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March 30, 1977

MEMO TO: G. F. Kemper State Highway Engineer Chairman, Research Committee

SUBJECT: Research Report No. 468, "Computerized Analysis of Stress-Strain Consolidation Data," KYHPR-75-74; HPR-PL-1(12), Part II

The report enclosed completes a task or phase of work which may be appreciated by persons involved in consolidation testing of soils or, more specifically, analysis of the data from consolidation tests. The difficulty of determining the preconsolidated condition of a soil has been an enduring one. Any errors affect estimates of foundation settlement. The computer program is readily implementable, and the report may properly be called an "Implementation Package."

Respectfully submitted

Jas. H. Havens Director of Research

gd Enclosure cc's: Research Committee

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COMPUTERIZED ANALYSIS OF STRESS-STRAIN CONSOLIDATION DATA

Interim Report KYHPR-75-74; HPR-PL-1(12), Part II

by

E. Gregory McNulty Research Engineer Assistant

Division of Research Bureau of Highways DEPARTMENT OF TRANSPORTATION Commonwealth of Kentucky

in cooperation with Federal Highway Administration U. S. DEPARTMENT OF TRANSPORTATION

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

March 1977

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INTRODUCTION

BACKGROUND

The problem of settlement has long been a concern to civil engineers. The Leaning Tower of Pisa remains a monumental reminder. Before Karl Terzaghi disclosed mechanics of the settlement process in the Erabaumechanik in 1925, only parts of the process had been understood -- no one had put it all together. Terzaghi described in an analytical fashion the process associated with the compression of a mass of discrete irregular particles into a denser material. This process became known as consolidation. The test developed by Terzaghi to study the characteristics of the consolidation process consisted of encasing a cylindrical specimen of particulate material in a ring to prevent lateral deformations, bounding the top and bottom of the specimen with porous stones to permit the escape of water from the soil specimen, and applying a vertical pressure to the sample. Deformations of the sample were measured and plotted as a function of stress. Because deformation is permitted only in the vertical direction, this test is commonly referred to today as the one-dimensional consolidation test. Test data have been studied using semilogarithmic graphical representations the stress-deformation (time-independent) of characteristics of the data. Such a representation yields the stress history and compressibility of the material. Knowledge of these material characteristics is of great practical value in the prediction of settlement associated with loadings where the effects of immediate settlement and lateral consolidation may be neglected.

The principle event in the stress history of a soil is that of the maximum, past, vertical pressure, the largest stress experienced by the material in its natural, subsurface environment. It is usually the result of loads imposed by past or present overlying materials and(or) the result of dessication. Today, the maximum, past, vertical pressure is referred to as the "preconsolidation stress." In 1936, Arthur Casagrande (1) devised an empirical, graphical procedure to determine the preconsolidation presssure from the semilogarithmic representation of time-independent, laboratory consolidation data. This method has come to be known as the "Casagrande construction." Figure 1 (2) illustrates the essential characteristics of this well known procedure.

Before 1955, the compressibility characteristics of particulate materials were expressed as the arithmetic

slopes of the line representations of the semilogarithmic, laboratory consolidation curves. However, these lines did not account for the effects of disturbance on the consolidation curves. In 1955, Schmertmann (3) developed a procedure which accounted for the effect of sample distrubance and estimated in situ compressibility characteristics Figure 2 (4) shows the essential characteristics of the Schmertmann procedure.

