3	.3			
3	S SC	47	MAINT	7/66	LIGHTWEIGHT	316		F	4	100	AC		.3	.3	.3			
4	S SC	35	MAINT	8/61		303		B	5	90	OA-135		.3	.3	.3			
5	S HMAC	31	NEW CON	11/57		317		D			OA-90	5.0		2.0	2.0			
6	SG SAND	31	NEW CON	11/57	SC,CL,SM											4.0	29.3	12.6

LOCATION

SECTION ID NO: 924
DISTRICT NO: 9
COUNTY NO/NAME: 14/BELL
CONTROL-SECTION: 15- 6
HIGHWAY: IH 35
MILE POINTS: 11.150 - 13.150
LANE: L

FROM POST 291 TO POST 289

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-12.5
MEAN TEMPERATURE:	47	51	58	67	74	80	83	83	78	68	58	50	66.8
PRECIPITATION:	2.1	2.4	1.8	2.9	4.5	2.8	2.3	3.1	3.4	3.9	2.1	1.9	33.3
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	9	4	1	0	0	0	0	0	0	0	1	5	23
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	29.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	90	46	81	82	90	90
RUTT	2 SL	3 SL	2 SL			
FLUSH	2 SL	1 MO	1 SL	1 SL	2 SL	1 MO
CORR						
RAVEL			1 SL			
ALLG CR		1 MO				
LONG CR		2 MO		1 SL		
TRANS CR		1 MO		1 SL		
CRACKS		PS		NS		
PATCHING		3 F	2 F	3 G	2 G	
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	67	69	74	76	79	80
ROADSIDE	65	75	85	77	82	77
DRAINAGE	93	80	83	80	80	90
TRAFFIC SER	82	80	82	82	82	90
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	5	2	3	2	2

TRAFFIC

1980 ADT:	16116
1980 PERCENT TRUCKS:	18.0
8/58-12/82 VEHICLES:	46965520
8/58-12/82 18K AXLES:	9294974

SKID NUMBER

DATE	AVG	LOW	HIGH
1/76	36	22	55
1/75	45	27	57

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.70	.287	10	7.7	3.30	4.10
77	4.23	.200	10	4.7	3.90	4.50
76	4.12	.162	10	3.9	3.80	4.30
75	4.06	.101	9	2.5	3.90	4.20
74	4.39	.117	9	2.7	4.20	4.60
73	4.11	.040	6	.9	4.10	4.20

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/10/76	.622	.277	.191	.074

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.502	.270

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	36	MAINT	7/71	LIGHTWEIGHT	316		LT. W	4					.3	.3			
2	S HMAC	30	MAINT	4/67		340		D MOD			AC	4.5		1.5	1.5			
3	S HMAC	20	NEW CON	8/58		317		C			ASPHAL	5.9		2.0	2.0			
4	B FLEX	20	NEW CON	8/58		218								4.0	4.0			
5	B FLEX	20	NEW CON	8/58	CRUSHED STONE	215A								6.0	.0			
6	B FLEX	20	NEW CON	8/58	CRUSHED STONE	215A								6.0	.0			
7	SG CLAY	20	NEW CON	8/58	CH,CL,MH												53.0	30.0

LOCATION

SECTION ID NO: 937
DISTRICT NO: 9
COUNTY NO/NAME: 14/BELL
CONTROL-SECTION: 185- 1
HIGHWAY: US 190
MILE POINTS: 36.050 - 38.030
LANE: L

FROM POST 38 TO POST 36

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-12.5
MEAN TEMPERATURE:	47	51	58	67	74	80	83	83	78	68	58	50	66.8
PRECIPITATION:	2.1	2.4	1.8	2.9	4.5	2.8	2.3	3.1	3.4	3.9	2.1	1.9	33.3
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	9	4	1	0	0	0	0	0	0	0	1	5	23
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	29.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	87	85	95	100	100	100
RUTT	1 SL	2 SL				
FLUSH	1 SL					
CORR						
RAVEL	2 SL		1 SL			
ALLG CR						
LONG CR		2 SL				
TRANS CR		1 SL				
CRACKS		NS				
PATCHING						
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	67	80	83	81	74	80
ROADSIDE	75	87	87	72	75	72
DRAINAGE	83	77	73	80	80	90
TRAFFIC SER	82	86	82	80	84	86

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	2	1	2	2	2

TRAFFIC

1980 ADT: 0
1980 PERCENT TRUCKS: .0
4/46-12/82 VEHICLES: 0
4/46-12/82 18K AXLES: 0

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.87	.200	10	5.2	3.60	4.30
77	4.35	.212	10	4.9	4.10	4.70
76	4.51	.218	10	4.8	4.10	4.80
75	4.26	.331	10	7.8	3.70	4.60
74	4.42	.270	10	6.1	4.00	4.70
73	4.21	.230	7	5.4	3.90	4.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/10/76	.911	.212	.240	.102

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.644	.206

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	19	MAINT	5/80									1.0					
2	S HMAC	18	MAINT	10/72		340		D MOD			AC	4.5		1.2	1.2			
3	S SC	14	MAINT	5/66		316								.3	.3			
4	S HMAC	10	WID-STR	6/63		340		D			AC	4.8		1.5	1.5			
5	S.ST	10	WID-STR	6/63		320		A	5	125	OA-135		.3	.2	.2			
6	B FLEX	10	WID-STR	6/63		242		B	2					10.5	.0			
7	B AS	4	NEW CON	4/46	SILICEOUS						ASPHAL			8.5	8.5			
8	SG CLAY	4	NEW CON	4/46	CH,CL												69.1	46.0

LOCATION

SECTION ID NO: 953
DISTRICT NO: 9
COUNTY NO/NAME: 14/BELL
CONTROL-SECTION: 836- 2
HIGHWAY: FM 440
MILE POINTS: 5.970 - 7.960
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-12.5
MEAN TEMPERATURE:	47	51	58	67	74	80	83	83	78	68	58	50	66.8
PRECIPITATION:	2.1	2.4	1.8	2.9	4.5	2.8	2.3	3.1	3.4	3.9	2.1	1.9	33.3
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	9	4	1	0	0	0	0	0	0	0	1	5	23
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	29.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	100	88	100	90	100
RUTT	1 SL	1 SL				
FLUSH						
CORR						
RAVEL	1 SL		1 SL			
ALLG CR					1 SL	
LONG CR	1 MO					
TRANS CR						
CRACKS	NS	NS				
PATCHING	1 P	1 G	1 P	1 G	1 F	
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***

RATING SCORES

SHOULDER	65	80	74	70	77	81
ROADSIDE	77	55	80	72	75	70
DRAINAGE	70	70	83	80	73	73
TRAFFIC SER	70	86	74	82	84	84
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	2	2	3	4	2

TRAFFIC

1980 ADT:	4439
1980 PERCENT TRUCKS:	8.0
11/62-12/82 VEHICLES:	12058258
11/62-12/82 18K AXLES:	939090

SKID NUMBER

DATE	AVG	LOW	HIGH
1/76	24	21	25
1/75	24	22	28

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.59	.398	9	15.4	1.90	3.10
77	4.19	.213	10	5.1	3.70	4.40
76	3.95	.263	10	6.7	3.40	4.40
75	3.83	.240	9	6.3	3.30	4.10
74	4.06	.219	9	5.4	3.70	4.50
73	3.85	.070	10	1.8	3.70	3.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/10/76	.928	.181	.416	.083

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.560	.303

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	21	MAINT	8/78	LIGHTWEIGHT	316		LT WT	4	120	EA-HVR		.4		.3			
2	S HMAC	16	MAINT	5/70		340		D MOD			AC	4.4		1.5	1.5			
3	S ST	12	NEW CON	11/62		322		A	3	95	OA-135		.3	.3	.3			
4	S ST	12	NEW CON	11/62		322		B	6	150	OA-135		.2	.2	.2			
5	B FLEX	12	NEW CON	11/62	CRUSHED STONE	242		B	2					6.0	.0			
6	SG CLAY	12	NEW CON	11/62	CH,CL,MH												54.3	31.6

LOCATION

SECTION ID NO: 966
DISTRICT NO: 9
COUNTY NO/NAME: 18/BOSQUE
CONTROL-SECTION: 258- 7
HIGHWAY: SH 6
MILE POINTS: 38.000 - 40.000
LANE: R

FROM POST 38 TO POST 40

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-10.2
MEAN TEMPERATURE:	43	48	55	66	73	80	83	83	77	67	55	47	65.2
PRECIPITATION:	2.1	2.3	1.6	3.6	4.4	3.5	1.9	2.2	3.4	3.9	2.4	2.0	33.2
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	11	7	1	0	0	0	0	0	0	0	1	7	29
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	86	85	75	85	95	63
RUTT	2 SL	2 SL	1 SL			
FLUSH	2 MO	1 SL	2 MO	2 SL	1 SL	
CORR	1 SL					
RAVEL		1 SL				1 SL
ALLG CR			1 SL			
LONG CR			1 SL			3 MO
TRANS CR		1 SL	1 SL	2 SL		2 MO
CRACKS	SEAL	NS	NS	NS		NS
PATCHING				1 G	1 G	
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	70	73	80	71	73	79
ROADSIDE	77	80	90	77	62	77
DRAINAGE	80	73	83	80	70	83
TRAFFIC SER	82	84	84	78	82	84
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	1	6	3	2	6

TRAFFIC

1980 ADT: 3000
1980 PERCENT TRUCKS: 14.0
9/66-12/82 VEHICLES: 7619107
9/66-12/82 18K AXLES: 1147743

SKID NUMBER

DATE	AVG	LOW	HIGH
1/76	20	17	21
1/76	20	17	21
1/75	22	18	25
2/73	28	0	0
1/72	23	0	0

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.60	.406	10	11.3	2.70	4.00
77	4.46	.190	10	4.3	4.10	4.60
76	4.31	.437	9	10.1	3.20	4.60
75	4.58	.169	10	3.7	4.20	4.80
74	4.53	.158	9	3.5	4.20	4.70
73	3.67	.240	9	6.6	3.30	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 9/76	.869	.208	.211	.054

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.598	.230

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	29	MAINT	9/74										.3	.3			
2	S HMAC	28	MAINT	4/74		340		D	MOD		AC	4.6		1.1	.0			
3	S HMAC	25	RECONST	9/66		340		D			AC	4.8		1.1	1.1			
4	B FLEX	25	RECONST	9/66		246								14.0	.0			
5	B AS	25	RECONST	9/66		1222		A			ASPHAL	5.0		2.0	2.0			
6	SG CLAY	25	RECONST	9/66	CH,CL											4.5	70.0	42.0

LOCATION

SECTION ID NO: 995
DISTRICT NO: 9
COUNTY NO/NAME: 110/HILL
CONTROL-SECTION: 14- 7
HIGHWAY: IH 35
MILE POINTS: 5.571 - 7.599
LANE: L

FROM POST 363 TO POST 361

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-7.7
MEAN TEMPERATURE:	43	48	55	66	73	80	84	84	77	67	55	48	65.4
PRECIPITATION:	2.1	2.2	2.0	3.9	4.7	3.4	2.0	2.2	3.6	4.3	2.6	2.2	35.3
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	10	6	2	0	0	0	0	0	0	0	2	6	29
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75
PRS	85	83	85	100
RUTT	2 MO	2 SL	1 SL	
FLUSH			1 SL	
CORR				
RAVEL			1 SL	
ALLG CR			1 SL	
LONG CR	2 MO	2 MO		
TRANS CR				
CRACKS	SEAL	NS		
PATCHING				
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	81	84	83	81
ROADSIDE	85	70	92	90
DRAINAGE	90	80	87	90
TRAFFIC SER	78	84	94	90

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY 2 3 2 1

TRAFFIC

1980 ADT:	0
1980 PERCENT TRUCKS:	.0
11/57-12/82 VEHICLES:	0
11/57-12/82 18K AXLES:	0

SKID NUMBER

DATE	AVG	LOW	HIGH
2/77	54	46	57
1/76	48	47	50
1/75	25	21	26

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.08	.162	10	4.0	3.80	4.30
77	4.62	.113	10	2.5	4.40	4.80
76	4.66	.151	10	3.2	4.40	4.80
75	4.87	.100	9	2.1	4.70	5.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 9/76	.551	.091	.087	.023

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.626	.213

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	58	MAINT	11/74	SILICEOUS	340		D MOD			AC	4.5		3.5	3.5			
2	S HMAC	58	MAINT	11/74	SILICEOUS	340		DL			AC	8.8		.7	.7			
3	S SC	52	MAINT	10/69		316		LT. W	4	120	EA-HVR		.4	.2	.2			
4	S HMAC	49	MAINT	8/67		340		D MOD			AC	4.7		1.0	.0			
5	S HMAC	43	MAINT	8/62		340		D			AC	5.2		1.5	.0			
6	S HMAC	27	NEW CON	11/57							AC			2.7	2.7			
7	B FLEX	27	NEW CON	11/57										17.5	17.5			
8	SG CLAY	27	NEW CON	11/57	CH												74.0	49.5

LOCATION

SECTION ID NO: 1001
DISTRICT NO: 9
COUNTY NO/NAME: 110/HILL
CONTROL-SECTION: 162- 2
HIGHWAY: SH 31
MILE POINTS: 7.970 - 9.960
LANE: L

FROM POST 10 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-7.7
MEAN TEMPERATURE:	43	48	55	66	73	80	84	84	77	67	55	48	65.4
PRECIPITATION:	2.1	2.2	2.0	3.9	4.7	3.4	2.0	2.2	3.6	4.3	2.6	2.2	35.3
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	10	6	2	0	0	0	0	0	0	0	2	6	29
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	95	66	33	63	90	100
RUTT	1 SL	2 SL	2 SL		1 SL	
FLUSH	1 SL	1 SL	2 SE	2 SL	2 SL	
CORR						
RAVEL			1 SL	1 SL		
ALLG CR		1 MO	2 MO			
LONG CR			1 MO	2 SL		
TRANS CR		2 MO	3 MO	3 SL		
CRACKS		NS	PS	NS		
PATCHING		1 F	3 G	2 G	2 G	
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	57	56	73	76	70	81
ROADSIDE	77	75	92	75	80	75
DRAINAGE	83	77	87	80	80	80
TRAFFIC SER	90	84	94	80	80	90
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	2	7	9	2	3	2

TRAFFIC

1980 ADT:	2900
1980 PERCENT TRUCKS:	14.0
7/42-12/82 VEHICLES:	13730106
7/42-12/82 18K AXLES:	2067966

SKID NUMBER

DATE	AVG	LOW	HIGH
1/76	52	31	60
1/75	56	22	65
2/74	64	41	70

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.94	.284	10	7.2	3.40	4.30
77	3.54	.267	10	7.6	3.10	3.90
76	3.39	.425	10	12.5	2.90	4.00
75	3.45	.360	10	10.4	2.90	4.00
74	3.84	.283	9	7.4	3.30	4.10
73	3.65	.270	10	7.3	3.20	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 8/76	.836	.163	.146	.063

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.013	.194

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	20	MAINT	7/73		316		LT. W	4	120	EA-HVR		.4	.2	.2			
2	S HMAC	18	MAINT	2/68		340		D MOD			AC	4.7		1.5	1.5			
3	S HMAC	9	WID-STR	5/59		317		C			AC	4.0		1.7	1.7			
4	B FLEX	9	WID-STR	5/59	CRUSHED STONE	215A								7.0	.0			
5	S PCC	6	NEW CON	7/42		SP								6.0	.0			
6	B FLEX	6	NEW CON	7/42		213								.0	3.5			
7	SG CLAY	6	NEW CON	7/42	CH,CL,MH											5.1	55.5	34.3

LOCATION

SECTION ID NO: 1043
DISTRICT NO: 10
COUNTY NO/NAME: 93/GREGG
CONTROL-SECTION: 96- 4
HIGHWAY: US 80
MILE POINTS: 6.000 - 8.000
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	36.2
MEAN TEMPERATURE:	44	48	55	65	72	78	82	81	76	66	55	48	64.8
PRECIPITATION:	3.5	3.8	3.5	5.7	4.7	4.7	2.8	2.8	5.4	3.4	3.9	4.2	48.4
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	4
TOTAL F-T CYCLES:	9	6	1	0	0	0	0	0	0	0	2	7	28
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	71	74	82	73	78	58
RUTT	2 SL	2 SL	2 SL			
FLUSH	3 SL	2 MO	2 SL	3 MO	1 SL	1 SL
CORR						
RAVEL	1 MO	2 MO	2 SL	2 MO		
ALLG CR						1 SL
LONG CR					2 SL	3 MO
TRANS CR	1 MO				2 SL	2 MO
CRACKS	NS				NS	NS
PATCHING					1 G	1 G
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	*** ***
RATING SCORES						
SHOULDER	63	81	69	57	57	73
ROADSIDE	80	77	70	75	72	72
DRAINAGE	93	87	50	80	70	70
TRAFFIC SER	66	92	84	54	72	78
*** *** ***	***	***	***	***	***	*** ***
PVMT URGENCY	4	2	2	4	3	4

TRAFFIC

1980 ADT: 11650
1980 PERCENT TRUCKS: 14.0
9/39-12/82 VEHICLES: 64204736
9/39-12/82 18K AXLES: 9672416

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.54	.467	9	18.3	1.90	3.60
77	3.14	.523	10	16.7	2.50	4.10
76	3.29	.610	10	18.5	2.20	4.20
75	3.19	.456	10	14.3	2.40	3.80
73	3.41	.406	7	11.9	3.00	4.20

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/ 4/76	.874	.195	.346	.089

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.503	.263

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	31	MAINT	8/75		316	B	J	3	78	AC		.4	.4	.4			
2	S HMAC	26	MAINT	11/65		340		C			AC	5.2		1.4	1.4			
3	S SC	24	MAINT	11/64										.3	.3			
4	S SC	23	MAINT	10/61		316		PB	4	100	OA-135		.2	.3	.3			
5	S HMAC	19	WID-STR	10/57		317		D			AC			2.0	2.0			
6	S ST	19	WID-STR	10/57		304		B	3		OA-135			.3	.3			
7	B FLEX	19	WID-STR	10/57	IRON ORE	214								6.0	12.0			
8	S PCC	13	NEW CON	9/39		320								6.0	6.0			
9	SG SAND	13	NEW CON	9/39	SC,CL,CH											4.0	38.3	17.8

LOCATION

SECTION ID NO: 1072
DISTRICT NO: 10
COUNTY NO/NAME: 212/SMITH
CONTROL-SECTION: 1934- 2
HIGHWAY: FM 2015
MILE POINTS: .000 - 2.850
LANE: L

FROM POST 6 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-19.5
MEAN TEMPERATURE:	36	39	45	55	65	73	76	75	68	58	45	38	56.5
PRECIPITATION:	.5	.9	1.1	1.1	1.9	3.1	2.7	2.5	1.5	1.8	.6	.6	18.3
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	21	18	13	2	0	0	0	0	0	0	12	23	93
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	13.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	89	86	80	93	85	88
RUTT	1 SL	2 SL	1 MO			
FLUSH						
CORR						
RAVEL		2 MO				1 SL
ALLG CR			1 MO			
LONG CR	1 SL					
TRANS CR	1 SL			1 MO		
CRACKS	PS			NS		
PATCHING	1 F		1 F	1 G	2 P	1 P
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	70	70	60	65	70	80
ROADSIDE	90	77	72	82	77	72
DRAINAGE	83	80	63	80	77	80
TRAFFIC SER	70	86	80	80	80	88

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	2	4	3	4	3

TRAFFIC

1980 ADT:	520
1980 PERCENT TRUCKS:	8.0
4/54-12/82 VEHICLES:	1736396
4/54-12/82 18K AXLES:	134926

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.77	.550	10	19.9	2.10	3.70
77	3.40	.330	10	9.7	2.80	3.80
76	3.18	.704	10	22.1	2.30	4.10
75	3.30	.464	9	14.1	2.50	3.90
74	3.28	.387	9	11.8	2.80	3.80
73	2.98	.487	9	16.3	2.10	3.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/ 4/76	1.231	.546	.533	.248

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.688	.275

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S ST	5	WID-STR	8/67										.6	.6			
2	B FLEX	5	WID-STR	8/67										.0	6.0			
3	S SC	4	MAINT	7/60										.3	.3			
4	S ST	1	NEW CON	4/54		304		A	3	80	OA-135		.3	.4	.4			
5	B FLEX	1	NEW CON	4/54	IRON ORE	214								6.0	6.0			
6	SG CLAY	1	NEW CON	4/54	CL,SC,CH											4.4	40.0	20.6

LOCATION

SECTION ID NO: 1174
DISTRICT NO: 11
COUNTY NO/NAME: 174/NACOGDOCHES
CONTROL-SECTION: 175- 7
HIGHWAY: US 59
MILE POINTS: 9.990 - 12.000
LANE: R

FROM POST 10 TO POST 12

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	39.6
MEAN TEMPERATURE:	45	49	56	65	72	78	81	81	76	66	56	48	65.0
PRECIPITATION:	4.2	3.7	3.8	4.8	4.6	4.4	3.6	4.4	4.7	3.4	4.1	4.6	50.2
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	4
TOTAL F-T CYCLES:	10	7	2	0	0	0	0	0	0	0	2	8	31
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	27.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	83	70	100	100	92	45
RUTT	1 SL	2 SL				2 SL
FLUSH	2 MO	2 MO			1 SL	3 SE
CORR						2 SL
RAVEL	1 SL	2 SL				2 SL
ALLG CR						3 MO
LONG CR		1 SL				
TRANS CR		1 SL			1 SL	
CRACKS	SEAL	NS			NS	
PATCHING						1 F
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	80	81	80	69	70	86
ROADSIDE	67	82	75	77	67	65
DRAINAGE	97	73	83	80	70	67
TRAFFIC SER	86	88	86	86	82	86
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	3	1	1	3	6

TRAFFIC

1980 ADT: 6021
1980 PERCENT TRUCKS: 21.0
9/59-12/82 VEHICLES: 14511271
9/59-12/82 18K AXLES: 3410822

SKID NUMBER

DATE	AVG	LOW	HIGH
11/75	41	34	50
11/75	42	34	49
6/75	29	24	32
3/75	29	22	40

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.39	.509	10	15.0	2.20	3.90
77	4.05	.165	10	4.1	3.90	4.30
76	4.40	.170	10	3.9	4.10	4.60
75	4.13	.195	10	4.7	3.80	4.40
74	3.86	.427	10	11.1	3.20	4.50
73	3.42	.435	4	12.7	2.80	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/30/76	.839	.223	.282	.059

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.539	.252

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	30	MAINT	2/75	SILICEOUS	340		D			AC	4.5		1.0	1.0			
2	S ASB	30	MAINT	2/75	SILICEOUS	292			4A		AC	5.5		2.0	2.0			
3	S SC	32	MAINT	1/74										.3	.3			
4	S SC	27	MAINT	7/68	PRECOATED AGGREGATE	316		PB	4	140	AC-5		.2	.2	.2			
5	S HMAC	23	MAINT	8/65		340		D			AC	5.0		1.3	1.3			
6	S ST	19	RECONST	9/59		305		B	3	100	OA-135		.3	.3	.3			
7	S ST	19	RECONST	9/59	ROCK ASPHALT	305			2P	120	OA-135		.2	.2	.2			
8	B FLEX	19	RECONST	9/59	IRON ORE	214								12.0	12.0			
9	SG CLAY	19	RECONST	9/59	CH,CL,MH											4.6	50.4	23.3

LOCATION

SECTION ID NO: 1190
DISTRICT NO: 11
COUNTY NO/NAME: 202/SABINE
CONTROL-SECTION: 64- 5
HIGHWAY: US 96
MILE POINTS: 6.000 - 8.000
LANE: L

FROM POST 8 TO POST 6

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	36.6
MEAN TEMPERATURE:	45	49	57	65	72	78	81	80	76	66	55	48	64.8
PRECIPITATION:	4.4	3.8	3.7	5.1	3.7	5.0	4.3	4.0	4.2	3.4	4.7	5.1	51.5
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	10	6	2	0	0	0	0	0	0	0	3	8	30
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	27.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	80	68	80	73	66	97
RUTT	1 SL	1 SL	3 SL		3 SL	
FLUSH	2 SL	2 SL		2 SL	3 SL	
CORR				1 SL		3 SE
RAVEL		1 SL	1 SL			
ALLG CR		1 SL				
LONG CR	1 SL	1 MO	2 SL	2 SL	2 SL	
TRANS CR	2 SL	1 MO	2 SL	2 SL	2 MO	1 SL
CRACKS	NS	PS	SEAL	PS	PS	PS
PATCHING				1 F	2 G	
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	77	74	77	59	63	86
ROADSIDE	72	77	77	60	75	77
DRAINAGE	87	53	87	53	80	73
TRAFFIC SER	86	88	84	72	80	78

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	3	0	5	5	3

TRAFFIC

1980 ADT:	2800
1980 PERCENT TRUCKS:	23.0
6/37-12/82 VEHICLES:	12012473
6/37-12/82 18K AXLES:	3169830

SKID NUMBER

DATE	AVG	LOW	HIGH
4/75	36	27	41

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.54	.425	10	16.7	1.80	3.10
77	3.32	.371	10	11.2	2.60	3.70
76	3.10	.521	10	16.8	2.00	3.80
75	3.14	.484	10	15.4	2.30	3.70
74	2.63	.287	10	10.9	2.20	3.00
73	3.57	.445	10	12.5	2.60	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/31/76	1.429	.319	.469	.071

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.767	.229

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	28	MAINT	6/79		316	B		4	140	AC		.3		.3			
2	S SC	27	MAINT	8/72	PRECOATED AGGREGATE	316	B	PB	4	140	AC-5		.2	.2	.2			
3	S HMAC	25	MAINT	8/66		340		D			AC	5.2		1.5	1.5			
4	S CMLRA	20	WID-STR	9/61		314		B						1.5	1.5			
5	B FLEX	20	WID-STR	9/61	IRON ORE	214								.0	7.0			
6	S CMLRA	16	MAINT	11/54		314		CC						1.3	1.3			
7	S PCC	8	NEW CON	6/37		SP								6.0	9.0			
8	SG CLAY	8	NEW CON	6/37	CL,CH											4.6	38.3	28.6

LOCATION

SECTION ID NO: 1218
DISTRICT NO: 11
COUNTY NO/NAME: 228/TRINITY
CONTROL-SECTION: 319- 2
HIGHWAY: SH 94
MILE POINTS: 2.940 - 4.950
LANE: L

FROM POST 24 TO POST 22

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	17.9
MEAN TEMPERATURE:	48	51	58	67	73	78	82	81	77	67	58	51	66.3
PRECIPITATION:	3.8	3.6	3.1	4.5	4.0	3.5	3.6	3.7	4.5	3.8	4.0	4.3	46.4
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	8	5	2	0	0	0	0	0	0	0	1	6	24
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	29.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	68	63	85	58	63	100
RUTT	1 SL	2 SL	1 SL	1 SL	1 SL	
FLUSH		2 SE	1 SL	2 SL	2 MO	
CORR		1 SL				
RAVEL		1 MO		1 MO	1 SL	
ALLG CR	1 MO			1 SL		
LONG CR	1 MO		1 SL	2 SL		
TRANS CR	2 MO		1 SL	2 SL		
CRACKS	NS		NS	NS		
PATCHING		1 P	2 G	2 G	3 P	
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	80	70	70	60	65	55
ROADSIDE	75	80	82	65	77	75
DRAINAGE	97	80	87	60	87	67
TRAFFIC SER	92	88	76	70	86	84
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	4	7	0	7	6	3

TRAFFIC

1980 ADT: 1555
1980 PERCENT TRUCKS: 23.0
6/30-12/82 VEHICLES: 6980011
6/30-12/82 18K AXLES: 1828249

SKID NUMBER

DATE	AVG	LOW	HIGH
5/75	53	48	58

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	1.99	.682	10	34.3	.80	2.90
77	2.94	.411	10	14.0	2.20	3.70
76	2.09	.893	10	42.7	.50	3.70
75	2.21	.853	10	38.6	1.00	3.50
74	2.78	.627	10	22.5	1.90	3.60
73	2.31	.682	7	29.5	1.40	3.40

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/31/76	1.648	.921	.578	.342

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.613	.238

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	20	MAINT	1/79		316		4	140	AC		.3		.4			
2	S SC	17	MAINT	8/72	LIGHTWEIGHT	316	LT. W	4	140	EA-HVR		.2	.2	.2			
3	S HMAC	13	MAINT	5/58		317	D MOD			AC	5.0		1.5	1.5			
4	S ST	3	NEW CON	6/30									.5	.5			
5	S ST	3	NEW CON	6/30									.5	.5			
6	B FLEX	3	NEW CON	6/30		38 MO							8.0	8.0			
7	SG CLAY	3	NEW CON	6/30	CL,ML,CH										4.2	32.4	14.9

LOCATION

SECTION ID NO: 1234
DISTRICT NO: 12
COUNTY NO/NAME: 20/BRAZORIA
CONTROL-SECTION: 178- 3
HIGHWAY: SH 35
MILE POINTS: 25.830 - 27.810
LANE: L

FROM POST 28 TO POST 26

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	38.5
MEAN TEMPERATURE:	52	55	60	68	74	79	82	81	78	70	62	55	68.5
PRECIPITATION:	4.0	4.2	3.1	3.2	4.9	6.2	4.2	5.5	7.3	4.2	4.4	4.6	55.7
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	3	1	0	0	0	0	0	0	0	0	0	1	8
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	33.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	73	83	90	78	83	83
RUTT	1 SL	2 SL	1 SL			
FLUSH						
CORR						
RAVEL		1 SL				
ALLG CR	1 MO					
LONG CR	1 MO		1 SL	1 MO	2 SL	1 MO
TRANS CR	2 MO	2 MO	2 SL	2 MO	2 SL	2 SL
CRACKS	PS	PS	PS	NS	NS	NS
PATCHING						
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	66	69	73	70	59	86
ROADSIDE	82	87	87	87	82	77
DRAINAGE	77	80	90	80	80	80
TRAFFIC SER	88	78	86	70	68	80
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	4	0	0	4	4	3

TRAFFIC

1980 ADT:	7760
1980 PERCENT TRUCKS:	14.0
12/37-12/82 VEHICLES:	33675680
12/37-12/82 18K AXLES:	5073042

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.47	.340	10	9.8	3.00	4.00
77	4.01	.173	10	4.3	3.80	4.30
76	4.31	.251	10	5.8	4.00	4.70
75	4.50	.115	10	2.6	4.30	4.70
74	4.32	.155	10	3.6	4.10	4.50
73	4.29	.238	10	5.5	3.80	4.50

DYNAFLECT DEFLECTION BASIN

DATE	W1 MEAN	W1 STD DEV	SCI MEAN	SCI STD DEV
	PAVEMENT		SUBGRADE	
STIFF. COEFF.:	.000		.000	

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	67	MAINT	10/71		340		H			AC			1.0	1.0			
2	S HMAC	56	MAINT	7/67		340		H			AC	5.3		1.0	1.0			
3	S HMAC	33	WID-STR	3/59		317		D	MOD					3.0	3.0			
4	S PCC	33	WID-STR	3/59		320								.0	8.0			
5	S PCC	12	NEW CON	12/37		SP								6.0	9.0			
6	SG CLAY	12	NEW CON	12/37	CH,CL,ML											5.3	56.3	39.7

LOCATION

SECTION ID NO: 1250
DISTRICT NO: 12
COUNTY NO/NAME: 102/HARRIS
CONTROL-SECTION: 500- 3
HIGHWAY: IH 45
MILE POINTS: .100 - 2.100
LANE: L

FROM POST 26 TO POST 24

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	11.2
MEAN TEMPERATURE:	52	54	61	69	75	80	83	82	79	71	61	55	69.0
PRECIPITATION:	3.5	3.6	2.8	3.5	4.9	4.8	3.6	4.2	5.4	4.3	3.6	3.8	48.1
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	2	1	0	0	0	0	0	0	0	0	0	1	6
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	33.4
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	89	82	87	73	92	78
RUTT		2 SL				
FLUSH						
CORR						
RAVEL	2 SL	2 SL				
ALLG CR						
LONG CR		1 SL	2 SL	2 MO	1 SL	1 MO
TRANS CR	1 SL	1 SL	1 SL	2 MO	1 SL	2 MO
CRACKS	NS	NS	NS	NS	NS	NS
PATCHING				1 G		
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	67	76	77	64	63	77
ROADSIDE	82	80	85	70	75	60
DRAINAGE	83	80	93	80	80	80
TRAFFIC SER	82	84	80	70	56	78
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	0	0	6	3	4

TRAFFIC

1980 ADT: 56448
1980 PERCENT TRUCKS: 8.0
6/52-12/82 VEHICLES: 130097216
6/52-12/82 18K AXLES: 10,165830

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.14	.151	10	3.6	3.90	4.40
77	4.18	.148	10	3.5	4.00	4.40
76	4.46	.212	10	4.8	4.10	4.70
75	4.30	.160	8	3.7	4.00	4.50
74	4.21	.196	8	4.6	3.80	4.40
73	4.32	.217	5	5.0	4.10	4.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/20/76	.685	.095	.024	.013

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.463	.153

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM CL	TYPE GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	262	MAINT	9/80		340			AC	6.0	1.0		1.0			
2	S HMAC	134	WID-STR	6/71		340	D		AC	5.3		5.3	5.3			
3	S PCC	134	WID-STR	6/71		360						.0	10.0			
4	S PCC	28	NEW CON	6/52		320						10.0	10.0			
5	B FLEX	28	NEW CON	6/52	SHELL	212	A					6.0	6.0			
6	SG CLAY	28	NEW CON	6/52	CH,CL,MH									5.2	66.6	43.9

LOCATION

SECTION ID NO: 1263
DISTRICT NO: 12
COUNTY NO/NAME: 85/GALVESTON
CONTROL-SECTION: 192- 4
HIGHWAY: SH 6
MILE POINTS: 1.980 - 3.890
LANE: R

FROM POST 2 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	18.4
MEAN TEMPERATURE:	53	55	61	69	75	80	83	83	80	73	63	57	69.7
PRECIPITATION:	2.6	2.6	2.1	2.7	3.1	4.0	3.1	4.6	6.1	2.8	3.0	4.0	40.6
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	34.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	81	88	92	92	93	100
RUTT	2 SL	1 SL	1 SL			
FLUSH			1 SL			
CORR			1 SL			
RAVEL		1 SL				
ALLG CR						
LONG CR	1 MO			1 SL		
TRANS CR	1 MO	2 SL	1 SL	1 SL	2 SL	
CRACKS	NS	NS	NS	NS	NS	
PATCHING						
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	70	65	80	55	60	60
ROADSIDE	77	82	85	75	77	75
DRAINAGE	90	73	90	80	60	73
TRAFFIC SER	84	74	88	78	74	86

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	0	0	2	2	1

TRAFFIC

1980 ADT: 8041
1980 PERCENT TRUCKS: 13.0
3/66-12/82 VEHICLES: 21685440
3/66-12/82 18K AXLES: 3011701

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.13	.157	10	3.8	3.90	4.40
77	4.38	.113	10	2.6	4.20	4.50
76	4.72	.079	10	1.7	4.60	4.80
75	4.50	.087	9	1.9	4.40	4.60
74	4.43	.050	9	1.1	4.40	4.50
73	4.72	.123	10	2.6	4.60	4.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/20/76	.493	.083	.016	.008

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.806	.155

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S HMAC	51	MAINT	8/73		340		H		AC	9.0		1.0	1.0			
2	S HMAC	39	MAINT	7/69		340		D		AC	5.0		.8	.8			
3	S HMAC	39	MAINT	7/69		340		G		AC	4.7		1.3	1.3			
4	S HMAC	32	NEW CON	3/66		340		D		AC	5.2		4.8	4.8			
5	B CS	32	NEW CON	3/66	SHELL	951				CEMENT			12.0	12.0			
6	SB LSS	32	NEW CON	3/66		260				LIME	6.0		6.0	6.0			
7	SG CLAY	32	NEW CON	3/66	CH,CL,MH										5.4	59.8	38.6

LOCATION

SECTION ID NO: 1289
DISTRICT NO: 12
COUNTY NO/NAME: 170/MONTGOMERY
CONTROL-SECTION: 110- 4
HIGHWAY: IH 45
MILE POINTS: 6.270 - 8.270
LANE: L

FROM POST 81 TO POST 79

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	13.1
MEAN TEMPERATURE:	49	52	59	68	74	80	83	82	78	69	59	52	67.5
PRECIPITATION:	3.5	3.6	2.5	4.3	4.8	4.4	2.8	4.2	4.9	4.1	3.7	4.2	47.0
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	7	3	1	0	0	0	0	0	0	0	1	3	16
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	30.9
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	60	78	88	83	87	92
RUTT		1 SL				
FLUSH						
CORR						1 SL
RAVEL						
ALLG CR						
LONG CR	2 SE	1 MO	1 SL	2 SL	2 SL	1 SL
TRANS CR	3 MO	2 MO	2 SL	2 SL	1 SL	1 SL
CRACKS	NS	NS	NS	NS	NS	NS
PATCHING	1 F					
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	79	86	93	69	66	51
ROADSIDE	77	87	87	77	75	72
DRAINAGE	97	67	90	67	87	73
TRAFFIC SER	84	88	82	88	92	80
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	5	0	0	3	0	4

TRAFFIC

1980 ADT: 53000
1980 PERCENT TRUCKS: 8.0
2/60-12/82 VEHICLES: 117905920
2/60-12/82 18K AXLES: 9186226

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
77	3.83	.457	10	11.9	2.90	4.20
76	4.05	.524	8	12.9	3.10	4.60
75	3.91	.449	8	11.5	3.20	4.50
74	4.14	.367	8	7.4	3.70	4.60
73	4.04	.250	8	6.2	3.50	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/19/76	.636	.158	.038	.037

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.462	.168

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	62	MAINT	6/72		340		H			AC	9.0		1.0	1.0			
2	S HMAC	48	MAINT	10/66		340		G			AC	4.6		2.0	2.0			
3	S PCC	36	NEW CON	2/60		320								11.0	11.0			
4	B FLEX	36	NEW CON	2/60		218								4.0	10.0			
5	SG CLAY	36	NEW CON	2/60	CL,SC,CH											4.3	41.6	20.3

LOCATION

SECTION ID NO: 1307
DISTRICT NO: 12
COUNTY NO/NAME: 170/MONTGOMERY
CONTROL-SECTION: 1062- 3
HIGHWAY: FM 1485
MILE POINTS: 21.780 - 23.780
LANE: R

FROM POST 12 TO POST 14

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	13.1
MEAN TEMPERATURE:	49	52	59	68	74	80	83	82	78	69	59	52	67.5
PRECIPITATION:	3.5	3.6	2.5	4.3	4.8	4.4	2.8	4.2	4.9	4.1	3.7	4.2	47.0
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	7	3	1	0	0	0	0	0	0	0	1	3	16
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	30.9
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	100	39	50	58	48	25
RUTT		1 MO	1 SL			
FLUSH		2 SL	1 MO			
CORR		1 SL				
RAVEL		1 SL	1 SL		1 MO	1 SL
ALLG CR					1 SE	3 SE
LONG CR			3 MO	2 SE	2 MO	3 SE
TRANS CR		1 SL	3 MO	3 SE	2 MO	3 SE
CRACKS		NS	NS	NS	NS	NS
PATCHING		1 G		2 G	1 G	
FAIL/MI	0	3	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	75	65	70	75	70	45
ROADSIDE	72	77	85	75	85	65
DRAINAGE	67	67	90	73	77	70
TRAFFIC SER	86	80	80	88	84	76
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	2	0	0	5	0	6

TRAFFIC

1980 ADT:	4000
1980 PERCENT TRUCKS:	8.0
11/56-12/82 VEHICLES:	8703775
11/56-12/82 18K AXLES:	677901

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.48	.365	10	10.5	2.90	4.10
77	3.99	.233	10	5.8	3.60	4.30
76	4.21	.247	10	5.9	3.60	4.50
74	4.28	.126	4	2.9	4.10	4.40
73	4.04	.180	7	4.5	3.80	4.20

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/19/76	1.324	.209	.397	.085

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.710	.230

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	11	MAINT	6/73										.3	.3			
2	S HMAC	5	MAINT	10/65		340		D			AC	4.5		2.8	.0			
3	S ST	2	NEW CON	11/56										.7	.7			
4	B FLEX	2	NEW CON	11/56										8.0	8.0			
5	SG CLAY	2	NEW CON	11/56	CL,ML,CH												28.9	18.8

LOCATION

SECTION ID NO: 1323
DISTRICT NO: 12
COUNTY NO/NAME: 237/WALLER
CONTROL-SECTION: 50- 5
HIGHWAY: US 290
MILE POINTS: 12.460 - 14.720
LANE: R

FROM POST 12 TO POST 14

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	16.3
MEAN TEMPERATURE:	48	51	59	68	74	80	83	82	78	70	59	52	67.5
PRECIPITATION:	3.4	3.6	2.0	3.8	5.1	4.2	2.4	3.7	5.0	4.0	3.5	3.6	44.4
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	7	3	0	0	0	0	0	0	0	0	1	3	15
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	30.7
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	87	68	60	66	88	65
RUTT	1 SL	1 SL			1 SL	
FLUSH			1 SL			
CORR						
RAVEL		1 SL				
ALLG CR	1 SL					
LONG CR	1 SL	2 MO	2 MO	3 MO	1 SL	2 MO
TRANS CR	1 SL	2 MO	3 MO	2 MO	1 MO	3 MO
CRACKS	NS	NS	NS	NS	NS	NS
PATCHING		1 G	1 F	2 G		1 F
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	65	65	85	45	60	65
ROADSIDE	70	75	82	85	75	65
DRAINAGE	70	77	73	80	77	73
TRAFFIC SER	82	84	84	82	78	80
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	0	0	5	0	4

TRAFFIC

1980 ADT: 12678
1980 PERCENT TRUCKS: 14.0
8/31-12/82 VEHICLES: 58284784
8/31-12/82 18K AXLES: 8780785

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.95	.299	10	7.6	3.20	4.30
77	3.17	.455	10	14.3	2.60	4.00
76	3.37	.634	10	18.8	2.50	4.20
75	3.60	.408	10	11.3	3.00	4.20
74	3.62	.289	11	8.0	3.30	4.30
73	3.75	.230	10	6.2	3.40	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/18/76	.416	.124	.019	.012

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.946	.188

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	38	MAINT	8/79		340					AC	6.0	1.0		.0			
2	S HMAC	38	MAINT	8/79		340					AC	6.0	1.0		.0			
3	S HMAC	30	MAINT	6/67		340		H			AC	4.5		2.0	.0			
4	S HMAC	24	WID-STR	8/63		340		D						3.5	.0			
5	B CS	24	WID-STR	8/63	SILICEOUS						CEMENT	6.0		.0	12.0			
6	S HMAC	17	MAINT	7/52		317	S	D	MOD		MC-1			1.3	.0			
7	S PCC	14	WIDEN	12/49		SP								.0	9.0			
8	S PCC	7	NEW CON	8/31										6.0	.0			
9	SG SAND	7	NEW CON	8/31	SC,CL,ML												25.8	11.0

LOCATION

SECTION ID NO: 1349
DISTRICT NO: 13
COUNTY NO/NAME: 62/DEWITT
CONTROL-SECTION: 270- 1
HIGHWAY: SH 72
MILE POINTS: 9.010 - 11.010
LANE: L

FROM POST 22 TO POST 20

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-10.1
MEAN TEMPERATURE:	50	55	61	70	76	81	84	84	79	71	61	54	69.3
PRECIPITATION:	2.3	2.8	1.5	2.8	4.5	3.9	1.2	2.5	5.6	4.2	2.3	2.0	35.8
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	6	3	0	0	0	0	0	0	0	0	1	3	15
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	33.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	90	92	83	86	80
RUTT	1 MO	1 SL	1 SL	1 SL		
FLUSH	1 MO					
CORR					1 SL	
RAVEL	1 SL					1 SL
ALLG CR						
LONG CR				1 SL	1 SL	2 MO
TRANS CR		2 MO	2 MO	2 SL	2 SL	1 SL
CRACKS	SEAL	SEAL	SEAL	SEAL	SEAL	SEAL
PATCHING	2 G	2 G	1 G	3 F	2 F	1 F
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	51	80	77	70	70	75
ROADSIDE	80	82	90	87	82	82
DRAINAGE	90	87	90	80	73	77
TRAFFIC SER	92	86	86	80	84	90
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	4	0	0	6	4	3