Analyses of time-independent, one-dimensional consolidation data by empirical, graphical techniques such as the Casagrande and Schmertmann constructions have several drawbacks in their practical applications. Graphical procedures require a certain amount of time and effort from competent personnel oftentimes require subjective judgements which are somewhat susceptible to various graphical or computational errors. Results of a survey conducted by Sallfors (5) of 28 geotechnical engineers emphasized these difficulties. Figure 3 shows the scatter among engineers asked to determine the preconsolidation pressure of a given set of time-independent consolidation data. Values reported ranged from about 47 to 73 kilopascals. At the 80-percent confidence interval, the values ranged from approximately 55 to 65 kilopascals. Twenty of the 28 values fell in that range. The results show not only the difficulty in determining the preconsolidation pressure but also reflect the fact that different methods were used. Sallfors' survey, while not directly pertinent to the graphical procedures under discussion, again suggests there is a need for some means to alleviate the problems associated with the analysis of time independent consolidation data. According to the Geodex Information Source (1973), the only published attempt involving a computer analysis of time-independent consolidation data is that of Schiffman (6). As documented in 1973, the program developed by Schiffman does not consider the graphical procedures discussed above and considers only data obtained from the standard, laboratory consolidation test. In essence, determines his program the coefficients for one-dimensional compression and expansion by calculating the arithmetic slope between consecutive data points on the void ratio-logarithm of effective-stress consolidation curves. The effect of specimen disturbance is not accounted for in the determination of the compression coefficients.

LOGARITHM, OV eo(INITIAL) or P. (PRECONSOLIDATION - e_v =0 PRESSURE) PRECOMPRESSION VOID RATIO, e HORIZONTAL CURVE BISECTOR POINT OF . TANGENT MAXIMUM CURVATURE VIRGIN HO COMPRESSION STRAIN, Ev **EXPANSION OR REBOUND CURVE**

Figure 1. Casagrande Construction for the Determination of the Preconsolidation Pressure (after Ladd, 1968).



Figure 2. Reconstruction of in situ Compression Curves Using Schmertmann's Construction (after Ladd, 1968).



Figure 3. Distribution of Evaluated Preconsolidation Pressures (80-percent confidence interval) (after Sallfors, 1975).

In May 1975, the Kentucky Department of Transportation's Division of Research began the development of a computer program which would completely reduce, analyze, and plot data obtained from three types of laboratory consolidation tests. The material presented herein is a detailed description of the computer program which was achieved during an ensuing year of research and development. Included are coding instructions and examples of input and output. The computer program contains several innovative features which provide for the mathematical application of the Casagrande and Schmertmann constructions and the determination of the preconsolidation pressure and in situ coefficients of compressibility. The program also provides for complete reduction and plotting of the time-independent consolidation data obtained from three laboratory tests: standard, controlled-gradient, and

controlled-rate-of-strain. A discussion of the latter two has been presented elsewhere (7, 8, 9). The following discussion also includes a description of the algorithm used to study the time-independent consolidation data, the use of the algorithm for determining the point of maximum curvature and the preconsolidation pressure, a new procedure for determining maximum curvature and preconsolidation pressure, and the computer program capabilities and limitations. The computer program in APPENDIX A does not consider time-dependent (compression as a function of time) data obtained from the various consolidation tests. Future efforts will be devoted to plotting and analyzing time-dependent consolidation data and to determining coefficients of consolidation, C_v. This second phase will be in a future report.

ALGORITHM FOR TIME-INDEPENDENT, LABORATORY, CONSOLIDATION TEST DATA

The algorithm presented herein is a means of automating the current, manual, graphical procedures to analyze the time-independent, laboratory consolidation data. Four main points will be discussed in the description of this algorithm: the type of numerical analysis employed, the reasons for choosing this type of numerical analysis, a brief description of the analytical procedures, and a general description of how they are used to automate the Casagrande and Schmertmann graphical constructions with respect to the semilog, time-independent, one-dimensional consolidation data.

TYPE OF NUMERICAL ANALYSIS

The central element of the algorithm is the use of analytical curve-fitting procedures to represent the standard, graphical, semilog representation of test data. An ordinary least-squares polynomial (10) is used to represent the compression curve characteristics; a linear, least-squares representation is used for the rebound or expansion data. It is important to understand that these two functions are applied to the logarithms, base ten, of the abscissae. In other words, the raw data points which originally span logarithmic cycles are now reduced to a common, narrow, arithmetic range of values.

CRITERIA FOR SELECTION OF ORDINARY POLYNOMIAL

Three criteria were considered in selecting ordinary polynominals: functional shape, functional simplicity, and analytical accuracy. Any analytical function which is used for curve fitting must satisfy the all-important criteria of functional shape or form. Implied in this statement is the requirement that the function have the flexibility to accurately duplicate the wide range of shapes or forms to be expected from a given set of data. The ordinary polynomial satisfies all of these requirements amazingly well. Other types of functional fits have been investigated. Exponential and logarithmic functions are not satisfactory because their seemingly appropriate shapes are too extreme and inflexible to provide an accurate estimate of the point of maximum curvature and linear portion of virgin compression. In contrast, rational functions based on Chebyshev (Tchebycheff) polynomials are much better for fitting curves than exponential or logarithmic functions. However, these types of rational functions still have the general characteristic of being too inflexible to satisfactorily describe some of the finer, yet essential, shape characteristics. Example fits of the rational function to data are given in Figure 4. It is obvious

from the figure that there are significant variations between rational functions of different orders. In contrast, the ordinary polynomials shown in Figure 5 do not vary significantly in their fit to the same data points shown in Figure 4. In view of this comparison, the shape of the ordinary polynominal has less dependence on the functional order used. This is very important from the standpoint of reducing the subjectivity involved in the choice of an appropriate order of the curve-fitting function.

The choice of any curve-fitting function should take into account the difficulty of manipulating the analytical expression. Differentiation and the use of related analytical expressions may become cumbersome for many types of functions. Exponential and logarithmic functions are especially cumbersome in a general operational sense because their related analytical operations are wholly dependent on the particular functional expression at hand. In other words, these types of functions are usually not derived from any particular recurrence relationship which can be used to obtain greater flexibility in functional shape. On the other hand, rational and polynomial functions do have desirable recurrence relationships. From the standpoint of mathematical manipulations, the ordinary polynomial is the most desirable of these functions because its recurrence relationships provide simpler analytical expressions. This fact is especially true from the standpoint of differentiation and generation of the functional expressions. The expressional forms of these two functions easily demonstrate this fact. The ordinary polynomial has the form

$$p(x) = c_1 + c_2 x + c_3 x^2 + \dots c_n x^{n-1}, \qquad 1$$

where p(x) is the given polynomial with terms having constant coefficients c for the abscissa terms x with integer powers n. The rational function using the ratio of two Chebyshev polynomials, $T_{n+1}(x)$ and $T_{m+1}(x)$, has the form

$$u(x)/v(x) = T_{n+1}(x)/T_{m+1}(x) =$$

$$\sum_{n=1}^{n} (2x(T_n(x)) - T_{n-1}(x)) / \sum_{n=1}^{n} (2x(T_m(x)) - T_{m-1}(x))$$

where $T_0(x) = 1$, $T_1(x) = x$, $T_2(x) = 2x^2 - 1$, and n and m are the degrees of the Chebyshev polynomials in the numerator and denominator, respectively. Derivatives are easily obtained on the ordinary polynomial using the product rule of differentiation,

$$d(p(x))/dx = ncx^{(n-1)},$$
 3

on the quantity

$$p(x)=cx^{n}.$$

In contrast, derivatives of the rational function will

involve a nontrivial consideration of its individual terms which have the somewhat peculiar recurrence relation shown in Equation 2. These derivatives are obtained using the quotient rule of differentiation,

$$d(u(x))/v(x))/dx = (v(du/dx) - u(dv/dx))/v^2, 5$$

which in this case is nontrivial. In view of these differences in simplicity and the indications of fit found in Figures 4 and 5, the benefits gained using a rational function as opposed to an ordinary polynomial would be questionable at best.



Figure 4. Examples of Curve Fits by Rational Functions Having the Form u(x)/v(x), where u(x) and v(x) are Chebyshev Polynomials Having Orders k and m, respectively.



Figure 5. Examples of Curve Fits by Ordinary Polynomials p(x) Having Different Orders n.