TRAFFIC

1980 ADT: 1150
1980 PERCENT TRUCKS: 18.0
2/52-12/82 VEHICLES: 5485866
2/52-12/82 18K AXLES: 1085516

SKID NUMBER

DATE	AVG	LOW	HIGH
5/75	43	25	55
5/75	47	28	56

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.99	.762	10	25.5	1.40	3.60
77	3.11	.549	10	17.6	2.20	3.90
76	3.20	1.007	10	31.5	1.10	4.20
75	3.09	.681	9	22.0	1.70	4.00
74	3.02	.570	9	18.9	1.90	3.60
73	3.22	.539	10	16.7	2.20	3.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/27/76	1.168	.225	.331	.094

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.720	.228

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	31	MAINT	9/77									1.0					
2	S SC	24	MAINT	8/69	PRECOATED AGGREGATE	316		PB	4	110	AC-5		.3	.3	.3			
3	S SC	20	MAINT	8/64		316								.3	.3			
4	S CMLRA	18	MAINT	10/58										.7	.7			
5	S SC	15	MAINT	6/52										.3	.3			
6	S ST	13	RECONST	2/52		304				76	RC-2		.4	.4	.4			
7	B FLEX	13	RECONST	2/52	SILICEOUS									11.0	11.0			
8	SG CLAY	13	RECONST	2/52	CL,SC,ML											4.3	34.9	16.0

LOCATION

SECTION ID NO: 1365
DISTRICT NO: 13
COUNTY NO/NAME: 76/FAYETTE
CONTROL-SECTION: 211- 6
HIGHWAY: US 77
MILE POINTS: 7.000 - 9.000
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	1.9
MEAN TEMPERATURE:	50	54	61	70	75	80	83	83	78	70	61	54	68.8
PRECIPITATION:	2.5	3.1	1.8	3.4	4.7	4.0	1.6	2.7	5.7	4.1	2.9	2.8	39.3
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	5	2	0	0	0	0	0	0	0	0	0	2	11
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.8
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	92	100	90	95	90	95
RUTT	1 SL	1 SL				
FLUSH	2 SL			1 SL		
CORR						
RAVEL					3 SL	1 SL
ALLG CR			1 SL			
LONG CR			1 SL			
TRANS CR						
CRACKS			NS			
PATCHING		1 G				
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	84	84	83	74	70	40
ROADSIDE	65	90	90	67	80	65
DRAINAGE	90	77	90	67	73	70
TRAFFIC SER	86	86	92	78	82	82
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	2	0	0	2	0	3

TRAFFIC

1980 ADT: 3660
1980 PERCENT TRUCKS: 18.0
4/40-12/82 VEHICLES: 11189965
4/40-12/82 18K AXLES: 2214087

SKID NUMBER

DATE	AVG	LOW	HIGH
9/76	34	29	48
9/76	35	24	47
6/75	33	23	37
6/75	33	27	37
8/74	38	30	43
8/74	40	36	44

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.66	.369	10	10.1	3.10	4.40
77	4.12	.123	10	3.0	4.00	4.30
76	4.35	.306	10	7.0	3.60	4.70
75	4.04	.259	10	6.4	3.60	4.40
74	4.17	.223	10	5.3	3.70	4.40
73	4.10	.210	10	5.1	3.70	4.40

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/29/76	1.126	.492	.365	.214

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.765	.249

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	38	MAINT	8/79		316	B	PB	4	130	AC		.3		.4			
2	S HMAC	28	MAINT	8/73	LIMESTONE/CALICHE	340		D			AC	5.2		1.4	1.4			
3	S SC	17	MAINT	7/64		316		PB	3	100	OA-135		.3	.3	.3			
4	S SC	13	MAINT	9/60	PRECOATED AGGREGATE	303		B	4	90	OA-135		.2	.3	.3			
5	S CMLRA	12	MAINT	5/56										.8	.8			
6	S SC	11	MAINT	7/53										.3	.3			
7	S ST	7	STAGE	8/40		305				100	OA-230		.2	.3	.3			
8	S ST	7	STAGE	8/40		305				180	OA-230		.3	.2	.2			
9	B FLEX	6	NEW CON	4/40	SILICEOUS	213A								6.0	4.3			
10	SG CLAY	6	NEW CON	4/40	CH,CL,SC												56.8	34.4

LOCATION

SECTION ID NO: 1394
DISTRICT NO: 13
COUNTY NO/NAME: 90/GONZALES
CONTROL-SECTION: 25- 5
HIGHWAY: US 90A
MILE POINTS: 4.000 - 6.000
LANE: L

FROM POST 6 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-14.5
MEAN TEMPERATURE:	50	54	61	70	75	81	84	83	79	70	60	53	68.9
PRECIPITATION:	2.0	2.6	1.7	2.8	3.8	4.1	1.3	2.3	4.5	4.1	2.3	1.8	33.3
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	6	3	0	0	0	0	0	0	0	0	1	3	14
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	76	75	74	73
PRS	95	95	90	100	100
RUTT	1 SL	1 SL			
FLUSH	1 SL		1 SL		
CORR					
RAVEL		1 SL			
ALLG CR					
LONG CR					
TRANS CR					
CRACKS					
PATCHING		1 G	1 F		
FAIL/MI	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	70	64	56	56	39
ROADSIDE	85	87	67	80	67
DRAINAGE	90	83	60	90	73
TRAFFIC SER	84	84	82	88	86

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY 2 0 3 0 5

TRAFFIC

1980 ADT:	1800
1980 PERCENT TRUCKS:	18.0
10/49-12/82 VEHICLES:	8112208
10/49-12/82 18K AXLES:	1605125

SKID NUMBER

DATE	AVG	LOW	HIGH
9/76	32	23	42
9/76	31	19	44
6/75	36	19	46
6/75	36	17	45

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.81	.409	10	10.7	3.20	4.40
75	3.79	.408	9	10.8	3.00	4.30
74	3.76	.348	10	9.3	3.10	4.10
73	3.68	.260	10	7.2	3.30	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/29/76	1.136	.317	.412	.178

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.907	.250

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	12	MAINT	9/77		316	B	PB	4	130	AC		.3		.4			
2	S SC	10	MAINT	6/71	PRECOATED AGGREGATE	316		PB	4	110	AC-5		.3	.3	.3			
3	S CMLRA	9	MAINT	3/60	ROCK ASPHALT									.8	.8			
4	S SC	7	MAINT	8/54		303		B	4	110	OA-135		.3	.3	.3			
5	S HMCL	6	NEW CON	10/49		SP		H			OA-230			.6	.6			
6	B FLEX	6	NEW CON	10/49	LIMESTONE/CALICHE	213								6.0	5.0			
7	SG CLAY	6	NEW CON	10/49	CL,SC,SM											4.4	39.0	20.4

LOCATION

SECTION ID NO: 1412
DISTRICT NO: 13
COUNTY NO/NAME: 241/WHARTON
CONTROL-SECTION: 89- 6
HIGHWAY: US 59
MILE POINTS: 15.330 - 17.330
LANE: L

FROM POST 32 TO POST 30

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	3.3
MEAN TEMPERATURE:	51	54	61	69	75	80	82	82	78	71	61	54	68.6
PRECIPITATION:	2.7	3.2	2.2	3.2	3.7	5.1	3.0	3.6	5.8	5.0	2.4	2.9	42.9
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	4	2	0	0	0	0	0	0	0	0	0	2	11
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.8
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	77	90	78	93	100
RUTT	1 MO	1 SL				
FLUSH	2 MO			1 SL		
CORR						
RAVEL	1 SL	1 SL				
ALLG CR		1 SL				
LONG CR		2 SL		1 SL		
TRANS CR		1 SL	1 SE	1 SE	2 SL	
CRACKS	SEAL	NS	PS	NS	NS	
PATCHING						
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	71	67	80	73	73	81
ROADSIDE	85	85	82	80	77	75
DRAINAGE	57	77	80	80	60	70
TRAFFIC SER	88	86	94	72	76	82
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	0	0	5	3	1

TRAFFIC

1980 ADT: 0
1980 PERCENT TRUCKS: .0
1/29-12/82 VEHICLES: 0
1/29-12/82 18K AXLES: 0

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.13	.371	10	9.0	3.60	4.70
77	4.07	.380	10	9.3	3.40	4.60
76	4.63	.200	10	4.3	4.20	4.80
75	4.30	.218	9	5.1	4.00	4.60
74	4.40	.122	9	2.8	4.20	4.60
73	4.07	.211	10	5.2	3.80	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/28/76	.694	.035	.018	.004

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	2.009	.164

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	33	MAINT	11/73	LIGHTWEIGHT	340		D			AC	10.1		1.0	1.0			
2	B AS	33	MAINT	11/73		292		A	4		AC	4.4		2.5	2.5			
3	S SC	20	MAINT	9/66	PRECOATED AGGREGATE	316		PB	4	110	AC-5		.2	.3	.3			
4	S HMAC	19	MAINT	9/63		340		D			AC	5.5		1.5	1.5			
5	S HMCL	11	MAINT	6/56	ROCK ASPHALT	319		DD						1.0	1.0			
6	S HMAC	9	MAINT	4/48										.8	.8			
7	S PCC	2	NEW CON	1/29		69								6.0	9.0			
8	SG CLAY	2	NEW CON	1/29	CH,CL,MH											5.2	66.2	43.7

LOCATION

SECTION ID NO: 1438
DISTRICT NO: 13
COUNTY NO/NAME: 241/WHARTON
CONTROL-SECTION: 1412- 3
HIGHWAY: FM 1301
MILE POINTS: 14.870 - 15.870
LANE: L

W-M CO.LINE TO 1 MI. N.

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	3.3
MEAN TEMPERATURE:	51	54	61	69	75	80	82	82	78	71	61	54	68.6
PRECIPITATION:	2.7	3.2	2.2	3.2	3.7	5.1	3.0	3.6	5.8	5.0	2.4	2.9	42.9
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	4	2	0	0	0	0	0	0	0	0	0	2	11
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.8
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	73	63	81	78	82	50
RUTT		2 SL				
FLUSH	1 SL					
CORR				1 SL		1 SL
RAVEL	1 SL	2 SL	1 SL			
ALLG CR		1 SL			1 SL	
LONG CR	1 MO	2 SL	2 SL	2 MO	1 SL	2 SE
TRANS CR	2 MO	3 MO	2 SL	2 MO	3 SL	3 SE
CRACKS	PS	PS	PS	PS	PS	NS
PATCHING		1 G				3 F
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	80	70	70	50	55	60
ROADSIDE	80	85	85	80	80	75
DRAINAGE	83	80	90	80	67	73
TRAFFIC SER	86	82	84	80	66	84
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	4	0	0	6	5	4

TRAFFIC

1980 ADT: 1950
1980 PERCENT TRUCKS: 8.0
6/58-12/82 VEHICLES: 6923777
6/58-12/82 18K AXLES: .539161

SKID NUMBER

DATE	AVG	LOW	HIGH
9/76	42	30	49
9/76	32	18	42
5/75	26	16	34
5/75	30	19	42

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.60	.292	5	8.1	3.10	3.80
77	3.90	.339	5	8.7	3.50	4.40
76	4.12	.377	5	9.1	3.50	4.50
75	3.74	.400	9	10.7	3.00	4.30
74	3.62	.222	9	6.1	3.20	3.90
73	3.41	.375	10	11.0	2.60	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/28/76	1.163	.246	.102	.045

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	2.190	.173

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	16	MAINT	7/78		316	B	PB	4	130	AC		.3		.4			
2	S CMLRA	5	WID-STR	7/68	ROCK ASPHALT	330		B			AC			2.1	.0			
3	S ST	5	WID-STR	7/68		320		B	4	90	AC-5		.3	.0	.3			
4	B CS	5	WID-STR	7/68		1182					CEMENT			.0	8.0			
5	SB LSS	5	WID-STR	7/68		260					LIME			.0	6.0			
6	S PCC	0	NEW CON	6/58										6.0	.0			
7	SG CLAY	0	NEW CON	6/58	CH,CL,SC											4.5	56.5	32.8

LOCATION

SECTION ID NO: 1543
DISTRICT NO: 15
COUNTY NO/NAME: 15/BEXAR
CONTROL-SECTION: 25- 2
HIGHWAY: IH 10
MILE POINTS: 33.130 - 35.130
LANE: R

FROM POST 588 TO 590

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-15.7
MEAN TEMPERATURE:	50	54	61	70	75	81	84	84	79	70	59	52	68.6
PRECIPITATION:	1.7	2.1	1.3	2.3	3.8	2.9	1.9	3.2	4.1	3.2	2.2	1.4	30.0
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	5	2	0	0	0	0	0	0	0	0	0	2	12
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80)	77	76	75	74	73
PRS	95	80	57	87	95	77
RUTT		2 SL	2 SL			
FLUSH	1 SL	1 MO	2 SL	2 SL		2 SL
CORR						
RAVEL		2 SL	2 MO			1 SL
ALLG CR					1 SL	
LONG CR			1 MO			1 SL
TRANS CR			1 MO			
CRACKS			PS			NS
PATCHING			2 F	3 G		1 F
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	71	64	64	60	67	76
ROADSIDE	77	85	82	75	90	87
DRAINAGE	70	93	93	80	83	90
TRAFFIC SER	90	64	90	78	78	80
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	2	3	9	3	0	3

TRAFFIC

1980 ADT: 14800
1980 PERCENT TRUCKS: 25.0
8/62-12/82 VEHICLES: 43596976
8/62-12/82 18K AXLES: 12593449

SKID NUMBER

DATE	AVG	LOW	HIGH
7/76	27	20	34
4/76	14	14	14
4/76	15	15	15
6/75	33	23	47

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.73	.347	10	9.3	3.10	4.20
77	3.20	.381	9	11.9	2.80	4.00
76	3.17	.643	10	20.3	2.00	4.20
75	3.08	.449	9	14.6	2.50	3.80
74	3.30	.325	9	9.9	2.90	3.90
73	3.46	.340	10	9.7	2.80	3.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
6/22/76	1.011	.143	.233	.055

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.488	.207

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	110	MAINT	8/78		340		D			AC	6.0	1.0		1.0			
2	S HMCL	110	MAINT	8/78		350		D			AC		1.0		.4			
3	S ST	110	MAINT	8/78		320	B	B	4	100	AC		.3		.3			
4	S HMAC	74	MAINT	8/68		340		D			AC	4.8		1.0	1.0			
5	S HMAC	36	NEW CON	8/62		317		D			AC	4.9		1.5	1.5			
6	B FLEX	36	NEW CON	8/62		SP								14.5	.0			
7	B FLEX	36	NEW CON	8/62		SP								9.0	13.5			
8	B AS	36	NEW CON	8/62		SP					AC	4.2		3.0	3.0			
9	SB LSS	36	NEW CON	8/62	CLAYEY SAND	SP					LIME	3.5		6.0	6.0			
10	SG CLAY	36	NEW CON	8/62	CH											5.4	74.0	49.5

LOCATION

SECTION ID NO: 1585
DISTRICT NO: 15
COUNTY NO/NAME: 95/GUADALUPE
CONTROL-SECTION: 366- 3
HIGHWAY: SH 123
MILE POINTS: 10.179 - 12.139
LANE: R

FROM POST 24 TO POST 26

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-16.3
MEAN TEMPERATURE:	50	54	61	70	75	81	84	83	79	70	59	52	68.6
PRECIPITATION:	1.8	2.5	1.3	2.4	3.9	3.1	1.7	3.4	4.0	3.5	2.4	1.6	31.4
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	6	3	0	0	0	0	0	0	0	0	0	3	13
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	95	48	43	46	68
RUTT		1 SL	2 SL			
FLUSH				2 SL		
CORR				2 SL		
RAVEL		1 SL	3 SE		1 SL	1 SL
ALLG CR			2 SL			
LONG CR	2 MO		1 SL	2 MO	2 MO	2 SL
TRANS CR	2 SL		2 SL	3 MO	2 MO	3 SE
CRACKS	NS		PS	PS	PS	PS
PATCHING			3 F	2 G	2 F	
FAIL/MI	0	0	0	1	1	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	67	79	64	64	66	71
ROADSIDE	90	82	87	82	90	82
DRAINAGE	87	80	83	80	90	90
TRAFFIC SER	94	86	74	82	86	90
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	2	4	6	0	4

TRAFFIC

1980 ADT: 3100
1980 PERCENT TRUCKS: 11.0
7/33-12/82 VEHICLES: 13550119
7/33-12/82 18K AXLES: 1550192

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.44	.272	10	7.9	3.10	3.90
77	3.51	.420	10	12.0	2.60	4.30
76	2.60	.696	10	26.8	1.50	3.50
75	2.42	.421	9	17.4	1.70	3.00
74	2.54	.316	9	12.4	2.10	2.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
6/23/76	.824	.240	.074	.037

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.959	.188

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S HMAC	39	MAINT	5/77							AC		1.0		1.0			
2	S ST	15	WIDEN	11/55		305		A	4	100	OA-175		.3	.0	.3			
3	S ST	15	WIDEN	11/55		305		A	4	100	OA-175		.3	.0	.3			
4	B FLEX	15	WIDEN	11/55	LIMESTONE/CALICHE	211								.0	6.0			
5	S HMAC	12	MAINT	1/53		317		B			AC	4.5		2.3	2.3			
6	S HMAC	12	MAINT	1/53		317		D			AC	5.0		.8	.8			
7	S PCC	3	NEW CON	7/33		SP								6.0	9.0			
8	SG CLAY	3	NEW CON	7/33	CL,SC,SM											4.1	37.1	17.9

LOCATION

SECTION ID NO: 1632
DISTRICT NO: 16
COUNTY NO/NAME: 4/ARANSAS
CONTROL-SECTION: 180- 5
HIGHWAY: SH 35
MILE POINTS: 3.730 - 5.730
LANE: L

FROM POST 26 TO POST 24

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-10.3
MEAN TEMPERATURE:	54	57	63	71	76	81	83	83	80	73	64	57	70.6
PRECIPITATION:	2.0	2.2	1.2	1.9	3.7	4.9	1.6	3.9	6.8	4.3	2.1	2.6	37.2
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	3
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	35.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	87	98	90	92	100	95
RUTT	1 SL	2 SL				
FLUSH	2 SL		1 SL			
CORR		1 SL				
RAVEL	1 SL		1 SL	2 SL		1 SL
ALLG CR						
LONG CR						
TRANS CR						
CRACKS	SEAL					
PATCHING						
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	83	79	80	81	79	83
ROADSIDE	77	82	77	70	80	75
DRAINAGE	90	93	37	70	60	67
TRAFFIC SER	82	88	88	84	82	84
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	2	0	0	2	2	2

TRAFFIC

1980 ADT: 0
1980 PERCENT TRUCKS: .0
5/48-12/82 VEHICLES: 0
5/48-12/82 18K AXLES: 0

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.90	.287	10	7.4	3.50	4.40
77	3.74	.165	10	4.4	3.50	4.00
76	3.63	.287	10	7.9	3.30	4.10
75	4.47	.125	10	2.8	4.30	4.70
74	3.65	.172	10	4.7	3.40	4.00
73	3.26	.240	10	7.4	2.80	3.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/26/76	1.125	.262	.321	.060

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.436	.221

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	22	MAINT	8/72	ROCK ASPHALT	316	B	PB	3	90	AC-5		.3	.3	.3			
2	S CMLRA	20	MAINT	7/69	ROCK ASPHALT	330		B			AC	7.5		1.3	1.3			
3	S HMAC	16	WID-STR	5/60	SHELL	317		C MOD			AC	7.0		2.5	2.5			
4	B FLEX	16	WID-STR	5/60	SHELL	SP								12.0	.0			
5	S SC	15	MAINT	6/54		303		B	2	90	OA-175		.3	.3	.3			
6	S ST	11	NEW CON	5/48		SP					RC-2		.7	1.4	1.4			
7	B FLEX	11	NEW CON	5/48	SHELL	SP								10.0	8.0			
8	SG SAND	11	NEW CON	5/48	SC,SM,SW											4.2	21.7	12.3

LOCATION

SECTION ID NO: 1674
DISTRICT NO: 16
COUNTY NO/NAME: 149/LIVE OAK
CONTROL-SECTION: 254- 1
HIGHWAY: US 281
MILE POINTS: 17.250 - 19.310
LANE: R

FROM POST 28 TO POST 30

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-19.1
MEAN TEMPERATURE:	52	56	62	71	76	81	83	83	79	71	62	55	69.9
PRECIPITATION:	1.8	2.4	.9	2.2	3.8	3.2	1.5	2.9	6.0	3.4	1.6	1.6	31.3
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	3	1	0	0	0	0	0	0	0	0	0	1	7
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	34.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	75	70	88	90	90	78
RUTT	2 SL	2 SL	1 SL			
FLUSH	3 MO	3 SL	2 MO	1 MO	1 SL	
CORR						
RAVEL		2 SL			1 SL	
ALLG CR	1 SL					
LONG CR		1 SL				2 SL
TRANS CR	1 SL					2 SL
CRACKS	PS	NS				NS
PATCHING		1 F	1 G	1 G		3 G
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	*** ***
RATING SCORES						
SHOULDER	76	74	83	73	80	79
ROADSIDE	77	77	80	85	72	80
DRAINAGE	90	80	73	90	80	87
TRAFFIC SER	74	82	82	80	80	90
*** *** ***	***	***	***	***	***	*** ***
PVMT URGENCY	4	0	0	4	3	2

TRAFFIC

1980 ADT: 6289
1980 PERCENT TRUCKS: 15.0
7/33-12/82 VEHICLES: 20308512
7/33-12/82 18K AXLES: 3289320

SKID NUMBER

DATE	AVG	LOW	HIGH
6/75	56	53	59
6/75	58	45	66
6/75	43	35	53
6/75	50	43	55

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.87	.472	10	16.4	1.70	3.40
76	3.58	.750	9	21.0	2.20	4.60
75	3.17	.701	10	22.1	2.00	4.20
74	3.56	.532	10	14.9	2.60	4.30
73	3.60	.374	10	10.4	3.00	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/27/76	1.220	.305	.471	.168

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.576	.228

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	63	MAINT	9/73	ROCK ASPHALT	316	B	PB	3	90	AC-5		.3	.3	.3			
2	S HMAC	60	MAINT	12/70		340		D			AC	4.9		1.3	1.3			
3	S SC	55	MAINT	9/68	ROCK ASPHALT	316		PB	3	90	AC-5		.3	.3	.3			
4	S CMLRA	40	WID-REC	7/63	ROCK ASPHALT	330		B			AC			1.3	1.3			
5	S ST	40	WID-REC	7/63	ROCK ASPHALT	320		PB	2	90	OA-175		.3	.3	.3			
6	B LST	40	WID-REC	7/63	LIMESTONE/CALICHE						LIME	1.0		.0	9.0			
7	B LST	40	WID-REC	7/63	LIMESTONE/CALICHE	248		A	4		LIME	1.2		7.0	.0			
8	S PCC	12	NEW CON	7/33										6.0	9.0			
9	SG CLAY	12	NEW CON	7/33	CL,CH,SC											4.2	48.0	26.7

LOCATION

SECTION ID NO: 1718
DISTRICT NO: 16
COUNTY NO/NAME: 196/REFUGIO
CONTROL-SECTION: 447- 4
HIGHWAY: SH 202
MILE POINTS: 3.990 - 6.000
LANE: L

FROM POST 6 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-9.9
MEAN TEMPERATURE:	55	58	64	71	77	81	84	84	80	73	64	57	71.0
PRECIPITATION:	1.9	2.7	1.6	2.6	4.5	4.1	2.2	3.8	6.7	4.7	2.2	2.2	39.3
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	3	1	0	0	0	0	0	0	0	0	0	1	6
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	36.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	76	75	74	73
PRS	88	90	100	100	95
RUTT	1 SL				
FLUSH	2 MO	1 SL			
CORR					
RAVEL					
ALLG CR		1 SL			
LONG CR					
TRANS CR					
CRACKS					
PATCHING		1 G	1 G		1 F
FAIL/MI	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	75	85	60	70	80
ROADSIDE	85	80	82	75	85
DRAINAGE	90	53	80	63	90
TRAFFIC SER	82	84	72	76	86

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	0	3	3	3

TRAFFIC

1980 ADT: 770
1980 PERCENT TRUCKS: 14.0
2/48-12/82 VEHICLES: 4201113
2/48-12/82 18K AXLES: .632093

SKID NUMBER

DATE	AVG	LOW	HIGH
6/75	68	51	77
6/75	60	48	71

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.88	.579	10	14.9	3.10	4.50
77	3.58	.527	10	14.7	2.60	4.10
76	3.31	1.082	10	32.7	1.50	4.40
75	3.78	.487	9	12.9	2.80	4.30
74	3.50	.552	10	15.8	2.50	4.10
73	3.30	.485	10	14.7	2.60	3.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/26/76	1.830	.461	.816	.211

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.433	.249

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	12	MAINT	6/77		316	B	PB	4	130	AC-5		.3		.0			
2	S SC	11	MAINT	9/73	ROCK ASPHALT	316		PB	4	100	AC-5		.3	.3	.3			
3	S SC	8	MAINT	9/68	PRECOATED AGGREGATE	316		PB	3	90	AC-5		.3	.3	.3			
4	S CMLRA	6	MAINT	9/65	ROCK ASPHALT	330		B						1.3	1.3			
5	S SC	5	MAINT	9/61	PRECOATED AGGREGATE	303		B	2	90	OA-175		.3	.3	.3			
6	S SC	3	MAINT	9/55		303		B	2	90	OA-175		.3	.3	.3			
7	S ST	2	NEW CON	2/48		305				75	OA-230		.3	.4	.4			
8	S ST	2	NEW CON	2/48		305				145	OA-230		.3	.2	.2			
9	B FLEX	2	NEW CON	2/48	LIMESTONE/CALICHE	SP								4.0	.0			
10	SB FLEX	2	NEW CON	2/48		210								6.0	.0			
11	SG CLAY	2	NEW CON	2/48	CL,SC,CH											4.2	42.0	22.3

LOCATION

SECTION ID NO: 1721
DISTRICT NO: 16
COUNTY NO/NAME: 196/REFUGIO
CONTROL-SECTION: 447- 5
HIGHWAY: FM 774
MILE POINTS: 2.040 - 4.030
LANE: R

FROM POST 2 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-9.9
MEAN TEMPERATURE:	55	58	64	71	77	81	84	84	80	73	64	57	71.0
PRECIPITATION:	1.9	2.7	1.6	2.6	4.5	4.1	2.2	3.8	6.7	4.7	2.2	2.2	39.3
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	3	1	0	0	0	0	0	0	0	0	0	1	6
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	36.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	88	92	95	100	88	88
RUTT	2 SL	1 SL		1 SL		
FLUSH	1 MO		1 SL			
CORR						
RAVEL		2 SL				1 SL
ALLG CR						
LONG CR					1 SL	
TRANS CR						
CRACKS	SEAL				NS	
PATCHING	1 G				2 F	2 F
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	80	70	65	65	60	75
ROADSIDE	90	87	82	80	75	77
DRAINAGE	90	80	90	90	67	87
TRAFFIC SER	82	82	84	72	76	76
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	2	0	0	2	4	3

TRAFFIC

1980 ADT:	1100
1980 PERCENT TRUCKS:	14.0
11/48-12/82 VEHICLES:	6240009
11/48-12/82 18K AXLES:	.939884

SKID NUMBER

DATE	AVG	LOW	HIGH
5/76	41	33	51
5/76	40	32	48

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.59	.563	10	15.7	2.60	4.30
77	3.67	.275	10	7.5	3.30	4.00
76	3.53	.699	10	19.8	2.50	4.40
74	3.32	.640	9	19.3	2.20	4.30
73	3.37	.510	10	15.2	2.60	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/26/76	2.437	.488	.946	.165

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.430	.209

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	35	MAINT	8/75	LIMESTONE/CALICHE	316	B	A	3	95	AC-5		.4	.3	.3			
2	S SC	25	MAINT	9/68	PRECOATED AGGREGATE	316		PB	3	90	AC-5		.3	.3	.3			
3	S CMLRA	23	MAINT	8/66	ROCK ASPHALT	330		B						1.1	1.1			
4	S SC	21	MAINT	8/64	PRECOATED AGGREGATE	316		PB	2	90	OA-175		.3	.3	.3			
5	S ST	10	WID-REC	7/58		305		B	1	75	OA-175		.3	.4	.4			
6	S ST	10	WID-REC	7/58		305		B	8	150	OA-175		.2	.2	.2			
7	B FLEX	10	WID-REC	7/58	LIMESTONE/CALICHE	218		B						.0	9.0			
8	B FLEX	10	WID-REC	7/58	LIMESTONE/CALICHE	218								5.0	.0			
9	B FLEX	1	NEW CON	11/48										11.0	11.0			
10	SG CLAY	1	NEW CON	11/48	CH,CL											5.2	57.2	34.8

LOCATION

SECTION ID NO: 1734
DISTRICT NO: 17
COUNTY NO/NAME: 26/BURLESON
CONTROL-SECTION: 116- 3
HIGHWAY: SH 21
MILE POINTS: 19.840 - 21.820
LANE: R

FROM POST 20 TO POST 22

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	2.1
MEAN TEMPERATURE:	48	51	59	68	74	80	84	83	78	69	58	52	67.4
PRECIPITATION:	2.4	2.9	2.2	4.1	3.6	4.1	2.4	2.6	5.4	3.6	3.2	3.0	39.5
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	6	2	0	0	0	0	0	0	0	0	0	3	14
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	30.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	76	75	74
PRS	44	68	77
RUTT	2 SL		
FLUSH	2 SL		
CORR			
RAVEL	2 MO		
ALLG CR	1 MO		
LONG CR	2 SL	2 MO	2 SL
TRANS CR	2 SL	2 MO	1 SL
CRACKS	NS	NS	NS
PATCHING	2 F	3 G	3 F
FAIL/MI	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	90	65	70
ROADSIDE	77	65	80
DRAINAGE	83	63	77
TRAFFIC SER	88	82	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	0	5	4

TRAFFIC

1980 ADT:	0
1980 PERCENT TRUCKS:	.0
7/37-12/82 VEHICLES:	0
7/37-12/82 18K AXLES:	0

SKID NUMBER

DATE	AVG	LOW	HIGH
2/75	35	21	43

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
76	2.95	.381	10	12.9	2.20	3.50
75	3.10	.409	9	13.2	2.60	3.70
74	2.43	.339	9	13.9	2.00	2.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
6/ 7/76	.962	.149	.076	.077

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.824	.176

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S ST	31	WID-REC	10/79		320	B	PB	3	100	AC		.3		.3			
2	B FLEX	31	WID-REC	10/79	CRUSHED STONE	249							1.0		9.0			
3	B AS	31	WID-REC	10/79		292			4		AC	4.7	1.0		1.6			
4	SB LSS	31	WID-REC	10/79		262					LIME	1.5	1.0		5.0			
5	S HMAC	23	MAINT	7/67	SLAG						AC	7.0		1.0	1.0			
6	S HMAC	18	WID-STR	2/59		317		C			AC			1.3	1.3			
7	S HMAC	18	WID-STR	2/59		317		D			AC			1.0	1.0			
8	B FLEX	18	WID-STR	2/59		215								.0	12.0			
9	S HMCL	15	MAINT	6/54		319		DD						1.0	1.0			
10	S PCC	11	NEW CON	7/37		SP								6.0	9.0			
11	SG CLAY	11	NEW CON	7/37	CL,SC,CH											5.0	44.1	25.8

LOCATION

SECTION ID NO: 1750
DISTRICT NO: 17
COUNTY NO/NAME: 154/MADISON
CONTROL-SECTION: 117- 4
HIGHWAY: US 190+
MILE POINTS: 8.030 - 10.010
LANE: R

FROM P.8 TO P.10

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	2.0
MEAN TEMPERATURE:	49	52	59	68	75	80	84	83	78	69	59	52	67.8
PRECIPITATION:	2.9	3.0	2.7	4.8	3.9	3.8	1.9	3.3	4.9	3.8	3.6	3.2	41.9
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	7	3	1	0	0	0	0	0	0	0	1	4	17
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	31.1
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	92	66	40	63	81	73
RUTT		2 SL	1 SL		2 SL	
FLUSH			2 SL	3 SL		3 MO
CORR						
RAVEL	2 SL		1 SL	1 SL		
ALLG CR		1 MO				
LONG CR		1 MO	1 MO	1 SL	1 SL	1 SL
TRANS CR		1 MO	1 SE	2 MO	2 MO	1 MO
CRACKS		NS	NS	NS	NS	NS
PATCHING		1 F	1 F	1 F		
FAIL/MI	0	0	1	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	71	50	75	35	70	60
ROADSIDE	72	72	80	75	72	75
DRAINAGE	100	73	60	73	57	77
TRAFFIC SER	98	82	82	82	78	72
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	2	3	4	4	3	3

TRAFFIC

1980 ADT: 2300
1980 PERCENT TRUCKS: 18.0
9/31-12/82 VEHICLES: 10083118
9/31-12/82 18K AXLES: 1995437

SKID NUMBER

DATE	AVG	LOW	HIGH
2/75	28	12	44

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.47	.662	10	19.1	1.80	4.00
77	3.16	.303	10	9.6	2.50	3.60
76	3.56	.467	10	13.1	2.70	4.20
75	3.03	.534	9	17.6	2.00	3.80
74	3.34	.340	9	10.2	2.80	3.90
73	3.31	.290	9	8.7	2.90	3.70

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/18/76	1.026	.260	.144	.062

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.801	.183

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	21	MAINT	9/71	ROCK ASPHALT	316		PB	4	110	AC-10		.3	.3	.3			
2	S HMAC	18	WID-STR	10/66	SLAG	340		E MOD			AC	6.2		1.0	1.0			
3	B AS	18	WID-STR	10/66		1222		A			AC	5.2		.0	6.0			
4	B AS	18	WID-STR	10/66		1222		B			AC	5.2		2.0	2.0			
5	SB LSS	18	WID-STR	10/66		260		A			LIME	4.0		.0	7.0			
6	S PCC	3	NEW CON	9/31										6.0	9.0			
7	SG CLAY	3	NEW CON	9/31	CH,CL,SC											5.8	55.1	33.4

LOCATION

SECTION ID NO: 1776
DISTRICT NO: 17
COUNTY NO/NAME: 198/ROBERTSON
CONTROL-SECTION: 205- 2
HIGHWAY: US 79
MILE POINTS: 6.000 - 8.000
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	1.3
MEAN TEMPERATURE:	47	50	58	67	73	79	83	83	77	68	57	50	66.6
PRECIPITATION:	3.1	3.1	2.5	4.5	3.6	3.3	1.6	2.9	4.1	4.3	3.1	3.1	39.1
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	8	5	1	0	0	0	0	0	0	0	1	5	22
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	29.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	85	100	73	67	93	87
RUTT			2 SL		1 SL	
FLUSH	3 MO		3 SL	1 SL		
CORR						
RAVEL				1 SL		1 SL
ALLG CR			1 MO	2 MO		
LONG CR				1 SL		1 SL
TRANS CR				1 SL		1 SL
CRACKS				NS		NS
PATCHING			1 F	1 G	1 P	
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***

RATING SCORES

SHOULDER	79	100	100	60	70	80
ROADSIDE	80	100	100	72	75	75
DRAINAGE	100	100	100	73	80	80
TRAFFIC SER	100	100	100	80	80	88
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	0	6	5	2	2

TRAFFIC

1980 ADT:	1499
1980 PERCENT TRUCKS:	18.0
7/33-12/82 VEHICLES:	9456315
7/33-12/82 18K AXLES:	1870998

SKID NUMBER

DATE	AVG	LOW	HIGH
2/75	31	9	42
2/75	31	21	52

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.10	.316	10	7.7	3.60	4.60
76	3.10	.467	10	15.1	2.30	3.70
75	3.22	.476	10	14.8	2.40	3.80
74	3.67	.302	10	8.2	3.00	4.10
73	3.50	.221	10	6.3	3.00	3.70

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/18/76	1.344	.299	.647	.147

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.469	.273

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S ST	24	WID-STR	5/77		320	B	PB	3	95	AC		.3	.4	.4			
2	B FLEX	24	WID-STR	5/77		246		D					1.0	.0	10.0			
3	B AS	24	WID-STR	5/77		292			4		AC	5.2	1.0	3.2	.0			
4	S HMAC	20	MAINT	11/65	SLAG	340		E MOD			AC	6.2		1.0	1.0			
5	S SC	15	MAINT	9/57	ROCK ASPHALT	303		PRECO	2P	80	OA-135		.2	.4	.4			
6	S CMLRA	10	MAINT	6/52	ROCK ASPHALT	314		D						.3	.3			
7	S SC	10	MAINT	6/52		303		A	8	90	RC-1		.3	.3	.3			
8	S HMAC	11	MAINT	10/43		309		M			RC			.7	.7			
9	S ST	8	STAGE	1/34										.5	.5			
10	B FLEX	4	NEW CON	7/33	IRON ORE	SP								8.0	8.0			
11	SG CLAY	4	NEW CON	7/33	CL,CH,SC											4.5	48.6	27.4

LOCATION

SECTION ID NO: 1792
DISTRICT NO: 17
COUNTY NO/NAME: 236/WALKER
CONTROL-SECTION: 213- 1
HIGHWAY: US 190
MILE POINTS: 7.200 - 9.192
LANE: L

FROM POST 28 TO POST 26

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	10.8
MEAN TEMPERATURE:	48	51	58	67	74	80	83	82	77	69	58	51	67.0
PRECIPITATION:	3.3	3.2	2.7	4.7	4.2	4.2	2.3	3.6	5.1	3.8	3.4	4.0	44.5
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	6	3	0	0	0	0	0	0	0	0	0	3	15
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	30.0
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76
PRS	97	51	68
RUTT		2 SL	1 SL
FLUSH			
CORR			
RAVEL			
ALLG CR		2 MO	1 SL
LONG CR		2 MO	2 MO
TRANS CR	1 SL	2 MO	2 MO
CRACKS	NS	NS	NS
PATCHING		1 F	1 G
FAIL/MI	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	70	75	75
ROADSIDE	72	65	62
DRAINAGE	90	70	90
TRAFFIC SER	82	82	88

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY 2 8 6

TRAFFIC

1980 ADT:	3200
1980 PERCENT TRUCKS:	18.0
2/44-12/82 VEHICLES:	13212776
2/44-12/82 18K AXLES:	2614624

SKID NUMBER

DATE	AVG	LOW	HIGH
2/75	19	17	21
2/75	20	17	25

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.23	.142	10	3.4	4.00	4.50
77	3.66	.392	10	10.7	2.80	4.00
76	3.26	.689	9	21.2	1.90	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/18/76	1.186	.298	.337	.183

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.093	.223

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S ST	20	RECONST	3/79		320	B	PB	3	100	AC		.3		.3			
2	B AS	20	RECONST	3/79		292			4		AC	5.0	1.0		2.5			
3	S HMAC	14	WID-STR	7/69		340		D			AC	4.0		1.0	1.0			
4	B AS	14	WID-STR	7/69		1619		A			AC	4.0		.0	7.0			
5	S HMAC	10	MAINT	3/54							AC			1.0	1.0			
6	S CMLRA	8	MAINT	3/51	ROCK ASPHALT	314		D						.3	.3			
7	S ST	7	NEW CON	2/44		305			SP	100	RC-2		.3	.3	.3			
8	S ST	7	NEW CON	2/44		305			SP	160	OA-230		.3	.2	.2			
9	B CS	7	NEW CON	2/44		SP					CEMENT	7.0		6.0	6.0			
10	SG CLAY	7	NEW CON	2/44	CH,SC,CL											4.5	36.0	25.2

LOCATION

SECTION ID NO: 1836
DISTRICT NO: 18
COUNTY NO/NAME: 61/DENTON
CONTROL-SECTION: 81- 6
HIGHWAY: US 377
MILE POINTS: 8.670 - 10.670
LANE: R

FROM FM 428 SO. TO SW 2 MI

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	8.8
MEAN TEMPERATURE:	43	48	55	65	72	79	84	83	76	67	55	47	65.0
PRECIPITATION:	1.6	2.0	2.6	4.2	4.6	3.4	2.4	2.2	5.3	3.5	2.3	2.1	36.3
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	4
TOTAL F-T CYCLES:	12	7	3	0	0	0	0	0	0	0	2	8	32
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.0
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	83	71	95	95	90	100
RUTT	2 SL	2 SL				
FLUSH	3 SL					
CORR						
RAVEL	1 SL		1 SL			
ALLG CR						
LONG CR		2 MO		1 SL	2 SL	
TRANS CR		2 MO				
CRACKS		NS		NS	NS	
PATCHING						
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	80	77	67	64	80	74
ROADSIDE	80	52	87	80	82	82
DRAINAGE	83	77	83	73	80	83
TRAFFIC SER	88	84	86	80	82	86

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	4	1	3	2	2

TRAFFIC

1980 ADT: 4185
1980 PERCENT TRUCKS: 17.0
4/62-12/82 VEHICLES: 11125588
4/62-12/82 18K AXLES: 2064234

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.26	.165	10	3.9	4.00	4.60
77	4.36	.127	10	2.9	4.10	4.60
76	4.34	.240	9	5.5	3.90	4.60
75	4.09	.260	10	6.4	3.60	4.40
74	4.24	.194	9	4.6	3.80	4.40
73	4.04	.180	10	4.6	3.70	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 3/76	.789	.181	.271	.051

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.599	.260

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	18	MAINT	10/79		316	B	PB	4	95	AC		.4		.4			
2	S HMAC	15	MAINT	9/69		340		D			AC	5.0		1.7	1.7			
3	S ST	13	WID-REC	4/62		305		B	2	80	OA-135		.3	.4	.4			
4	S ST	13	WID-REC	4/62	PRECOATED AGGREGATE	305		B	4	120	OA-135		.2	.2	.2			
5	B FLEX	13	WID-REC	4/62		215								12.0	.0			
6	SG CLAY	13	WID-REC	4/62	CL,SC,CH											4.0	33.7	16.7

LOCATION

SECTION ID NO: 1852
DISTRICT NO: 18
COUNTY NO/NAME: 61/DENTON
CONTROL-SECTION: 1567- 2
HIGHWAY: FM 423
MILE POINTS: 1.290 - 3.270
LANE: L

FROM POST 8 TO POST 6

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	8.8
MEAN TEMPERATURE:	43	48	55	65	72	79	84	83	76	67	55	47	65.0
PRECIPITATION:	1.6	2.0	2.6	4.2	4.6	3.4	2.4	2.2	5.3	3.5	2.3	2.1	36.3
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	4
TOTAL F-T CYCLES:	12	7	3	0	0	0	0	0	0	0	2	8	32
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.0
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	48	81	90	100	100	92
RUTT	2 MO	2 SL				
FLUSH	1 SL					2 SL
CORR			3 SL			
RAVEL	2 SL		1 SL			
ALLG CR			1 SL			
LONG CR	1 SL	1 MO				
TRANS CR	1 MO	1 MO				
CRACKS	NS	NS				
PATCHING						
FAIL/MI	1	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	65	60	70	50	45	55
ROADSIDE	85	87	92	70	77	82
DRAINAGE	83	87	67	80	80	80
TRAFFIC SER	80	80	82	84	82	78
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	6	2	2	2	1	3

TRAFFIC

1980 ADT:	2900
1980 PERCENT TRUCKS:	8.0
6/60-12/82 VEHICLES:	6477923
6/60-12/82 18K AXLES:	.513135

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.94	.538	10	18.3	2.00	3.60
77	3.39	.399	10	11.8	2.50	3.90
76	2.94	.683	10	23.2	1.50	3.70
75	2.92	.444	9	15.2	2.10	3.50
73	3.02	.096	4	3.2	2.90	3.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 4/76	1.126	.136	.124	.056

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.569	.199

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S ASB	6	MAINT	10/73		292			4		AC	4.2		4.4	4.4			
2	S SC	5	MAINT	8/71	PRECOATED AGGREGATE	316		PB	4	115	AC-10		.3	.3	.3			
3	S SC	4	MAINT	8/67	PRECOATED AGGREGATE	316		PB	4	125	AC-10		.3	.2	.2			
4	S SC	3	MAINT	8/63	PRECOATED AGGREGATE	316		PB	4	125	OA-135		.2	.2	.2			
5	S ST	2	WID-REC	6/60		305		B	2	80	OA-135		.2	.4	.4			
6	S ST	2	WID-REC	6/60		305		B	5	125	OA-135		.3	.2	.2			
7	B FLEX	2	WID-REC	6/60		SP							.2	6.0	.0			
8	B FLEX	2	WID-REC	6/60		210		A						12.0	.0			
9	SG CLAY	2	WID-REC	6/60	CH												74.0	49.5