The final reason for choosing the ordinary polynomial as the curve-fitting function is the accuracy which can be obtained in the first and second derivatives of the analytical expression. This is due more to the functional characteristic than to a shape characteristic. As pointed out in the discussion of functional shape, the ordinary polynomial usually will provide a very good fit of the semilog representation of compression data. Consequently, differentiation based on the mathematical definitions of Equations 3 or 5 will yield accurate estimates of the first and second derivaties. When a finite difference approach is used as a check on the derivatives of the generated ordinary polynomial (Equation 3), the same results can be obtained if the increments are sufficiently small. The derivatives obtained by the two mathematical definitions will be legitimate if the polynomial curve provides a good representation of the data. In contrast, as the functional representation of the data becomes less accurate (as in the cases of rational functions and low degree polynomials), the legitimacy of the first- and higher-order derivatives becomes increasingly questionable.

ANALYTICAL PROCEDURES

This algorithm employs a variety of analytical procedures to represent the geometrical characteristics of the semilog, stress-deformation, consolidation curves. To begin with, the equation of the fitted ordinary polynomial is used to evaluate ordinate values at various abscissa locations on the curve. Slopes at these abscissa locations are determined using Equation 3. It should be noted that the rebound data are fitted only with a straight line. These analytically determined slopes are used with associated abscissa and ordinate values to produce equations of straight lines. Another geometrical quantity represented by analytical procedures is the radius of curvature. After the mathematical definition of Equation 3 is applied twice to evaluate the second derivative, the radius of curvature can be analytically determined at various abscissa locations through the use of the following mathematical definition:

$$R = (1 + (dy/dx)^2)^{3/2} / (d^2y/dx^2), \qquad 6$$

where R is the radius of curvature. The point of maximum curvature is given by the minimum value of the radius, 'R'. Another means of determining the point of maximum curvature is by approximating other geometrical characteristics of the curve. A combination of the procedures which set up equations of straight lines form the basis of this new method to determine the point of maximum curvature. A more complete discussion of this method follows in the section entitled "Graphical Method to Select Point of Maximum Curvature".

AUTOMATION OF THE CASAGRANDE AND SCHMERTMANN CONSTRUCTIONS

The analytical procedures described in the preceeding section form the basis for the mathematical representation of the two most widely used methods in the analysis of time-independent settlement. In review, the Casagrande construction is used by this algorithm to estimate the probable preconsolidation pressure, and the Schmertmann construction is employed to account for the effects of disturbance on the compressibility of the specimen. Steps in the two empirical constructions are described here to illustrate the various analytical procedures.

The first step in the Casagrande construction is the selection of the point of maximum curvature on the polynominal representation of the compression data. In the manual application of this step, a subjective decision is made on the basis of the appearance of the curve. In the analytical application of this step, the point of maximum curvature may be selected by one of two possible methods. One method employs the

mathematical definition of the radius of curvature given in Equation 6 and is called the Analytical Method. The other is the newly developed Graphical Method, and the pictorial characteristics of the compression curve are used to choose the point of maximum curvature. This method is discussed further in the section entitled "Graphical Method to Select Point of Maximum Curvature". After the point of maximum curvature has been selected, lines horizontal and tangential to the fitted polynominal are mathematically determined at this point as shown by lines A and B, respectively, in Figure 6. The angle between these two lines is then bisected and mathematically represented by another line as shown by line C in Figure 6. The final step in the Casagrande construction comes in the selection of the line representation of the virgin compression curve. The polynomial representation of the compression curve is analyzed for a representative slope and suitable intercept, as shown by line D in Figure 6. The preconsolidation pressure, P_c (PROBABLE), is then determined at the intersection point of lines D and C, as shown in Figure 6, by taking the antilog of the abscissa at that point.

Following the Casagrande construction, the Schmertmann construction employs similar procedures to estimate the in situ compressibility characteristics implied by the geometrical nature of the consolidation curves. The mathematical steps exactly parallel those in the manual construction. In situ compressibility of the compression curve characteristics are approximated by two straight lines. First, the initial portion of the compression curve is represented by a line going through the in situ state of stress and strain having the slope of the rebound curve, line E in Figure 6. Finally, the in situ, virgin compression curve is represented by a line going from the end point of line F at the preconsolidation pressure to the point where the virgin curve, line D, intersects the ordinate value of strain at 42 percent of the initial void ratio. This is line G in Figure 6.

A minimum preconsolidation pressure, P_{c} (MINIMUM), is shown in Figure 6. This lower limit of preconsolidation pressure is determined in accordance with a procedure reviewed and modified by Schmertmann (4). This minimum preconsolidation pressure is found simply by extending the virgin curve represented by line D in Figure 6 until it intersects either the $\epsilon_{v} = 0$ line or the in situ recompression curve represented by line F.



Figure 6. Combined Use of the Casagrande and Schmertmann Constructions.

GRAPHICAL METHOD TO SELECT POINT OF MAXIMUM CURVATURE

Equation 6 can not be used successfully on curves having ill-defined curvature. The conceptual basis of this graphical method is the idealization of the recompression and virgin compression curves as straight line segments which have a transitional curve between them. Several assumptions are made. The first is that the recompression curve has the same slope as the rebound curve. Note that the Schmertmann construction employs a similar assumption. Second, the transitional curve between the two straight-line segments is to be smooth, evenly distributed, and have its point of maximum curvature at the center of its variance from the straight-line segments. An analogous situation can be found with the spiral highway curve and the principle, there, of gradual transition. Finally, the center point of the transitional curve is found by bisecting the interior angle formed by the intersection of the line representations of the recompression and virgin portions of the compression curves to obtain the point of maximum curvature as shown in Figure 7.

The implementation of this graphical method follows procedures outlined below. Consult Figure 7 for each of the following steps:

1. A line with the slope of the rebound curve is placed tangent to the recompression curve. If it is impossible to locate a tangent with this slope on the recompression curve, the line is arbitrarily drawn through the recompression curve at some point -preferably the earliest possible point on the curve which is free from any irregular effects possibly produced during initial loading.

2. The virign compression curve is then represented by a line having the slope of its straight portion.

3. Extend the tangent of the recompression curve and the straight-line representation of the virgin compression curve until they intersect.

4. Bisect the interior angle formed by the intersection of these two lines.

5. Extend the angle bisector until it intersects the compression curve. This point of intersection is selected as the point of maximum curvature.



Figure 7. Graphical Procedure to Select Point of Maximum Curvature.

Most consolidation (compression) curves will not rigorously follow the assumption that their points of maximum curvature will be located at the center of their transitional curves. If the point of maximum curvature can be chosen accurately by visual inspection, it may be located slightly before or after the graphically selected point, and its location depends entirely on the characteristic shape of the time-independent compression curve. Nevertheless, this graphical approach is a more rational procedure to the determination of the point of maximum curvature on curves having ill-defined curvature than the traditional method of selecting this point by visual inspection. This method also provides more consistent results with curves having ill-defined curvature. In adddition, it is obvious from the nature of the Casagrande construction that the selection of the point of maximum curvature is less critical to the determined value of the preconsolidation stress than the selection of the virgin compression curve. And since this graphical approach determines the midpoint of the range of the possible points of maximum curvature, it is a reasonably good

approximation to the midpoint of the range of possible values for the preconsolidation stress as determined by the Casagrande construction. Consequently, even though Casagrande does not use the construction which bears his name (11), the graphical approach to the selection of the point of maximum curvature is in keeping with his statement that the preconsolidation pressure should always be considered in terms of a range of values (12).

INFLUENCE OF POLYNOMIAL DEGREE ON ANALYSIS

The polynomial degree has been found to have a range of effects on three particular considerations: the shape of the fitted curve, the selected point of maximum curvature, and the values of the preconsolidation pressure and compression ratio. Similarly, since the effects of polynomial degree are largely dependent on the size of the data set being fitted, the three preceding points must be considered in terms of standard consolidation data versus controlled consolidation data.