LOCATION

SECTION ID NO: 1865
DISTRICT NO: 18
COUNTY NO/NAME: 71/ELLIS
CONTROL-SECTION: 172- 8
HIGHWAY: US 287
MILE POINTS: 25.670 - 27.720
LANE: R

FROM POST 26 TO POST 28

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-2.0
MEAN TEMPERATURE:	44	48	56	66	73	80	84	83	77	67	55	48	65.6
PRECIPITATION:	2.1	2.4	2.3	4.6	4.5	3.2	1.7	2.7	4.8	4.4	2.7	2.6	38.0
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	11	6	2	0	0	0	0	0	0	0	2	7	29
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	26.8
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	76	45	63	78	75	73
RUTT	2 SL	1 SL	1 SL			
FLUSH			1 SL			
CORR						
RAVEL		1 SL				
ALLG CR		1 MO	1 MO			
LONG CR	1 SE	2 SE	1 MO	2 MO	1 MO	2 MO
TRANS CR	1 SE	2 SE	2 MO	2 SL	3 MO	2 MO
CRACKS	PS	NS	NS	NS	NS	NS
PATCHING		1 F		1 G		
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	71	51	66	71	71	67
ROADSIDE	80	82	87	75	75	80
DRAINAGE	77	77	70	70	90	77
TRAFFIC SER	78	84	90	84	82	88
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	7	7	4	4	3

TRAFFIC

1980 ADT: 3800
1980 PERCENT TRUCKS: 8.0
7/33-12/82 VEHICLES: 24222928
7/33-12/82 18K AXLES: 1886261

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.84	.327	10	11.5	2.30	3.30
77	4.23	.177	10	4.2	4.00	4.50
76	3.90	.231	10	5.9	3.60	4.20
75	3.57	.260	9	7.3	3.20	3.90
74	3.86	.222	10	5.8	3.60	4.00
73	3.86	.180	9	4.7	3.60	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 5/76	.652	.110	.039	.014

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	2.262	.163

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	23	MAINT	8/80		316	B	PB	2	67	AC-5		.5		.3			
2	S HMAC	16	MAINT	4/70										1.6	1.6			
3	S HMAC	11	WID-STR	8/59		317		C			AC	5.5		1.6	1.6			
4	S PCC	11	WID-STR	8/59		320								.0	9.0			
5	S HMAC	10	MAINT	9/57		317		C			AC	5.0		1.4	1.4			
6	S HMAC	7	MAINT	12/51		317		D			AC	4.0		1.5	1.5			
7	S PCC	5	NEW CON	7/33		SP								6.0	9.0			
8	SG CLAY	5	NEW CON	7/33	CH,CL												69.1	44.8

LOCATION

SECTION ID NO: 1894
DISTRICT NO: 18
COUNTY NO/NAME: 199/ROCKWALL
CONTROL-SECTION: 9-12
HIGHWAY: IH 30
MILE POINTS: 7.320 - 9.320
LANE: R

FROM POST 18 TO POST 20

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-1.7
MEAN TEMPERATURE:	43	47	55	65	72	79	83	82	76	66	55	47	64.6
PRECIPITATION:	1.5	1.9	2.1	4.2	4.4	2.9	2.7	2.5	4.9	2.9	2.1	1.9	34.2
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	11	7	2	0	0	0	0	0	0	0	2	8	34
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.8
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	34	28	84	85	82	89
RUTT	2 MO	3 SL	2 SL		2 SL	1 SL
FLUSH	1 SL			1 SL		
CORR	1 MO					1 SL
RAVEL						
ALLG CR	3 MO	2 SE				
LONG CR	1 SE	3 SE	2 SL	2 SL	3 SL	1 SL
TRANS CR	2 MO	3 SE	2 SL	2 SL	3 SL	1 SL
CRACKS	NS	PS	PS	SEAL	SEAL	SEAL
PATCHING	1 P	1 P			1 G	1 P
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***

RATING SCORES

SHOULDER	49	60	70	67	70	70
ROADSIDE	72	75	80	77	85	80
DRAINAGE	87	67	67	80	90	87
TRAFFIC SER	64	72	88	82	86	86
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	7	9	2	5	4	3

TRAFFIC

1980 ADT:	19400
1980 PERCENT TRUCKS:	13.0
11/55-12/82 VEHICLES:	59547856
11/55-12/82 18K AXLES:	8270620

SKID NUMBER

DATE	AVG	LOW	HIGH
6/76	36	23	47
4/75	36	21	52
6/74	40	33	55
1/73	39	34	47
7/72	44	39	53

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.74	.735	10	26.8	1.40	3.60
77	3.01	.725	10	24.1	1.40	4.00
76	3.36	.392	10	11.7	2.80	3.80
75	3.28	.291	9	8.9	3.00	4.00
74	3.35	.165	10	4.9	3.10	3.60
73	3.47	.150	7	4.3	3.20	3.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 4/76	1.294	.220	.257	.072

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.561	.184

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	37	MAINT	5/72		340		D			AC	5.0		1.2	.0			
2	S HMAC	29	MAINT	10/66		340		D			AC	5.0		1.6	.0			
3	S SC	20	MAINT	7/60	PRECOATED AGGREGATE	303		B	4	90	OA-135		.2	.3	.3			
4	S HMAC	16	MAINT	7/58		317		C			AC	4.0		1.5	1.5			
5	S SC	15	MAINT	2/58										.3	.3			
6	S HMAC	9	STAGE	9/56		317		C			ASPHAL	5.5		2.5	2.5			
7	B FLEX	9	STAGE	9/56	LIMESTONE/CALICHE	215								9.0	.0			
8	B FLEX	7	NEW CON	11/55	SANDSTONE	215A								11.0	.0			
9	SG CLAY	7	NEW CON	11/55	CH											5.4	74.0	49.5

LOCATION

SECTION ID NO: 1941
DISTRICT NO: 19
COUNTY NO/NAME: 172/MORRIS
CONTROL-SECTION: 10- 8
HIGHWAY: US 67
MILE POINTS: 7.930 - 9.920
LANE: L

FROM POST 10 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	32.2
MEAN TEMPERATURE:	45	49	57	66	73	80	83	83	77	67	56	48	65.8
PRECIPITATION:	2.8	3.3	3.8	6.1	4.3	3.5	3.2	2.8	4.1	3.9	4.2	4.1	46.2
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	9	5	1	0	0	0	0	0	0	0	2	6	25
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	27.7
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	78	85	73	73	93	73
RUTT	1 SL	1 SL	1 SL			
FLUSH						
CORR						
RAVEL			1 SL			
ALLG CR	2 SL	1 SL	1 SL	2 MO		
LONG CR	1 SL		1 SL			3 SL
TRANS CR	2 SL	1 SL	2 MO	2 MO	1 MO	1 MO
CRACKS	NS	NS	NS	NS	NS	NS
PATCHING		1 P		1 G	1 G	1 F
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	85	85	85	65	70	75
ROADSIDE	77	77	77	65	80	85
DRAINAGE	77	83	77	60	70	77
TRAFFIC SER	62	78	78	68	66	76
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	3	2	1	4	3	3

TRAFFIC

1980 ADT: 2100
1980 PERCENT TRUCKS: 18.0
10/65-12/82 VEHICLES: 10097620
10/65-12/82 18K AXLES: 1998158

SKID NUMBER

DATE	AVG	LOW	HIGH
12/76	25	15	32
3/74	26	17	34

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.39	.393	10	11.6	2.80	3.90
77	3.90	.183	10	4.7	3.60	4.20
76	3.94	.366	10	9.3	3.20	4.50
75	3.23	.415	7	12.9	2.60	3.70
73	3.67	.227	9	6.3	3.40	4.00

DYNAFLECT DEFLECTION BASIN

DATE	W1 MEAN	W1 STD DEV	SCI MEAN	SCI STD DEV
8/ 2/76	1.017	.147	.361	.039

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.807	.233

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	34	MAINT	4/67	LIMESTONE/CALICHE	340		C			AC-20	5.9		.0	1.8			
2	S HMAC	34	MAINT	4/67	LIMESTONE/CALICHE	340		C			AC-20	5.9		1.7	1.7			
3	S ST	32	NEW CON	10/65		320		A	2	75	OA-135		.3	.4	.4			
4	B FLEX	32	NEW CON	10/65	IRON ORE	240								10.0	.0			
5	SB LSS	32	NEW CON	10/65	CLAYEY SAND	260					LIME			6.0	.0			
6	SG CLAY	32	NEW CON	10/65	CL,CH,SC											4.0	34.3	18.4

LOCATION

SECTION ID NO: 1967
DISTRICT NO: 19
COUNTY NO/NAME: 183/PANOLA
CONTROL-SECTION: 247- 2
HIGHWAY: US 79
MILE POINTS: .000 - 1.070
LANE: R

FROM FM 31 TO POST 10

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	25.8
MEAN TEMPERATURE:	47	50	57	66	73	79	82	81	76	66	56	49	65.7
PRECIPITATION:	3.9	3.6	3.7	5.1	4.0	3.7	3.3	2.7	4.5	3.3	4.2	4.6	46.5
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	8	5	1	0	0	0	.0	0	0	0	2	7	25
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	28.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	64	51	73	10	86	90
RUTT	2 SL	2 SL				
FLUSH		1 SL				
CORR						
RAVEL		1 SL				
ALLG CR	1 MO	1 MO		2 MO		
LONG CR	2 MO	1 MO	1 SE	3 SE	2 SL	2 SL
TRANS CR	1 MO	2 MO	1 SE	3 SE	2 SL	1 SL
CRACKS	PS	NS	NS	PS	PS	PS
PATCHING	1 F	1 F		2 P	1 G	
FAIL/MI	0	0	0	1	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	87	77	86	71	73	87
ROADSIDE	85	82	85	70	72	82
DRAINAGE	90	80	83	80	70	77
TRAFFIC SER	76	88	90	82	78	88
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	4	7	8	5	4	2

TRAFFIC

1980 ADT:	0
1980 PERCENT TRUCKS:	.0
3/36-12/82 VEHICLES:	0
3/36-12/82 18K AXLES:	0

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.62	.264	6	10.1	2.20	3.00
77	3.43	.283	10	8.3	3.10	4.00
76	3.32	.581	5	17.5	2.80	4.00
75	3.28	.455	5	13.9	2.80	3.80
73	3.38	.626	5	18.5	2.40	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
8/ 3/76	.770	.130	.189	.153

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	1.300	.226

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	24	MAINT	5/72		340		D			AC-20	7.0		1.3	1.3			
2	S SC	20	MAINT	8/66	ROCK ASPHALT	316		PB	1	65	AC-10		.5	.4	.4			
3	S ST	17	WIDEN	8/64		320		A	3	90	OA-135		.3	.0	.3			
4	B FLEX	17	WIDEN	8/64	IRON ORE	240			2					.0	10.0			
5	S HMAC	14	WID-STR	5/59		317		C			AC	4.5		1.5	1.5			
6	B FLEX	14	WID-STR	5/59	IRON ORE	214								.0	10.0			
7	S PCC	4	NEW CON	3/36		SP								6.0	6.0			
8	SG CLAY	4	NEW CON	3/36	CL,CH,SC											4.5	33.8	17.1

LOCATION

SECTION ID NO: 1983
DISTRICT NO: 19
COUNTY NO/NAME: 230/UPSHUR
CONTROL-SECTION: 392- 2
HIGHWAY: US 259
MILE POINTS: 5.960 - 7.990
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	42.1
MEAN TEMPERATURE:	43	47	54	64	71	77	82	81	75	65	54	46	63.5
PRECIPITATION:	2.8	3.5	3.5	6.5	4.4	4.1	2.5	2.4	4.7	3.4	4.1	4.0	46.1
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	4
TOTAL F-T CYCLES:	11	8	3	0	0	0	0	0	0	0	3	9	36
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	24.7
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	66	55	56	65	83	95
RUTT	2 SL	2 SL	2 SL			
FLUSH		1 MO	1 SL			
CORR						1 SL
RAVEL	1 SL	1 MO				
ALLG CR	1 SL	2 MO	1 MO			
LONG CR	1 MO	1 SL	2 MO	3 MO	2 SL	1 SL
TRANS CR	2 MO	1 SL	2 MO	3 MO	2 SL	
CRACKS	NS	NS	NS	NS	NS	NS
PATCHING			1 G		1 G	
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	80	63	66	67	66	86
ROADSIDE	77	77	70	70	72	82
DRAINAGE	87	87	93	80	70	83
TRAFFIC SER	82	82	82	72	68	82
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	4	7	4	0	3	2

TRAFFIC

1980 ADT:	8013
1980 PERCENT TRUCKS:	18.0
12/61-12/82 VEHICLES:	20528032
12/61-12/82 18K AXLES:	4062659

SKID NUMBER

DATE	AVG	LOW	HIGH
11/76	38	33	43
11/76	39	26	45
4/74	38	32	46
4/74	39	32	45
4/74	44	40	48

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.73	.648	10	23.7	1.80	3.90
77	3.53	.460	10	13.0	2.80	4.10
76	3.78	.625	10	16.5	3.00	4.60
75	3.56	.470	10	13.2	2.80	4.20
73	3.52	.479	7	13.6	3.00	4.40

DYNAFLECT DEFLECTION BASIN

DATE	W1 MEAN	W1 STD DEV	SCI MEAN	SCI STD DEV
8/ 2/76	.791	.195	.316	.065

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.627	.272

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	25	MAINT	9/63	SLAG	340		C			AC	6.2		1.5	1.5			
2	S ST	21	RECONST	12/61		304		A	2	75	DA-135		.3	.4	.4			
3	B FLEX	21	RECONST	12/61	IRON ORE	214								10.0	10.0			
4	SG SAND	21	RECONST	12/61	SC,CL,CH											4.0	35.8	17.8

LOCATION

SECTION ID NO: 2002
DISTRICT NO: 20
COUNTY NO/NAME: 36/CHAMBERS
CONTROL-SECTION: 508- 2
HIGHWAY: IH 10
MILE POINTS: 9.188 - 10.880
LANE: L

FROM POST 808 TO POST 806

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	39.1
MEAN TEMPERATURE:	50	54	60	69	75	80	83	82	78	70	60	53	68.3
PRECIPITATION:	3.6	3.9	2.8	4.3	4.5	4.4	4.5	5.3	5.5	4.1	3.7	4.7	51.4
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	5	2	0	0	0	0	0	0	0	0	0	2	11
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75
PRS	86	100	100	100
RUTT		1 SL	1 SL	
FLUSH	1 SL			
CORR				
RAVEL				
ALLG CR				
LONG CR				
TRANS CR	1 MO			
CRACKS	NS			
PATCHING	2 G			
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	81	74	89	69
ROADSIDE	85	85	90	57
DRAINAGE	97	93	93	63
TRAFFIC SER	76	88	74	72

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY 2 0 0 1

TRAFFIC

1980 ADT: 20000
1980 PERCENT TRUCKS: 18.0
11/58-12/82 VEHICLES: 58460592
11/58-12/82 18K AXLES: 11570211

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	55	50	59

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.91	.360	8	9.2	3.40	4.30
77	4.42	.492	10	11.1	3.20	4.80
76	4.71	.157	7	3.3	4.50	4.90
75	4.59	.135	7	2.9	4.40	4.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/22/76	.751	.118	.214	.041

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.576	.237

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S FC	54	MAINT	9/75	LIGHTWEIGHT	3022			1		AC			1.0	1.0			
2	S SC	40	MAINT	9/70		316		B	4	95	AC-10		.3	.3	.3			
3	S SC	38	MAINT	1/70										.3	.3			
4	S HMAC	31	MAINT	10/67		340		E MOD			AC-20	5.0		1.0	1.0			
5	S SC	19	MAINT	8/62	PRECOATED AGGREGATE	316		PB	3	90	OA-175		.3	.3	.3			
6	S HMAC	10	NEW CON	11/58		317		D			AC	5.0		3.0	3.0			
7	B FLEX	10	NEW CON	11/58	SHELL	212								14.0	.0			
8	SG CLAY	10	NEW CON	11/58	CH											5.0	63.4	38.9

LOCATION

SECTION ID NO: 2015
DISTRICT NO: 20
COUNTY NO/NAME: 36/CHAMBERS
CONTROL-SECTION: 389- 2
HIGHWAY: SH 146
MILE POINTS: .000 - .800
LANE: L

FROM M.B. CL TO LIBERTY CO.LN

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	39.1
MEAN TEMPERATURE:	50	54	60	69	75	80	83	82	78	70	60	53	68.3
PRECIPITATION:	3.6	3.9	2.8	4.3	4.5	4.4	4.5	5.3	5.5	4.1	3.7	4.7	51.4
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	5	2	0	0	0	0	0	0	0	0	0	2	11
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	73
PRS	73	78	80	75	97
RUTT		2 SL	1 SL		
FLUSH	1 SL	1 SL		2 SL	
CORR					
RAVEL					
ALLG CR					
LONG CR	2 MO	1 SL	2 SL	1 MO	
TRANS CR	2 MO	1 SL	1 SL	1 MO	1 SL
CRACKS	PS	NS	NS	NS	NS
PATCHING		1 P	1 P		
FAIL/MI	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***					
RATING SCORES					
SHOULDER	69	77	84	70	87
ROADSIDE	75	80	85	52	82
DRAINAGE	93	77	93	63	80
TRAFFIC SER	90	88	84	72	92
*** *** *** *** *** *** *** *** *** *** ***					
PVMT URGENCY	4	0	0	4	2

TRAFFIC

1980 ADT:	5100
1980 PERCENT TRUCKS:	18.0
6/45-12/82 VEHICLES:	19431744
6/45-12/82 18K AXLES:	3845675

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	29	21	35
9/75	22	19	24
9/75	32	13	52
9/75	22	19	24
9/75	32	13	52
6/74	28	23	33

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.98	.206	4	6.9	2.70	3.20
77	3.96	.230	5	5.8	3.60	4.20
76	3.27	.386	4	11.8	2.90	3.80
75	3.50	.245	4	7.0	3.20	3.80
74	3.52	.096	4	2.7	3.40	3.60
73	3.65	.129	4	3.5	3.50	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/22/76	.816	.131	.038	.018

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	2.810	.161

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	21	MAINT	10/72		316	B	B	4	95	AC-10		.3	.3	.3			
2	S HMAC	12	WID-STR	9/59		317		D			AC	4.2		1.2	1.2			
3	S HMAC	12	WID-STR	9/59		317		A			AC	4.2		.0	13.0			
4	S PCC	6	NEW CON	6/45		SP								7.5	9.0			
5	SG CLAY	6	NEW CON	6/45	CH											5.0	68.9	46.1

LOCATION

SECTION ID NO: 2044
DISTRICT NO: 20
COUNTY NO/NAME: 124/JEFFERSON
CONTROL-SECTION: 508- 4
HIGHWAY: SH 73
MILE POINTS: 7.504 - 9.508
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	31.5
MEAN TEMPERATURE:	51	54	60	69	75	80	82	82	78	70	60	54	68.4
PRECIPITATION:	4.1	3.9	2.7	4.4	4.2	4.2	5.5	6.0	6.1	3.7	4.1	4.9	53.9
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	3	1	0	0	0	0	0	0	0	0	0	2	8
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	32.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	95	88	65	82	70	88
RUTT		2 SL	3 SE	1 SL	3 MO	1 SL
FLUSH		1 SL	1 SL	2 SL	3 MO	2 MO
CORR				1 MO		
RAVEL	1 SL	1 SL		1 SL	1 SL	
ALLG CR			1 SL			
LONG CR			2 SL			
TRANS CR						
CRACKS	SEAL		NS			
PATCHING		1 G	1 G	1 F	1 G	
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***

RATING SCORES

SHOULDER	60	60	60	65	55	55
ROADSIDE	75	82	85	65	80	62
DRAINAGE	97	77	90	70	67	70
TRAFFIC SER	88	88	70	76	82	80
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	2	0	0	5	4	5

TRAFFIC

1980 ADT: 3700
1980 PERCENT TRUCKS: 18.0
10/56-12/82 VEHICLES: 12234719
10/56-12/82 18K AXLES: 2421457

SKID NUMBER

DATE	AVG	LOW	HIGH
8/76	38	20	55

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.83	.283	10	7.4	3.40	4.30
77	3.73	.652	10	17.5	2.40	4.50
76	3.20	.682	10	21.3	1.90	4.00
75	3.23	.521	10	16.1	2.30	3.90
73	3.58	.180	9	5.2	3.20	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/22/76	2.089	.250	.576	.091

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.785	.189

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	45	MAINT	8/72	ROCK ASPHALT	316	B	PB	4	95	AC-10		.3	.3	.3			
2	S HMAC	40	MAINT	10/65		340		D			AC	5.0		1.3	1.3			
3	S SC	23	MAINT	9/60										.3	.3			
4	S HMAC	11	NEW CON	10/56		317		D			AC	4.6		2.0	2.0			
5	B FLEX	11	NEW CON	10/56	FIELD SAND	212								10.0	10.0			
6	SB LSS	11	NEW CON	10/56		SP					LIME			4.0	4.0			
7	SG CLAY	11	NEW CON	10/56	CH											5.0	76.2	53.8

LOCATION

SECTION ID NO: 2060
DISTRICT NO: 20
COUNTY NO/NAME: 229/TYLER
CONTROL-SECTION: 213- 7
HIGHWAY: US 190
MILE POINTS: .459 - 2.459
LANE: R

FROM FM 1746 TO 2 MI EAST

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	30.8
MEAN TEMPERATURE:	49	52	59	67	73	77	80	80	76	67	58	52	66.5
PRECIPITATION:	4.3	4.6	3.0	4.1	5.0	4.6	4.1	3.7	4.8	4.1	4.1	5.4	51.9
WET F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL F-T CYCLES:	8	5	2	0	0	0	0	0	0	0	2	6	25
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	30.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75
PRS	78	87	77	92
RUTT	1 SL	1 SL	1 SL	
FLUSH				
CORR				
RAVEL		1 SL	1 SL	1 SL
ALLG CR	1 SL		1 SL	
LONG CR	1 SL	1 SL	2 SL	
TRANS CR	2 MO	1 SL	1 SL	1 SL
CRACKS	NS	NS	NS	NS
PATCHING		1 G	1 G	1 G
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	83	83	71	66
ROADSIDE	75	70	72	52
DRAINAGE	77	67	90	70
TRAFFIC SER	90	86	94	66

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	0	0	2

TRAFFIC

1980 ADT:	3495
1980 PERCENT TRUCKS:	17.0
10/43-12/82 VEHICLES:	12860820
10/43-12/82 18K AXLES:	2386088

SKID NUMBER

DATE	AVG	LOW	HIGH
9/76	34	25	39
7/74	41	37	44

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.32	.410	10	12.4	2.70	4.10
77	3.82	.230	10	6.0	3.50	4.20
76	3.76	.369	10	9.8	3.10	4.30
75	3.73	.267	10	7.2	3.30	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
7/21/76	.775	.242	.261	.083

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.688	.269

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S HMAC	33	WID-STR	8/75		320		C			AC	5.0	1.0	1.5	1.5			
2	B AS	33	WID-STR	8/75		292			4		AC	7.0	1.0	.0	10.0			
3	SB FLEX	33	WID-STR	8/75		131	2	C					1.0	.0	12.0			
4	S HMAC	26	MAINT	8/68	LIMESTONE/CALICHE	340		C			AC-20	4.7		1.3	1.3			
5	S SC	20	MAINT	8/63		316		B	3	95	OA-175		.3	.3	.3			
6	S SC	15	MAINT	7/56		303		B	3	110	OA-175		.3	.3	.3			
7	S SC	11	MAINT	12/50										.3	.3			
8	S ST	7	NEW CON	10/43		306A				60	AC		.2	.5	.5			
9	S ST	7	NEW CON	10/43		306A				120	AC		.3	.2	.2			
10	S ST	7	NEW CON	10/43		306A				170	AC		.2	.2	.2			
11	B FLEX	5	NEW CON	10/43	IRON ORE	214								8.0	8.0		19.0	4.0
12	SG SAND	5	NEW CON	10/43	SC,SM,CH											4.3	32.2	11.6

LOCATION

SECTION ID NO: 2086
DISTRICT NO: 21
COUNTY NO/NAME: 66/KENEDY
CONTROL-SECTION: 327- 2
HIGHWAY: US 77
MILE POINTS: 5.950 - 7.960
LANE: R

FROM POST 6 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-28.4
MEAN TEMPERATURE:	56	60	66	74	79	82	84	84	80	74	65	59	72.4
PRECIPITATION:	1.9	1.8	.5	1.2	3.7	3.4	1.1	2.7	5.4	2.6	1.2	1.2	26.8
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	4
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	37.7
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	77	76	74	73
PRS	80	85	90	87
RUTT	2 SL	2 SL	1 SL	
FLUSH	2 SL	1 SL	1 SL	
CORR				
RAVEL	1 SL	2 SL	1 SL	1 SL
ALLG CR				
LONG CR				1 SL
TRANS CR				1 SL
CRACKS				NS
PATCHING	1 F			
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	84	89	74	90
ROADSIDE	80	80	77	80
DRAINAGE	73	87	70	90
TRAFFIC SER	80	90	78	78

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY 3 1 0 0

TRAFFIC

1980 ADT:	4700
1980 PERCENT TRUCKS:	14.0
3/61-12/82 VEHICLES:	13059943
3/61-12/82 18K AXLES:	1967603

SKID NUMBER

DATE	AVG	LOW	HIGH
1/77	42	33	50
2/76	42	23	50
5/75	47	36	54

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
77	3.87	.395	10	10.2	3.00	4.30
76	4.00	.377	10	9.4	3.00	4.30
74	3.58	.252	9	7.1	3.10	3.90
73	3.53	.183	10	5.2	3.30	3.80

DYNAFLECT DEFLECTION BASIN

DATE	W1 MEAN	W1 STD DEV	SCI MEAN	SCI STD DEV
	PAVEMENT		SUBGRADE	
STIFF. COEFF.:	.000		.000	

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	27	MAINT	10/78		316	B	PB.	4A	120	AC		.3		.4			
2	S SC	23	MAINT	6/74	PRECOATED AGGREGATE	316	B	PB	4A	120	AC		.2	.2	.2			
3	S HMAC	20	MAINT	1/68		340					AC			4.0	4.0			
4	S HMAC	18	RECONST	3/61		317					AC			2.5	2.5			
5	B FLEX	18	RECONST	3/61										11.0	11.0			
6	SG CLAY	18	RECONST	3/61	SC,SM,SP												30.7	12.3

LOCATION

SECTION ID NO: 2117
DISTRICT NO: 21
COUNTY NO/NAME: 109/HIDALGO
CONTROL-SECTION: 255- 7
HIGHWAY: US 281
MILE POINTS: 24.012 - 26.012
LANE: R

FROM POST 24 TO POST 26

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-37.0
MEAN TEMPERATURE:	58	62	68	76	79	82	84	85	82	75	67	61	73.7
PRECIPITATION:	1.4	1.3	.7	1.2	2.4	3.1	1.1	1.6	3.9	3.2	1.1	1.0	21.9
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	39.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	74
PRS	100	86	92	87
RUTT		2 SL	1 SL	1 SL
FLUSH		2 MO	2 SL	2 SL
CORR		1 SL		
RAVEL				1 SL
ALLG CR				
LONG CR				
TRANS CR				
CRACKS	SEAL			
PATCHING				
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	90	76	86	73
ROADSIDE	90	75	85	75
DRAINAGE	83	87	83	70
TRAFFIC SER	82	84	90	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	1	3	1	0

TRAFFIC

1980 ADT: 6200
1980 PERCENT TRUCKS: 14.0
5/61-12/82 VEHICLES: 16271121
5/61-12/82 18K AXLES: 2451007

SKID NUMBER

DATE	AVG	LOW	HIGH
2/76	26	10	40
5/75	26	13	37

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.07	.206	10	5.1	3.80	4.40
77	3.84	.255	10	6.6	3.50	4.30
76	4.03	.271	10	6.7	3.60	4.60
74	3.80	.258	10	6.8	3.40	4.20
73	3.64	.201	10	5.5	3.30	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 9/76	1.296	.224	.462	.099

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.000	.000

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	62	MAINT	11/78		340		D			AC	6.0	1.0		1.5			
2	S SC	53	MAINT	8/73	PRECOATED AGGREGATE	316	B	PB	3	75	AC		.3	.4	.4			
3		53	NEW CON	8/73														
4	S HMAC	35	MAINT	9/64		340					AC-20	5.9		1.5	1.5			
5	S ST	26	NEW CON	5/61	PRECOATED AGGREGATE	305		PRECO	1P	40	OA-135		.1	.7	.7			
6	S ST	26	NEW CON	5/61	PRECOATED AGGREGATE	305		PRECO	4P	110	OA-135		.1	.3	.3			
7	B FLEX	26	NEW CON	5/61		SP								10.0	10.0			
8	SB LSS	26	NEW CON	5/61		SP					LIME	2.0		6.0	6.0			

LOCATION

SECTION ID NO: 2120
DISTRICT NO: 21
COUNTY NO/NAME: 109/HIDALGO
CONTROL-SECTION: 863- 1
HIGHWAY: FM 493
MILE POINTS: 22.486 - 24.481
LANE: R

FROM POST 26 TO POST 28

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-37.0
MEAN TEMPERATURE:	58	62	68	76	79	82	84	85	82	75	67	61	73.7
PRECIPITATION:	1.4	1.3	.7	1.2	2.4	3.1	1.1	1.6	3.9	3.2	1.1	1.0	21.9
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	1
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	39.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	73	73
PRS	67	56	62	85	58
RUTT	1 MO	2 SL		1 SL	2 MO
FLUSH	2 SL	2 MO	1 SL		
CORR	1 SL				
RAVEL	1 SL	1 SL	2 SL		1 SL
ALLG CR	1 SE	1 SE	2 MO	1 SL	2 MO
LONG CR				1 SL	1 SL
TRANS CR				1 SL	1 SL
CRACKS	PS	NS		NS	NS
PATCHING		3 F	3 F	2 G	2 F
FAIL/MI	0	0	0	0	0
*** *** ***	***	***	***	***	***
RATING SCORES					
SHOULDER	55	65	80	80	50
ROADSIDE	85	80	75	82	72
DRAINAGE	63	60	83	90	70
TRAFFIC SER	66	70	86	82	76
*** *** ***	***	***	***	***	***
PVMT URGENCY	4	9	5	4	0

TRAFFIC

1980 ADT:	1420
1980 PERCENT TRUCKS:	8.0
1/47-12/82 VEHICLES:	4967792
1/47-12/82 18K AXLES:	386904

SKID NUMBER

DATE	AVG	LOW	HIGH
1/77	32	25	37
1/76	29	21	40
3/75	24	20	30

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.31	.307	10	9.3	2.80	3.90
77	3.37	.320	10	9.5	2.80	3.90
76	3.79	.461	8	12.2	3.30	4.40
73	3.54	.152	10	4.2	3.40	3.90
73	3.11	.190	9	6.1	2.90	3.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
5/30/72	3.740	.680	1.496	.298

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.000	.000

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	25	MAINT	8/76										.3	.3			
2	S HMAC	17	MAINT	3/71							AC			1.3	1.3			
3	S SC	14	MAINT	9/67	SILICEOUS	316		A	5	120	EA-HVM		.4	.2	.2			
4	S SC	10	MAINT	9/61										.3	.3			
5	S SC	4	MAINT	6/56										.3	.3			
6	S SC	3	MAINT	6/50	ROCK ASPHALT	303				120	RC-2		.3	.2	.2			
7	S ST	1	NEW CON	1/47		304A				90	OA-135		.3	.3	.3			
8	B FLEX	1	NEW CON	1/47		SP								4.0	4.0			
9		1	NEW CON	1/47														

LOCATION

SECTION ID NO: 2133
DISTRICT NO: 21
COUNTY NO/NAME: 253/ZAPATA
CONTROL-SECTION: 38- 4
HIGHWAY: US 83
MILE POINTS: 36.000 - 38.000
LANE: L

FROM POST 38 TO POST 36

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-40.1
MEAN TEMPERATURE:	55	60	65	74	80	84	86	86	82	74	65	57	72.9
PRECIPITATION:	1.5	1.6	.6	1.0	1.6	3.3	.6	1.7	3.0	2.2	1.0	1.4	19.6
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	1	0	0	0	0	0	0	0	0	0	0	0	3
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	37.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	73
PRS	77	70	85	92
RUTT	1 SL	2 SL	2 SL	1 SL
FLUSH	2 SL	1 SL		
CORR				
RAVEL		1 SL		
ALLG CR	1 SL	1 SL	1 SL	
LONG CR	1 SL	1 SL	1 SL	1 SL
TRANS CR		1 SL	1 SL	1 SL
CRACKS	NS	NS	NS	NS
PATCHING	1 F	1 F	1 G	1 G
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	81	74	79	83
ROADSIDE	80	77	87	85
DRAINAGE	87	83	83	90
TRAFFIC SER	82	88	92	86

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	6	6	2

TRAFFIC

1980 ADT:	2500
1980 PERCENT TRUCKS:	14.0
8/53-12/82 VEHICLES:	7823161
8/53-12/82 18K AXLES:	1178218

SKID NUMBER

DATE	AVG	LOW	HIGH
12/76	30	24	43
2/76	28	16	35
3/75	28	22	32

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.34	.504	10	15.1	2.60	4.00
77	3.41	.482	10	14.1	2.50	3.90
76	3.36	.862	10	25.6	1.60	4.20
73	3.80	.115	10	3.0	3.60	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
3/25/75	1.158	.313	.440	.183

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.000	.000

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	31	MAINT	6/78		316	B	PB	4A	125	AC		.3		.4			
2	S HMAC	27	MAINT	6/67		340		D			AC-20	5.8		1.0	1.0			
3	S SC	23	MAINT	8/59										.3	.3			
4	S ST	18	NEW CON	8/53		305		A	5	90	OA-135		.2	.3	.3			
5	S ST	18	NEW CON	8/53		305		A	10	170	OA-135		.3	.2	.2			
6	B FLEX	18	NEW CON	8/53		SP								4.0	.0			
7	B FLEX	18	NEW CON	8/53		SP								4.0	.0			
8	SG CLAY	18	NEW CON	8/53	CL,CH,SC											5.5	49.6	27.0

LOCATION

SECTION ID NO: 2159
DISTRICT NO: 22
COUNTY NO/NAME: 64/DIMMIT
CONTROL-SECTION: 37- 6
HIGHWAY: US 83
MILE POINTS: 17.720 - 19.770
LANE: R

FROM POST 18 TO POST 20

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-26.8
MEAN TEMPERATURE:	53	58	65	74	79	84	86	86	81	73	63	56	71.9
PRECIPITATION:	.8	1.1	.7	1.4	2.1	2.6	1.4	3.1	4.0	2.5	.9	.9	21.4
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	3	1	0	0	0	0	0	0	0	0	0	1	7
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	36.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	100	50	67	90	92	88
RUTT		2 SL				
FLUSH		2 SL	1 MO		2 SL	2 MO
CORR					2 MO	
RAVEL		2 SL	2 SL			
ALLG CR		3 SE	3 SL	1 SL		
LONG CR				1 SL		
TRANS CR						
CRACKS		NS		NS		
PATCHING		1 P				
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	96	63	64	67	76	71
ROADSIDE	85	75	85	82	80	82
DRAINAGE	83	83	83	70	87	90
TRAFFIC SER	84	82	90	76	82	80
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	1	9	8	3	0	4

TRAFFIC

1980 ADT:	2100
1980 PERCENT TRUCKS:	18.0
9/60-12/82 VEHICLES:	5438465
9/60-12/82 18K AXLES:	1076378

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.91	.264	10	6.8	3.60	4.30
77	3.50	.738	10	21.1	1.80	4.30
76	4.10	.275	10	6.7	3.70	4.50
75	3.95	.350	10	8.9	3.40	4.30
74	2.35	.587	10	25.0	1.60	3.30
73	2.65	.550	10	20.7	2.00	3.70

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
6/14/76	1.746	.319	.780	.158

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.382	.253

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	46	MAINT	7/78		316	B	PB	4	100	EAHVRS		.4		.4			
2	S CMLRA	44	MAINT	9/74	ROCK ASPHALT	330								.8	.8			
3	S SC	41	MAINT	9/73										.3	.3			
4	S SC	35	MAINT	9/66	PRECOATED AGGREGATE	316		PB	4	90	AC-5		.3	.3	.3			
5	S ST	30	NEW CON	9/60		304		W	5	100	OA-175		.3	.3	.3			
6	B FLEX	30	NEW CON	9/60		218								6.0	.0			
7	B FLEX	30	NEW CON	9/60	LIMESTONE/CALICHE	211								9.0	.0			
8	SG CLAY	30	NEW CON	9/60	CL,SC,CH											4.8	39.5	18.4

LOCATION

SECTION ID NO: 2222
DISTRICT NO: 22
COUNTY NO/NAME: 254/ZAVALA
CONTROL-SECTION: 1279- 1
HIGHWAY: FM 1025
MILE POINTS: 2.000 - 4.000
LANE: R

FROM POST 2 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-30.2
MEAN TEMPERATURE:	52	57	65	73	78	83	86	85	80	72	61	54	71.0
PRECIPITATION:	.9	1.4	.6	1.5	2.8	2.6	1.6	2.9	3.2	3.0	1.0	.8	22.4
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL F-T CYCLES:	3	1	0	0	0	0	0	0	0	0	0	2	8
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	35.0
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75
PRS .	100	62	85	75
RUTT		1 SL	2 SL	
FLUSH		2 SL	2 SL	
CORR				1 MO
RAVEL		1 SL		1 SL
ALLG CR		3 SL	1 SL	3 MO
LONG CR				
TRANS CR		1 SL		
CRACKS		NS		
PATCHING		2 F		
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	80	60	80	80
ROADSIDE	85	80	90	70
DRAINAGE	93	57	83	80
TRAFFIC SER	88	86	92	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY 1 9 1 5

TRAFFIC

1980 ADT: 417
1980 PERCENT TRUCKS: 14.0
5/63-12/82 VEHICLES: 1402124
5/63-12/82 18K AXLES: 210340

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.32	.204	10	4.7	4.00	4.60
77	3.08	.449	10	14.6	2.30	3.60
76	4.54	.215	7	4.7	4.20	4.80
75	3.75	.378	10	10.1	2.90	4.30

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
6/15/76	2.941	1.229	1.025	.617

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.635	.208

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S CMLRA	18	MAINT	8/74	ROCK ASPHALT	330		C MOD						1.0	1.0			
2	S SC	17	MAINT	5/73	PRECOATED AGGREGATE	316	B	PB	4	109	EAHVR9		.4	.3	.3			
3	S CMLRA	14	MAINT	7/68	ROCK ASPHALT	330		C MOD						.8	.8			
4	S ST	12	RECONST	5/63		320		B	3	80	OA-175		.3	.4	.4			
5	B FLEX	12	RECONST	5/63		246								4.0	4.0			
6	B LST	12	RECONST	5/63		252					LIME	1.0		4.0	4.0			
7	SG CLAY	12	RECONST	5/63	CL,CH											4.4	48.2	28.4

LOCATION

SECTION ID NO: 2308
DISTRICT NO: 23
COUNTY NO/NAME: 206/SAN SABA
CONTROL-SECTION: 289- 4
HIGHWAY: SH 16
MILE POINTS: 1.960 - 3.920
LANE: L

FROM POST 4 TO POST 2

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-22.3
MEAN TEMPERATURE:	44	47	55	65	72	79	83	82	76	65	53	46	64.5
PRECIPITATION:	1.4	1.6	1.3	2.4	3.6	2.1	1.6	2.4	3.6	3.4	1.4	1.3	25.9
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	13	8	3	0	0	0	0	0	0	0	3	10	38
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	76	80	62	78	78	70
RUTT	2 SL	1 SL	1 SL	2 SL		
FLUSH			1 MO	1 MO		
CORR						
RAVEL	1 SL	2 MO				
ALLG CR			2 MO			
LONG CR	1 SL	1 SL	1 SL	1 SL	2 MO	3 MO
TRANS CR	2 MO	1 SL	2 MO	2 SL	2 MO	2 MO
CRACKS	NS	NS	PS	PS	PS	PS
PATCHING	1 G			1 G	1 G	1 F
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	84	66	74	47	63	64
ROADSIDE	70	82	90	75	77	82
DRAINAGE	73	80	90	87	83	80
TRAFFIC SER	88	90	84	78	80	86
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	2	7	4	4	4

TRAFFIC

1980 ADT:	0
1980 PERCENT TRUCKS:	.0
10/40-12/82 VEHICLES:	0
10/40-12/82 18K AXLES:	0

SKID NUMBER

DATE	AVG	LOW	HIGH
8/75	29	19	51

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.99	.307	10	10.3	2.50	3.30
77	3.57	.316	10	8.9	3.10	4.00
76	2.81	.603	10	21.4	1.80	3.70
75	3.39	.362	9	10.7	2.90	3.80
74	3.30	.356	10	10.8	2.80	3.80
73	3.42	.449	9	13.1	2.70	4.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/16/75	1.557	.391	.595	.069

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.602	.257

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	17	MAINT	9/77	LIGHTWEIGHT	316	B	LT WT	4	135	EA-CRS		.4		.4			
2	S SC	15	MAINT	6/66	PRECOATED AGGREGATE	316		PB	4	115	AC-5		.3	.3	.3			
3	S HMAC	13	MAINT	9/56		317					AC	5.0		1.8	1.8			
4	S SC	8	MAINT	4/47		303A				120	OA-230		.3	.2	.2			
5	S ST	5	NEW CON	10/40		305				100	OA-135		.2	.3	.3			
6	S ST	5	NEW CON	10/40		305				200	OA-135		.3	.1	.1			
7	B FLEX	5	NEW CON	10/40		211								3.0	.0			
8	B FLEX	5	NEW CON	10/40	LIMESTONE/CALICHE	211								3.0	.0			
9	SG CLAY	5	NEW CON	10/40	CL,ML,CH											4.4	42.8	22.6

LOCATION

SECTION ID NO: 2324
DISTRICT NO: 24
COUNTY NO/NAME: 72/EL PASO
CONTROL-SECTION: 2121- 4
HIGHWAY: IH 10
MILE POINTS: 46.875 - 48.895
LANE: L

FROM POST 48 TO POST 46

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-46.6
MEAN TEMPERATURE:	42	46	54	61	70	78	80	78	72	62	50	43	61.8
PRECIPITATION:	.3	.4	.3	.0	.2	.7	1.8	1.8	1.2	.7	.3	.4	8.1
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	1	2
TOTAL F-T CYCLES:	20	14	4	0	0	0	0	0	0	0	7	18	66
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	22.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	73
PRS	83	73	76	83
RUTT	2 MO	2 SL	1 SL	
FLUSH	1 SL	2 SL		3 SL
CORR				
RAVEL				
ALLG CR				
LONG CR		1 MO	2 MO	
TRANS CR	1 MO	1 MO	1 MO	2 SL
CRACKS	SEAL	NS	PS	NS
PATCHING			1 F	
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	74	81	64	89
ROADSIDE	87	75	77	67
DRAINAGE	93	80	83	90
TRAFFIC SER	86	74	86	92

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	3	2	2

TRAFFIC

1980 ADT:	8100
1980 PERCENT TRUCKS:	36.0
7/60-12/82 VEHICLES:	22181440
7/60-12/82 18K AXLES:	9544453

SKID NUMBER

DATE	AVG	LOW	HIGH
6/76	34	27	39

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.45	.758	10	22.0	2.50	4.50
77	3.98	.413	10	10.4	3.30	4.60
76	4.36	.378	10	8.7	3.80	4.80
73	4.36	.200	10	5.0	4.00	4.70

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
12/ 9/75	.690	.165	.132	.060

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.687	.231

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	14	MAINT	4/69		346		D			AC	5.3		.9	.9			
2	S HMAC	14	MAINT	4/69		346		B			AC	5.3		2.0	2.0			
3	S HMAC	14	MAINT	4/69		340		D			AC	5.5		1.1	1.1			
4	S SC	9	MAINT	6/67										.3	.3			
5	S HMAC	2	NEW CON	7/60		317		B			AC	5.1		2.0	2.0			
6	S HMAC	2	NEW CON	7/60		317		C			AC	5.1		1.5	1.5			
7	B FLEX	2	NEW CON	7/60		215								10.0	.0	2.4	30.0	8.0
8	SG SAND	2	NEW CON	7/60	SM,SC,SP											3.7	19.0	3.0

LOCATION

SECTION ID NO: 2337
DISTRICT NO: 24
COUNTY NO/NAME: 55/CULBERSON
CONTROL-SECTION: 233- 5
HIGHWAY: SH 54
MILE POINTS: 46.630 - 48.600
LANE: L

FROM POST 50 TO POST 48

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-44.1
MEAN TEMPERATURE:	44	47	54	63	72	79	80	78	73	63	51	45	62.8
PRECIPITATION:	.5	.3	.2	.2	.5	.9	1.7	2.2	1.7	1.4	.4	.3	10.2
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	15	10	4	0	0	0	0	0	0	0	4	13	49
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	24.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	85	61	73	73	83	83
RUTT	1 SL	2 SL				
FLUSH		2 SL				
CORR						
RAVEL	3 MO		1 SL			
ALLG CR		2 MO				1 SL
LONG CR		1 MO	2 MO	2 MO	2 SL	1 SL
TRANS CR		1 MO	2 MO	2 MO	2 SL	2 SL
CRACKS	SEAL	PS	PS	NS	NS	NS
PATCHING						
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	65	75	80	50	60	80
ROADSIDE	85	77	85	77	75	87
DRAINAGE	73	80	83	73	90	90
TRAFFIC SER	86	88	92	76	84	96
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	3	3	2	4	3	2

TRAFFIC

1980 ADT:	219
1980 PERCENT TRUCKS:	8.0
9/42-12/82 VEHICLES:	1051284
9/42-12/82 18K AXLES:	81201

SKID NUMBER

DATE	AVG	LOW	HIGH
10/75	40	20	47
10/75	38	16	46

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.72	.274	10	7.4	3.10	4.00
77	3.92	.220	10	5.6	3.50	4.20
76	3.86	.368	9	9.5	3.00	4.30
75	3.51	.242	9	6.9	3.00	3.70
74	3.88	.277	9	7.1	3.40	4.20
73	3.69	.169	9	5.3	3.30	3.90

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
12/ 9/75	.983	.312	.483	.146

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.447	.314

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	23	MAINT	6/79		316	B	B	4	120	AC-5		.4		.4			
2	S HMAC	22	MAINT	5/71		340		D			AC	5.0		1.5	1.5			
3	S SC	19	MAINT	8/62		316		B	4	130	OA-135		.3	.2	.2			
4	S SC	18	MAINT	6/56		303		B	3	115	OA-135		.3	.3	.3			
5	S SC	17	MAINT	7/49		303A				125	OA-135		.3	.2	.2			
6	S ST	10	STAGE	11/43		301A				100	AC		.4	.3	.3			
7	B FLEX	9	NEW CON	9/42		SP								6.0	6.0			
8		9	NEW CON	9/42												3.4		

LOCATION

SECTION ID NO: 2353
DISTRICT NO: 24
COUNTY NO/NAME: 72/EL PASO
CONTROL-SECTION: 374- 2
HIGHWAY: US 180
MILE POINTS: 24.882 - 26.882
LANE: L

FROM POST 18 TO POST 16

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-46.6
MEAN TEMPERATURE:	42	46	54	61	70	78	80	78	72	62	50	43	61.8
PRECIPITATION:	.3	.4	.3	.0	.2	.7	1.8	1.8	1.2	.7	.3	.4	8.1
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	1	2
TOTAL F-T CYCLES:	20	14	4	0	0	0	0	0	0	0	7	18	66
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	22.5
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	73	62	46	60	73	82
RUTT	2 SL	2 SL	2 SL		1 SL	
FLUSH	2 SL	2 SL	1 SL			
CORR						
RAVEL	1 SL	2 SL	2 MO			
ALLG CR		2 MO	1 SE	1 MO		1 SL
LONG CR	1 SL	1 MO		3 MO	2 MO	1 SL
TRANS CR	2 SL		3 SE	3 MO	3 MO	3 SL
CRACKS	NS	SEAL	PS	PS	PS	PS
PATCHING						
FAIL/MI	0	0	0	0	0	0
*** *** *** *** *** *** *** *** *** *** ***						
RATING SCORES						
SHOULDER	69	73	64	69	73	76
ROADSIDE	75	77	75	70	72	85
DRAINAGE	97	87	87	83	80	90
TRAFFIC SER	74	76	82	74	80	92
*** *** *** *** *** *** *** *** *** *** ***						
PVMT URGENCY	4	3	9	6	4	4

TRAFFIC

1980 ADT:	1791
1980 PERCENT TRUCKS:	14.0
2/55-12/82 VEHICLES:	8135537
2/55-12/82 18K AXLES:	1225318

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.80	.368	10	13.1	2.30	3.50
77	3.30	.226	10	6.9	2.90	3.60
76	3.36	.391	9	11.6	2.70	3.90
75	3.52	.097	9	2.8	3.40	3.70
74	3.46	.246	9	7.1	3.10	3.80
73	3.63	.130	10	3.7	3.30	3.80

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
12/10/75	1.307	.301	.452	.077

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.590	.255

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	29	MAINT	5/80		316	B	PB	4	115	AC		.3		.4			
2	S SC	23	MAINT	9/75	SILICEOUS	316	B	B	4	115	AC		.3	.3	.3			
3	S HMAC	19	MAINT	8/63	LIMESTONE/CALICHE	340		D			AC	5.3		1.3	1.3			
4	S HMAC	12	WID-REC	2/55		317		C			AC	5.0		2.0	2.0			
5	B FLEX	12	WID-REC	2/55		215								7.0	.0			
6	SG SAND	12	WID-REC	2/55	SM,SC											4.0	19.2	4.4

LOCATION

SECTION ID NO: 2395
DISTRICT NO: 24
COUNTY NO/NAME: 189/PRESIDIO
CONTROL-SECTION: 20- 8
HIGHWAY: US 90
MILE POINTS: 6.320 - 8.330
LANE: R

FROM POST 34 TO POST 36

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-3.4
MEAN TEMPERATURE:	45	48	55	64	71	77	78	76	72	63	52	46	62.8
PRECIPITATION:	.4	.3	.3	.3	.7	1.7	1.9	2.6	2.1	1.2	.6	.3	12.3
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL F-T CYCLES:	17	12	7	0	0	0	0	0	0	0	6	16	62
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	25.4
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	87	78	80	96	91	93
RUTT	1 SL	2 SL	1 SL			
FLUSH	1 SL	2 MO	2 SL			
CORR						
RAVEL	1 SL	2 SL	2 MO		1 SL	1 SL
ALLG CR						
LONG CR				1 SL	1 SL	
TRANS CR	1 SL			1 SL	1 SL	1 SL
CRACKS	NS			SEAL	SEAL	SEAL
PATCHING			1 G	1 G		
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	89	74	70	64	70	71
ROADSIDE	92	70	90	72	75	80
DRAINAGE	90	70	60	80	90	90
TRAFFIC SER	94	66	86	78	80	88
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	2	3	7	3	3	2

TRAFFIC

1980 ADT:	0
1980 PERCENT TRUCKS:	.0
10/59-12/82 VEHICLES:	0
10/59-12/82 18K AXLES:	0

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.21	.218	10	5.2	3.90	4.50
77	4.43	.082	10	1.9	4.30	4.50
76	4.69	.099	10	2.1	4.50	4.80
75	4.55	.143	10	3.2	4.30	4.80
74	4.67	.125	10	2.7	4.40	4.80
73	4.46	.160	10	3.5	4.20	4.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
12/ 9/75	.932	.105	.421	.060

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.442	.288

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	29	MAINT	5/80		316	B	B	4	115	AC		.3		.4			
2	S SC	28	MAINT	10/75	SILICEOUS	316		B	4	115	AC		.3	.3	.3			
3	S HMAC	26	MAINT	4/70	TRAP ROCK	340		D			AC-10	6.7		1.3	1.3			
4	S SC	20	MAINT	6/64	PRECOATED AGGREGATE	316		PB	4	90	OA-135		.2	.3	.3			
5	S ST	17	NEW CON	10/59		306		B	1	70	OA-135		.3	.4	.4			
6	S ST	17	NEW CON	10/59		306		B	4	120	OA-135		.3	.2	.2			
7	S ST	17	NEW CON	10/59		306		B	10	150	OA-135		.3	.2	.2			
8	B FLEX	17	NEW CON	10/59	LIMESTONE/CALICHE	211								12.0	.0			
9	SG CLAY	17	NEW CON	10/59	CL,SC												39.8	20.8

LOCATION

SECTION ID NO: 2468
DISTRICT NO: 25
COUNTY NO/NAME: 65/DONLEY
CONTROL-SECTION: 42- 8
HIGHWAY: US 287
MILE POINTS: 7.770 - 9.880
LANE: L

FROM HALL CO.LINE TO POST 34

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-20.0
MEAN TEMPERATURE:	36	40	48	59	68	75	80	79	71	60	48	40	59.0
PRECIPITATION:	.6	.7	1.1	1.4	3.6	3.7	2.1	2.4	2.3	1.6	.7	.7	20.9
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	20	17	11	1	0	0	0	0	0	0	9	20	81
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	15.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	63	70	80	92	100	65
RUTT	1 SL					
FLUSH		2 SL	1 SL			
CORR						
RAVEL		1 SL				
ALLG CR	2 MO	1 MO	2 MO			
LONG CR	2 MO			1 SL		3 MO
TRANS CR	1 MO	1 MO		1 SL		2 SE
CRACKS	NS	NS		NS		NS
PATCHING						
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	76	76	70	73	84	86
ROADSIDE	82	80	82	67	87	80
DRAINAGE	90	77	80	77	80	90
TRAFFIC SER	84	92	94	82	82	92

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	4	6	7	3	1	5

TRAFFIC

1980 ADT: 4900
1980 PERCENT TRUCKS: 18.0
6/58-12/82 VEHICLES: 17230064
6/58-12/82 18K AXLES: 3410063

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.09	.247	10	6.0	3.60	4.50
77	4.26	.178	10	4.2	4.00	4.60
76	4.74	.117	10	2.5	4.50	4.90
75	4.49	.137	10	3.1	4.30	4.70
74	4.75	.113	11	2.4	4.60	4.90
73	3.86	.150	10	3.9	3.60	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 5/75	.914	.202	.262	.104

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.759	.240

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	26	MAINT	9/74										1.5	1.5			
2	S SC	20	MAINT	7/65	PRECOATED AGGREGATE	316		PB	4	100	AC-5		.3	.3	.3			
3	S HMAC	16	WID-STR	6/58		317		C			AC	4.5		2.5	2.5			
4	B FLEX	16	WID-STR	6/58	SILICEOUS	213A								8.0	8.0			
5	SG SAND	16	WID-STR	6/58	SC,CL,SM											3.6	27.2	10.5

LOCATION

SECTION ID NO: 2502
DISTRICT NO: 5
COUNTY NO/NAME: 54/CROSBY
CONTROL-SECTION: 131- 3
HIGHWAY: US 82
MILE POINTS: 13.000 - 15.000
LANE: L

POST 14 TO POST 12

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-20.7
MEAN TEMPERATURE:	37	41	48	59	68	75	79	77	70	60	48	41	59.2
PRECIPITATION:	.5	.8	1.1	1.2	2.8	2.9	2.6	2.3	3.0	2.3	.9	.7	21.2
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	20	17	10	1	0	0	0	0	0	0	7	19	76
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	17.3
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	65	80	59	85	100	95
RUTT		1 SL	1 SL			
FLUSH	2 SL	1 SL	2 MO			
CORR						
RAVEL		1 SL				
ALLG CR	1 MO	1 MO				
LONG CR	1 MO	1 MO	2 MO			1 SL
TRANS CR	1 SE		1 MO			
CRACKS	PS		PS			NS
PATCHING			3 F	2 P		
FAIL/MI	0	0	0	0	0	0
*** *** ***	***	***	***	***	***	***
RATING SCORES						
SHOULDER	71	73	67	71	73	79
ROADSIDE	72	90	90	77	80	85
DRAINAGE	63	87	87	80	90	90
TRAFFIC SER	80	80	94	84	86	70
*** *** ***	***	***	***	***	***	***
PVMT URGENCY	4	4	7	0	2	3

TRAFFIC

1980 ADT:	3600
1980 PERCENT TRUCKS:	18.0
6/59-12/82 VEHICLES:	15094645
6/59-12/82 18K AXLES:	2986207

SKID NUMBER

DATE	AVG	LOW	HIGH
2/76	21	16	26
4/73	30	25	33

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.26	.143	10	3.4	4.10	4.50
77	4.57	.134	10	2.9	4.40	4.80
76	4.76	.135	10	2.8	4.60	4.90
75	4.58	.180	9	3.9	4.20	4.80
74	4.58	.190	10	4.1	4.30	4.80
73	4.33	.142	10	3.3	4.10	4.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 3/75	1.027	.354	.262	.136

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.499	.236

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	21	MAINT	10/78			B	PB	4	120	AC		.3		.0			
2	S HMAC	16	MAINT	9/72		340		C			AC	6.3		1.5	1.5			
3	S ASB	16	MAINT	9/72		2043			4		AC	7.2		2.5	2.5			
4	S HMAC	14	RECONST	6/59		317		D			AC	5.5		1.2	1.2			
5	S ST	14	RECONST	6/59		304		A	5	90	OA-230		.3	.3	.3			
6	B LST	14	RECONST	6/59		218					LIME	1.5		14.0	12.0			
7	SG CLAY	14	RECONST	6/59	CL,CH											4.5	47.5	27.5

LOCATION

SECTION ID NO: 2620
DISTRICT NO: 5
COUNTY NO/NAME: 152/LUBBOCK
CONTROL-SECTION: 131- 1
HIGHWAY: US 62+8
MILE POINTS: 19.590 - 21.590
LANE: L

FROM POST 24 TO POST 22

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-25.8
MEAN TEMPERATURE:	38	42	49	60	69	76	79	77	70	60	48	41	59.7
PRECIPITATION:	.4	.6	1.0	1.0	2.5	3.2	2.4	2.1	2.3	2.1	.6	.5	18.6
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	20	15	8	1	0	0	0	0	0	0	7	18	71
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	18.2
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74	73
PRS	48	70	62	83	92	90
RUTT		2 SL				
FLUSH	3 MO	2 SL	2 SL			
CORR						
RAVEL		1 SL				
ALLG CR	2 MO	2 MO	2 SE	1 SL		2 SL
LONG CR	1 MO			1 SL	1 SL	
TRANS CR	2 MO		1 SE	1 MO	1 SL	
CRACKS	NS	NS	PS	NS	NS	
PATCHING						
FAIL/MI	0	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	66	73	73	70	80	71
ROADSIDE	82	80	90	70	75	82
DRAINAGE	90	77	80	77	70	90
TRAFFIC SER	84	88	94	86	84	82

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	6	6	7	5	3	4

TRAFFIC

1980 ADT: 9304
1980 PERCENT TRUCKS: 18.0
12/58-12/82 VEHICLES: 32892384
12/58-12/82 18K AXLES: 6509684

SKID NUMBER

DATE	AVG	LOW	HIGH
3/76	23	13	32
4/73	31	24	52

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.14	.227	10	5.5	3.70	4.40
77	4.30	.206	10	4.8	4.00	4.60
76	4.76	.097	10	2.0	4.60	4.90
75	4.39	.089	10	2.0	4.30	4.50
74	4.47	.090	10	2.1	4.30	4.60
73	4.38	.123	10	2.8	4.10	4.50

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/31/71	1.395	.181	.396	.141

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.435	.239

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	35	MAINT	10/78		316	B	PB	4	120	AC-5		.3		.4			
2	S HMAC	26	MAINT	9/72	SILICEOUS	340		C			AC-10	6.3		1.5	1.5			
3	S ASB	26	MAINT	9/72	LIMESTONE/CALICHE	2043			4		AC-10	7.2		2.5	2.5			
4	S HMAC	20	STAGE	6/59	LIMESTONE/CALICHE	317		D			OA-135	5.7		1.3	1.3			
5	S ST	19	NEW CON	12/58						90	OA-230		.3	.3	.3			
6	B LST	19	NEW CON	12/58	LIMESTONE/CALICHE	218					LIME	1.0		13.0	13.0		36.0	17.0
7	SG CLAY	19	NEW CON	12/58	CL,SC,SM											3.6	33.4	17.2

LOCATION

SECTION ID NO: 2659
DISTRICT NO: 5
COUNTY NO/NAME: 86/GARZA
CONTROL-SECTION: 53- 5
HIGHWAY: US 84
MILE POINTS: 28.000 - 30.000
LANE: R

FROM POST 28 TO POST 30

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-23.5
MEAN TEMPERATURE:	39	43	50	61	69	77	80	79	71	62	50	43	60.8
PRECIPITATION:	.7	.7	1.1	1.2	2.8	3.2	2.5	2.5	2.6	2.0	.9	.7	21.0
WET F-T CYCLES:	1	1	0	0	0	0	0	0	0	0	0	1	5
TOTAL F-T CYCLES:	18	14	7	0	0	0	0	0	0	0	5	15	61
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	20.0
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	73
PRS	100	61	53	79	82
RUTT		2 SL	1 SL	1 SL	
FLUSH		2 SL	3 MO	2 SL	1 SL
CORR					
RAVEL		1 SL	1 SL		2 SL
ALLG CR		1 MO		1 SL	
LONG CR		1 MO	1 SE	1 SL	
TRANS CR		1 MO	1 SE	1 SL	
CRACKS		PS	NS	NS	
PATCHING				1 G	1 F
FAIL/MI	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	87	69	76	76	76
ROADSIDE	75	82	85	67	72
DRAINAGE	90	80	80	70	90
TRAFFIC SER	92	80	86	80	86

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	1	7	7	4	2

TRAFFIC

1980 ADT:	3800
1980 PERCENT TRUCKS:	18.0
8/61-12/82 VEHICLES:	12724481
8/61-12/82 18K AXLES:	2517868

SKID NUMBER

DATE	AVG	LOW	HIGH
1/75	32	14	40
1/75	34	23	41
5/74	31	21	35
5/74	28	24	39

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.94	.126	10	3.2	3.80	4.20
77	3.40	.422	10	12.4	2.80	3.90
76	3.21	.477	10	14.9	2.40	3.90
75	3.56	.300	9	8.6	3.00	4.00
73	3.91	.162	9	4.1	3.60	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 1/75	.899	.416	.233	.152

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.484	.238

STRUCTURAL SECTION

LAYER	DESCRIPTION	WORK JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	30	MAINT	8/75	PRECOATED AGGREGATE	316		PB	4	135	AC		.3	.2	.2			
2	S HMAC	27	MAINT	1/71	LIMESTONE/CALICHE	340		C			AC-10	6.3		1.5	1.5			
3	S ASB	27	MAINT	1/71	LIMESTONE/CALICHE	1636					AC-10	6.7		3.0	3.0		28.0	10.0
4	S HMAC	23	RECONST	8/61	LIMESTONE/CALICHE	317		D			OA-90	6.2		1.6	1.6			
5	B FLEX	23	RECONST	8/61	LIMESTONE/CALICHE	211								16.0	16.0	2.7	30.0	8.0
6	SG CLAY	23	RECONST	8/61	CL,CH											5.3	42.0	25.0

LOCATION

SECTION ID NO: 2808
DISTRICT NO: 5
COUNTY NO/NAME: 185/PARMER
CONTROL-SECTION: 52- 1
HIGHWAY: US 70+U
MILE POINTS: 4.000 - 6.000
LANE: R

POST 4 TO POST 6

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-25.9
MEAN TEMPERATURE:	36	39	46	56	66	74	77	75	68	57	45	38	56.7
PRECIPITATION:	.5	.4	.6	.8	1.8	2.9	2.6	2.4	1.9	1.5	.6	.4	16.5
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	7
TOTAL F-T CYCLES:	22	19	13	2	0	0	0	0	0	1	12	23	94
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	13.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	74
PRS	90	82	85	61
RUTT	2 SL	2 SL	2 SL	1 SL
FLUSH	2 SL	2 SL	2 SL	2 MO
CORR				
RAVEL		2 SL	1 SL	
ALLG CR				
LONG CR				2 SL
TRANS CR				3 SL
CRACKS	SEAL			NS
PATCHING				3 G
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	73	81	90	71
ROADSIDE	77	85	77	82
DRAINAGE	80	73	90	80
TRAFFIC SER	90	88	92	72

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	2	1	4

TRAFFIC

1980 ADT:	2900
1980 PERCENT TRUCKS:	18.0
10/64-12/82 VEHICLES:	9472655
10/64-12/82 18K AXLES:	1874788

SKID NUMBER

DATE	AVG	LOW	HIGH
12/76	20	11	28
12/76	20	11	28
12/76	17	13	23
2/76	11	6	16
2/76	13	7	16
2/76	13	7	16
8/75	24	16	28
8/75	24	16	28
8/75	20	15	24
6/75	25	16	31

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.49	.088	10	2.0	4.40	4.60
77	4.34	.127	10	2.9	4.10	4.50
76	4.66	.108	10	2.3	4.50	4.80
74	2.90	.422	10	14.5	2.30	3.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/30/75	.759	.086	.249	.025

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.557	.264

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	21	MAINT	3/75		340		C			AC	7.3		1.5	1.5			
2	S ASB	21	MAINT	3/75		292			4		AC	6.4		3.0	3.0			
3	S SC	19	MAINT	9/69		316		PB	SP	100	AC-5		.3	.3	.3			
4	S HMAC	17	STAGE	7/65	LIMESTONE/CALICHE	340		D			AC-10	7.0		1.3	1.3			
5	S ST	16	NEW CON	10/64	SILICEOUS	320		A	SP	100	OA-175		.4	.3	.3			
6	B FLEX	16	NEW CON	10/64	LIMESTONE/CALICHE	232		B	2					6.0	6.0	2.3	34.0	11.0
7	SB FLEX	16	NEW CON	10/64		260					LIME	1.5		6.0	6.0			
8	SG CLAY	16	NEW CON	10/64	CL,SC,SM											3.6	28.8	12.8

LOCATION

SECTION ID NO: 2811
DISTRICT NO: 5
COUNTY NO/NAME: 185/PARMER
CONTROL-SECTION: 52- 1
HIGHWAY: US 70+U
MILE POINTS: 4.000 - 6.000
LANE: L

POST 6 TO POST 4

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-25.9
MEAN TEMPERATURE:	36	39	46	56	66	74	77	75	68	57	45	38	56.7
PRECIPITATION:	.5	.4	.6	.8	1.8	2.9	2.6	2.4	1.9	1.5	.6	.4	16.5
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	7
TOTAL F-T CYCLES:	22	19	13	2	0	0	0	0	0	1	12	23	94
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	13.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	74
PRS	85	82	90	61
RUTT	2 SL	2 SL	2 SL	1 SL
FLUSH	2 SL	2 SL	2 SL	2 MO
CORR				
RAVEL		2 SL		
ALLG CR				
LONG CR				2 SL
TRANS CR	1 MO			3 SL
CRACKS	SEAL			NS
PATCHING				3 G
FAIL/MI	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	73	83	90	71
ROADSIDE	77	82	77	82
DRAINAGE	80	73	90	80
TRAFFIC SER	90	88	92	72

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	2	1	4

TRAFFIC

1980 ADT:	2900
1980 PERCENT TRUCKS:	18.0
10/64-12/82 VEHICLES:	9472655
10/64-12/82 18K AXLES:	1874788

SKID NUMBER

DATE	AVG	LOW	HIGH
12/76	17	13	23
2/76	11	6	16
8/75	20	15	24
6/75	25	16	31
4/73	34	27	48

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.49	.129	10	2.9	4.30	4.70
77	4.34	.171	10	3.9	4.10	4.60
76	4.73	.067	10	1.4	4.60	4.80
74	3.04	.196	10	6.4	2.90	3.40

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/30/75	.622	.107	.191	.041

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.537	.266

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	21	MAINT	3/75		340		C			AC	7.3		1.5	1.5			
2	S ASB	21	MAINT	3/75		292			4		AC	6.4		3.0	3.0			
3	S SC	19	MAINT	9/69		316		PB	SP	100	AC-5		.3	.3	.3			
4	S HMAC	17	STAGE	7/65	LIMESTONE/CALICHE	340		D			AC-10	7.0		1.3	1.3			
5	S ST	16	NEW CON	10/64	SILICEOUS	320		A	SP	100	OA-175		.4	.3	.3			
6	B FLEX	16	NEW CON	10/64	LIMESTONE/CALICHE	232		B	2					6.0	6.0	2.3	34.0	11.0
7	SB FLEX	16	NEW CON	10/64		252					LIME	1.5		6.0	6.0			
8	SG CLAY	16	NEW CON	10/64	CL,SC,SM											3.6	28.8	12.8

LOCATION

SECTION ID NO: 2984
DISTRICT NO: 25
COUNTY NO/NAME: 135/KING
CONTROL-SECTION: 133- 1
HIGHWAY: US 82
MILE POINTS: 13.750 - 15.730
LANE: L

FROM POST 16 TO POST 14

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-23.0
MEAN TEMPERATURE:	40	44	51	62	70	78	83	81	73	63	51	43	61.9
PRECIPITATION:	.7	.7	1.1	1.2	2.8	3.4	2.1	3.1	3.1	2.5	.9	.9	22.6
WET F-T CYCLES:	0	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL F-T CYCLES:	16	12	7	0	0	0	0	0	0	0	5	14	55
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	20.8
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	80	10	8	40	67
RUTT	1 SL	2 SL	2 SL		
FLUSH	3 SE	2 SL	1 SL	1 SL	
CORR					
RAVEL		1 SL			
ALLG CR		3 SE	2 SE	2 MO	
LONG CR		2 SE	2 SE	3 SE	1 MO
TRANS CR		2 SE	2 SE	3 SE	2 MO
CRACKS		PS	PS	SEAL	SEAL
PATCHING		3 P	2 P	3 F	3 P
FAIL/MI	0	0	1	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	90	63	64	70	100
ROADSIDE	90	85	87	80	80
DRAINAGE	83	80	80	80	90
TRAFFIC SER	86	86	92	84	88

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	9	8	6	6

TRAFFIC

1980 ADT:	1450
1980 PERCENT TRUCKS:	18.0
11/38-12/82 VEHICLES:	10050744
11/38-12/82 18K AXLES:	1987658

SKID NUMBER

DATE	AVG	LOW	HIGH
11/70	39	31	49
11/70	42	29	47

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	4.03	.200	10	5.0	3.70	4.30
77	1.72	.444	10	25.8	1.10	2.60
76	.91	.303	10	33.3	.50	1.60
75	2.06	.320	9	15.4	1.60	2.50
74	1.99	.340	9	17.3	1.40	2.40

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
10/18/75	1.314	.202	.296	.102

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.645	.225

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S ST	23	WID-REC	7/79		322	B	A	5A	110	AC		.3	.4	.4			
2	S ST	23	WID-REC	7/79		322	B	PB	3	85	AC		.4	.3	.0			
3	S ST	23	WID-REC	7/79		322	B	A	5A	110	AC		.3	.0	.4			
4	B FLEX	23	WID-REC	7/79		246							1.0	5.0	5.0			
5	SB FLEX	23	WID-REC	7/79	LIMESTONE/CALICHE	215A							1.0	5.0	5.0		27.0	5.0
6	SB FLEX	23	WID-REC	7/79	LIMESTONE/CALICHE	252					ASP		1.0	6.0	6.0			
7	SG CLAY	23	WID-REC	7/79	MH,CL,CH								1.0			4.7	46.9	29.0
8	S SC	21	MAINT	9/68	PRECOATED AGGREGATE	316		LT. W	4	100	AC-5		.3	.3	.3			
9	S HMAC	19	MAINT	1/63	LIMESTONE/CALICHE	880		D			OA-90	6.4		1.5	1.5			
10	S HMAC	14	MAINT	2/57		317		D			OA-90	6.0		2.3	2.3			
11	S SC	11	MAINT	7/43						65	RO-95		.3	.4	.4			
12	S ST	7	NEW CON	11/38	LIMESTONE/CALICHE	303A				120	OA-230		.3	.3	.3			
13	B FLEX	7	NEW CON	11/38	LIMESTONE/CALICHE	215A								9.0	6.5		27.0	5.0
14	SG CLAY	7	NEW CON	11/38	CL,CH,MH											4.7	46.9	29.0

LOCATION

SECTION ID NO: 3061
DISTRICT NO: 25
COUNTY NO/NAME: 173/MOTLEY
CONTROL-SECTION: 146- 1
HIGHWAY: US 62+U
MILE POINTS: 16.440 - 18.510
LANE: L

POST 18 TO POST 16

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-25.2
MEAN TEMPERATURE:	40	43	51	62	70	77	82	80	72	63	50	43	61.6
PRECIPITATION:	.5	.6	1.0	1.1	3.0	3.4	2.3	2.4	2.6	2.4	.9	.8	20.9
WET F-T CYCLES:	0	1	0	0	0	0	0	0	0	0	0	1	5
TOTAL F-T CYCLES:	16	13	7	0	0	0	0	0	0	0	5	13	56
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	20.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	75	37	38	78	78
RUTT		2 SL	1 SL		
FLUSH		2 MO	2 SL		
CORR					
RAVEL		1 SL	1 SL		
ALLG CR	3 SE	2 MO	2 MO		
LONG CR		2 MO	2 MO	1 MO	2 MO
TRANS CR		2 MO	3 MO	3 MO	2 MO
CRACKS	NS	PS	PS	PS	PS
PATCHING		2 F	2 F		
FAIL/MI	0	0	0	0	0
*** *** *** ***	*** ***	*** ***	*** ***	*** ***	*** ***
RATING SCORES					
SHOULDER	54	64	73	70	84
ROADSIDE	65	75	87	80	85
DRAINAGE	63	73	77	80	90
TRAFFIC SER	94	86	92	84	84
*** *** *** ***	*** ***	*** ***	*** ***	*** ***	*** ***
PVMT URGENCY	4	8	8	3	3

TRAFFIC

1980 ADT:	1000
1980 PERCENT TRUCKS:	18.0
8/56-12/82 VEHICLES:	5013850
8/56-12/82 18K AXLES:	990770

SKID NUMBER

DATE	AVG	LOW	HIGH
10/74	52	45	60
11/70	52	43	60
11/70	53	42	58

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	2.24	.450	10	20.1	1.60	2.80
77	2.56	.504	10	19.7	1.90	3.30
76	1.78	.795	10	44.7	.80	3.00
75	2.73	.362	10	13.3	2.40	3.20
74	2.47	.370	10	14.8	2.10	3.00

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/19/75	1.407	.199	.453	.071

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.641	.240

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S SC	25	MAINT	9/68	SILICEOUS	316		PB	4	100	AC-5		.3	.3	.3			
2	S HMAC	22	MAINT	9/61	SILICEOUS	340		C			OA-90	4.6		1.5	1.5			
3	S ST	17	RECONST	8/56	LIMESTONE/CALICHE	303		B	3	90	OA-175		.3	.3	.3			
4	B FLEX	17	RECONST	8/56	SILICEOUS	213								9.0	6.0		20.0	4.0
5	SG SAND	17	RECONST	8/56	SC,CL,SM											3.9	25.5	8.8

LOCATION

SECTION ID NO: 3074
DISTRICT NO: 25
COUNTY NO/NAME: 173/MOTLEY
CONTROL-SECTION: 145- 8
HIGHWAY: US 62+U
MILE POINTS: 10.200 - 12.270
LANE: R

FROM POST 10 TO POST 12

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-25.2
MEAN TEMPERATURE:	40	43	51	62	70	77	82	80	72	63	50	43	61.6
PRECIPITATION:	.5	.6	1.0	1.1	3.0	3.4	2.3	2.4	2.6	2.4	.9	.8	20.9
WET F-T CYCLES:	0	1	0	0	0	0	0	0	0	0	0	1	5
TOTAL F-T CYCLES:	16	13	7	0	0	0	0	0	0	0	5	13	56
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	20.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	90	51	63	87	73
RUTT		2 SL			
FLUSH	1 SL				
CORR					
RAVEL	1 SL	1 SL			
ALLG CR		1 MO	1 MO		
LONG CR		2 MO	2 MO	1 SL	2 MO
TRANS CR		3 MO	3 MO	3 SL	3 MO
CRACKS		PS	PS	PS	PS
PATCHING		1 F	1 G	1 G	
FAIL/MI	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	79	71	81	73	84
ROADSIDE	80	80	75	80	85
DRAINAGE	90	77	83	80	90
TRAFFIC SER	80	88	94	76	80

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	2	8	7	4	3

TRAFFIC

1980 ADT: 1050
1980 PERCENT TRUCKS: 18.0
6/64-12/82 VEHICLES: 3216198
6/64-12/82 18K AXLES: 636139

SKID NUMBER

DATE	AVG	LOW	HIGH
10/74	43	37	48
11/70	50	43	55
11/70	49	42	56

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.26	.425	10	13.0	2.80	4.00
77	3.17	.442	10	14.0	2.50	3.90
76	3.10	.648	10	20.9	2.00	4.10
75	3.49	.465	10	13.3	2.80	4.20
74	3.35	.455	10	13.6	2.70	4.10

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/19/75	.857	.142	.392	.047

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.441	.289

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	18	MAINT	4/67	SILICEOUS	340		C			AC-20	4.8		1.5	1.5			
2	S ST	16	RECONST	6/64		322			3	90	OA-230		.3	.3	.3			
3	S ST	16	RECONST	6/64		322			5	110	OA-230		.3	.3	.3			
4	B FLEX	16	RECONST	6/64	SILICEOUS	238			2					14.0	14.0		22.5	4.0
5	SG SAND	16	RECONST	6/64	SC,CL,SM											3.9	25.5	8.8

LOCATION

SECTION ID NO: 3147
DISTRICT NO: 25
COUNTY NO/NAME: 65/DONLEY
CONTROL-SECTION: 42- 6
HIGHWAY: US 287
MILE POINTS: 8.180 - 10.230
LANE: L

FROM POST 10 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-20.0
MEAN TEMPERATURE:	36	40	48	59	68	75	80	79	71	60	48	40	59.0
PRECIPITATION:	.6	.7	1.1	1.4	3.6	3.7	2.1	2.4	2.3	1.6	.7	.7	20.9
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	20	17	11	1	0	0	0	0	0	0	9	20	81
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	15.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	92	61	81	89	100
RUTT		2 SL	2 SL		
FLUSH		2 MO		2 SL	
CORR		1 SL			
RAVEL	2 SL	1 MO	1 SL		
ALLG CR		2 SL	1 SL		
LONG CR		1 SL			
TRANS CR				1 SL	
CRACKS		NS		NS	
PATCHING			2 F		
FAIL/MI	0	0	0	0	0
*** *** ***	***	***	***	***	***
RATING SCORES					
SHOULDER	73	74	74	71	76
ROADSIDE	85	82	82	77	80
DRAINAGE	77	73	80	80	80
TRAFFIC SER	86	86	94	76	80
*** *** ***	***	***	***	***	***
PVMT URGENCY	2	7	5	2	2

TRAFFIC

1980 ADT: 5066
1980 PERCENT TRUCKS: 18.0
4/58-12/82 VEHICLES: 17982832
4/58-12/82 18K AXLES: 3558628

SKID NUMBER

DATE	AVG	LOW	HIGH
8/74	42	30	55

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.67	.211	10	5.8	3.40	4.10
77	3.46	.357	10	10.3	2.90	4.10
76	3.86	.357	10	9.2	3.50	4.50
75	3.93	.211	10	5.4	3.60	4.20
74	4.15	.201	10	4.9	3.70	4.40

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 5/75	1.069	.245	.387	.100

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.479	.252

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S HMAC	33	MAINT	6/73	SILICEOUS	340		D			AC-20	5.4		1.5	1.5			
2	S SC	30	MAINT	7/66	LIGHTWEIGHT	316		LT. W	4	100	AC-5		.3	.3	.3			
3	S HMAC	23	RECONST	4/58		317		C			OA-135	5.3		2.3	2.3			
4	B FLEX	23	RECONST	4/58	SILICEOUS	213A								13.0	10.0		22.0	6.0
5	SG SAND	23	RECONST	4/58	SC,CL,SM											3.9	25.5	8.8

LOCATION

SECTION ID NO: 3150
DISTRICT NO: 25
COUNTY NO/NAME: 65/DONLEY
CONTROL-SECTION: 310- 1
HIGHWAY: SH 70
MILE POINTS: 22.350 - 24.400
LANE: L

FROM POST 14 TO POST 12

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-20.0
MEAN TEMPERATURE:	36	40	48	59	68	75	80	79	71	60	48	40	59.0
PRECIPITATION:	.6	.7	1.1	1.4	3.6	3.7	2.1	2.4	2.3	1.6	.7	.7	20.9
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	20	17	11	1	0	0	0	0	0	0	9	20	81
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	15.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	85	68	78	71	98
RUTT		2 SL			
FLUSH	2 SL				
CORR					
RAVEL	1 SL	2 SL	1 SL		
ALLG CR			2 MO	1 SL	
LONG CR		1 MO		2 MO	
TRANS CR	1 SL	2 MO		2 SL	
CRACKS	SEAL	PS		NS	
PATCHING		3 G	2 G	2 G	2 G
FAIL/MI	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	77	71	69	77	81
ROADSIDE	82	77	82	80	77
DRAINAGE	83	87	87	80	80
TRAFFIC SER	78	80	88	82	80

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY	3	5	6	4	2

TRAFFIC

1980 ADT:	1500
1980 PERCENT TRUCKS:	8.0
10/60-12/82 VEHICLES:	4652728
10/60-12/82 18K AXLES:	362336

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.75	.378	10	10.1	3.20	4.20
77	3.93	.330	10	8.4	3.20	4.20
76	4.31	.367	10	8.5	3.60	4.80
75	4.41	.280	9	6.4	4.10	4.80
74	4.38	.277	9	6.3	3.80	4.70

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 4/75	.859	.179	.345	.093

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.552	.267

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	THICKNESS EDGE	TTC	LL	PI
1	S SC	25		9/78			B	B	3	85	AC-5		.4		.4			
2	S HMAC	23	MAINT	4/70	SILICEOUS	340		D			AC-20	5.8		1.5	1.5			
3	S ST	16	RECONST	10/60		305		A	3	100	OA-230		.3	.3	.3			
4	S ST	16	RECONST	10/60		305		B	5	120	OA-230		.3	.2	.2			
5	B FLEX	16	RECONST	10/60	SILICEOUS	213A								12.0	12.0		22.0	6.0
6	SG CLAY	16	RECONST	10/60	CL,SC,SM											3.4	29.4	12.6

LOCATION

SECTION ID NO: 3163
DISTRICT NO: 25
COUNTY NO/NAME: 65/DONLEY
CONTROL-SECTION: 310- 1
HIGHWAY: SH 70
MILE POINTS: 18.240 - 20.280
LANE: L

FROM POST 10 TO POST 8

ENVIRONMENTAL - 20 YEAR SUMMARY (1955-1974)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
THORNTHWAITE INDEX:	-	-	-	-	-	-	-	-	-	-	-	-	-20.0
MEAN TEMPERATURE:	36	40	48	59	68	75	80	79	71	60	48	40	59.0
PRECIPITATION:	.6	.7	1.1	1.4	3.6	3.7	2.1	2.4	2.3	1.6	.7	.7	20.9
WET F-T CYCLES:	1	1	1	0	0	0	0	0	0	0	0	1	6
TOTAL F-T CYCLES:	20	17	11	1	0	0	0	0	0	0	9	20	81
DIST TEMP CONSTANT:	-	-	-	-	-	-	-	-	-	-	-	-	15.6
SOLAR RADIATION:													

PAVEMENT CONDITION SURVEY

PVMT RATING	80	77	76	75	74
PRS	80	51	68	87	98
RUTT		2 SL			
FLUSH	1 MO				
CORR					
RAVEL	1 MO	1 MO	1 SL		
ALLG CR		2 MO	2 MO		
LONG CR		1 MO	1 MO	2 SL	
TRANS CR		2 MO		1 SL	
CRACKS		PS	NS	NS	
PATCHING	1 G	3 G	2 G	1 G	2 G
FAIL/MI	0	0	0	0	0

*** *** *** *** *** *** *** *** *** *** ***

RATING SCORES

SHOULDER	77	71	69	73	81
ROADSIDE	82	75	82	80	77
DRAINAGE	80	80	87	80	80
TRAFFIC SER	80	82	90	86	84

*** *** *** *** *** *** *** *** *** *** ***

PVMT URGENCY 3 7 6 3 2

TRAFFIC

1980 ADT: 780
1980 PERCENT TRUCKS: 8.0
9/61-12/82 VEHICLES: 2850254
9/61-12/82 18K AXLES: 221924

SKID NUMBER

DATE	AVG	LOW	HIGH

SERVICEABILITY INDEX

YR	MEAN	STD DEV	N	CV	LOW	HIGH
80	3.80	.492	10	13.0	2.90	4.30
77	3.90	.170	10	4.4	3.60	4.10
76	4.51	.281	10	6.2	4.10	4.90
75	4.50	.163	10	3.6	4.20	4.80
74	4.47	.106	10	2.4	4.30	4.60

DYNAFLECT DEFLECTION BASIN

	W1		SCI	
DATE	MEAN	STD DEV	MEAN	STD DEV
11/ 4/75	.958	.093	.390	.043

	PAVEMENT	SUBGRADE
STIFF. COEFF.:	.522	.266

STRUCTURAL SECTION

LAYER	DESCRIPTION	JOB	WORK TYPE	DATE	AGG / SOIL TYPE	ITEM	CL	TYPE	GR	AGG. RATE	ADMIX	PCNT	APPL RATE	THICKNESS CENT	EDGE	TTC	LL	PI
1	S HMAC	23	MAINT	4/70	SILICEOUS	340		D			AC-20	5.8		1.5	1.5			
2	S ST	18	RECONST	9/61	SILICEOUS	305		A	3	100	OA-175		.3	.3	.3			
3	S ST	18	RECONST	9/61	LIMESTONE/CALICHE	305		B	5	120	OA-175		.3	.2	.2			
4	B FLEX	18	RECONST	9/61	SILICEOUS	218								12.0	12.0		31.0	11.0
5	SG SAND	18	RECONST	9/61	SC,CL,SM											3.6	25.5	8.6

SECTION NO. 319

GENERAL

District No.: 4 County Name: Carson Highway: US 60 Mile Points: 7.10-8.86

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	9/72	1.7	5.3	AC-20	94	1939	4.3	---				
2	HMAC	8/54	1.5	5.0	OA-135	136	----	---	100				
3	Flex	8/54	14.0										
4	Clay									47.5	27.5	CL	35

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -18.7

SECTION NO. 393

GENERAL

District No.: 4 County Name: Oldham Highway: IH 40 Mile Points: 5.43-7.43

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	9/73	1.5	5.3	AC-10	127	923	5.0	---				
2	HMAC	2/69	1.4	5.5	AC-5	139	---	---	111				
3	HMAC	2/69	1.7	5.0	AC-5	139	---	---	111				
4	Flex	2/69	8.0										
5	Clay	2/69								47.5	27.5	CL	39.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -18.2

SECTION NO. 2502

GENERAL

District No.: 5 County Name: Crosby Highway: US 82 Mile Points: 13.0-15.0

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	9/72	1.5	6.3	AC-10	95	895	2.4	---				
2	HMAC	6/59	1.2	5.5	OA-135	134	---	---	111				
3	Flex	6/59	14.0										
4	Clay									47.5	27.5	CL	42.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -20.7

SECTION NO. 2620

GENERAL

District No.: 5 County Name: Lubbock Highway: US 62 Mile Points: 19.59-21.59

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	9/72	1.5	6.3	AC-10	95	895	2.4	---				
2	HMAC	6/59	1.3	5.7	OA-135	132	---	---	100				
3	Flex	6/59	13.0										
4	Clay									33.4	17.2	CL	50.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -25.8

SECTION NO. 2659

GENERAL

District No.: 5 County Name: Garza Highway: US 84 Mile Points: 28.0-30.0

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	1/71	1.5	6.3	AC-10	79	1172	2.9	---				
2	HMAC	8/61	1.6	6.2	OA-90	93	----	---	116				
3	Flex	3/61	16.0										
4	Clay									42.0	25.0	CL	37.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -23.5