EFFECT OF POLYNOMIAL DEGREE ON THE SHAPE OF FITTED POLYNOMIAL CURVE

For controlled test data, the polynominal degree has been found to have a small effect on the polynominal curve's shape for two reasons. First, the large number of data points involved in the controlled consolidation test usually gives a well-defined curve which can be easily duplicated by high-degree polynomials. Secondly, since the large number of data points allows the use of higher degree polynomials, the undulatory characteristics of low-degree polynomials cited by Hastings (13) are automatically avoided.

In contrast, consolidation curves derived from standard tests do not have the benefit of a large number of data points. The scarcity of data points introduces a reasonable amount of ambiguity into the shape of the curve. This ambiguity appears in the analysis of these standard compression curves irrespective of any curve-fitting process which is used, manual or analytical. Because of this ambiguity, a certain amount of variation in the shape of the compression curve results for polynomials of different degrees.

In addition, the small number of data points from the standard test limits the curve-fitting procedure to use of low-degree polynomials which have a certain undulatory characteristic. These shape characteristics of low-degree polynomials can sometimes introduce frustrating variations into the curve. These variations usually arise in cases where the curves assumes an almost horizontal character in the initial portion followed by a sharp angular break into the virgin compression portion. As Hastings (13) points out, the low-degree polynomials cannot turn sharply and go as straight as it is sometimes required by curves like the ones shown in Figure 8 (14). Figure 9 shows the best possible, low-degree polynomial fit on Crawford's "End of Primary" curve of Figure 8. From this figure, one can get an idea of the shape limitations of low-degree polynomials.



Figure 8. Crawford's 1964 Illustration of the Influences of Secondary Compression on the Preconsolidation Pressure.



Figure 9. Best Low-Degree Polynomial Fit on Crawford's "End of Primary Curve" in Figure 8.

EFFECT OF POLYNOMIAL DEGREE ON THE SELECTION OF POINT OF MAXIMUM CURVATURE

The point of maximum curvature can be selected either by the Analytical or Graphical Methods discussed earlier in the section entitled "Algorithm for Time-Independent, Laboratory, Consolidation Test Data". As far as the controlled test data curves are concerned, both the Analytical and Graphical Methods give very consistent choices for the point of maximum curvature for polynomials of degree nine or greater when these two methods are considered separately. Figures 10 and 11, which will be discussed in greater detail later in this section, show that an acceptable consistency is obtained within each method to select a point of maximum curvature for polynomials of degree six or greater. Consistency occurs in each of these two methods after the sixth degree; there are two reasons: the shape of the well-defined compression curves are accurately duplicated with higher degree polynomials, and the undulatory characteristics more often found in low-degree polynomials are avoided, particularly in the initial portions of the compression curve and area of maximum curvature.

Figure 10. Preconsolidation Stress Plotted as a Function of Polynomial Degree of the Analytical and Graphical Methods to Select a Point of Maximum Curvature, Controlled-Gradient Test 13.

See. 9





Figure 11. Compression Ratio Plotted as a Function of Polynomial Degree for the Analytical and Graphical Methods to Select a Point of Maximum Curvature, Controlled-Gradient Test 13.

In contrast, the effect of changing polynominal degree on the selection of the point of maximum curvature from polynomial fits of standard consolidation data is significantly greater. The number of data points involved restricts one to the use of low-degree polynomials on data groups that already admit a reasonable amount of ambiguity into their curve given representations. Hence, the undulatory characteristics of low-degree polynomials and the ambiguities inherent from few data points, selection of the point of maximum curvature can be affected in three ways: by localized undulations in the initial portion of the compression curve representations, by changes in the location of the point of maximum curvature with different polynomial degrees, and by special problems caused by a nonexistent or ambiguously defined point of maximum curvature. For the Analytical Method, the presence of localized irregularities in the initial portion of the polynomial representation of the compression curve can cause an erroneous point of maximum curvature to be chosen. Secondly, changes in the polynomial degree used in fitting a group of standard data can shift the point of maximum curvature from one location to another because of the ambiguities possible when fitting a few data points and the undulatory nature of low-degree polynomials. An example of the effects of the undulatory nature of low-degree polynomials on the selection of the point of maximum curvature can be realized through a comparison of the analyzed consolidation curves of Standard Test 24 in Figures 12a and 12b with Figure 12c. Thirdly, special problems occur when the Analytical Method is used on a polynomial representation of a set of consolidation data lacking a distinct and unique point of maximum curvature. In other words, the curve may lack a unique point of maximum curvature due to the nature of the data or because of the poor representation afforded by the low-degree polynomial. An excellent example of the nature of the data contributing to the ill-defined point of maximum curvature is shown in Figure 13 of Standard Test 12. Even though the third, fourth, fifth, and even sixth degree polynomials provide excellent representations of the data, the small differences in shape between these polynomials overshadow the ambiguous information furnished by the data points concerning the point of maximum curvature and give rise to significant differences in the location of the point of maximum curvature.