SECTION NO. 2808

GENERAL

District No.: 5 County Name: Parmer Highway: US 70 Mile Points: 4.00-6.00

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	3/75	1.5	7.3	AC-20	86	2001	7.5	---				
2	HMAC	7/65	1.3	7.0	AC-10	94	----	---	115				
3	Flex	7/65	12.0										
4	Clay									28.8	12.8	CL	18.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -25.9

SECTION NO. 2811

GENERAL

District No.: 5 County Name: Parmer Highway: US 70 Mile Points: 4.00-6.00

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	3/75	1.5	7.3	AC-20	86	2001	7.5	---				
2	HMAC	7/65	1.3	7.0	AC-10	94	----	---	115				
3	Flex	7/65	12.0										
4	Clay									28.8	12.8	CL	18.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -25.9

SECTION NO. 848

GENERAL

District No.: 8 County Name: Callahan Highway: IH 20 Mile Points: 17.67-19.67

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	10/73	1.2	6.0	AC-20	65	1710	3.3	---				
2	HMAC	10/66	3.0	6.0	AC-20	68	2205	3.6	---				
3	Flex	10/66	23.0										
4	Clay									48.6	24.4	CL	40.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -18.7

SECTION NO. 893

GENERAL

District No.: 8 County Name: Mitchell Highway: IH 20 Mile Points: 12.18-14.17

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	10/73	1.3	6.0	AC-20	61	1600	3.3	---				
2	HMAC	11/57	2.0	5.0	OA-90	91	----	---	115				
3	Sand	11/57								29.3	12.6	CL	20.2

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -25.4

SECTION NO. 924

GENERAL

District No.: 9 County Name: Bell Highway: IH 35 Mile Points: 11.15-13.15

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	4/67	1.5	4.5	AC-20	49	2666	3.7	---				
2	HMAC	8/58	2.0	5.9	OA-90	92	--	---	118				
3	Flex	8/58	16.0										
4	Clay									53.0	30.0	CH	48.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -12.5

SECTION NO. 937

GENERAL

District No.: 9 County Name: Bell Highway: US 190 Mile Points: 36.05-38.05

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	10/72	1.2	4.5	AC-20	72	1849	5.2	---				
2	HMAC	6/63	1.5	4.8	OA-90	95	----	---	115				
3	Flex	6/63	10.5										
4	Clay									69.1	46.0	CH	50.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -12.5

SECTION NO. 966

GENERAL

District No.: 9 County Name: Bosque Highway: SH 6 Mile Points: 38.0-40.0

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	4/74	1.1	4.6	AC-10	106	935	2.6	---				
2	HMAC	9/66	1.1	4.8	AC-10	122	1120	3.6	---				
3	Flex	9/66	14.0										
4	Clay	9/66								70.0	42.0	CH	51.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -10.2

SECTION NO. 995

GENERAL

District No.: 9 County Name: Hill Highway: IH 35 Mile Points: 5.571-7.599

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	8/62	1.5	5.2	RC-2	134.0	---	---	118				
2	HMAC	11/57	2.7	2.7	OA-90	92.0	---	---	118				
3	Flex	11/57	17.5										
4	Clay									74.0	49.5	CH	56.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -7.7

SECTION NO. 1263

GENERAL

District No.: 12 County Name: Galveston Highway: SH 6 Mile Points: 1.98-3.89

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	7/69	0.8	5.0	AC-10	89	1151	2.7	---				
2	HMAC	3/66	4.8	5.2	OA-90	89	----	---	116				
3	CS	3/66	12.0										
4	LSS	3/66	6.0										
5	Clay									59.8	38.6	CH	38.0

CLIMATIC DATA

Climatic Region I

Thornthwaite
Moisture Index= 18.4

SECTION NO. 1543

GENERAL

District No.: 15 County Name: Bexar Highway: IH 10 Mile Points: 33.13-35.13

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	8/68	1.0	4.8	AC-20	72	1849	5.2	---				
2	HMAC	8/62	1.5	4.9	OA-90	95	----	---	115				
3	Flex	8/62	23.5										
4	LSS	8/62	4.5										
5	Clay									74.0	49.5	CH	55.0

CLIMATIC DATA

Climatic Region IV

Thornthwaite
Moisture Index= -15.7

SECTION NO. 1894

GENERAL

District No.: 18 County Name: Rockwall Highway: IH 30 Mile Points: 7.32-9.32

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	7/58	1.5	4.0	OA-90	87	---	---	119				
2	HMAC	9/56	2.5	5.5	OA-135	129	---	---	109				
3	Flex	9/56	20.0										
4	Clay									74.0	49.5	CH	45.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -1.7

SECTION NO. 2002

GENERAL

District No.: 20 County Name: Chambers Hwy. Highway: IH 10 Mile Points: 9.188-10.88

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	10/67	1.0	5.0	AC-10	89	1151	2.7	---				
2	HMAC	11/58	3.0	5.0	OA-90	89	----	---	116				
3	Flex	11/58	14.0										
4	Clay									63.4	38.9	CH	50.0

CLIMATIC DATA

Climatic Region I

Thornthwaite
Moisture Index= 39.1

SECTION NO. 2044

GENERAL

District No.: 20 County Name: Jefferson Highway: SH 73 Mile Points: 7.504-9.508

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	10/65	1.3	5.0	AC-10	89	1151	2.7	---				
2	HMAC	10/56	2.0	4.6	OA-90	89	----	---	116				
3	Flex	10/56	10.0										
4	LSS	10/56	4.0										
5	Clay									76.2	53.8	CH	58.0

CLIMATIC DATA

Climatic Region I

Thornthwaite
Moisture Index= 31.5

SECTION NO. 2086

GENERAL

District No.: 21 County Name: Kenedy Highway: US 77 Mile Points: 5.95-7.96

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	1/68	4.0	5.0	AC-20	55	---	---	122				
2	HMAC	3/61	2.6	5.0	OA-90	92	---	---	115				
3	Flex	3/61	11.0										
4	Clay									30.7	12.3	SC	31.0

CLIMATIC DATA

Climatic Region IV

Thornthwaite
Moisture Index= -28.4

SECTION NO. 2324

GENERAL

District No.: 24 County Name: El Paso Highway: IH 10 Mile Points: 46.87-48.89

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	4/69	0.9	5.3	AC-20	53	2209	3.9	---				
2	HMAC	7/60	3.5	5.1	OA-90	91	----	---	117				
3	Flex	7/60	10.0										
4	Sand									19.0	3.0	SM	28.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -46.6

SECTION NO. 2353

GENERAL

District No.: 24 County Name: El Paso Highway: US 180 Mile Points: 24.88-26.88

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	8/63	1.3	5.3	OA-90	93	----	---	116				
2	HMAC	2/55	2.0	5.0	OA-135	122	----	---	112				
3	Flex	2/55	7.0										
4	Sand									19.2	4.4	SM	30.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -46.6

SECTION NO. 2468

GENERAL

District No.: 25 County Name: Donley Highway: US 287 Mile Points: 7.77-9.88

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	9/74	1.5	---	AC-10	95	895	2.4	---				
2	HMAC	6/58	2.5	4.5	OA-135	134	---	---	111				
3	Flex	6/58	8.0										
4	Sand									27.2	10.5	SM	19.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -20.0

SECTION NO. 3147

GENERAL

District No.: 25 County Name: Donley Highway: US 287 Mile Points: 8.18-10.23

PAVEMENT STRUCTURE

					Asphalt Data					Subgrade Data			
Layer	Desc.	Date	Thick-ness	% in Mix	Grade	Penetration mm @ 77°F	Viscosity,Stk 140°F	Viscosity,Stk 275°F	Ring & Ball,°F	LL	PL	USCS	Clay %
1	HMAC	6/73	1.5	5.4	AC-20	95	895	2.4	---				
2	HMAC	4/58	2.3	5.3	OA-135	134	---	---	111				
3	Flex	4/58	13.0										
4	Sand									25.5	8.8	SC	19.0

CLIMATIC DATA

Climatic Region V

Thornthwaite
Moisture Index= -20.0

APPENDIX C

CHARACTERIZATION OF ASPHALTIC CONCRETE MATERIAL PROPERTIES

APPENDIX C

CHARACTERIZATION OF ASPHALTIC CONCRETE MATERIAL PROPERTIES

ASPHALT CONCRETE MODULUS

One of the more acceptable methods of determining the modulus of asphalt concrete was developed by Van der Poel (40). Through his research efforts with the Shell Oil Company, Van der Poel developed his well known nomograph, shown in Figure C-1. The basis of this nomograph is that the 'stiffness' of the mix can be determined if some basic properties of bitumen and mix are known. The term 'stiffness' was introduced by Van der Poel in lieu of modulus because the term modulus implies an elastic response whereas stiffness, as used by Van der Poel, implies the visco-elastic effects of mix temperature and time of loading placed upon the mix (41).

In order to use his nomograph, only a few basic properties of the bitumen and mix are required to be known. These are outlined below.

- Penetration at 77°F (AASHTO T-49)
- Ring and Ball Softening Point (AASHTO T-53)
- Asphalt in mix, percent
- Age of mix, time in service
- Time of loading

With this given data, the penetration index can be calculated.

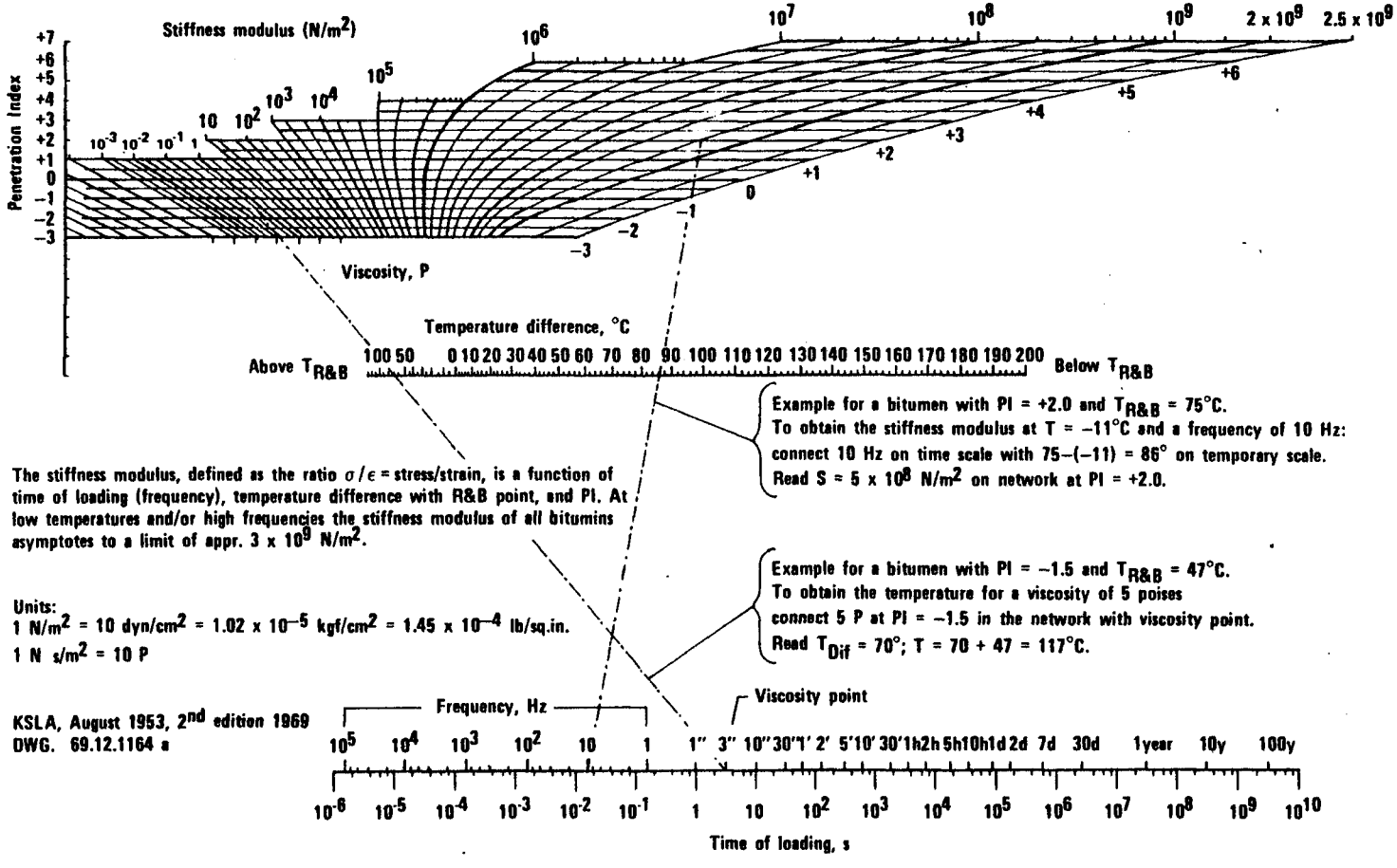


FIGURE C-1. Van der Poel's Nomograph Relating Bitumen Stiffness Modulus to Penetration Index, Ring and Ball Softening Point, and Loading Time

$$\frac{20-PI}{10+PI} = 50\left(\frac{\log 800-\log Pen}{T_{RB}-T}\right) \qquad \text{(C-1)}$$

where

PI = Penetration index,

Pen = Penetration, mm

T_{RB} = Ring and Ball softening point, °C, and

T = Temperature of penetration determination, °C.

The stiffness of the bitumen can now be determined by use of Figure C-1. To calculate the mix stiffness, the following procedure must be followed:

1. Compute the volume concentration of aggregate, as in Figure C-2:

$$C_v = \frac{1}{1 + \frac{(Asp)(2.65)}{(100)}} \qquad \text{(C-2)}$$

where

C_v = Volume concentration of aggregate, and

Asp = Asphalt in mix, percent

2. Compute the mix stiffness:

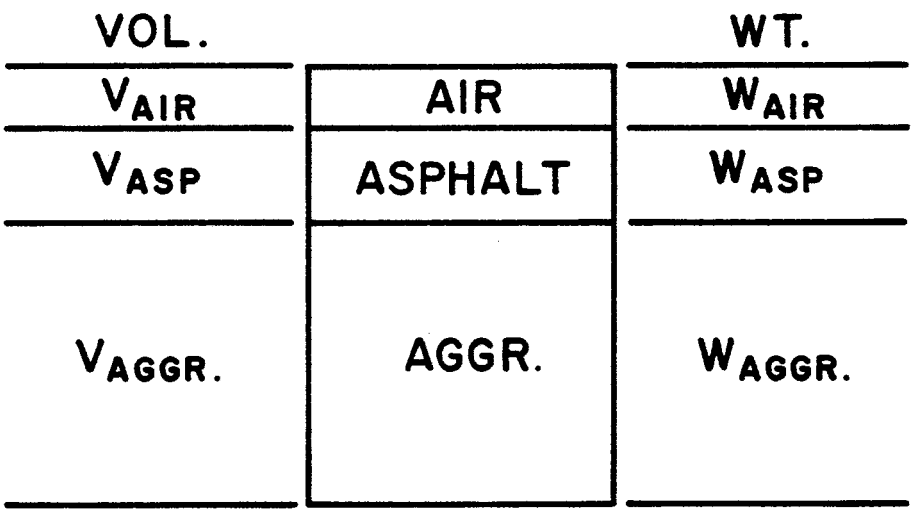
$$S_m = S_b\left[1+\left(\frac{2.5}{m}\right)\left(\frac{C_v}{1-C_v}\right)\right]^n \qquad \text{(C-3)}$$

where

S_m = Mix stiffness, kg/cm^2

S_b = Bitumin stiffness, kg/cm^2, and

n = $0.83 \log_{10}[(4x10^5)/S_b]$



C_V = VOLUME CONCENTRATION OF AGGR.

$$C_V = \frac{V_{AGGR.}}{V_{AGGR.} + V_{ASP}}$$

B_V = VOLUME CONCENTRATION OF ASPHALT

$$B_V = \frac{V_{ASP}}{V_{AGGR.} + V_{ASP}}$$

FIGURE C-2. Block Diagram of Asphaltic Concrete Mixture

Figure C-3 can also be used to determine the mix stiffness.

A log mix stiffness vs log loading time curve, as shown in Figure 2 for different temperatures can be developed by following the procedure just outlined. By developing this curve, the slope, m, can be determined. By use of Figures C-4, C-5, and C-6 the fracture parameters n_T, n_F, A_T, and A_F can be determined. However, a computerized version of Van der Poel's nomograph has been developed by de Bats (42) and is in use at Texas Transportation Institute. This program has been modified to compute all fracture parameters at any desired temperature and time of loading; thus, alleviating many of the tedious calculations required to compute the fracture parameters.

USE OF VISCOSITY IN DETERMINING STIFFNESS OF AN ASPHALT CONCRETE

In order to better define the temperature susceptibility of an asphalt cement, McLeod has developed a method of calculating a 'PEN-VIS value instead of a 'PI' value as used by other researchers (40). McLeod's development procedure will not be discussed here since it has been well documented elsewhere (43,44).

To calculate the stiffness of an asphalt concrete, the following procedure must be followed.

1. The following are known:
   a. Viscosity @ 275°F, cSt (AASHTO T-201) or @ 140°F, poises
   b. Penetration @ 77°F (AASHTO T-49)
   c. Asphalt in mix, percent
   d. Age of mix,

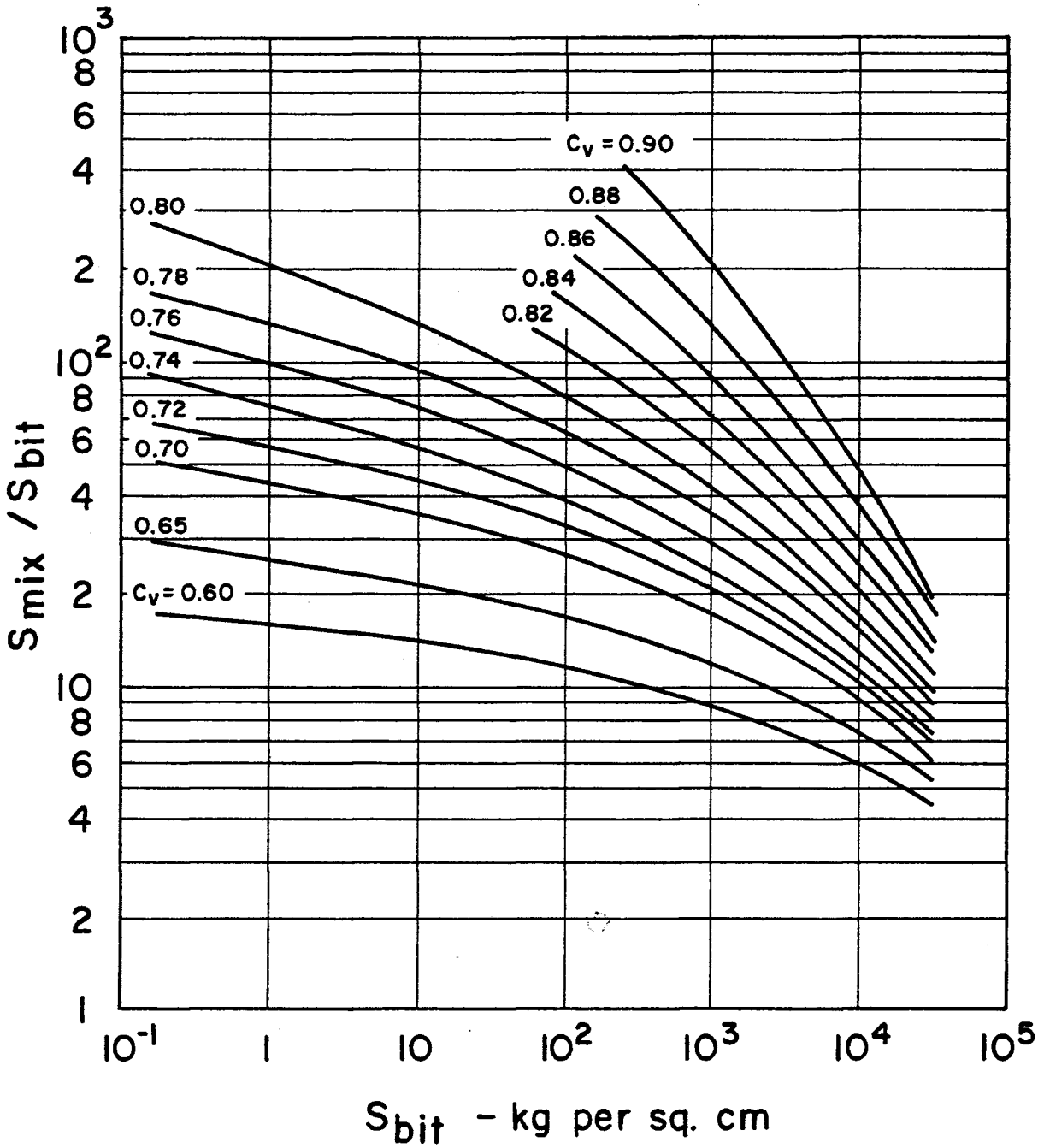


FIGURE C-3. Relation Between Stiffness of Mix and Stiffness of Bitumen

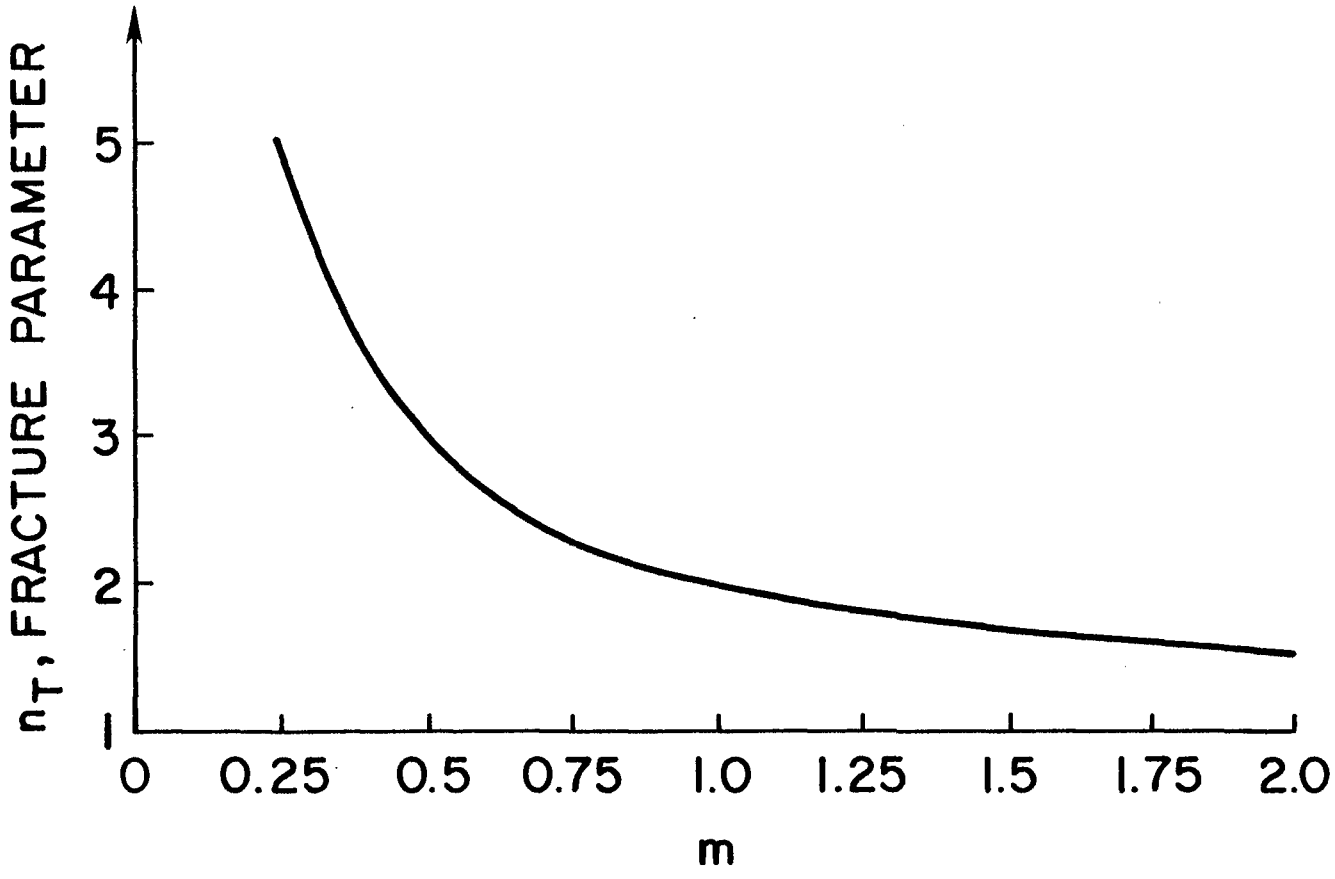


FIGURE C-4. Relation Between m, the Slope of the Log Mix Stiffness vs Log Loading Time Curve and n_T, the Thermal Fracture Parameter

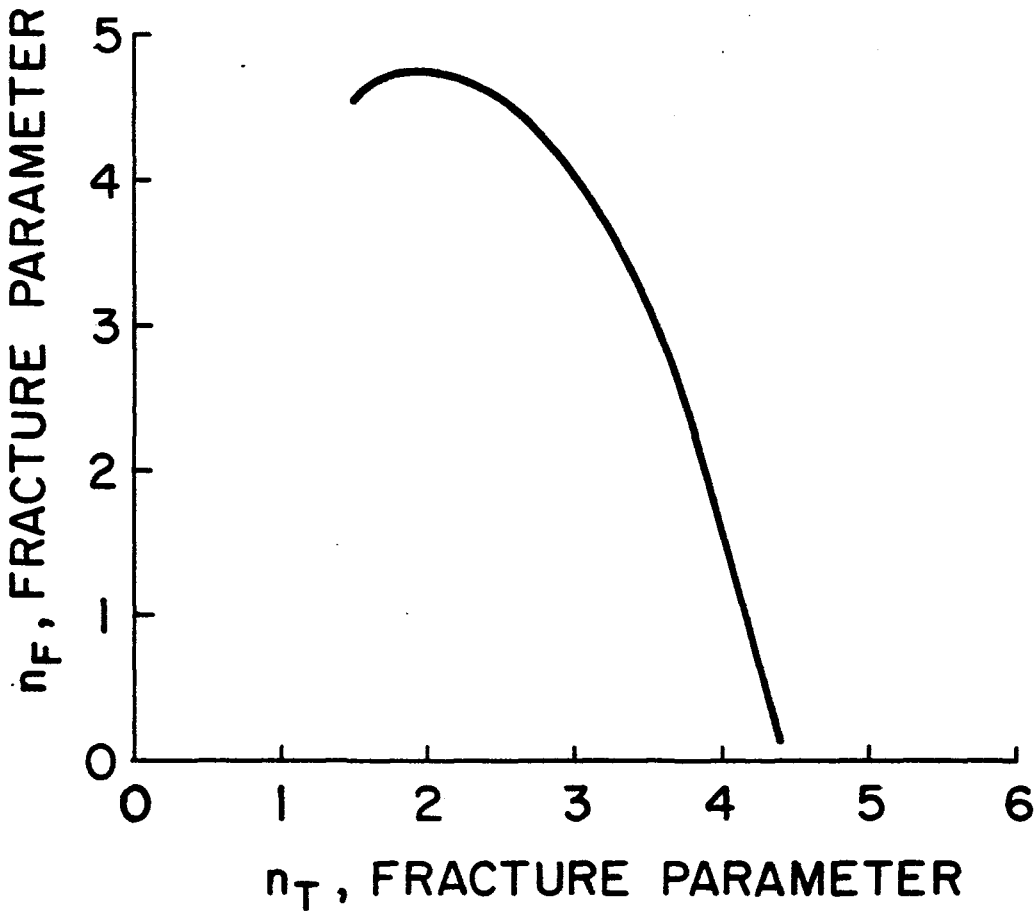


FIGURE C-5. A Relation Between n_T, the Thermal Fracture Parameter and n_F, the Load Fatigue Fracture Parameter

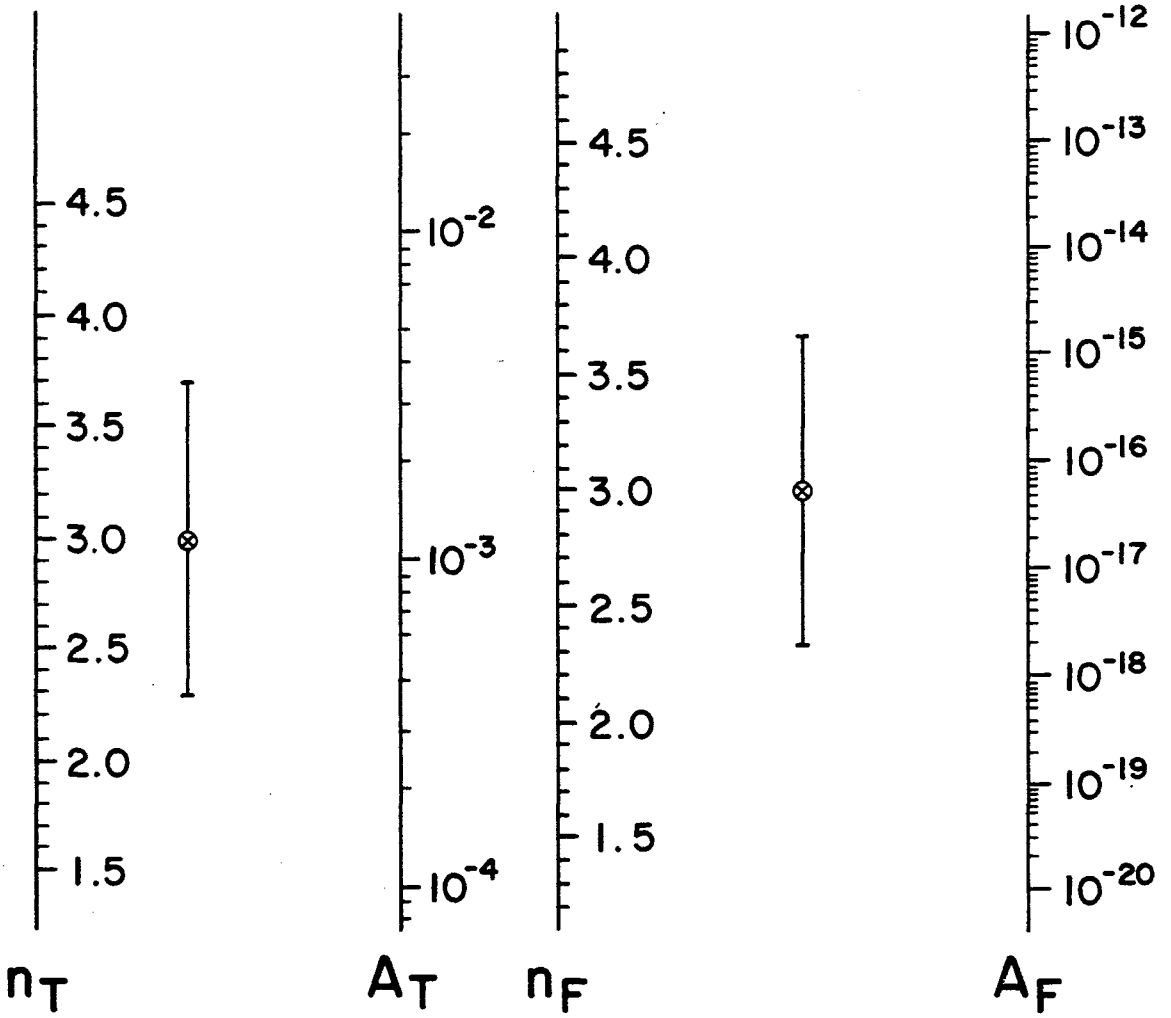


FIGURE C-6. A Relation Between n_T and A_T and Between n_F and A_F

e. Time of loading

2. Calculate the PEN-VIS number:

a. If the viscosity if given in cSt at 275°F:

(1) Compute viscosity in cSt at 275°F at the following PEN-VIS numbers:

For PEN-VIS = 0.0

$$\text{Log}_{10}L=4.25800-0.79674(\text{Log}_{10}\text{PEN}) \qquad \text{(C-4)}$$

For PEN-VIS = -1.5

$$\text{Log}_{10}M=3.46289-0.61094(\text{Log}_{10}\text{PEN}) \qquad \text{(C-5)}$$

(2) Compute the actual PEN-VIS number:

$$\text{PVN} = \frac{\text{Log}_{10}L-\text{Log}_{10}X}{\text{Log}_{10}L-\text{Log}_{10}M}(-1.5) \qquad \text{(C-6)}$$

b. If the viscosity is given in poises at 140°F:

(1) Compute viscosity in poises at 140°F at the following PEN-VIS numbers:

For PEN-VIS = 0.0

$$\text{Log}_{10}L=6.49445-1.58596(\text{Log}_{10}\text{PEN}) \qquad \text{(C-7)}$$

For PEN-VIS = -1.5

$$\text{Log}_{10}M=5.37851-1.35732(\text{Log}_{10}\text{PEN}) \qquad \text{(C-8)}$$

(2) Compute the actual PEN-VIS number:

$$\text{PVN} = \frac{\text{Log}_{10}L-\text{Log}_{10}X}{\text{Log}_{10}L-\text{Log}_{10}M}(-1.5) \qquad \text{(C-9)}$$

where

PVN = PEN-VIS number

L = Viscosity in cSt at 275°F for a PVN = 0.0,

M = Viscosity in cSt at 275°F for a PVN = -1.5,

X = Viscosity in cSt at 275°F for the given asphalt cement, and

PEN = Penetration at 77°F

3. Determine the Base Temperature of the Asphalt Cement.

   a. Use the nomograph in Figure C-7 to derive at a temperature difference, ΔT_B.

   b. Add the temperature difference, ΔT_B, to the penetration test temperature to derive the Base Temperature, T_B.

4. Compute the Stiffness of an Asphalt Cement, use Figure C-8.

   a. Select time of loading.

   b. Compute the difference between the Base Temperature, T_B, and the Service Temperature, Ts. Is this sum greater than or smaller than the Base Temperature?

   c. Using Figure C-8, extend a straight line through the time of loading, the temperature value computed in 4-b and the PVN.

   d. Read the stiffness value in kg/cm^2.

5. Compute the stiffness of an Asphalt Concrete using Figure C-3.

   a. Determine the volume concentration of aggregate by equation C-2.

   b. Select the appropriate rate of Sm/S_b from Figure C-3 and compute Sm.

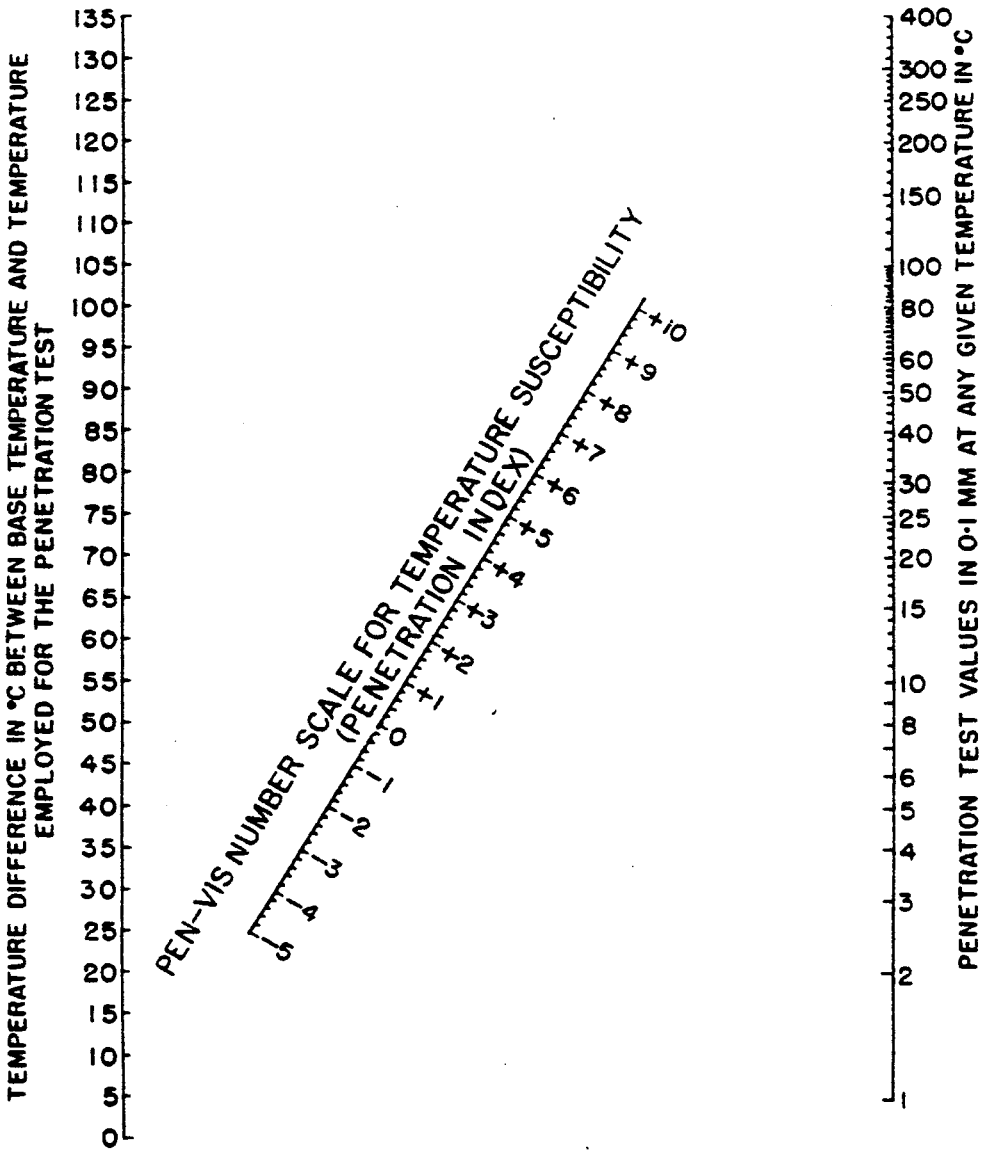


FIGURE C-7. Relation Between Penetration, Temperature, and Pen-Vis Number

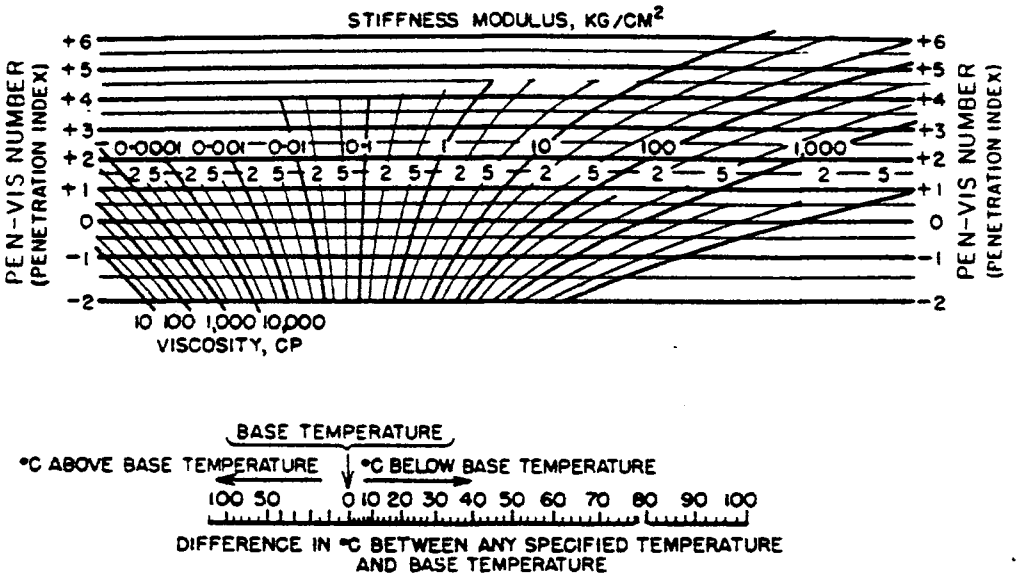


FIGURE C-8. Relation Between Pen-Vis Number, Temperature, Loading Time and Bitumen Stiffness

APPENDIX D

SENSITIVITY ANALYSIS USING THE ILLI-PAVE COMPUTER PROGRAM

Introduction

One of the most significant features of the ILLI-PAVE (33,45,46) finite element model of pavement analysis is the ability to incorporate both linear and nonlinear stress-strain behavior of the pavement component materials. As illustrated in Figure D-1 (a), this program models the pavement structure as a three-dimensional section by using a two-dimensional half space of a finite solid of revolution. The solution of the three-dimensional solid may be specified in terms of a plane radial section with rectangular configuration by use of symmetry as shown in Figure D-1 (b). This rectangular half space is then divided into sets of rectangular elements which are commonly connected at the nodal points. A typical ILLI-PAVE mesh is shown in Figure D-2.

According to Yoder and Witczak (41), the nonlinear stress-strain behavior of a granular base material or of a subgrade is best characterized by the following relations:

Granular Base Material:

$$M_F = k_1 \sigma_3^{k_3} \qquad \text{(D-1)}$$

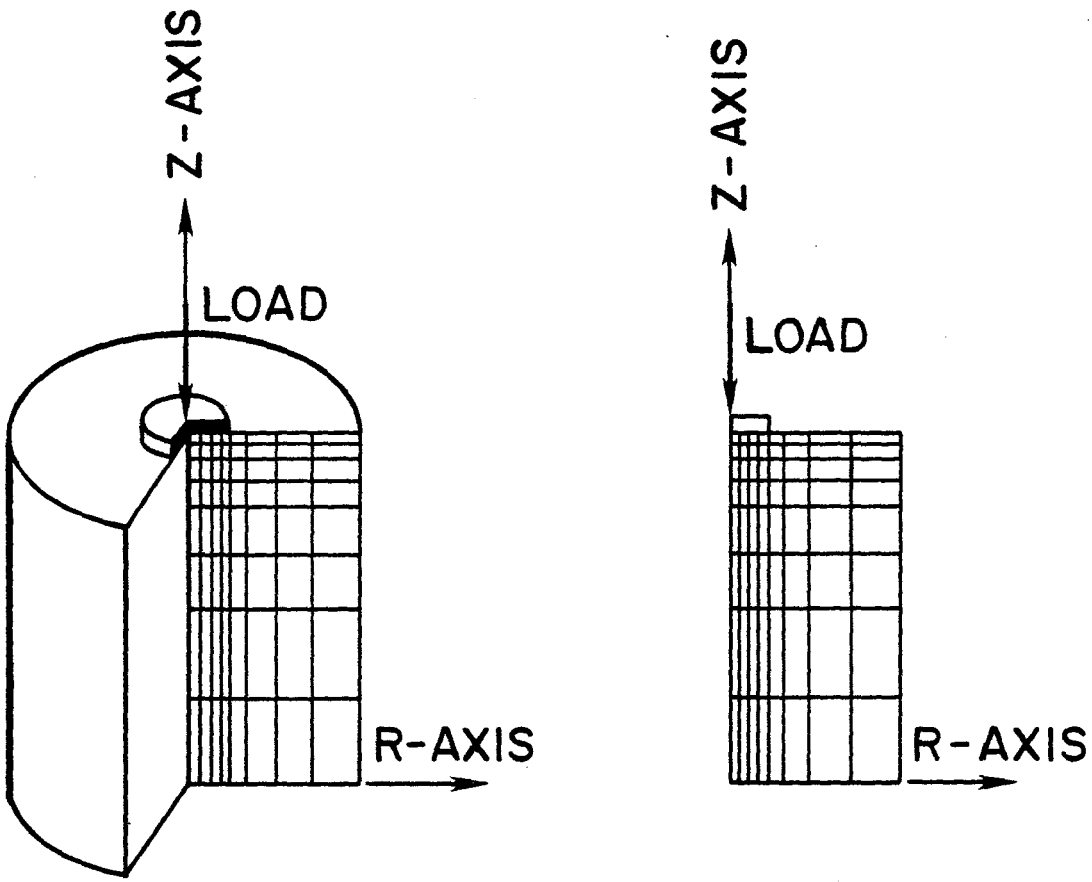


FIGURE D-1. Loading and Finite Element Mesh Configuration for ILLI-PAVE

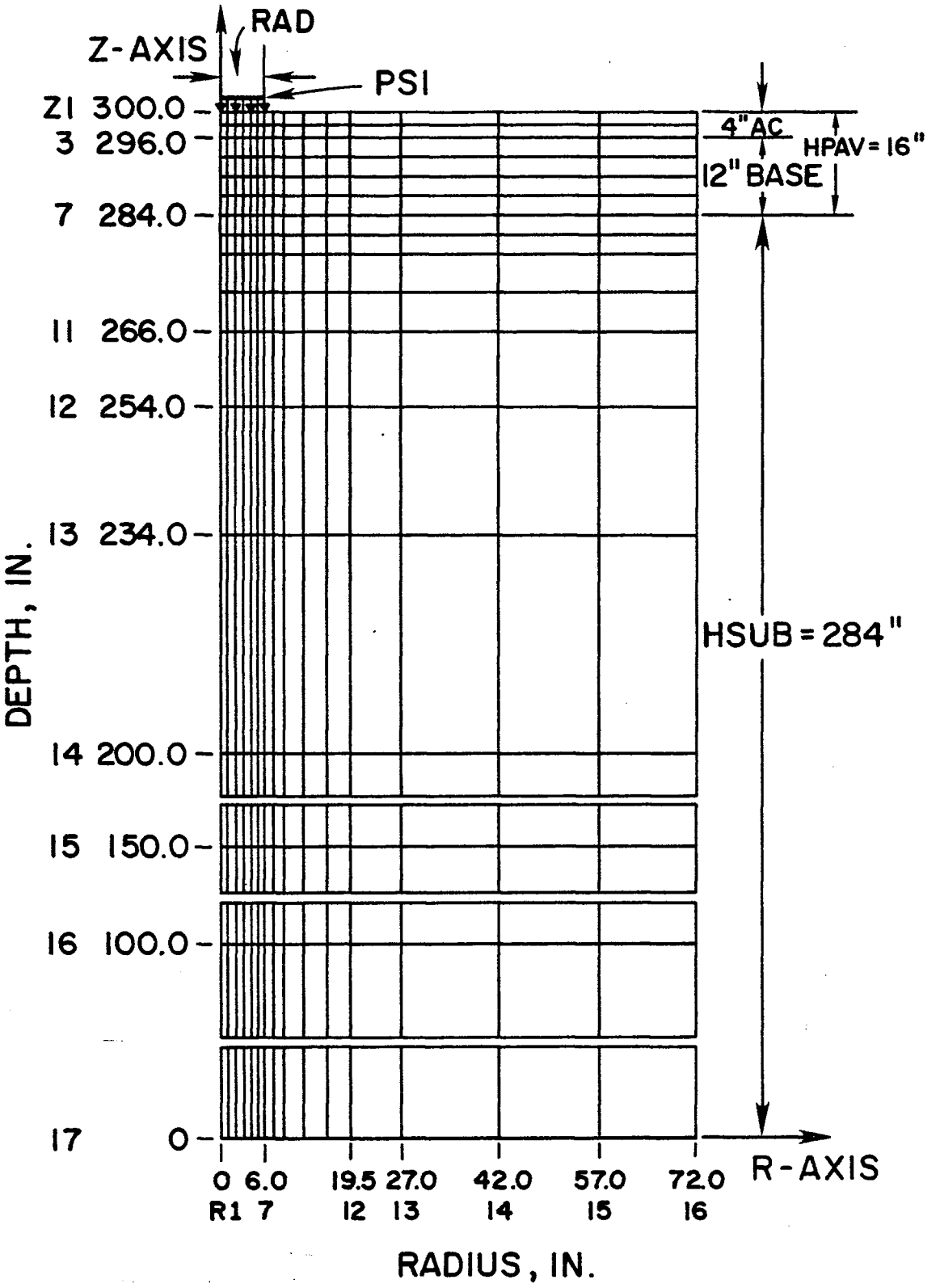


FIGURE D-2. Typical ILLI-PAVE Mesh and Applied Load

or

$$M_R = k_1' \theta^{k_2'} \tag{D-2}$$

Subgrade Soil, as illustrated in Figure D-3:

for $C_1 > (\sigma_1 - \sigma_3)$

$$M_R = C_2 + C_3 [C_1 - (\sigma_1 - \sigma_3)] \tag{D-3}$$

for $C_1 < (\sigma_1 - \sigma_3)$

$$M_R = C_2 + C_4 [(\sigma_1 - \sigma_3) - C_1] \tag{D-4}$$

where

M_R = resilient modulus, psi

T_1 = major principal stress, psi

T_3 = minor principal stress, psi, and

k_1, k_2, k_1', k_2' = experimental test constants.

C_1, C_2, C_3, C_4

Due to the tedious testing procedures (47) involved in determining the resilient modulus, a method is required that will adequately predict an equivalent material modulus which will result in the identical critical strain parameters that are a result of the nonlinear stress-strain behavior of the material under study.

Through a search of the literature, various methods were found that would predict an equivalent material modulus. However, for the two layers concerned, granular base and subgrade soils, only two methods for each of the two layers were considered. After an appropriate method had been chosen, a sensitivity analysis of its applicability was performed.

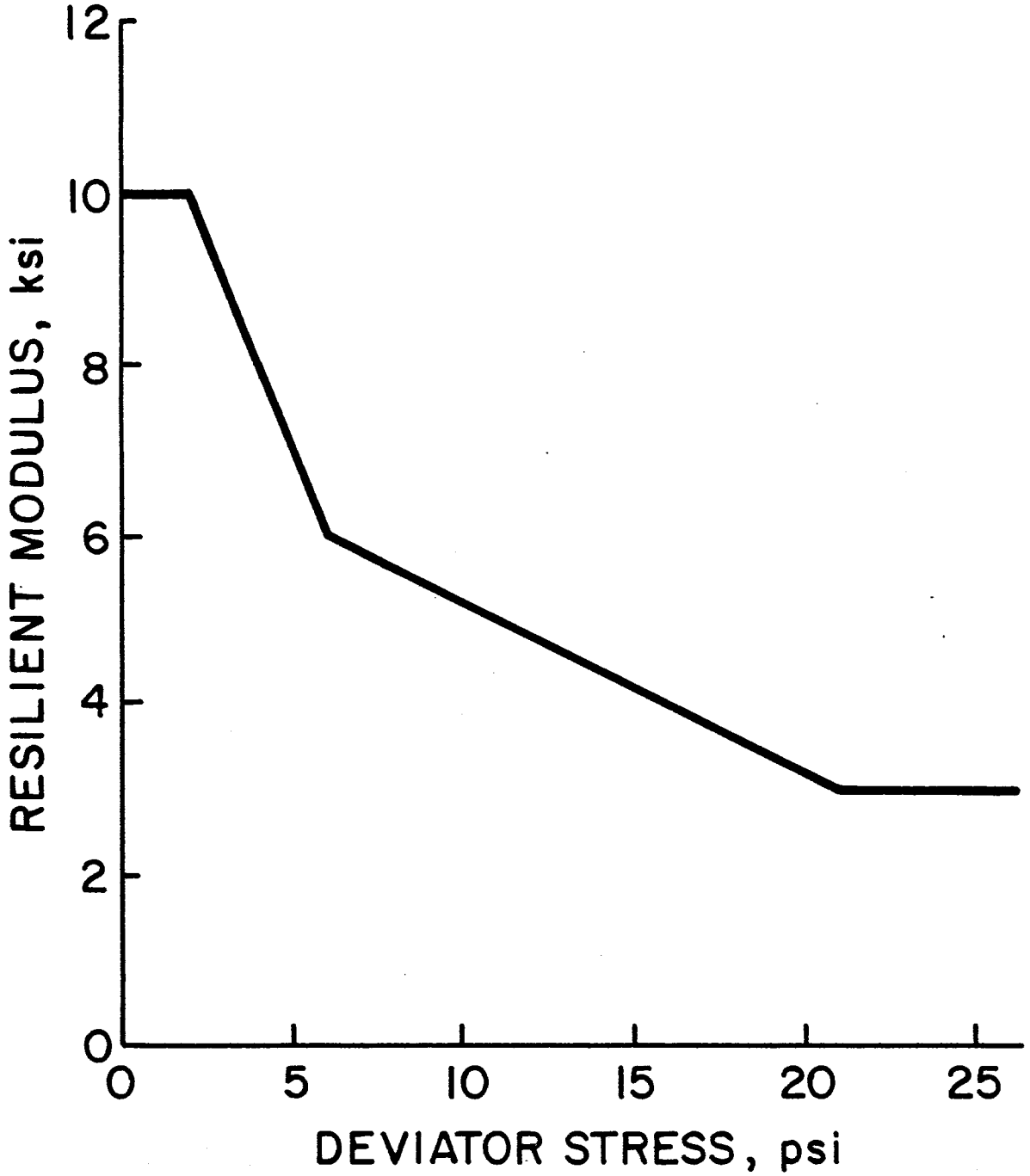


FIGURE D-3. Variation of Subgrade Resilient Modulus with Resilient Stress

Subgrade Soils

Two methods for predicting an equivalent subgrade modulus were considered in this analysis. These methods shall be referred to as:

1. Thompson's Method (48)
2. Ahmad's Method (49)

Since the development of the theory and procedure are documented elsewhere (48,49), it will not be discussed here.

The Thompson's Method was developed from tests on various soils within the state of Illinois while the Ahmad's Method was developed from soils in the state of Texas. Because of the regionalization of the two studies and the fact that pavement sections of interest are all within Texas, the Ahmad's Method was chosen for predicting an equivalent subgrade modulus.

Ahmad's Method is incorporated in a computer program (49) which was modified to compute the equivalent subgrade modulus. Input variables to this program are:

E_1 = stiffness of surface layer, psi

E_2 = modulus of granular material, psi

E_3 = modulus of subgrade material, psi

h_1 = existing surface layer thickness, inch

h_2 = granular layer thickness, inch

ACCLAY = clay content of subgrade, percent, and

SUCI70 = equivalent suction level for soil with 70 percent clay, psi.

Since the program computes values for the base and subgrade courses by an iterative procedure, the initially assumed values of the base and

subgrade moduli have an insignificant impact upon the final values of the subgrade modulus.

Granular Base Material

From a review of the literature, two methods for predicting an equivalent base modulus were considered. These methods shall be identified as:

1. Smith's Method (50)
2. Ahmad's Method (49)

Since both methods are thoroughly covered elsewhere (49,50), the developmental theory of the methods will not be discussed.

By examination of Figure D-3, it can be seen that the R^2 (correlation coefficient) for the Smith's Method is relatively constant with depth while the R^2 for the Ahmad's Method varies with depth. It was upon the criterion of a constant R^2 with depth that the Smith's Method of predicting an equivalent base modulus was chosen. The basic form of the regression equation for the Smith's Method is:

$$\text{Log } E_R = B_0 + B_1 \text{Log} h_1 + B_2 \text{Log} E_1 + B_3 \text{Log} E_3 + B_4 \text{Log} K_1 \qquad \text{(D-5)}$$

where

E_R = equivalent base modulus, psi

h_1 = existing surface layer thickness, inch

E_1 = stiffness of surface layer, psi

E_3 = equivalent subgrade modulus, psi

k_1 = experimental test constant, and

B_0, B_1, B_2, B_3, B_4 = regression constants summarized in Table D-1.

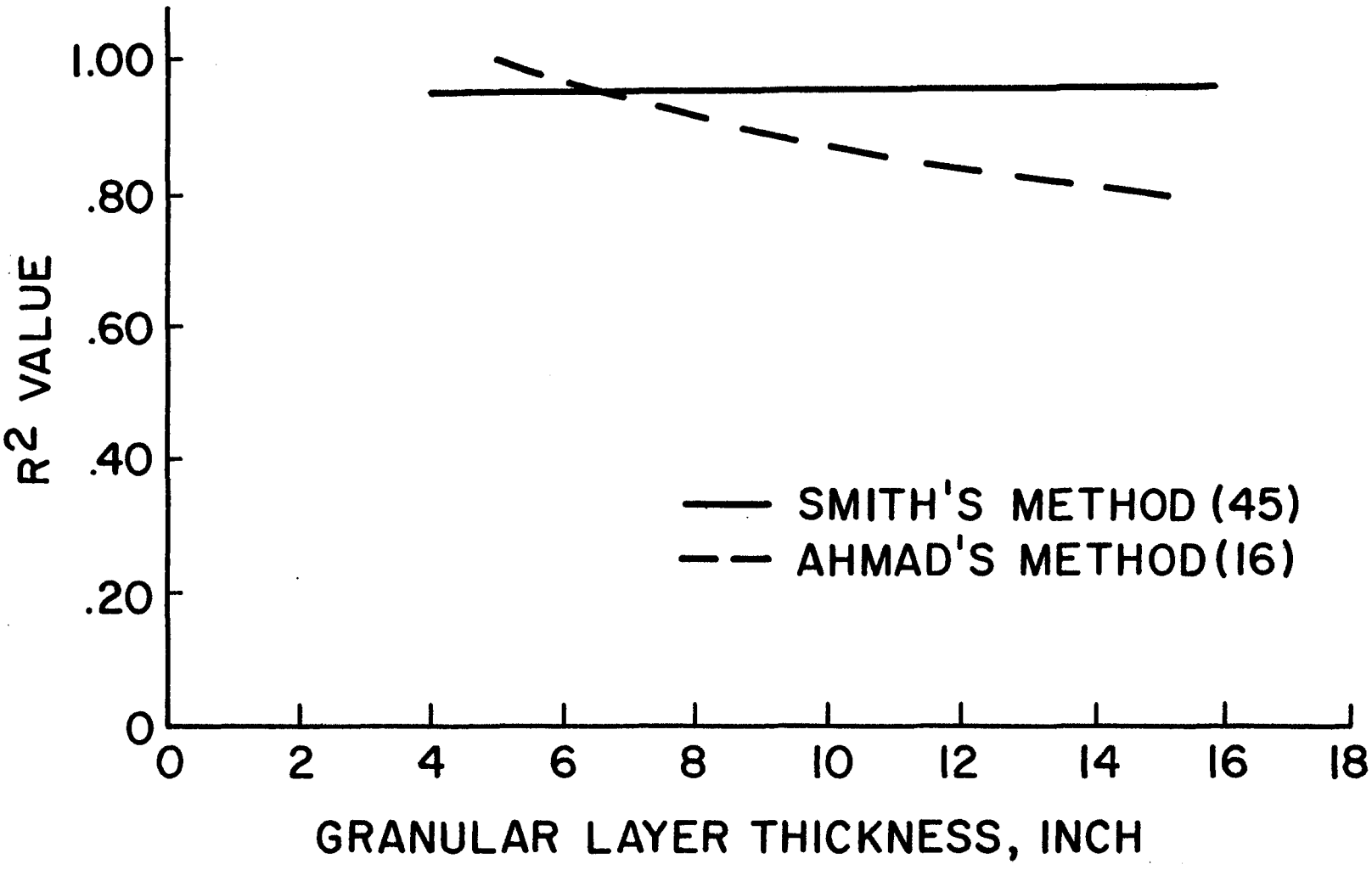


FIGURE D-4. Coefficient of Determination (R^2) of Granular Base Course Modulus with Layer Thickness

Sensitivity Analysis of Using an Equivalent Material Modulus

In completing this sensitivity analysis, the example problem given in the ILLI-PAVE user's guide (33) was chosen as the control section. All material properties and the pavement cross-section are illustrated in Figure D-4.

In order to accurately model the loads to which a pavement is subjected under a Falling Weight Deflectometer, a 9,000 lb circular rigid plate load with a radius of six inches was used. This loading exerts a pressure of 80 psi. From the deflections computed in ILLI-PAVE, as in Table D-2, a modulus of subgrade reaction (41,51) was computed by use of the following relationship.

$$k = \frac{p}{\delta} \qquad \text{(D-6)}$$

where

k = modulus of subgrade reaction, pci,

p = pressure applied to plate, psi, and

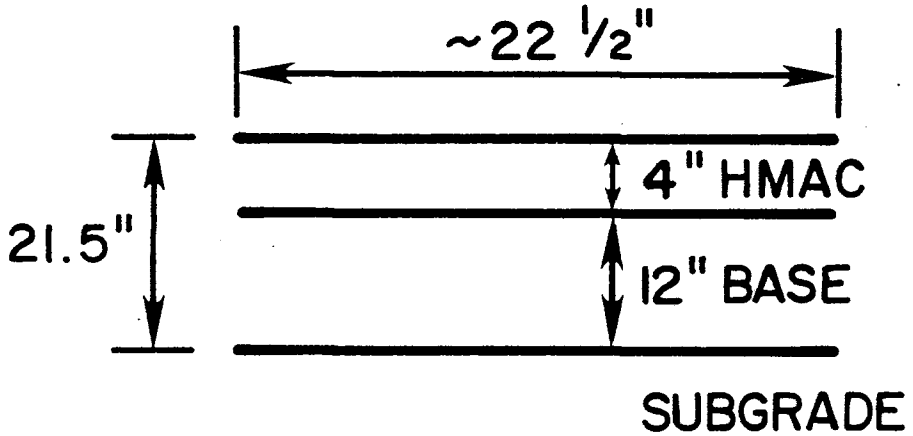
δ = vertical deflection of surface pavement, inch.

This modulus of subgrade reaction computed from ILLI-PAVE is an input parameter to ILLI-SLAB (34,35). ILLI-SLAB is based on the classical theory for medium-thick plates resting on a Winkler foundation. The elements in ILLI-SLAB are characterized as rectangular plate elements exhibiting 12 degrees of freedom.

The analysis using the ILLI-SLAB model was completed in two steps. First a load was placed adjacent to a crack, as shown in Figure F-2. From this load placement, a deflection on the loaded side, w_ℓ, and on the unloaded side, w_u, of the crack was computed. Next, the load was placed equidistant between adjacent cracks. At

CONSTANT	GRANULAR LAYER THICKNESS, h_2, inch		
	4	10	16
B_0	0.884	0.900	0.877
B_1	-0.436	-0.417	-0.426
B_2	-0.116	-0.128	-0.121
B_3	0.373	0.298	0.216
B_4	0.755	0.844	0.933

TABLE D-1. SUMMARY OF REGRESSION CONSTANTS (51).



MATERIAL PROPERTIES

Control Section
- Asphalt Concrete
  - Density = 145 pcf Coefficient of earth pressure at rest = 0.67
  - Poisson's Ratio = 0.40 E = 500 ksi
- Crushed Stone
  - Density = 135 pcf Coefficient of earth pressure at rest = 0.60
  - Poisson's Ratio = 0.38
  - Shear Strength ($C=0$, $\phi=40°$) EFAIL = 4000 psi
  - Resilient Modulus Model:

$$E,psi = 5000\theta^{0.5}$$

- Subgrade
  - Density = 120 pcf Coefficient of earth pressure at rest = 0.82
  - Poisson's Ratio = 0.45
  - Shear Strength ($C=10.5$ psi, $\phi=0$)
  - Resilient Modulus - Deviator Stress Relation Shown in Figure D-5
  - EFAIL = 3000 psi

Modified Section
- Asphalt Concrete
  - Same as control section
- Crushed Stone
  - Density = 135 pcf Coefficient of earth pressure at rest = 0.60
  - Poisson's Ratio = 0.38
  - Resilient Modulus = 17617
- Subgrade
  - Density = 120 pcf Coefficient of earth pressure at rest = 0.82
  - Poisson's Ratio = 0.45
  - Resilient Modulus = 11000

FIGURE D-5. MATERIAL PROPERTIES FOR PAVEMENT SENSITIVITY ANALYSIS

COMPUTED PROPERTY	CONTROL SECTION	MODIFIED SECTION
DEFLECTIONS: (in.)		
at surface	0.02304	0.02071
interface of HMAC and Base	0.02275	0.02050
STRESSES: (psi)		
at surface		
σ_1	147.0	150.0
σ_3	68.0	67.0
at interface of HMAC and Base		
σ_1	30.1	26.8
σ_3	-47.5	-49.9
MODULUS OF SUBGRADE REACTION, pci	3472.2	3862.9

TABLE D-2. RESULTS OF ILLI-PAVE SENSITIVITY ANALYSIS.

this position a deflection away from the crack, w_c, was computed. These three deflections, w_ℓ, w_u, w_c, are used to compute the shearing and bending efficiency factors (Equations 33 and 34)

Tables D-2 and D-3 summarize the results of this sensitivity analysis. Due to the extremely small percent change in the shearing and bending efficiency factors, it can be concluded that for the purposes of this study, the use of an equivalent material modulus as computed by the selected methods is adequate to use in the ILLI-PAVE model in lieu of the more complicated and difficult to obtain nonlinear characterization of the pavement structure.

DEFLECTIONS
(in., x 10^{-2})

SECTION	DEGREE OF CRACK INTERLOCK	LOADED SIDE OF CRACK w_ℓ	UNLOADED SIDE OF CRACK w_u	MIDWAY BETWEEN CRACKS w_c	SHEARING EFFICIENCY FACTOR p	BENDING EFFICIENCY FACTOR f	CHANGE IN SHEARING EFFICIENCY PERCENT	CHANGE IN BENDING EFFICIENCY PERCENT
CONTROL	MAXIMUM	0.609	0.604	0.547	0.502	0.891	0.0	+0.9
MODIFIED		0.549	0.544	0.497	0.502	0.899		
CONTROL	MEDIUM	0.788	0.437	0.547	0.644	0.880	+1.1	+1.1
MODIFIED		0.718	0.385	0.497	0.651	0.890		
CONTROL	MINIMUM	1.243	0.015	0.547	0.988	0.850	+0.1	+2.0
MODIFIED		1.112	0.013	0.497	0.989	0.867		

TABLE D-3. RESULTS OF ILLI-PAVE SENSITIVITY ANALYSIS

APPENDIX E

DERIVATION OF AN EQUIVALENT LOADING STRIP

The CRACKTIP model as used by Chang (38) assumes a strip loading plate of infinite width. For this computer model to be useful in pavement deflection computations, an equivalent loading plate has to be developed in order to model the circular loaded areas commonly used in pavement modeling, as in Figure E-1(b).

The loads for the equivalent circular loaded area were derived from an approximate elastic theory solution used in the analysis of beams, plates and shells resting upon a subgrade. The equation selected was developed by Vlasov and Leont'ev (24) and is as follows:

$$w_f = w_c e^{-\alpha(x-b)} \qquad \text{(E-1)}$$

where

w_f = deflection at any radius X,

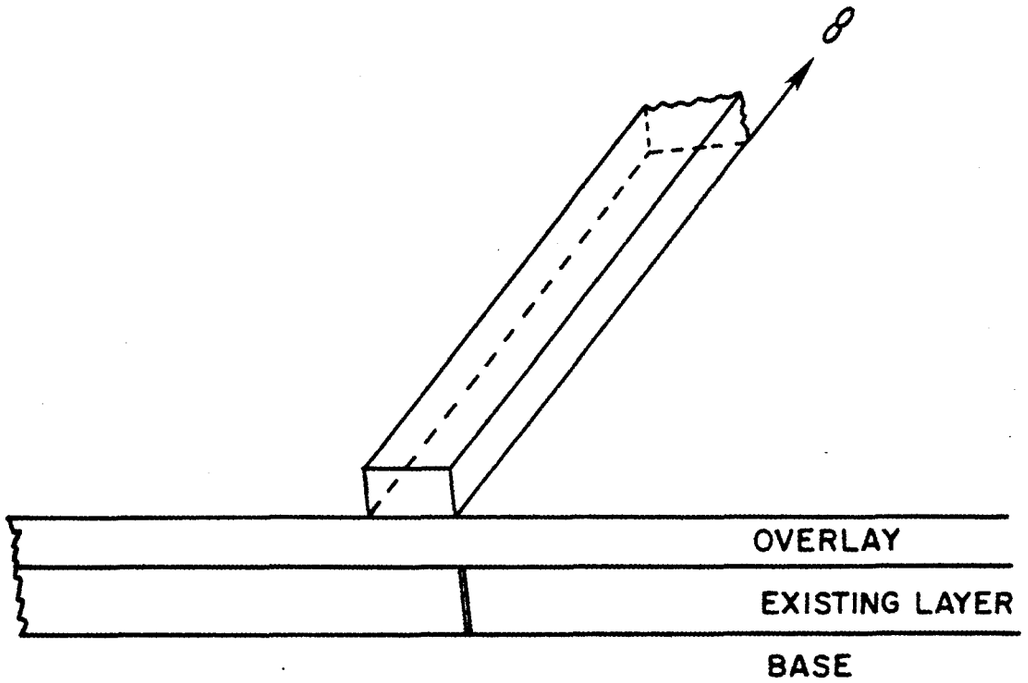
w_c = deflection under loading plate,

X = distance from center of loaded area,

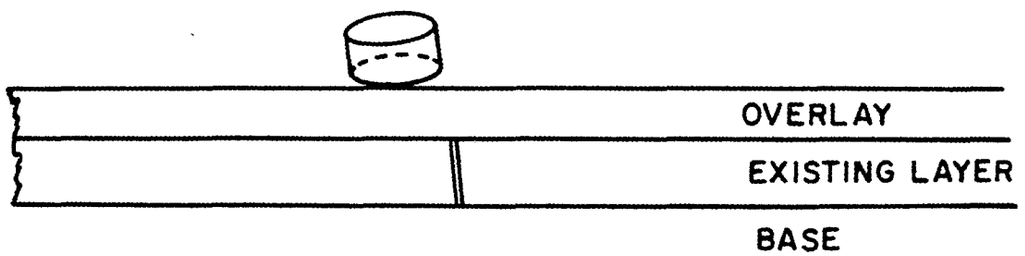
b = radius of loaded area,

$$\alpha = \frac{k}{2t}$$

$$k = \frac{E\delta}{(1-\nu^2)H}$$



(A)



(B)

FIGURE E-1. Loading Strip and Circular Loaded Area For Two-Dimensional Finite Element Analysis

$$t = \frac{E\delta H}{12(1+\nu)}$$

$$H = \sum_{i=1}^{\ell} h_i \left(\frac{E_i}{E_o}\right)^n$$

$$\delta =$$

H = a transformed thickness,

n = 1/3, from Odemark's assumption, (22)

ℓ = the number of layers,

h_i = the thickness of layer i,

E_i = the elastic modulus of layer i,

E_o = the elastic modulus of the datum layer, which was chosen to be the subgrade.

Through substitution, Equation E-1 can be rewritten as:

$$\frac{w_f}{w_c} = e^{-\frac{3.303}{H}(x-b)} \qquad \text{(E-2)}$$

A typical pavement deflection basin produced by a circular uniform load is shown in Figure E-2. The area of this basin can be computed by integrating Equation E-2. This was accomplished through use of Simpson's Rule. The total area of the basin was divided into two segments: the first segment is the area immediately under the circular loading area and the second segment is the remaining area outside from under the circular loading area. A ratio of the areas was computed as:

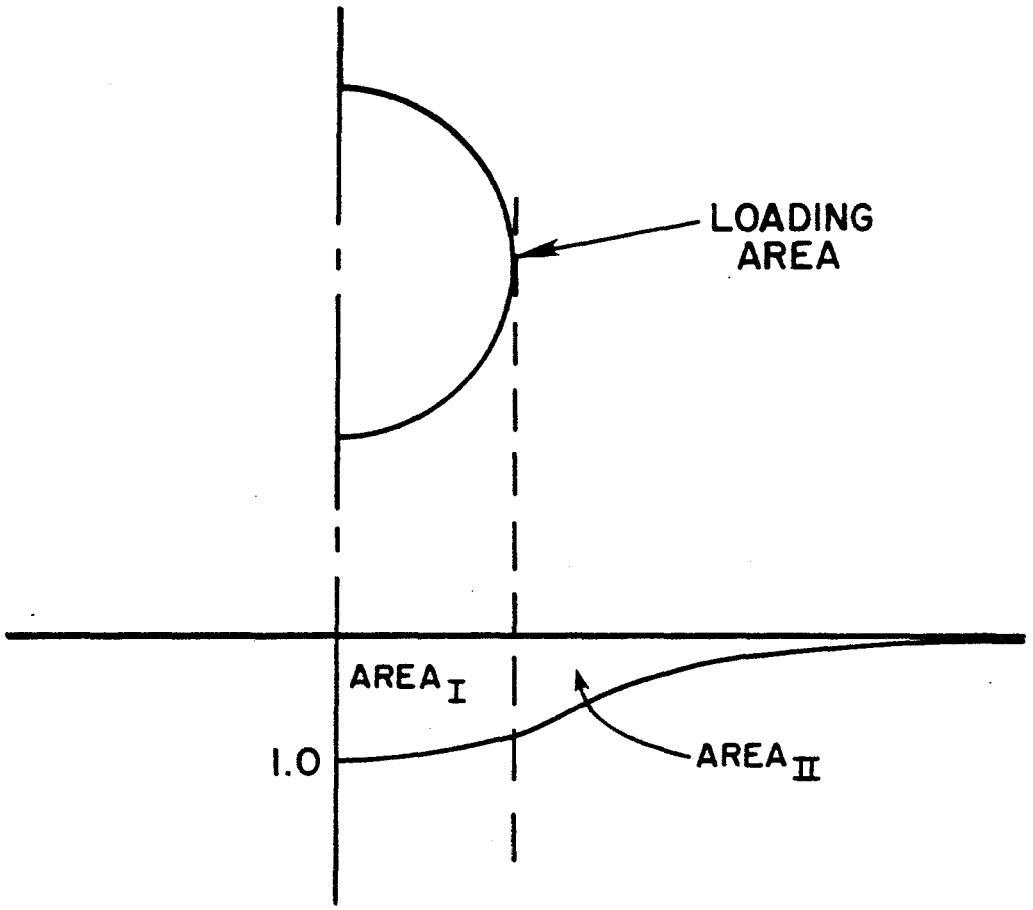


FIGURE E-2. Deflection Basin Produced by a Circular Loaded Area

$$R = \frac{Area_I}{Area_I + Area_{II}} \qquad \text{(E-3)}$$

Thus, R being a reduction factor, is multiplied by the actually applied pressure (p = 80 psi) to compute an equivalent pressure, which is shown in Table E-1.

This procedure is repeated at differing radius, X, values to develop a loading configuration as depicted in Figure E-1(b). The equivalent pressure values, p_e, are used in the CRACKTIP model.

RADIUS inch	$AREA_I$ $inch^2$	$AREA_{II}$ $inch^2$	R, $\frac{AREA_I}{AREA_I+AREA_{II}}$	EQUIVALENT PRESSURE, Pe (Rx80 psi)
6	6.0	22.726	0.209	16.72
5.809	5.809	22.711	0.204	16.32
5.196	5.196	22.700	0.186	14.88
3.969	3.969	22.700	0.149	11.91
0	0	0	0	0

TABLE E-1. EQUIVALENT PRESSURES

APPENDIX F

ANALYSIS OF LOAD TRANSFER AND THERMAL CONTRACTION OF CRACKS IN OVERLAID PAVEMENTS

APPENDIX F

ANALYSIS OF LOAD TRANSFER AND THERMAL CONTRACTION OF CRACKS IN OVERLAID PAVEMENTS

INTRODUCTION

This appendix gives details of the analysis that was conducted on the 23 sections of overlaid pavement in the dry, freeze-thaw cycling zone of west Texas in developing the Level 2 overlay design procedure that is described in Chapter 2. The analysis was done in three parts: analysis of load transfer with deflections at a crack, analysis of thermally-associated crack opening, and regression analysis. Each will be discussed separately below.

ANALYSIS OF LOAD TRANSFER WITH DEFLECTIONS

The proper analysis of the load-transfer characteristics of a crack in an existing pavement requires that deflections be obtained on both sides of the crack and at a distance midway between adjacent cracks. For an asphalt concrete pavement, the load transfer across a crack is primarily a function of the aggregate interlocking action between the two faces of the crack. The aggregate interlocking action at a crack is a function of the crack opening and the type of aggregate (degree of angularity and maximum size) in the mix, as shown

in Figure F-1.

Since the load transfer at most cracks is less than 100 percent efficient, unequal stresses develop on either side of the crack. The type of stresses that are transferred across a crack are shearing forces and bending moments. To quantify the efficiency with which these two forces are transferred across a crack, Lytton (51) has used beam-on-elastic foundation theory to develop the following efficiency factors.

Shearing:

$$p = \frac{W_\ell}{W_\ell + W_u} \qquad \text{(F-1)}$$

Bending:

$$f = 2 - \frac{(W_\ell + W_u)}{bW_c} \qquad \text{(F-2)}$$

where

p = Shearing efficiency factor, which ranges from 1/2 (good) to 1 (poor)

f = Bending efficiency factor, which ranges from 0 (poor) to 1 (good)

W_ℓ = Deflection on the loaded side of crack,

W_u = Deflection on the unloaded side of the crack,

W_c = Deflection at a distance midway between adjoining cracks, and

b = a correction factor which ranges from approximately 2.0 to 5.5.

By computation of the deflection measurements of a cracked

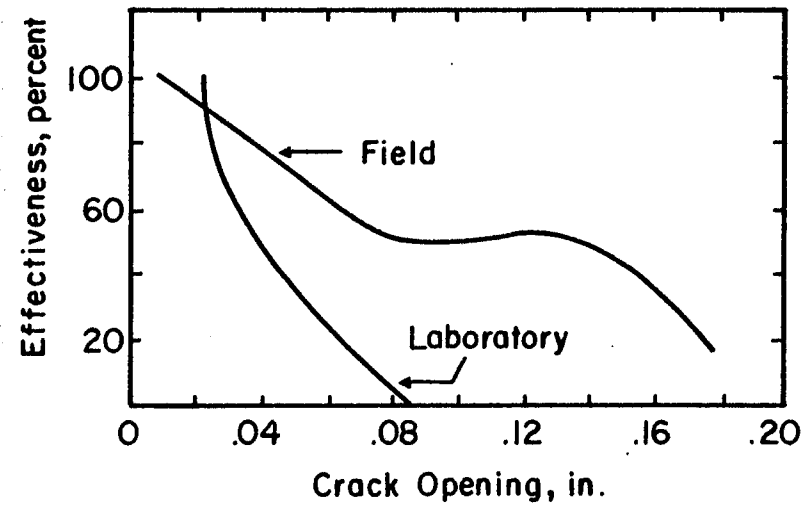


FIGURE F-1. Influence of Crack Opening Upon Load Transfer Effectiveness (33)

pavement, as illustrated in Figure F-2, values of both efficiency factors can be calculated.

For the purposes of this research, the deflection analysis of the existing layer was accomplished through the use of a finite-element computer program called ILLI-SLAB (34,35). This finite-element program is capable of modeling a two-layered elastic pavement system that contains cracks or joints and is discussed in detail in Appendix D. The basis for this program is the classical foundation theory developed by Winkler for medium-thick plates. A typical crack configuration and loading scheme are depicted in Figure F-3.

In order to model the deflection of an overlay, a modified version of an elastic finite element computer program with a hybrid crack tip element named CRACKTIP (38) was utilized. A typical mesh configuration of an overlay over a cracked pavement is pictured in Figure F-4. The darkened area under the left edge of the loading plate is the crack in the existing layer of asphalt concrete. By varying the aggregate interlock value of the crack, deflections were computed and analyzed. Before using this program, the loading strip as shown in Figure F-4 had to be modified to accept an equivalent loading plate so as to produce the same effect as a circular load. The analysis to determine an equivalent loading strip is presented in Appendix E.

From this analysis it was found that when an overlay is placed on top of a cracked existing pavement and subjected to load, the deflections on both sides of the crack are practically equal to the deflection at the midpoint between cracks. The calculated results are

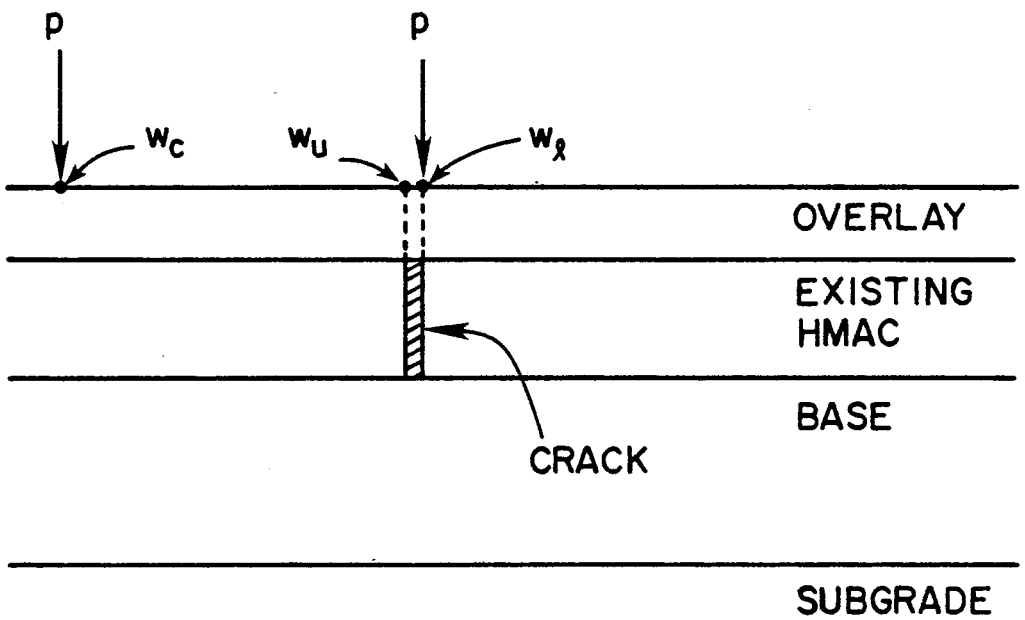


FIGURE F-2. Deflection of an Overlay on Top of a Cracked Existing Surface

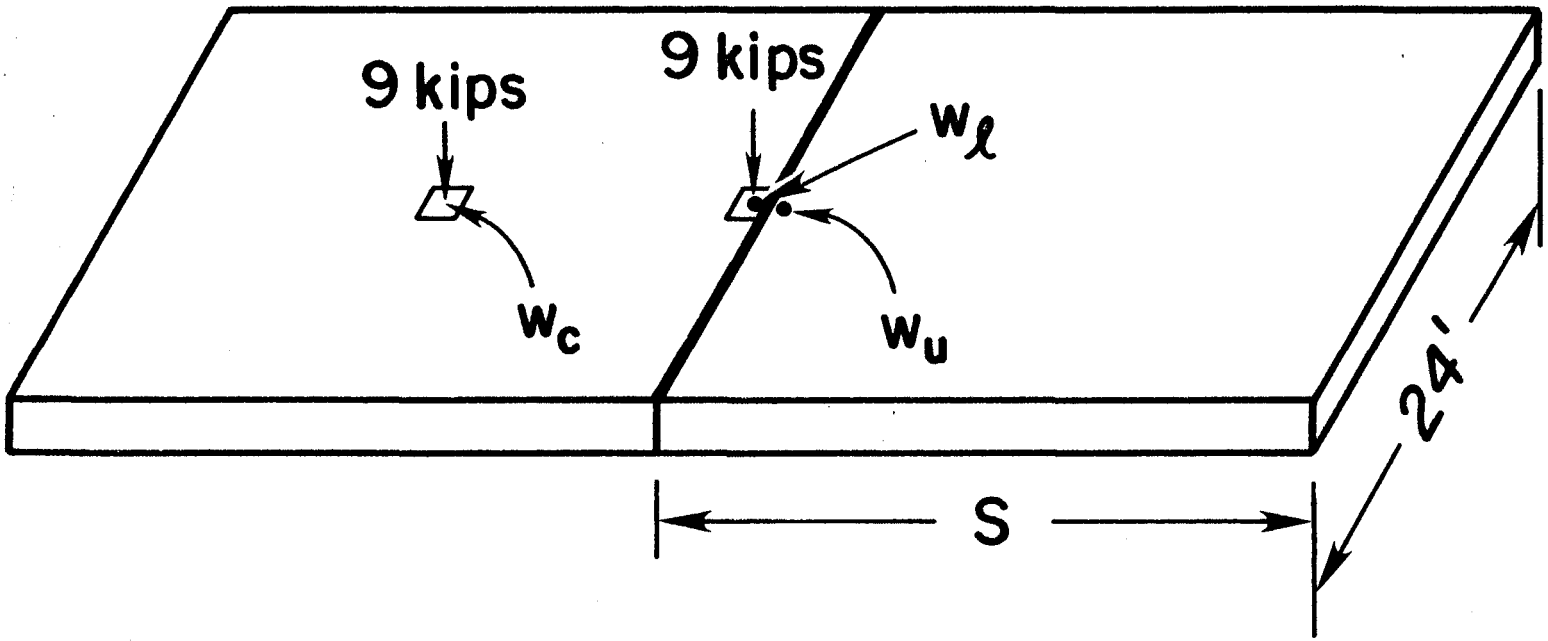


FIGURE F-3. Load Placement on Cracked Pavement for Completion of Deflection Evaluation

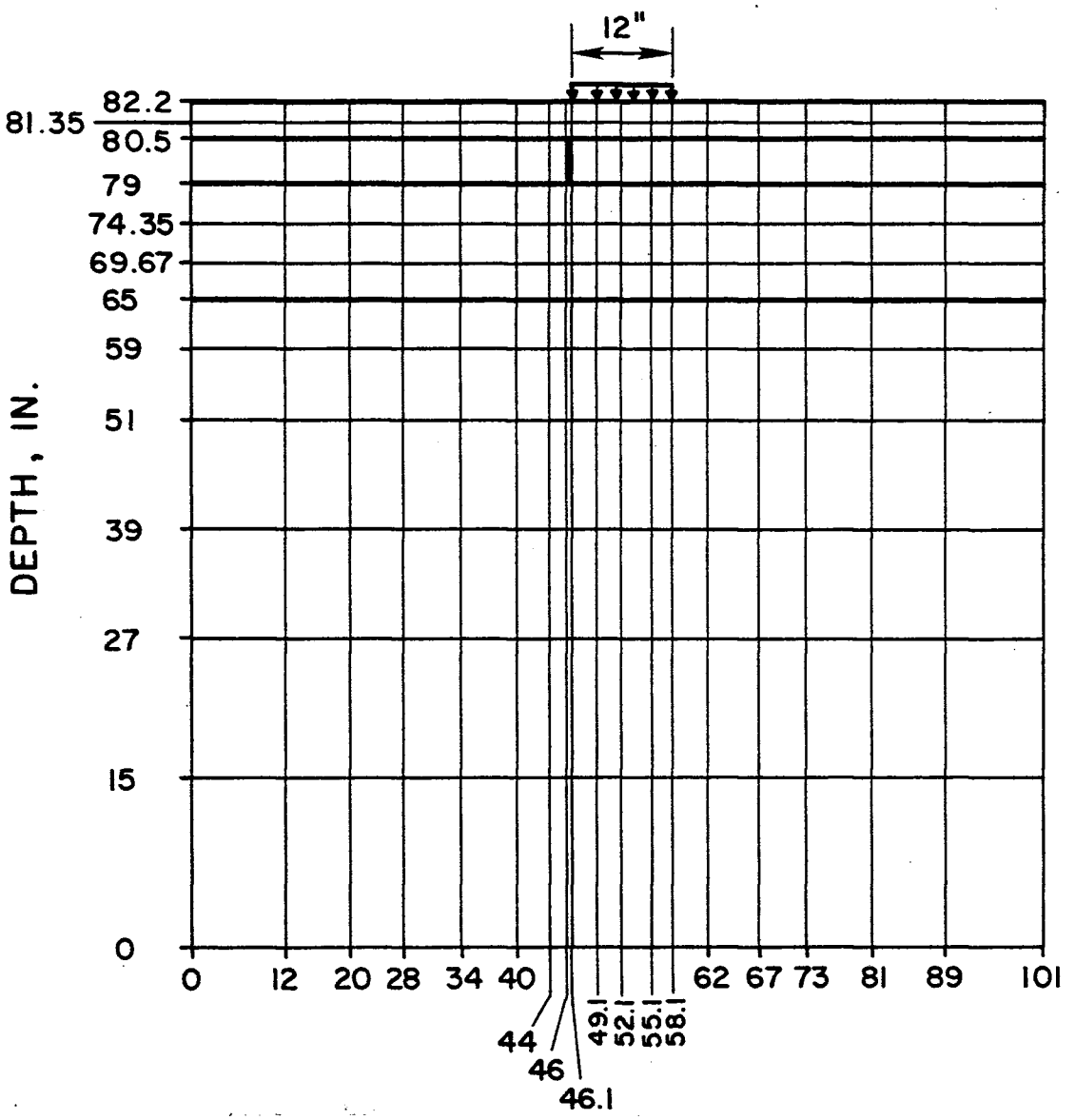


FIGURE F-4. Typical Mesh Configuration Used in CRACKTIP

SECTION		MAXIMUM AGGREGATE INTERLOCK	MEDIUM AGGREGATE INTERLOCK	MINIMUM AGGREGATE INTERLOCK
319				
A	W_ℓ	0.011506	0.011550	0.011607
	W_u	0.011504	0.011541	0.011588
	W_c	0.011504	0.011504	0.011504
B	W_ℓ	0.012107	0.012122	0.012137
	W_u	0.012104	0.012104	0.012101
	W_c	0.012104	0.012104	0.012104
C	W_ℓ	0.007417	0.007421	0.007427
	W_u	0.007409	0.007385	0.007356
	W_c	0.007409	0.007409	0.007409
2509				
A	W_ℓ	0.011301	0.011362	0.011429
	W_u	0.011298	0.011348	0.011402
	W_c	0.011298	0.011298	0.011298
B	W_ℓ	0.012026	0.012041	0.012057
	W_u	0.012022	0.012017	0.012006
	W_c	0.012022	0.012022	0.012022
C	W_ℓ	0.006606	0.006607	0.006609
	W_u	0.006601	0.006577	0.006549
	W_c	0.006601	0.006601	0.006601

TABLE F-1. STEP A-OVERLAY DEFLECTIONS WITH CRACK IN EXISTING PAVEMENT (inches)

given in Table F-1. The pavement sections 319 and 2502 which are referred to in Table F-1 are actual pavement sections in Texas which had been overlaid. The codes A, B, and C refer to high, medium, and low temperatures.