In contrast to the selection of the point of maximum curvature by the Analytical Method, the Graphical Method is influenced differently with varying amounts of significance for the three problems discussed above with respect to standard data. It may be helpful here for the reader to re-acquaint himself with the earlier description of the Graphical Method, with special attention to Figure 7, in the section entitled "Graphical Method to Determine Point of Maximum Curvature". As for the first problem, localized irregularities in the initial portion of the polynomial for the initial compression curve can disturb the Graphical Method by causing slight displacements or offsets up or down in the initial tangent line shown in Part 1 of Figure 7. An actual example of an upward displacement of this tangent line can be seen in the sixth degree polynomial fit on Standard Test 24 in Figure 19c. This upward displacement of the initial tangent line causes the angle bisector of Part 4 of Figure 7 to intersect the compression curve at a point further back up the curve. A downward displacement of the intitial tangent line will cause the point of maximum curvature to be located at a point further down on the compression curve. As for the second problem, the location chosen by the Graphical Method as the point of maximum curvature is largely unaffected by small changes in the shape of the fitted curve in the general area of the point of maximum curvature with changing polynomial degree. In other words, the point chosen remains essentially the same with changing polynomial degree. Basically, this fact comes about because the point selected by the Graphical Method is determined mostly by the interior angle formed by the intersection of the straight-line representations of the recompression and virgin compression curves shown in Figure 7. Hence, the Graphical Method is largely unaffected by changes in the characteristics of the fitted polynomial between the straight-line representations of the recompression and virgin compression curves.

Finally, the special problems encountered by the Analytical Method with an ill-defined point of maximum curvature are largely avoided by the use of the Graphical Method. When the data are responsible for these problems, as in the case in Figure 13 for Standard Test 12, the Graphical Method becomes more consistent and gives just as reasonable results by pictorially taking the midpoint of the range of possibilities for the point of maximum curvature, as shown in Figure 14.





Figure 13. Standard Test 12, Analytical Method Used to Determine a Point of Maximum Curvature: (a) 3rd-Degree Fit; (b) 4th-Degree Fit; (c) 5th-Degree Fit; (d) 6th-Degree Fit.



Figure 14. Standard Test 12, Graphical Method Used to Determine a Point of Maximum Curvature: (a) 3rd-Degree Fit; (b) 4th-Degree Fit; (c) 5th-Degree Fit; (d) 6th-Degree Fit.

INFLUENCE OF POLYNOMIAL DEGREE ON THE VALUES OF THE PRECONSOLIDATION STRESS AND COMPRESSION RATIO

Variations caused by polynomial degree in the shape of the fitted curve and selected point of maximum curvature affect the values of preconsolidation stress, P_c , and the compression ratio, CR. Many observations to be made herein have already been mentioned. For controlled test data, the large number of data points allows the use of higher degree polynomials which give consistent results for the preconsolidation stress and compression ratio after the sixth degree. This consistency primarily reflects a lack of change in the shape of the fitted curve with increasing degree. Figures 10 and 11 demonstrate this point for the values of preconsolidation stress and compression ratio, respectively. The most representative values for these two parameters are usually obtained when the highest polynomial degree of 11 is used; but of course, the polynomial representation of a compression curve must be smooth and well defined by sufficient data points from a controlled consolidation test. The obvious trend of lower values for P_c and CR in Figures 10 and 11 for the Analytical Method is due only to the character of the data and its fitted polynomial but not because the Graphical Method always gives a trend of higher values for P_c and CR. In other words, for differently shaped compression curves, the Graphical Method could give a trend of lower values for P_c and CR.