Using this same CRACKTIP program, the crack was allowed to propagate through the overlay. The cracked overlay was subjected to the identical loading scheme as in the previous analysis. The deflections in this analysis are given in Table F-2. The deflection values in Tables F-1 and F-2 show that as the crack propagates through the overlay, there is a corresponding loss in the efficiency of load transfer across the crack.

Through the regression analysis of the deflection data of the pavement sections that were analyzed, a relationship was developed between the bending efficiency factor, f, and the ratio of W_ℓ to W_c, as shown in Figure F-5. By use of this relationship a value for b, as given in Equation F-2, does not need to be calculated.

ANALYSIS OF THERMALLY ASSOCIATED CRACK OPENING

Pavement damage associated with climatic variations is the cause of many types of distress which occur to pavements. One of the major causes of reflection cracking is the shear stresses which develop at the interface between the overlay and the underlying asphalt concrete layer when the lower layer cools and contracts resulting in the opening and closing of the cracks beneath the intact overlay.

In order to predict the crack opening and the consequent shear

SECTION		MAXIMUM AGGREGATE INTERLOCK	MEDIUM AGGREGATE INTERLOCK	MINIMUM AGGREGATE INTERLOCK
319				
A	W_ℓ	0.011506	0.011675	0.012728
	W_u	0.011504	0.011622	0.012234
	W_c	0.011504	0.011504	0.011504
B	W_ℓ	0.012107	0.012232	0.013041
	W_u	0.012104	0.012139	0.012680
	W_c	0.012104	0.012104	0.012104
C	W_ℓ	0.007417	0.007590	0.007844
	W_u	0.007410	0.007336	0.007513
	W_c	0.007410	0.007410	0.007410
2502				
A	W_ℓ	0.011301	0.011558	0.012740
	W_u	0.011298	0.011479	0.012019
	W_c	0.011298	0.011298	0.011298
B	W_ℓ	0.012026	0.012169	0.012950
	W_u	0.012021	0.012043	0.012470
	W_c	0.012021	0.012021	0.012021
C	W_ℓ	0.006606	0.006763	0.006682
	W_u	0.006601	0.006573	0.006940
	W_c	0.006601	0.006601	0.006601

TABLE F-2. STEP B-OVERLAY DEFLECTIONS WITH CRACK PROPAGATED TO SURFACE. (inches)

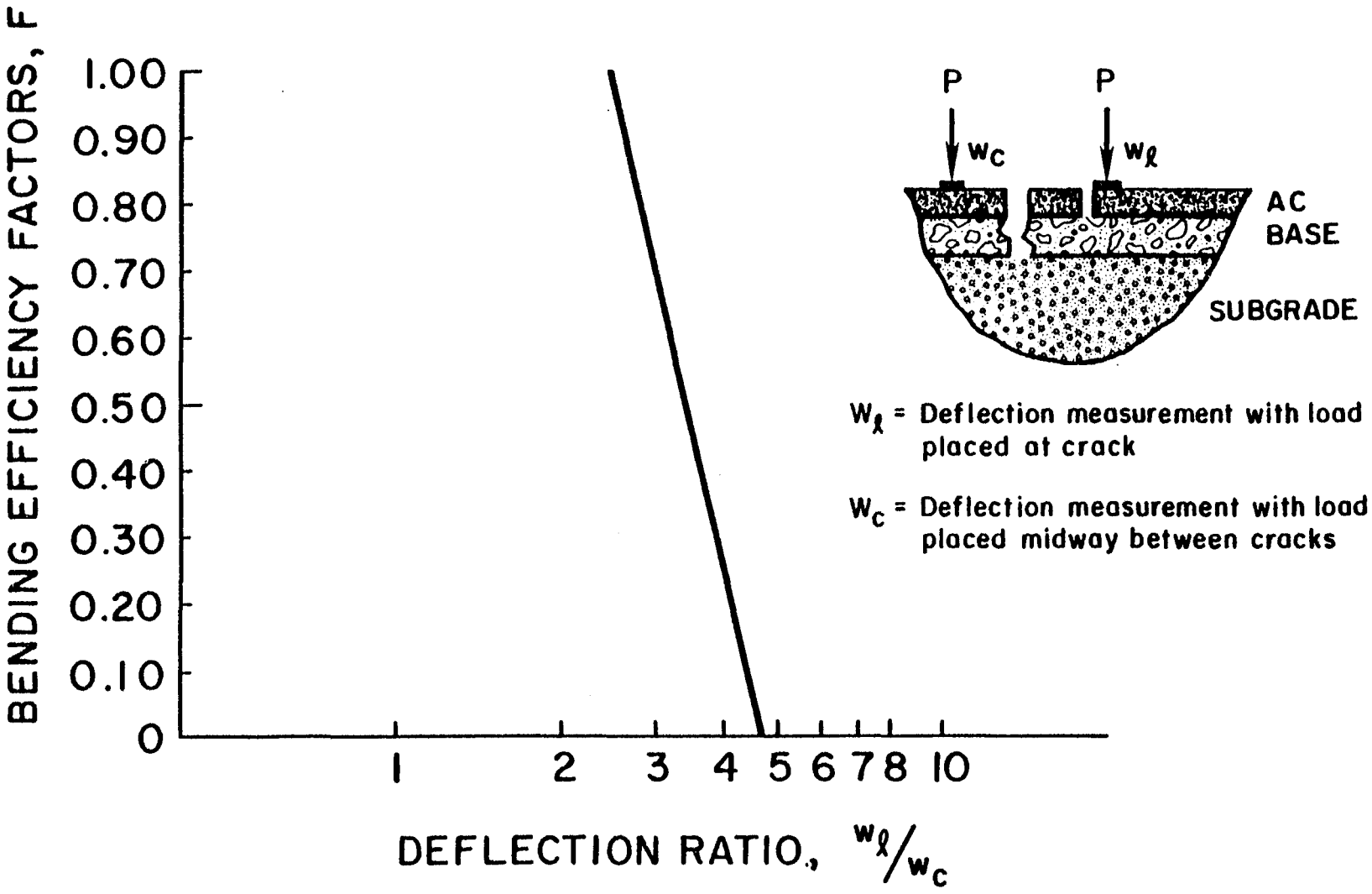


FIGURE F-5. Relationship Between Deflections and the Bending Efficiency Factor

stresses, the change in temperature, T, at the interface between the overlay and the existing layer must be predicted. Several researchers have developed models to predict this value (36, 52, 53), but the model developed by Barber (52) and altered by Shahin and McCullough (36) was selected because of the degree to which it is applicable to the problem of reflection cracking. This model considers daily temperature, wind velocity, and solar radiation as the climatic inputs. The pavement thermal properties are absorptivity, thermal conductivity, and mix density and are given in Table F-3. The pavement thermal properties were held constant throughout the analyses that were made.

The temperature equation reported by Shahin and McCullough is as follows:

$$T = T_m + T_v \frac{He^{-xc}}{(H+C)^2 + C^2} \mathrm{Sin}(S_i) \qquad \text{(F-3)}$$

where

S_1 = 6.81768(0.0576t - 0.075xc - 0.288); (7:00 a.m. to 2:00 p.m.) t = 2 to 9

S_2 = 14.7534(0.02057t - 0.075xc - 0.288); (3:00 p.m. to 7:00 p.m.) t = 10 to 14

S_3 = -6.94274(0.02057t - 0.12xc - 0.288); (8:00 p.m. to 6:00 a.m.) t = 15 to 25

T_v = 0.5TR + 3R; if $\mathrm{Sin}(S_i) > 0$,

T_m = T_A + R; if $\mathrm{Sin}(S_i) > 0$,

T_v = 0.5TR; if $\mathrm{Sin}(S_i) < 0$, and

T_m = TA + 0.5R; if $\mathrm{Sin}(S_i) < 0$.

PAVEMENT THERMAL PROPERTY	VALUE
Absorptivity, b	0.95
Thermal conductivity, k	0.70 BTU/hr
Specific heat, s	0.22
Density, w	145 pcf

TABLE F-3. AVERAGE VALUES OF THE THERMAL PROPERTIES OF ASPHALT CONCRETE MIXTURES.

The change in temperature, ΔT, parameter which was used to calculate the crack opening was computed as the difference between the average annual minimum and average annual maximum temperatures as shown in Figure F-6.

Shahin and McCullough's computer program was modified in order to make the calculations given above. This program was also modified to read climatic data from magnetic tapes. These data were secured from the Texas Natural Resources Information System (54) and the National Oceanic and Atmospheric Administration (55).

To illustrate the cycling of crack opening and closing, an analysis was made on two pavement sections which are described in Table F-4 and which are located in different climatic regions. Shahin and McCullough's computer program (36) was modified to include Equation 72 in order to complete this analysis. Figure F-7, shows that the crack opening throughout the year is very similar in the two climatic regions, and there is no significant difference in the magnitude of the two crack openings. It is also apparent that the change in the daily crack opening occurs gradually throughout the year.

REGRESSION ANALYSIS

The development of design equations for overlays to retard reflection cracking was made using the Statistical Analysis System developed by the SAS Institute Inc. (56) which is readily accessible through the Texas A&M University Data Processing Center.

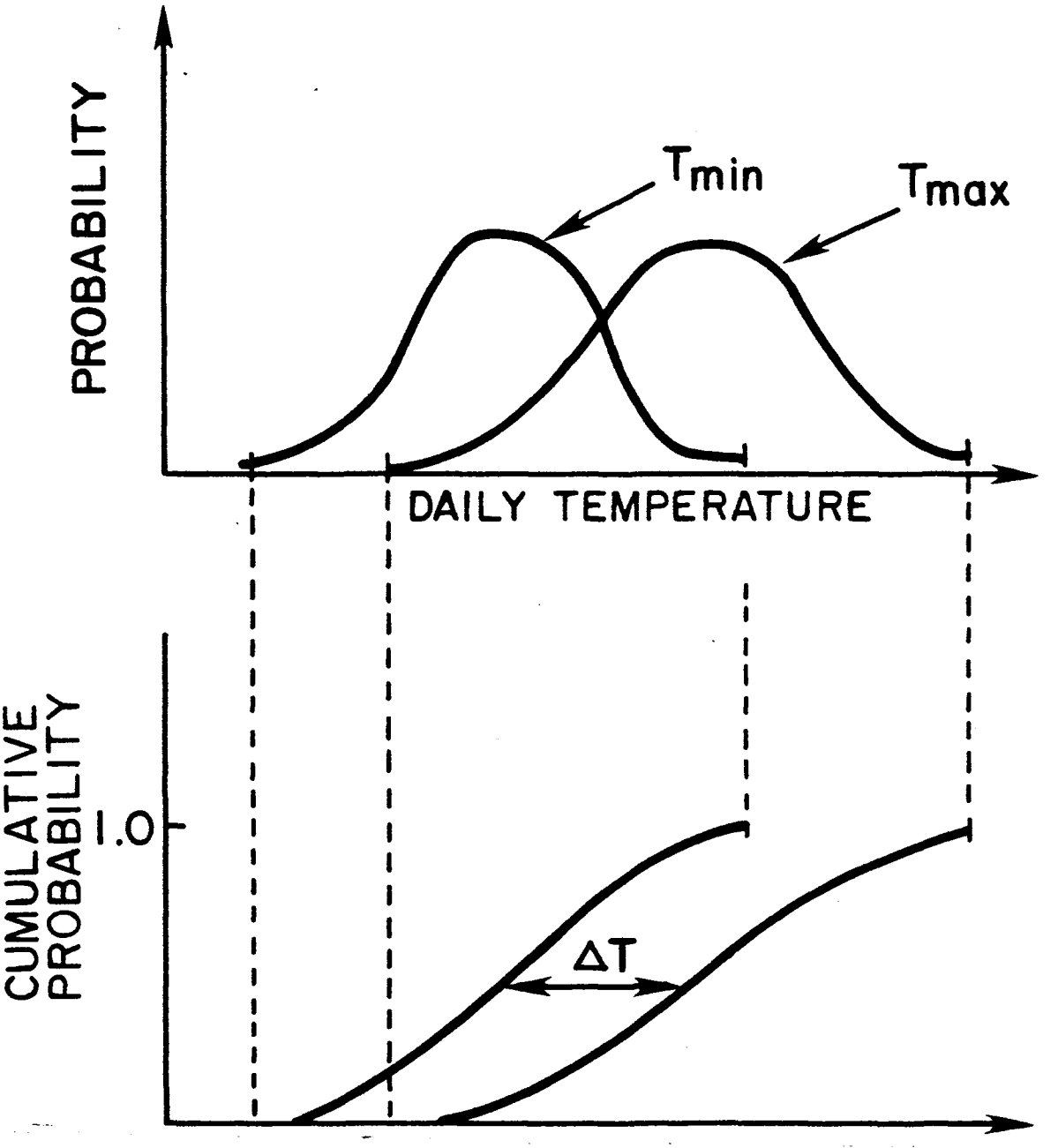


FIGURE F-6. Change in Temperature at Interface of the Overlay and Existing Pavement

PAVEMENT SECTION NUMBER	CLIMATIC REGION	LOCATION
393	V	IH-40, Oldham Co., Texas
2044	I	SH-73, Jefferson Co., Texas

TABLE F-4. PAVEMENT SECTIONS USED IN CRACK CYCLE ANALYSIS.

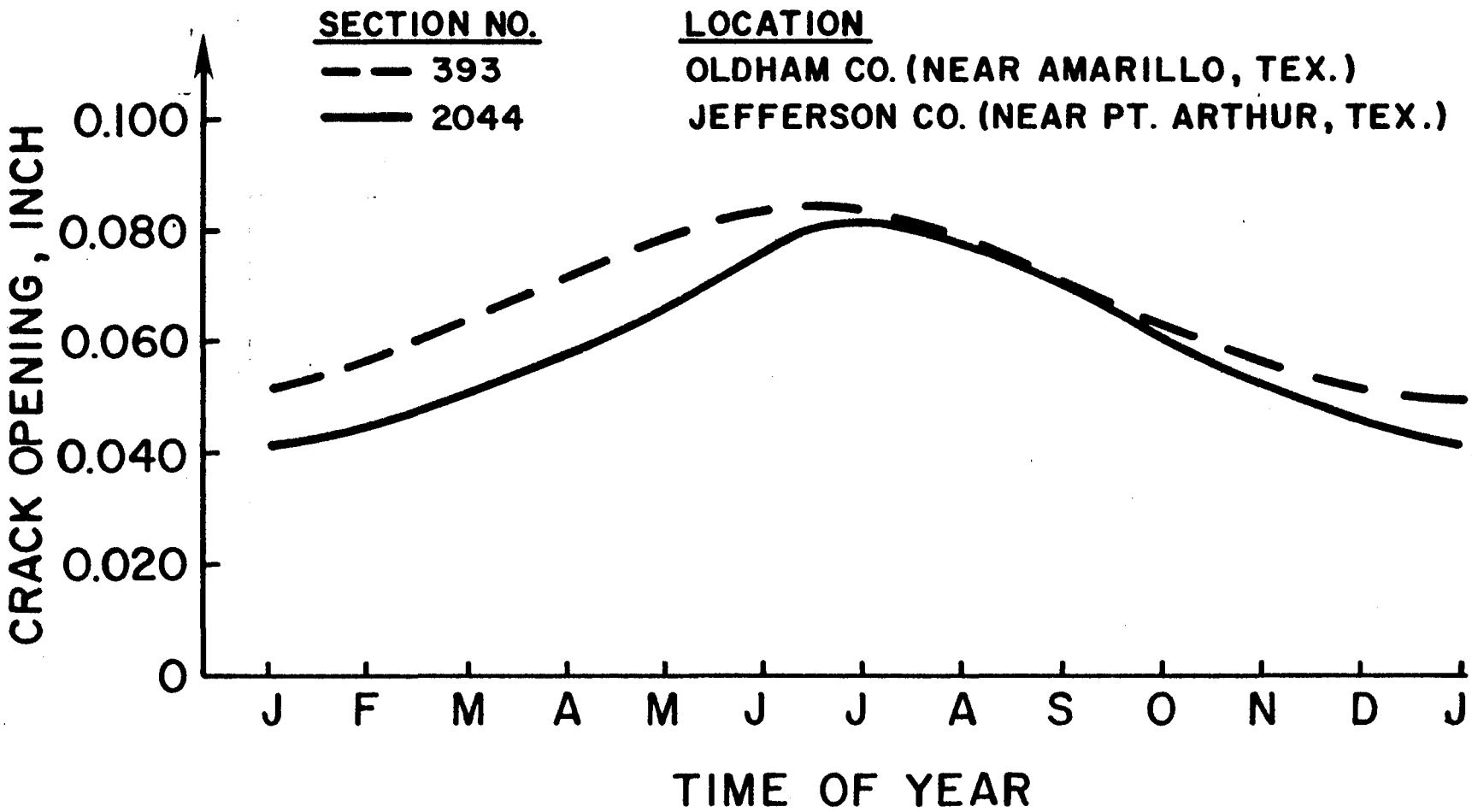


FIGURE F-7. Contraction Caused by Thermal Stresses of Two Pavement Sections Located in Differing Climatic Regions

To facilitate the analysis of the data computed, a matrix of computed values of the number of load repetitions to failure was constructed, including N_{FB} (bending), Equation 69; N_{FS} (shearing), Equation 70; and N_{FT} (thermal), Equation 71. Table F-5 categorizes these number of cycles to failure into high, medium, and low values of the stress type, the design temperature, and the degree of aggregate interlock on the faces of the crack. A matrix of 27 variables was compiled for each pavement section by using this scheme.

In order to assemble the best possible equation of the form suggested by Equation 52, a stepwise multiple linear regression was used in order to include only those variables that affect the dependent variable most significantly. This method provides an economical equation in which the least number of independent variables necessary to explain the dependent variable are selected. Using SAS, the stepwise multiple linear regression begins by selecting the 'best' one-variable model, then the 'best' two-variable model and so on. This procedure continues until a predesignated criterion is exceeded by the inclusion of another independent variable. By use of this procedure, only the most significant of the 27 variables, in Table F-5, was selected for the final design equation.

The initial stepwise analysis attempted to develop an equation for reflection cracking severity for all of the pavement sections within the State of Texas as shown in Figure F-8. This analysis consisted of 23 sites or sets of observations, each containing one dependent variable and 27 independent variables, the dependent

	Temperature, °C								
	0			25			60		
STRESS	AGGREGATE INTERLOCK			AGGREGATE INTERLOCK			AGGREGATE INTERLOCK		
Bending	High NFB-AH	Medium NFB-AM	Low NFB-AL	High NFB-BH	Medium NFB-BM	Low NFB-BL	High NFB-CH	Medium NFB-CM	Low NFB-CL
Shearing	High NFS-AH	Medium NFS-AM	Low NFS-AL	High NFS-BH	Medium NFS-BM	Low NFS-BL	High NFS-CH	Medium NFS-CM	Low NFS-CL
Thermal	High NFT-AH	Medium NFT-AM	Low NFT-AL	High NFT-BH	Medium NFT-BM	Low NFT-BL	High NFT-CH	Medium NFT-CM	Low NFT-CL

TABLE F-5. MATRIX OF INPUT VARIABLES.

variable being the actual number of load repetitions to cause the severity of reflection cracking to reach a designated level of damage. From previous research completed at Texas Transportation Institute the actual values for ρ and β as used in Equation 41, has been back-calculated from actual field observations. Thus, using Equation 41, it is a simple matter to compute the actual number of load repetitions to achieve a particular level of distress. For the test sites under study in this research, the respective ρ, β, and number of load repetitions to failure are reported in Appendix G. The regression analysis was performed at three damage levels; 0.33, 0.40, and 0.50. This range was selected because it is believed by the author that some level of maintenance will be applied to the pavement when it has deteriorated to within this range of damage. Upon the completion of a stepwise multiple linear regression of this data set, it was found that no single variable or combination of variables would produce a suitable equation that would be valid for the entire State of Texas.

The second phase of this analysis consisted of segregating the pavement sections according to climatic regions, as shown in Appendix B and Figure F-8. The range of variables that were used in the regression for Climatic Region V (north and west Texas) is given in Table F-6. Results of the various forms of equations examined are given in Tables F-7 through F-10.

The regression model selected as the best is exhibited in Table F-8 and depicted in Figures F-9 through F-11. The models developed for Climatic Region I were deleted from further consideration due to

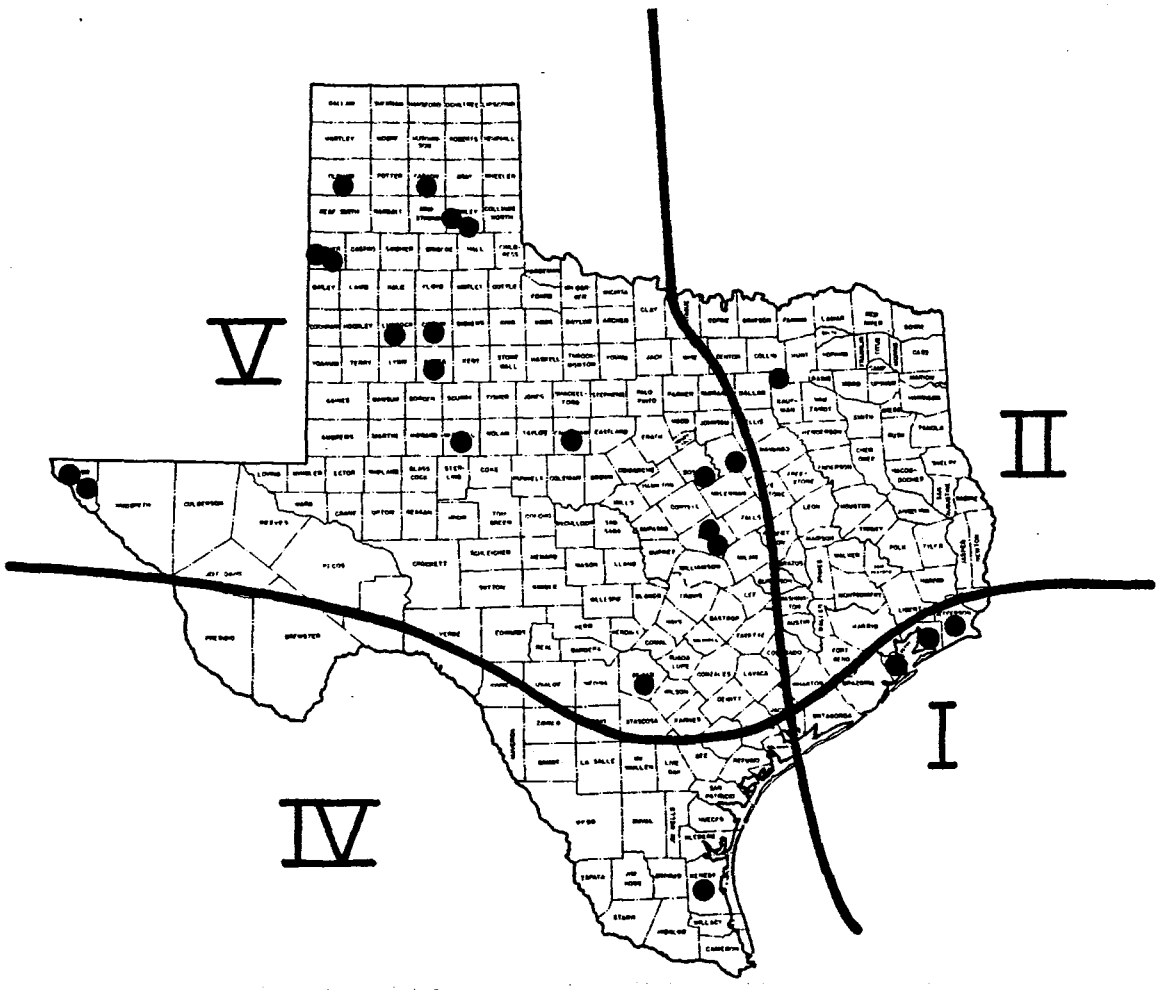


FIGURE F-8. Climatic Regions Included in Texas

VARIABLE	INPUT RANGE*
Modified Modulus of Subgrade Reaction (k')	1522-6157 pci
Stiffness of Overlay (E_1)	2.6×10^5-1.2×10^6 psi
Stiffness of Existing Layer (E_2)	1.1×10^5-5.7×10^6 psi
Overlay Thickness (h_1)	1.1-4.0 in.
Existing Layer Thickness (h_2)	1.1-3.5 in.
Fracture Parameter due to Fatigue (n_F)	4.052-4.552

*computed at 25°C.

TABLE F-6. RANGE OF INPUT VARIABLES TO DESIGN EQUATIONS, CLIMATIC REGION V.

Number of Pavement Sections = 3

Damage Level = 0.33

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-BL	-13.842	0.0001
NFB-CL	7442.281	0.0001
INTERCEPT	0.723×10^6	
R^2=1.00		

$$N_F = 0.723 \times 10^6 - 13.842(NFB)_{BL} + 7442.281(NFB)_{CL}$$

Damage Level = 0.40

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-BL	-46.416	0.0001
NFB-CL	24956.779	0.0001
INTERCEPT	0.847×10^6	
R^2=1.00		

$$N_F = 0.847 \times 10^6 - 46.416(NFB)_{BL} + 24956.779(NFB)_{CL}$$

Damage Level = 0.50

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-BL	-112.243	0.0001
NFB-CL	60350.462	0.0001
INTERCEPT	1.085×10^6	
R^2=1.00		

$$N_F = 1.085 \times 10^6 - 112.243(NFB)_{BL} + 60350.462(NFB)_{CL}$$

TABLE F-7. LINEAR REGRESSIONS-CLIMATIC REGION I.

Number of Pavement Sections = 17

Damage Level = 0.33

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-BH	-13.444	0.0001
NFB-CH	795.947	0.0001
NFS-BH	85.284×10^6	0.0003
INTERCEPT	0.181×10^6	

$R^2=0.936$

$$N_F = 0.181\times10^6-13.444(NFB)_{BH}+795.947(NFB)_{CH}+85.284\times10^6(NFS)_{BH}$$

Damage Level = 0.40

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-BH	-15.912	0.0001
NFB-CH	948.843	0.0001
NFS-BH	99.543×10^6	0.0003
INTERCEPT		

$R^2=0.943$

$$N_F = 0.18\times10^6-15.912(NFB)_{BH}+948.843(NFB)_{CH}+99.543\times10^6(NFS)_{BH}$$

Damage Level = 0.50

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-BH	-20.560	0.0001
NFB-CH	1239.815	0.0001
NFS-BH	125.774×10^6	0.0003
INTERCEPT	0.171×10^6	

$R^2=0.952$

$$N_F = 0.171\times10^6-20.560(NFB)_{BH}+1239.815(NFB)_{CH}+125.774\times10^6(NFS)_{BH}$$

TABLE F-8. LINEAR REGRESSIONS-CLIMATIC REGION V.

Number of Pavement Sections = 17

Damage Level = 0.33

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-CH	8.357×10^4	0.0008
NFT-AL	5.177×10^6	0.0321
NFS-CH	-103.88×10^6	0.0689
INTERCEPT	-12.943×10^6	

$R^2=0.6228$

$$N_F = -12.943\times10^6+8.357\times10^4(NFB)_{CH}+5.177\times10^6(NFT)_{AL}-103.88\times10^6(NFS)_{CH}$$

Damage Level = 0.40

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-CH	10.364×10^4	0.0007
NFT-AL	4.804×10^6	0.0262
NFS-CH	-129.115×10^6	0.0587
INTERCEPT	-14.056×10^6	

$R^2=0.6275$

$$N_F = -14.056\times10^6+10.364\times10^4(NFB)_{CH}+4.804\times10^6(NFT)_{AL}-129.115\times10^6(NFS)_{CH}$$

Damage Level = 0.50

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFB-CH	13.236×10^4	0.0004
NFT-AL	4.556×10^6	0.0163
NFS-CH	-680.129×10^6	0.0356
INTERCEPT	-17.385×10^6	

$R^2=0.644$

$$N_F = -17.385\times10^6+13.236\times10^4(NFB)_{CH}+4.556\times10^6(NFT)_{AL}-680.129\times10^6(NFS)_{CH}$$

TABLE F-9. LINEAR REGRESSION WITH DEPENDENT VARIABLES RAISED TO A POWER-CLIMATIC REGION V.

Number of Pavement Sections = 17

Damage Level = 0.33

No equation could be constructed that was adequately reliable.

Damage Level = 0.40

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFS-CM	0.0	0.0001
INTERCEPT	-0.11×10^{-6}	
$R^2=0.157$		

$$\frac{1}{N_F} = -0.11 \times 10^{-6} + 0.0\left(\frac{1}{NFS}\right)_{CM}^{0.64089}$$

Damage Level = 0.50

VARIABLE	COEFFICIENT	PROBABILITY LEVEL
NFS-CM	0.1×10^{-7}	0.0001
NFB-BM	-0.289×10^{-4}	
INTERCEPT	0.3×10^{-7}	
$R^2=0.427$		

$$\frac{1}{N_F} = 0.3 \times 10^{-7} + 0.1 \times 10^{-7}\left(\frac{1}{NFS}\right)_{CM}^{0.62698} - 0.289 \times 10^{-4}\left(\frac{1}{NFB}\right)_{BM}^{0.36961}$$

TABLE F-10. LINEAR REGRESSION WITH DEPENDENT VARIABLES RAISED TO A POWER AND USE OF MINER'S RULE-CLIMATIC REGION V.

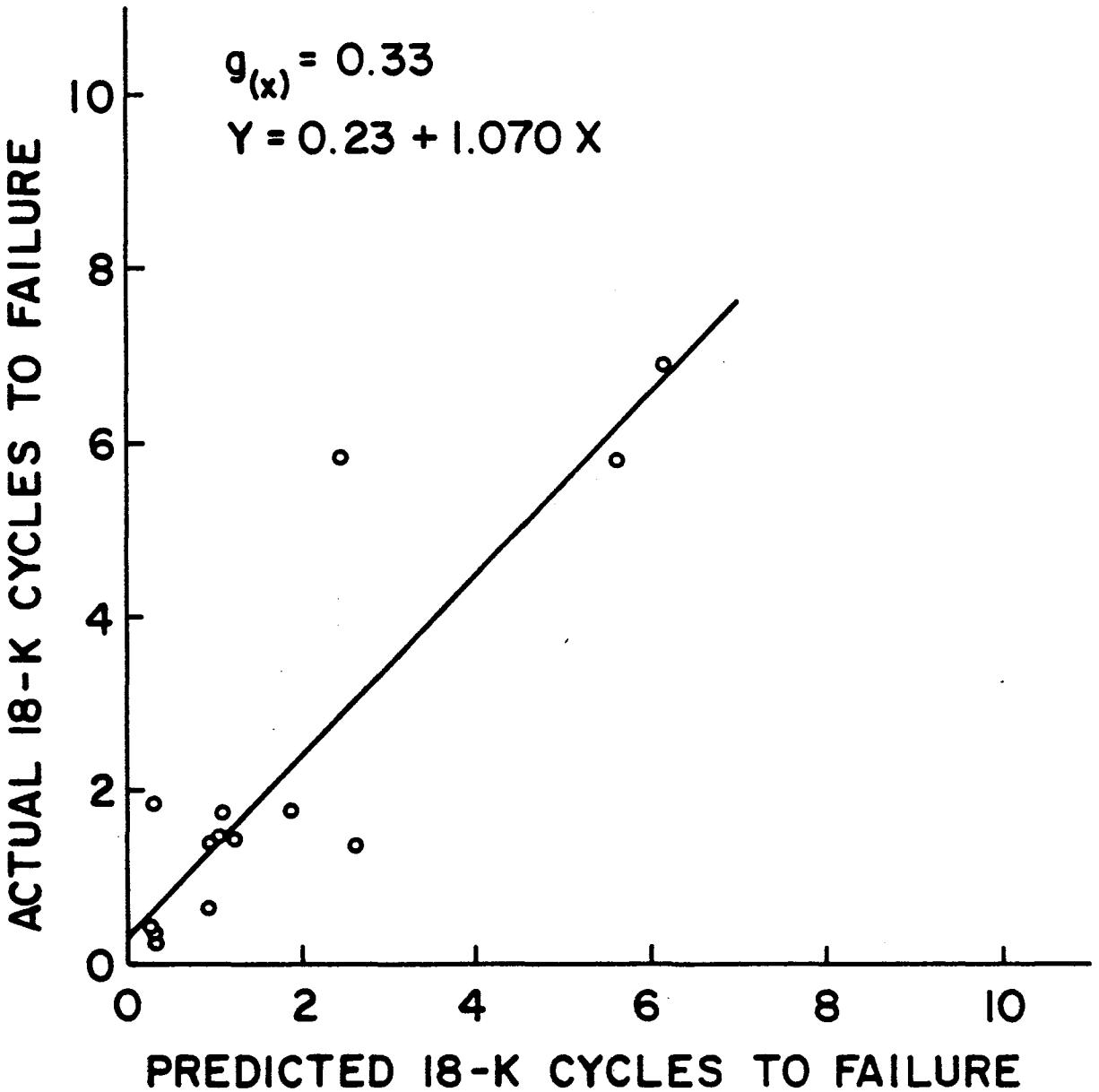


FIGURE F-9. Best Model for Climatic Region V at Damage Level of 0.33

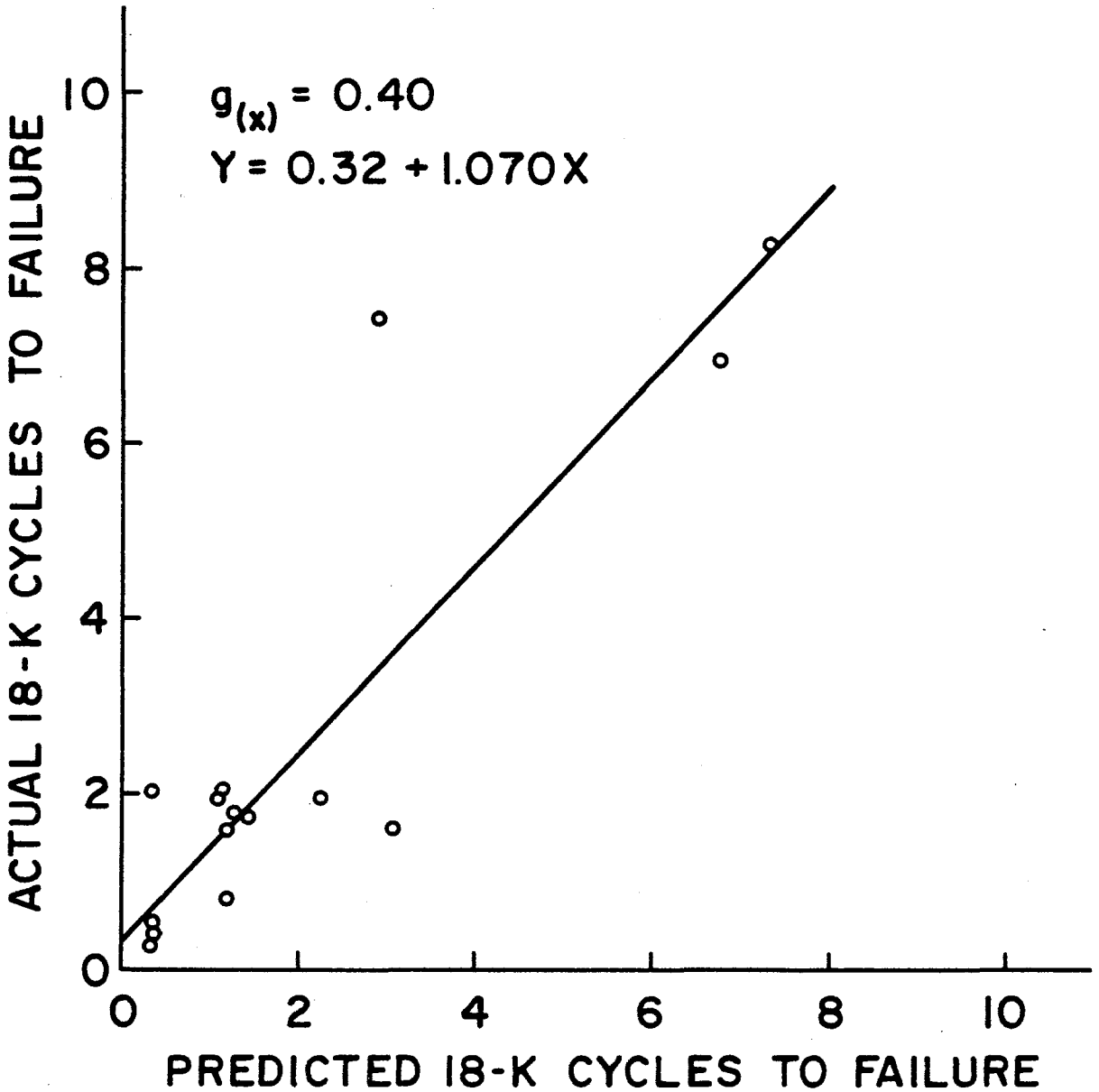


FIGURE F-10. Best Model for Climatic Region V at Damage Level of 0.40

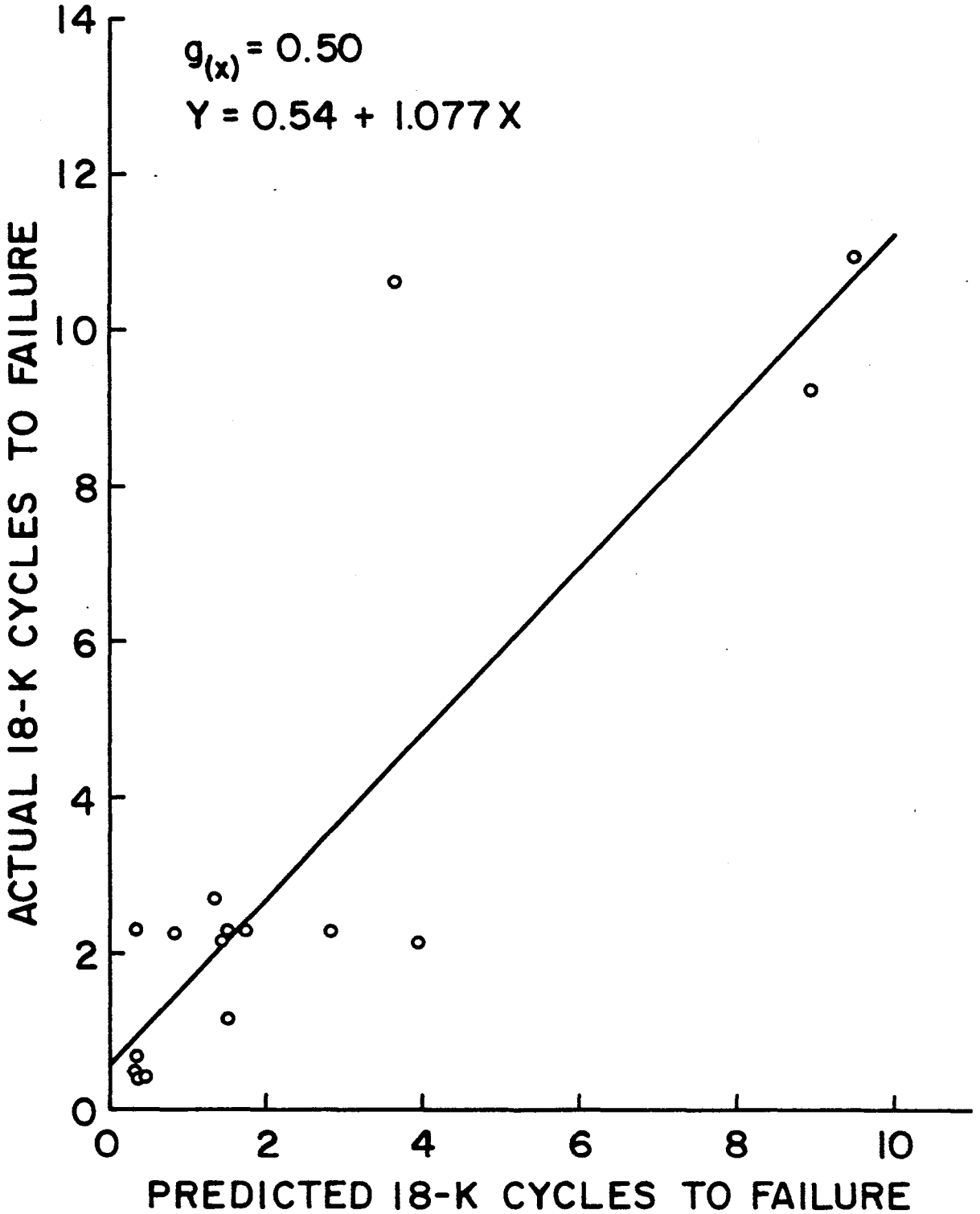


FIGURE F-11. Best Model for Climatic Region V at Damage Level of 0.50

the fact that only three pavement sections were located within this region. The same holds true for the pavement sections located in Climatic Regions II and IV.

It should be noted at this point that the selected regression equation does not include the number of thermal stress cycles, Equation 71. The bending and shearing stress parameters, both of which are load associated, were selected as the most significant variables in predicting the severity of reflection cracking.

APPENDIX G

INPUT DATA FOR THE LEVEL 2 OVERLAY DESIGN EQUATION

The parameters used in this research were computed from actual field data and construction records whenever it was available. Various computer programs, PONOS, ILLI-SLAB, and ILLI-PAVE were utilized to compute the variables from the field data and pavement layer thicknesses.

Data from the Texas State Department of Highways and Public Transportation and Texas Transportation Institute that was used in this research are presented in the appendix.

TABLE G-1. LOAD CYCLES TO FAILURE
BY SEVERITY OF TRANSVERSE CRACKING

SECTION NUMBER	ρ	β	LOAD CYCLES TO FAILURE ($x10^6$) DAMAGE LEVEL 0.33	0.40	0.50
319	3.4693	0.5252	2.851	4.098	6.971
393	0.7724	1.3442	0.717	0.824	1.015
2502	0.4773	1.0	0.431	0.521	0.689
2620	0.3235	1.0	0.292	0.353	0.467
2659	0.3425	2.6386	0.329	0.354	0.394
2808*	0.3235	1.0	0.292	0.353	0.467
2811*	0.3235	1.0	0.292	0.353	0.467
848	6.3872	1.0	5.809	6.971	9.215
893	1.5934	1.0	1.449	1.739	2.299
924	4.3574	1.2847	4.021	4.664	5.796
937	1.5755	1.0	1.433	1.719	2.273
966	0.1216	0.6730	0.104	0.138	0.210
995	7.5758	1.0	6.833	8.268	10.930
1263*	3.0	1.0	2.706	3.274	4.328
1543	9.3946	1.0	8.474	10.253	13.554
1894	1.8731	1.0	1.690	2.044	2.702
2002*	0.8054	1.0	0.726	0.879	1.162
2044	0.8054	1.0	0.726	0.879	1.162
2086*	1.0	1.0	0.902	1.091	1.443
2324	2.6565	0.6095	2.243	3.066	4.847
2353*	2.6565	0.6095	2.243	3.066	4.847
2468*	1.4701	1.0	1.326	1.604	2.121
3147	1.4701	1.0	1.326	1.604	2.121

*ρ & β values were not available; thus, had to be derived by correlating with other sections with similar traffic, climatic conditions, and construction.

SECTION NUMBER	OVERLAY MODULUS E1, PSI	EXISTING PAVEMENT MDULUS E2, PSI	FRACTURE PARAMETERS THERMAL N	THERMAL A	FATIGUE N	FATIGUE A	SHEARING EFFICI. P2	BENDING EFFICI. F2	PAVEMENT MODIFIED H2M, INCH	THICKNESS OVERLAY H1, INCH	DAYS IN YEAR WITH TEMP. LESS THAN STRESS-FREE PERCENT
319-A1	0.30E 07	0.47E 07	3.750	0.20E-03	2.356	0.12E-14	0.501	1.0	1.50	1.70	50.0
319-A2	0.30E 07	0.47E 07	3.750	0.20E-03	2.356	0.12E-14	0.595	0.5	0.69	1.70	50.0
319-A3	0.30E 07	0.47E 07	3.750	0.20E-03	2.356	0.12E-14	0.979	0.0	0.24	1.70	50.0
393-A1	0.23E 07	0.36E 07	3.717	0.22E-03	2.449	0.78E-15	0.502	1.0	3.08	1.50	50.0
393-A2	0.23E 07	0.36E 07	3.717	0.22E-03	2.449	0.78E-15	0.649	0.5	1.28	1.50	50.0
393-A3	0.23E 07	0.36E 07	3.717	0.22E-03	2.449	0.78E-15	0.988	0.0	0.51	1.50	50.0
2502-A1	0.28E 07	0.35E 07	3.441	0.40E-03	3.157	0.28E-16	0.501	1.0	1.20	1.50	45.4
2502-A2	0.28E 07	0.35E 07	3.441	0.40E-03	3.157	0.28E-16	0.572	0.5	0.58	1.50	45.4
2502-A3	0.28E 07	0.35E 07	3.441	0.40E-03	3.157	0.28E-16	0.971	0.0	0.20	1.50	45.4
2620-A1	0.25E 07	0.34E 07	3.510	0.34E-03	2.990	0.62E-16	0.501	1.0	1.30	1.50	45.4
2620-A2	0.25E 07	0.34E 07	3.510	0.34E-03	2.990	0.62E-16	0.573	0.5	0.63	1.50	45.4
2620-A3	0.25E 07	0.34E 07	3.510	0.34E-03	2.990	0.62E-16	0.972	0.0	0.21	1.50	45.4
2659-A1	0.24E 07	0.23E 07	3.660	0.25E-03	2.604	0.38E-15	0.501	1.0	1.60	1.50	42.6
2659-A2	0.24E 07	0.23E 07	3.660	0.25E-03	2.604	0.38E-15	0.598	0.5	0.73	1.50	42.6
2659-A3	0.24E 07	0.23E 07	3.660	0.25E-03	2.604	0.38E-15	0.980	0.0	0.26	1.50	42.6
2808-A1	0.14E 07	0.19E 07	3.712	0.22E-03	2.461	0.74E-15	0.501	1.0	1.30	1.50	50.0
2808-A2	0.14E 07	0.19E 07	3.712	0.22E-03	2.461	0.74E-15	0.562	0.5	0.65	1.50	50.0
2808-A3	0.14E 07	0.19E 07	3.712	0.22E-03	2.461	0.74E-15	0.966	0.0	0.22	1.50	50.0
2811-A1	0.14E 07	0.19E 07	3.712	0.22E-03	2.461	0.74E-15	0.501	1.0	1.30	1.50	50.0
2808-A2	0.14E 07	0.19E 07	3.712	0.22E-03	2.461	0.74E-15	0.562	0.5	0.65	1.50	50.0
2808-A3	0.14E 07	0.19E 07	3.712	0.22E-03	2.461	0.74E-15	0.966	0.0	0.22	1.50	50.0
848-A1	0.26E 07	0.19E 07	3.864	0.16E-03	2.018	0.59E-14	0.502	1.0	2.98	1.20	42.4
848-A2	0.26E 07	0.19E 07	3.864	0.16E-03	2.018	0.59E-14	0.655	0.5	1.22	1.20	42.4
848-A3	0.26E 07	0.19E 07	3.864	0.16E-03	2.018	0.59E-14	0.989	0.0	0.48	1.20	42.4
893-A1	0.27E 07	0.21E 07	3.874	0.15E-03	1.987	0.68E-14	0.501	1.0	1.99	1.30	34.4
893-A2	0.27E 07	0.21E 07	3.874	0.15E-03	1.987	0.68E-14	0.558	0.0	1.01	1.30	34.4
893-A3	0.27E 07	0.21E 07	3.874	0.15E-03	1.987	0.68E-14	0.964	0.0	0.33	1.30	34.4
924-A1	0.36E 07	0.29E 07	4.162	0.79E-04	1.028	0.60E-12	0.502	1.0	1.99	1.50	38.0
924-A2	0.36E 07	0.29E 07	4.162	0.79E-04	1.028	0.60E-12	0.616	0.5	0.88	1.50	38.0
924-A3	0.36E 07	0.29E 07	4.162	0.79E-04	1.028	0.60E-12	0.984	0.0	0.32	1.50	38.0
937-A1	0.36E 07	0.35E 07	4.311	0.57E-04	0.477	0.80E-11	0.501	1.0	1.50	1.20	38.0
937-A2	0.36E 07	0.35E 07	4.311	0.57E-04	0.477	0.80E-11	0.578	0.5	0.72	1.20	38.0
937-A3	0.36E 07	0.35E 07	4.311	0.57E-04	0.477	0.80E-11	0.974	0.0	0.24	1.20	38.0
966-A1	0.41E 07	0.40E 07	3.769	0.19E-03	2.300	0.16E-14	0.501	1.0	1.10	1.10	40.2
966-A2	0.41E 07	0.40E 07	3.769	0.19E-03	2.300	0.16E-14	0.568	0.5	0.54	1.10	40.2
966-A3	0.41E 07	0.40E 07	3.769	0.19E-03	2.300	0.16E-14	0.969	0.0	0.18	1.10	40.2
995-A1	0.20E 07	0.29E 07	3.844	0.16E-03	2.078	0.44E-14	0.502	1.0	2.69	1.50	38.8
995-A2	0.20E 07	0.29E 07	3.844	0.16E-03	2.078	0.44E-14	0.661	0.5	1.08	1.50	38.8
995-A3	0.20E 07	0.29E 07	3.844	0.16E-03	2.078	0.44E-14	0.990	0.0	0.43	1.50	38.8

SECTION NUMBER	OVERLAY MODULUS E1, PSI	EXISTING PAVEMENT MODULUS E2, PSI	FRACTURE PARAMETERS THERMAL N	THERMAL A	FATIGUE N	FATIGUE A	SHEARING EFFICI. P2	BENDING EFFICI. F2	PAVEMENT MODIFIED H2M, INCH	THICKNESS OVERLAY H1, INCH	DAYS IN YEAR WITH TEMP. LESS THAN STRESS-FREE PERCENT
1263-A1	0.34E 07	0.27E 07	3.832	0.17E-03	2.115	0.38E-14	0.509	1.0	4.69	2.10	35.8
1263-A2	0.34E 07	0.27E 07	3.832	0.17E-03	2.115	0.38E-14	0.818	0.5	1.45	2.10	35.8
1263-A3	0.34E 07	0.27E 07	3.832	0.17E-03	2.115	0.38E-14	0.997	0.0	0.76	2.10	35.8
1543-A1	0.36E 07	0.35E 07	4.311	0.57E-04	0.477	0.80E-11	0.501	1.0	1.50	1.00	38.3
1543-A2	0.36E 07	0.35E 07	4.311	0.57E-04	0.477	0.80E-11	0.581	0.5	1.50	1.00	38.3
1543-A3	0.36E 07	0.35E 07	4.311	0.57E-04	0.477	0.80E-11	0.975	0.0	1.50	1.00	38.3
1894-A1	0.44E 07	0.26E 07	4.329	0.54E-04	0.406	0.11E-10	0.502	1.0	2.49	1.50	40.4
1894-A2	0.44E 07	0.26E 07	4.329	0.54E-04	0.406	0.11E-10	0.651	0.5	1.02	1.50	40.4
1894-A3	0.44E 07	0.26E 07	4.329	0.54E-04	0.406	0.11E-10	0.988	0.0	0.59	1.50	40.4
2002-A1	0.34E 07	0.27E 07	3.832	0.17E-03	2.116	0.38E-14	0.502	1.0	2.98	1.00	35.8
2002-A2	0.34E 07	0.27E 07	3.832	0.17E-03	2.116	0.38E-14	0.666	0.5	1.19	1.00	35.8
2002-A3	0.34E 07	0.27E 07	3.832	0.17E-03	2.116	0.38E-14	0.990	0.0	0.48	1.00	35.8
2044-A1	0.34E 07	0.27E 07	3.832	0.17E-03	2.115	0.38E-14	0.501	1.0	1.99	1.30	35.8
2044-A2	0.34E 07	0.27E 07	3.832	0.17E-03	2.115	0.38E-14	0.593	0.5	0.93	1.30	35.8
2044-A3	0.34E 07	0.27E 07	3.832	0.17E-03	2.115	0.38E-14	0.979	0.0	0.32	1.30	35.8
2086-A1	0.30E 07	0.31E 07	3.959	0.13E-03	1.718	0.24E-13	0.502	1.0	2.49	4.00	20.2
2086-A2	0.30E 07	0.31E 07	3.959	0.13E-03	1.718	0.24E-13	0.628	0.5	1.07	4.00	20.2
2086-A3	0.30E 07	0.31E 07	3.959	0.13E-03	1.718	0.24E-13	0.986	0.0	0.40	4.00	20.2
2324-A1	0.38E 07	0.30E 07	4.008	0.11E-03	1.557	0.51E-13	0.503	1.0	3.47	4.00	21.9
2324-A2	0.38E 07	0.30E 07	4.008	0.11E-03	1.557	0.51E-13	0.668	0.5	1.39	4.00	21.9
2324-A3	0.38E 07	0.30E 07	4.008	0.11E-03	1.557	0.51E-13	0.990	0.0	0.56	4.00	21.9
2353-A1	0.29E 07	0.39E 07	3.794	0.18E-03	2.228	0.22E-14	0.501	1.0	1.99	1.30	21.9
2353-A2	0.29E 07	0.39E 07	3.794	0.18E-03	2.228	0.22E-14	0.585	0.5	0.94	1.30	21.9
2353-A3	0.29E 07	0.39E 07	3.794	0.18E-03	2.228	0.22E-14	0.976	0.0	0.33	1.30	21.9
2468-A1	0.28E 07	0.35E 07	3.441	0.40E-03	2.461	0.74E-15	0.501	1.0	2.49	1.50	48.1
2468-A2	0.28E 07	0.35E 07	3.441	0.40E-03	2.461	0.74E-15	0.605	0.5	1.13	1.50	48.1
2468-A3	0.28E 07	0.35E 07	3.441	0.40E-03	2.461	0.74E-15	0.982	0.0	0.40	1.50	48.1
3147-A1	0.28E 07	0.35E 07	3.441	0.40E-03	2.461	0.74E-15	0.502	1.0	2.29	1.50	48.1
3147-A2	0.28E 07	0.35E 07	3.441	0.40E-03	2.461	0.74E-15	0.621	0.5	1.00	1.50	48.1
3147-A3	0.28E 07	0.35E 07	3.441	0.40E-03	2.461	0.74E-15	0.985	0.0	0.37	1.50	48.1

SECTION NUMBER	DAILY PAVEMENT TEMPERATURE CHANGE T, DEG.FAH.	MODIFIED SUBGRADE MODULUS K , PCI	AVERAGE DAILY TRAFFIC
319-A1	31.50	3893.	3290.
319-A2	31.50	2185.	3290.
319-A3	31.50	996.	3290.
393-A1	31.50	6064.	5800.
393-A2	31.50	3127.	5800.
393-A3	31.50	1541.	5800.
2502-A1	35.00	2893.	3265.
2502-A2	35.00	1689.	3265.
2502-A3	35.00	746.	3265.
2620-A1	35.00	2937.	7370.
2620-A2	35.00	1712.	7370.
2620-A3	35.00	757.	7370.
2659-A1	34.40	4184.	3740.
2659-A2	34.40	2337.	3740.
2659-A3	34.40	1069.	3740.
2808-A1	31.50	2423.	3090.
2808-A2	31.50	1440.	3090.
2808-A3	31.50	628.	3090.
2811-A1	31.50	2423.	3090.
2808-A2	31.50	1440.	3090.
2808-A3	31.50	628.	3090.
848-A1	30.90	7159.	8670.
848-A2	30.90	3658.	8670.
848-A3	30.90	1817.	8670.
893-A1	33.40	2049.	7160.
893-A2	33.40	1227.	7160.
893-A3	33.40	533.	7160.
924-A1	28.90	4975.	14480.
924-A2	28.90	2703.	14480.
924-A3	28.90	1269.	14480.
937-A1	30.50	3090.	4370.
937-A2	30.50	1786.	4370.
937-A3	30.50	795.	4370.
966-A1	30.40	2723.	2715.
966-A2	30.40	1601.	2715.
966-A3	30.40	704.	2715.
995-A1	29.80	7549.	18395.
995-A2	29.80	3822.	18395.
995-A3	29.80	1914.	18395.

SECTION NUMBER	DAILY PAVEMENT TEMPERATURE CHANGE T, DEG.FAH.	MODIFIED SUBGRADE MODULUS K , PCI	AVERAGE DAILY TRAFFIC
1263-A1	24.70	26303.	7140.
1263-A2	24.70	10911.	7140.
1263-A3	24.70	6714.	7140.
1543-A1	33.20	3263.	14740.
1543-A2	33.20	1876.	14740.
1543-A3	33.20	838.	14740.
1894-A1	28.90	7008.	16260.
1894-A2	28.90	3602.	16260.
1894-A3	28.90	1780.	16260.
2002-A1	29.80	7668.	16780.
2002-A2	29.80	3853.	16780.
2002-A3	29.80	1944.	16780.
2044-A1	28.30	3732.	2705.
2044-A2	28.30	2102.	2705.
2044-A3	28.30	955.	2705.
2086-A1	18.40	5351.	3810.
2086-A2	18.40	2852.	3810.
2086-A3	18.40	1362.	3810.
2324-A1	26.80	7133.	6980.
2324-A2	26.80	3581.	6980.
2324-A3	26.80	1812.	6980.
2353-A1	42.10	3150.	2010.
2353-A2	42.10	1799.	2010.
2353-A3	42.10	809.	2010.
2468-A1	35.10	3926.	4720.
2468-A2	35.10	2167.	4720.
2468-A3	35.10	1001.	4720.
3147-A1	35.10	4978.	4970.
3147-A2	35.10	2683.	4970.
3147-A3	35.10	1268.	4970.

SECTION NUMBER	OVERLAY MODULUS E1, PSI	EXISTING PAVEMENT MODULUS E2, PSI	FRACTURE PARAMETERS THERMAL N	THERMAL A	FATIGUE N	FATIGUE A	SHEARING EFFICI. P2	BENDING EFFICI. Γ2	PAVEMENT MODIFIED H2M, INCH	THICKNESS OVERLAY H1, INCH	DAYS IN YEAR WITH TEMP. LESS THAN STRESS-FREE PERCENT
319-B1	0.61E 06	0.14E 07	2.695	0.22E-02	4.410	0.81E-19	0.501	1.0	1.50	1.70	50.0
319-B2	0.61E 06	0.14E 07	2.695	0.22E-02	4.410	0.81E-19	0.578	0.5	0.72	1.70	50.0
319-B3	0.61E 06	0.14E 07	2.695	0.22E-02	4.410	0.81E-19	0.973	0.0	0.25	1.70	50.0
393-B1	0.46E 06	0.11E 07	2.734	0.20E-02	4.368	0.99E-19	0.502	1.0	3.08	1.50	50.0
393-B2	0.46E 06	0.11E 07	2.734	0.20E-02	4.368	0.99E-19	0.617	0.5	1.36	1.50	50.0
393-B3	0.46E 06	0.11E 07	2.734	0.20E-02	4.368	0.99E-19	0.984	0.0	0.50	1.50	50.0
2502-B1	0.45E 06	0.11E 07	2.537	0.31E-02	4.552	0.42E-19	0.501	1.0	1.20	1.50	45.4
2502-B2	0.45E 06	0.11E 07	2.537	0.31E-02	4.552	0.42E-19	0.565	0.5	0.59	1.50	45.4
2502-B3	0.45E 06	0.11E 07	2.537	0.31E-02	4.552	0.42E-19	0.967	0.0	0.20	1.50	45.4
2620-B1	0.42E 06	0.10E 07	2.576	0.28E-02	4.521	0.48E-19	0.501	1.0	1.30	1.50	45.4
2620-B2	0.42E 06	0.10E 07	2.576	0.28E-02	4.521	0.48E-19	0.564	0.5	0.65	1.50	45.4
2620-B3	0.42E 06	0.10E 07	2.576	0.28E-02	4.521	0.48E-19	0.966	0.0	0.21	1.50	45.4
2659-B1	0.45E 06	0.64E 06	2.635	0.25E-02	4.469	0.61E-19	0.501	1.0	1.60	1.50	42.6
2659-B2	0.45E 06	0.64E 06	2.635	0.25E-02	4.469	0.61E-19	0.584	0.5	0.76	1.50	42.6
2659-B3	0.45E 06	0.64E 06	2.635	0.25E-02	4.469	0.61E-19	0.975	0.0	0.26	1.50	42.6
2808-B1	0.26E 06	0.50E 06	2.721	0.20E-02	4.383	0.92E-19	0.501	1.0	1.30	1.50	50.0
2808-B2	0.26E 06	0.50E 06	2.721	0.20E-02	4.383	0.92E-19	0.555	0.5	0.66	1.50	50.0
2808-B3	0.26E 06	0.50E 06	2.721	0.20E-02	4.383	0.92E-19	0.960	0.0	0.22	1.50	50.0
2811-B1	0.26E 06	0.50E 06	2.721	0.20E-02	4.383	0.92E-19	0.501	1.0	1.30	1.50	50.0
2811-B2	0.26E 06	0.50E 06	2.721	0.20E-02	4.383	0.92E-19	0.555	0.5	0.66	1.50	50.0
2811-B3	0.26E 06	0.50E 06	2.721	0.20E-02	4.383	0.92E-19	0.960	0.0	0.22	1.50	50.0
848-B1	0.56E 06	0.51E 06	2.727	0.20E-02	4.376	0.95E-19	0.502	1.0	2.98	1.20	42.4
848-B2	0.56E 06	0.51E 06	2.727	0.20E-02	4.376	0.95E-19	0.626	0.5	1.29	1.20	42.4
848-B3	0.56E 06	0.51E 06	2.727	0.20E-02	4.376	0.95E-19	0.985	0.0	0.48	1.20	42.4
893-B1	0.59E 06	0.60E 06	2.722	0.20E-02	4.382	0.93E-19	0.500	1.0	2.00	1.30	34.4
893-B2	0.59E 06	0.60E 06	2.722	0.20E-02	4.382	0.93E-19	0.541	0.5	1.05	1.30	34.4
893-B3	0.59E 06	0.60E 06	2.722	0.20E-02	4.382	0.93E-19	0.949	0.0	0.34	1.30	34.4
924-B1	0.91E 06	0.85E 06	2.833	0.16E-02	4.251	0.17E-18	0.501	1.0	1.99	1.50	38.0
924-B2	0.91E 06	0.85E 06	2.833	0.16E-02	4.251	0.17E-18	0.593	0.5	0.93	1.50	38.0
924-B3	0.91E 06	0.85E 06	2.833	0.16E-02	4.251	0.17E-18	0.978	0.0	0.32	1.50	38.0
937-B1	0.99E 06	0.11E 06	2.965	0.12E-02	4.067	0.40E-18	0.501	1.0	1.50	1.20	38.0
937-B2	0.99E 06	0.11E 06	2.965	0.12E-02	4.067	0.40E-18	0.564	0.5	0.74	1.20	38.0
937-B3	0.99E 06	0.11E 06	2.965	0.12E-02	4.067	0.40E-18	0.974	0.0	0.24	1.20	38.0
966-B1	0.86E 06	0.13E 06	2.704	0.21E-02	4.401	0.85E-19	0.501	1.0	1.10	1.10	40.2
966-B2	0.86E 06	0.13E 06	2.704	0.21E-02	4.401	0.85E-19	0.561	0.5	0.55	1.10	40.2
966-B3	0.86E 06	0.13E 06	2.704	0.21E-02	4.401	0.85E-19	0.964	0.0	0.18	1.10	40.2
995-B1	0.42E 06	0.85E 06	2.832	0.16E-02	4.252	0.17E-18	0.502	1.0	2.69	1.50	38.8
995-B2	0.42E 06	0.85E 06	2.832	0.16E-02	4.252	0.17E-18	0.502	0.5	1.15	1.50	38.8
995-B3	0.42E 06	0.85E 06	2.832	0.16E-02	4.252	0.17E-18	0.986	0.0	0.43	1.50	38.8

SECTION NUMBER	OVERLAY MODULUS E1, PSI	EXISTING PAVEMENT MODULUS E2, PSI	FRACTURE PARAMETERS THERMAL N	THERMAL A	FATIGUE N	FATIGUE A	SHEARING EFFICI. P2	BENDING EFFICI. F2	PAVEMENT MODIFIED H2M, INCH	THICKNESS OVERLAY H1, INCH	DAYS IN YEAR WITH TEMP. LESS THAN STRESS-FREE PERCENT
1263-B1	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.506	1.0	4.73	2.10	35.8
1263-B2	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.768	0.5	1.58	2.10	35.8
1263-B3	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.996	0.0	0.76	2.10	35.8
1543-B1	0.99E 06	0.11E 07	2.965	0.12E-02	4.067	0.40E-18	0.501	1.0	1.50	1.00	38.3
1543-B2	0.99E 06	0.11E 07	2.965	0.12E-02	4.067	0.40E-18	0.569	0.5	0.74	1.00	38.3
1543-B3	0.99E 06	0.11E 07	2.965	0.12E-02	4.067	0.40E-18	0.969	0.0	0.25	1.00	38.3
1894-B1	0.12E 07	0.57E 06	2.975	0.11E-02	4.052	0.43E-18	0.502	1.0	2.49	1.50	40.4
1894-B2	0.12E 07	0.57E 06	2.975	0.11E-02	4.052	0.43E-18	0.620	0.5	1.09	1.50	40.4
1894-B3	0.12E 07	0.57E 06	2.975	0.11E-02	4.052	0.43E-18	0.984	0.0	0.59	1.50	40.4
2002-B1	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.502	1.0	2.98	1.00	35.8
2002-B2	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.632	0.5	1.28	1.00	35.8
2002-B3	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.986	0.0	0.48	1.00	35.8
2044-B1	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.501	1.0	1.99	1.30	35.8
2044-B2	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.575	0.5	0.97	1.30	35.8
2044-B3	0.74E 06	0.74E 06	2.722	0.20E-02	4.381	0.93E-19	0.972	0.0	0.33	1.30	35.8
2086-B1	0.67E 06	0.95E 06	2.751	0.19E-02	4.350	0.11E-18	0.501	1.0	2.49	4.00	20.2
2086-B2	0.67E 06	0.95E 06	2.751	0.19E-02	4.350	0.11E-18	0.602	0.5	1.14	4.00	20.2
2086-B3	0.67E 06	0.95E 06	2.751	0.19E-02	4.350	0.11E-18	0.981	0.0	0.40	4.00	20.2
2324-B1	0.89E 06	0.94E 06	2.737	0.19E-02	4.365	0.10E-18	0.502	1.0	3.48	4.00	21.9
2324-B2	0.89E 06	0.94E 06	2.737	0.19E-02	4.365	0.10E-18	0.631	0.5	1.49	4.00	21.9
2324-B3	0.89E 06	0.94E 06	2.737	0.19E-02	4.365	0.10E-18	0.986	0.0	0.56	4.00	21.9
2353-B1	0.60E 06	0.13E 07	2.721	0.20E-02	4.383	0.92E-19	0.501	1.0	1.99	1.30	21.9
2353-B2	0.60E 06	0.13E 07	2.721	0.20E-02	4.383	0.92E-19	0.564	0.5	0.99	1.30	21.9
2353-B3	0.60E 06	0.13E 07	2.721	0.20E-02	4.383	0.92E-19	0.967	0.0	0.33	1.30	21.9
2468-B1	0.45E 06	0.11E 07	2.537	0.31E-02	4.383	0.92E-19	0.501	1.0	2.49	1.50	48.1
2468-B2	0.45E 06	0.11E 07	2.537	0.31E-02	4.383	0.92E-19	0.582	0.5	1.19	1.50	48.1
2468-B3	0.45E 06	0.11E 07	2.537	0.31E-02	4.383	0.92E-19	0.975	0.0	0.41	1.50	48.1
3147-B1	0.45E 06	0.11E 07	2.537	0.31E-02	4.383	0.92E-19	0.501	1.0	2.29	1.50	48.1
3147-B2	0.45E 06	0.11E 07	2.537	0.31E-02	4.383	0.92E-19	0.596	0.5	1.06	1.50	48.1
3147-B3	0.45E 06	0.11E 07	2.537	0.31E-02	4.383	0.92E-19	0.979	0.0	0.37	1.50	48.1

SECTION NUMBER	DAILY PAVEMENT TEMPERATURE CHANGE T, DEG.FAH.	MODIFIED SUBGRADE MODULUS K , PCI	AVERAGE DAILY TRAFFIC
319-B1	31.50	3186.	3290.
319-B2	31.50	1841.	3290.
319-B3	31.50	820.	3290.
393-B1	31.50	4918.	5800.
393-B2	31.50	2668.	5800.
393-B3	31.50	1255.	5800.
2502-B1	35.00	2413.	3265.
2502-B2	35.00	1427.	3265.
2502-B3	35.00	625.	3265.
2620-B1	35.00	2440.	7370.
2620-B2	35.00	1445.	7370.
2620-B3	35.00	633.	7370.
2659-B1	34.40	3314.	3740.
2659-B2	34.40	1896.	3740.
2659-B3	34.40	852.	3740.
2808-B1	31.50	1899.	3090.
2808-B2	31.50	1142.	3090.
2808-B3	31.50	495.	3090.
2811-B1	31.50	1899.	3090.
2811-B2	31.50	1142.	3090.
2811-B3	31.50	495.	3090.
848-B1	30.90	5820.	8670.
848-B2	30.90	3111.	8670.
848-B3	30.90	1483.	8670.
893-B1	33.40	1522.	7160.
893-B2	33.40	938.	7160.
893-B3	33.40	401.	7160.
924-B1	28.90	3932.	14480.
924-B2	28.90	2215.	14480.
924-B3	28.90	1007.	14480.
937-B1	30.50	2542.	4370.
937-B2	30.50	1505.	4370.
937-B3	30.50	654.	4370.
966-B1	30.40	2253.	2715.
966-B2	30.40	1341.	2715.
966-B3	30.40	585.	2715.
995-B1	29.80	6157.	18395.
995-B2	29.80	3260.	18395.
995-B3	29.80	1567.	18395.

SECTION NUMBER	DAILY PAVEMENT TEMPERATURE CHANGE T, DEG.FAH.	MODIFIED SUBGRADE MODULUS K , PCI	AVERAGE DAILY TRAFFIC
1263-B1	24.70	19235.	7140.
1263-B2	24.70	8449.	7140.
1263-B3	24.70	4886.	7140.
1543-B1	33.20	2728.	14740.
1543-B2	33.20	1601.	14740.
1543-B3	33.20	705.	14740.
1894-B1	28.90	5450.	16260.
1894-B2	28.90	2942.	16260.
1894-B3	28.90	1390.	16260.
2002-B1	29.80	6058.	16780.
2002-B2	29.80	3208.	16780.
2002-B3	29.80	1542.	16780.
2044-B1	28.30	3059.	2705.
2044-B2	28.30	1777.	2705.
2044-B3	28.30	788.	2705.
2086-B1	18.40	4337.	3810.
2086-B2	18.40	2406.	3810.
2086-B3	18.40	1107.	3810.
2324-B1	26.80	5672.	6980.
2324-B2	26.80	3008.	6980.
2324-B3	26.80	1444.	6980.
2353-B1	42.10	2452.	2010.
2353-B2	42.10	1452.	2010.
2353-B3	42.10	635.	2010.
2468-B1	35.10	3204.	4720.
2468-B2	35.10	1838.	4720.
2468-B3	35.10	823.	4720.
3147-B1	35.10	4024.	4970.
3147-B2	35.10	2255.	4970.
3147-B3	35.10	1030.	4970.

SECTION NUMBER	OVERLAY MODULUS E1, PSI	EXISTING PAVEMENT MDULUS E2, PSI	FRACTURE PARAMETERS THERMAL N	THERMAL A	FATIGUE N	FATIGUE A	SHEARING EFFICI. P2	BENDING EFFICI. F2	PAVEMENT MODIFIED H2M, INCH	THICKNESS OVERLAY H1, INCH	DAYS IN YEAR WITH TEMP. LESS THAN STRESS-FREE PERCENT
319-C1	0.17E 05	0.35E 05	2.328	0.49E-02	4.673	0.24E-19	0.501	1.0	1.50	1.70	50.0
319-C2	0.17E 05	0.35E 05	2.328	0.49E-02	4.673	0.24E-19	0.602	0.5	0.68	1.70	50.0
319-C3	0.17E 05	0.35E 05	2.328	0.49E-02	4.673	0.24E-19	0.979	0.0	0.24	1.70	50.0
393-C1	0.16E 05	0.50E 05	2.344	0.47E-02	4.667	0.24E-19	0.501	1.0	3.09	1.50	50.0
393-C2	0.16E 05	0.50E 05	2.344	0.47E-02	4.667	0.24E-19	0.588	0.5	1.45	1.50	50.0
393-C3	0.16E 05	0.50E 05	2.344	0.47E-02	4.667	0.24E-19	0.976	0.0	0.50	1.50	50.0
2502-C1	0.68E 04	0.52E 05	2.255	0.58E-02	4.698	0.21E-19	0.501	1.0	1.20	1.50	45.4
2502-C2	0.68E 04	0.52E 05	2.255	0.58E-02	4.698	0.21E-19	0.602	0.5	0.55	1.50	45.4
2502-C3	0.68E 04	0.52E 05	2.255	0.58E-02	4.698	0.21E-19	0.979	0.0	0.19	1.00	45.4
2620-C1	0.78E 04	0.46E 05	2.267	0.56E-02	4.695	0.21E-19	0.501	1.0	1.30	1.50	45.4
2620-C2	0.78E 04	0.46E 05	2.267	0.56E-02	4.695	0.21E-19	0.605	0.5	0.59	1.50	45.4
2620-C3	0.78E 04	0.46E 05	2.267	0.56E-02	4.695	0.21E-19	0.980	0.0	0.21	1.50	45.4
2659-C1	0.10E 05	0.39E 05	2.285	0.54E-02	4.689	0.22E-19	0.501	1.0	1.60	1.50	42.6
2659-C2	0.10E 05	0.39E 05	2.285	0.54E-02	4.689	0.22E-19	0.602	0.5	0.73	1.50	42.6
2659-C3	0.10E 05	0.39E 05	2.285	0.54E-02	4.689	0.22E-19	0.979	0.0	0.26	1.50	42.6
2808-C1	0.80E 04	0.25E 05	2.303	0.52E-02	4.683	0.23E-19	0.501	1.0	1.32	1.50	50.0
2808-C2	0.80E 04	0.25E 05	2.303	0.52E-02	4.683	0.23E-19	0.592	0.5	0.61	1.50	50.0
2808-C3	0.80E 04	0.25E 05	2.303	0.52E-02	4.683	0.23E-19	0.976	0.0	0.21	1.50	50.0
2811-C1	0.80E 04	0.25E 05	2.303	0.52E-02	4.683	0.23E-19	0.501	1.0	1.30	1.50	50.0
2811-C2	0.80E 04	0.25E 05	2.303	0.52E-02	4.683	0.23E-19	0.592	0.5	0.61	1.50	50.0
2811-C3	0.80E 04	0.25E 05	2.303	0.52E-02	4.683	0.23E-19	0.976	0.0	0.21	1.50	50.0
848-C1	0.15E 05	0.38E 05	2.319	0.50E-02	4.677	0.23E-19	0.501	1.0	2.99	1.20	42.4
848-C2	0.15E 05	0.38E 05	2.319	0.50E-02	4.677	0.23E-19	0.605	0.5	1.36	1.20	42.4
848-C3	0.15E 05	0.38E 05	2.319	0.50E-02	4.677	0.23E-19	0.980	0.0	0.49	1.20	42.4
893-C1	0.16E 05	0.58E 05	2.316	0.50E-02	4.678	0.23E-19	0.501	1.0	1.99	1.30	34.4
893-C2	0.16E 05	0.58E 05	2.316	0.50E-02	4.678	0.23E-19	0.566	0.5	0.99	1.30	34.4
893-C3	0.16E 05	0.58E 05	2.316	0.50E-02	4.678	0.23E-19	0.966	0.0	0.33	1.30	34.4
924-C1	0.29E 05	0.60E 05	2.368	0.45E-02	4.656	0.26E-19	0.501	1.0	1.99	1.50	38.0
924-C2	0.29E 05	0.60E 05	2.368	0.45E-02	4.656	0.26E-19	0.596	0.5	0.92	1.50	38.0
924-C3	0.29E 05	0.60E 05	2.368	0.45E-02	4.656	0.26E-19	0.977	0.0	0.32	1.50	38.0
937-C1	0.47E 05	0.83E 05	2.441	0.38E-02	4.617	0.31E-19	0.501	1.0	1.50	1.20	38.0
937-C2	0.47E 05	0.83E 05	2.441	0.38E-02	4.617	0.31E-19	0.584	0.5	0.71	1.20	38.0
937-C3	0.47E 05	0.83E 05	2.441	0.38E-02	4.617	0.31E-19	0.973	0.0	0.25	1.20	38.0
966-C1	0.23E 05	0.79E 05	2.353	0.46E-02	4.663	0.25E-19	0.501	1.0	1.10	1.10	40.2
966-C2	0.23E 05	0.79E 05	2.353	0.46E-02	4.663	0.25E-19	0.583	0.5	0.52	1.10	40.2
966-C3	0.23E 05	0.79E 05	2.353	0.46E-02	4.663	0.25E-19	0.973	0.0	0.18	1.10	40.2
995-C1	0.20E 05	0.60E 05	2.379	0.44E-02	4.651	0.26E-19	0.501	1.0	2.69	1.50	38.8
995-C2	0.20E 05	0.60E 05	2.379	0.44E-02	4.651	0.26E-19	0.600	0.5	1.23	1.50	38.8
995-C3	0.20E 05	0.60E 05	2.379	0.44E-02	4.651	0.26E-19	0.979	0.0	0.44	1.50	38.8

SECTION NUMBER	OVERLAY MODULUS E1, PSI	EXISTING PAVEMENT MDULUS E2, PSI	FRACTURE PARAMETERS THERMAL N	THERMAL A	FATIGUE N	FATIGUE A	SHEARING EFFICI. P2	BENDING EFFICI. F2	PAVEMENT MODIFIED H2M, INCH	THICKNESS OVERLAY H1, INCH	DAYS IN YEAR WITH TEMP. LESS THAN STRESS-FREE PERCENT
1263-C1	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.503	1.0	4.76	2.10	35.8
1263-C2	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.687	0.5	1.83	2.10	35.8
1263-C3	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.991	0.0	0.77	2.10	35.8
1543-C1	0.47E 05	0.83E 05	2.441	0.38E-02	4.617	0.31E-19	0.501	1.0	1.50	1.00	38.3
1543-C2	0.47E 05	0.83E 05	2.441	0.38E-02	4.617	0.31E-19	0.583	0.5	0.71	1.00	38.3
1543-C3	0.47E 05	0.83E 05	2.441	0.38E-02	4.617	0.31E-19	0.973	0.0	0.25	1.00	38.3
1894-C1	0.63E 05	0.19E 05	2.464	0.36E-02	4.603	0.33E-19	0.501	1.0	2.49	1.50	40.4
1894-C2	0.63E 05	0.19E 05	2.464	0.36E-02	4.603	0.33E-19	0.598	0.5	1.15	1.50	40.4
1894-C3	0.63E 05	0.19E 05	2.464	0.36E-02	4.603	0.33E-19	0.978	0.0	0.60	1.50	40.4
2002-C1	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.501	1.0	2.99	1.00	35.8
2002-C2	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.598	0.5	1.38	1.00	35.8
2002-C3	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.978	0.0	0.49	1.00	35.8
2044-C1	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.501	1.0	1.99	1.30	35.8
2044-C2	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.598	0.5	0.92	1.30	35.8
2044-C3	0.21E 05	0.40E 05	2.344	0.47E-02	4.667	0.24E-19	0.978	0.0	0.32	1.30	35.8
2086-C1	0.30E 05	0.31E 05	3.959	0.13E-03	1.718	0.24E-13	0.501	1.0	2.49	4.00	20.2
2086-C2	0.30E 05	0.31E 05	3.959	0.13E-03	1.718	0.24E-13	0.588	0.5	1.17	4.00	20.2
2086-C3	0.30E 05	0.31E 05	3.959	0.13E-03	1.718	0.24E-13	0.975	0.0	0.41	4.00	20.2
2324-C1	0.22E 05	0.71E 05	2.334	0.48E-02	4.671	0.24E-19	0.501	1.0	3.49	4.00	21.9
2324-C2	0.22E 05	0.71E 05	2.334	0.48E-02	4.671	0.24E-19	0.575	0.5	1.69	4.00	21.9
2324-C3	0.22E 05	0.71E 05	2.334	0.48E-02	4.671	0.24E-19	0.972	0.0	0.57	4.00	21.9
2353-C1	0.18E 05	0.66E 05	2.337	0.48E-02	4.670	0.24E-19	0.501	1.0	1.99	1.30	21.9
2353-C2	0.18E 05	0.66E 05	2.337	0.48E-02	4.670	0.24E-19	0.579	0.5	0.96	1.30	21.9
2353-C3	0.18E 05	0.66E 05	2.337	0.48E-02	4.670	0.24E-19	0.972	0.0	0.33	1.30	21.9
2468-C1	0.68E 05	0.52E 05	2.255	0.58E-02	4.683	0.23E-19	0.501	1.0	2.49	1.50	48.1
2468-C2	0.68E 05	0.52E 05	2.255	0.58E-02	4.683	0.23E-19	0.575	0.5	1.21	1.50	48.1
2468-C3	0.68E 05	0.52E 05	2.255	0.58E-02	4.683	0.23E-19	0.970	0.0	0.41	1.50	48.1
3147-C1	0.68E 05	0.52E 05	2.255	0.58E-02	4.683	0.23E-19	0.501	1.0	2.29	1.50	48.1
3147-C2	0.68E 05	0.52E 05	2.255	0.56E-02	4.683	0.23E-19	0.582	0.5	1.09	1.50	48.1
3147-C3	0.68E 05	0.52E 05	2.255	0.58E-02	4.683	0.23E-19	0.973	0.0	0.38	1.50	48.1

SECTION NUMBER	DAILY PAVEMENT TEMPERATURE CHANGE T, DEG.FAH.	MODIFIED SUBGRADE MODULUS K , PCI	AVERAGE DAILY TRAFFIC
319-C1	31.50	2032.	3290.
319-C2	31.50	1128.	3290.
319-C3	31.50	520.	3290.
393-C1	31.50	3144.	5800.
393-C2	31.50	1786.	5800.
393-C3	31.50	807.	5800.
2502-C1	35.00	1882.	3265.
2502-C2	35.00	1044.	3265.
2502-C3	35.00	482.	3265.
2620-C1	35.00	2002.	7370.
2620-C2	35.00	1105.	7370.
2620-C3	35.00	512.	7370.
2659-C1	34.40	2170.	3740.
2659-C2	34.40	1204.	3740.
2659-C3	34.40	555.	3740.
2808-C1	31.50	1515.	3090.
2808-C2	31.50	856.	3090.
2808-C3	31.50	389.	3090.
2811-C1	31.50	1515.	3090.
2811-C2	31.50	856.	3090.
2811-C3	31.50	389.	3090.
848-C1	30.90	3515.	8670.
848-C2	30.90	1941.	8670.
848-C3	30.90	899.	8670.
893-C1	33.40	1867.	7160.
893-C2	33.40	1102.	7160.
893-C3	33.40	484.	7160.
924-C1	28.90	2679.	14480.
924-C2	28.90	1502.	14480.
924-C3	28.90	687.	14480.
937-C1	30.50	2070.	4370.
937-C2	30.50	1184.	4370.
937-C3	30.50	533.	4370.
966-C1	30.40	1618.	2715.
966-C2	30.40	927.	2715.
966-C3	30.40	416.	2715.
995-C1	29.80	3423.	18395.
995-C2	29.80	1905.	18395.
995-C3	29.80	876.	18395.

SECTION NUMBER	DAILY PAVEMENT TEMPERATURE CHANGE T, DEG.FAH.	MODIFIED SUBGRADE MODULUS K , PCI	AVERAGE DAILY TRAFFIC
1263-C1	24.70	9072.	7140.
1263-C2	24.70	4428.	7140.
1263-C3	24.70	2303.	7140.
1543-C1	33.20	2066.	14740.
1543-C2	33.20	1184.	14740.
1543-C3	33.20	532.	14740.
1894-C1	28.90	2450.	16260.
1894-C2	28.90	1368.	16260.
1894-C3	28.90	628.	16260.
2002-C1	29.80	3297.	16780.
2002-C2	29.80	1841.	16780.
2002-C3	29.80	844.	16780.
2044-C1	28.30	2484.	2705.
2044-C2	28.30	1387.	2705.
2044-C3	28.30	636.	2705.
2086-C1	18.40	2910.	3810.
2086-C2	18.40	1653.	3810.
2086-C3	18.40	748.	3810.
2324-C1	26.80	2974.	6980.
2324-C2	26.80	1728.	6980.
2324-C3	26.80	767.	6980.
2353-C1	42.10	2293.	2010.
2353-C2	42.10	1323.	2010.
2353-C3	42.10	591.	2010.
2468-C1	35.10	2385.	4720.
2468-C2	35.10	1386.	4720.
2468-C3	35.10	616.	4720.
3147-C1	35.10	2473.	4970.
3147-C2	35.10	1419.	4970.
3147-C3	35.10	637.	4970.

SECTION NUMBER	DAILY PAVEMENT TEMPERATURE CHANGE T, DEG.FAH.	MODIFIED SUBGRADE MODULUS K , PCI	AVERAGE DAILY TRAFFIC
1263-C1	24.70	9072.	7140.
1263-C2	24.70	4428.	7140.
1263-C3	24.70	2303.	7140.
1543-C1	33.20	2066.	14740.
1543-C2	33.20	1184.	14740.
1543-C3	33.20	532.	14740.
1894-C1	28.90	2450.	16260.
1894-C2	28.90	1368.	16260.
1894-C3	28.90	628.	16260.
2002-C1	29.80	3297.	16780.
2002-C2	29.80	1841.	16780.
2002-C3	29.80	844.	16780.
2044-C1	28.30	2484.	2705.
2044-C2	28.30	1387.	2705.
2044-C3	28.30	636.	2705.
2086-C1	18.40	2910.	3810.
2086-C2	18.40	1653.	3810.
2086-C3	18.40	748.	3810.
2324-C1	26.80	2974.	6980.
2324-C2	26.80	1728.	6980.
2324-C3	26.80	767.	6980.
2353-C1	42.10	2293.	2010.
2353-C2	42.10	1323.	2010.
2353-C3	42.10	591.	2010.
2468-C1	35.10	2385.	4720.
2468-C2	35.10	1386.	4720.
2468-C3	35.10	616.	4720.
3147-C1	35.10	2473.	4970.
3147-C2	35.10	1419.	4970.
3147-C3	35.10	637.	4970.