In contrast, since the standard test data allow greater variation in the shape of the fitted polynomial and the selected point of maximum curvature with polynominal degree, the of changing values preconsolidation stress and compression ratio consequentially show less consistency with changing polynomial degree. However, fair consistency in the determination of P_c and CR is retained for certain polynomial degrees within each of the two methods to select a point of maximum curvature. In Figures 15 and 16 for Standard Test 24, good consistency is obtained by the fourth and fifth degree polynomials. In Figures 17 and 18 for Standard Test 12, satisfactory consistency is obtained in the third, fourth, and fifth degree polynomials. Note that in both sets of figures for Standard Tests 12 and 24, this consistency breaks down at the sixth degree. At the sixth degree, this breakdown in consistency can be expected since there is no least-squares smoothing afforded by the fitting polynomial when the polynomial degree is equal to the number of data points minus one.

Changes in the shape of the fitted polynomial with changing polynomial degree, particularly in the initial portion of compression data curve, are primarily responsible for the sudden changes in the determined

values of P_c and CR. In Figures 15 and 16 for the use of the Analytical Method on the data of Standard Test 24, the change in the shape of the fitted polynomial at the sixth degree occurs because the few data points in the initial portion of the compression curve cannot prevent the polynomial from curving in this region. Curving of the polynomial in the initial data causes the point of maximum curvature to move further down the curve and thereby cause an increase in P_c and CR shown at point C in Figures 15 and 16, respectively. This effect can be seen by comparing the analyzed consolidation curves for the fourth, fifth, and sixth degree polynomials in Figures 12a, b, and c, respectively. In contrast, the curving of the sixth degree polynomial in the initial data of the compression curve of Standard Test 24 produces an opposite effect on the determined values of P_c and CR when the Graphical Method is used. This undulation in the fitted curve causes an upward displacement of the initial tangent found by the Graphical Method The effect of this undulation can be noted by comparing the analyzed consolidation curves for the fourth, fifth, and sixth degree polynomials in Figures 19a, b, and c. In Figure 19c the upward displacement of the initial tangent moves the selected point of maximum curvature back up the compression curve with a consequential reduction of P_c and CR at point E' in Figures 15 and 16, respectively.

The effect of changes in the shape of the fitted polynomial at the sixth degree is quite different for the data of Standard Test 12. Here again there is no least-squares smoothing at the sixth degree. For the Analytical Method's determination of P_c and CR for standard test 24, there was an increase in their values at the sixth degree, as shown in Figures 17 and 18 and point C. However, for Standard Test 12, the values of P_cand CR show instead a decrease at the sixth degree. This change in the values of P_c and CR for Standard Test 12 is also caused by a small shape aberration of the sixth degree polynomial fit in the initial data points of the compression curve. The decrease of the values of P_c and CR occurs because the point of maximum curvature is moved back up the curve instead of down the curve, as in the case of the previously discussed example of Standard Test 24. The backward shift of the point of maximum curvature can be easily seen by comparing the analyzed consolidation curves of Standard Test 12 for the third, fourth, fifth, and sixth degree polynomials in Figure 13 a, b, c, and d, respectively. As for the effect of this sixth degree polynomial shape aberration on the values of P_c and CR determined with the use of the Graphical Method to select the point of maximum curvature, there is not as large a change as accompanied the previously discussed example of Standard Test 24 of the preceeding discussion concerning the Analytical Method and

Figure 15. Preconsolidation Stress Plotted as a Function of Polynomial Degree for the Analytical and Graphical Methods to Select a Point of Maximum Curvature, Standard Test 24.



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Figure 16. Compression Ratio Plotted as a Function of Polynomial Degree for the Analytical and Graphical Methods of Selecting a Point of Maximum Curvature, Standard Test 24.





re 18. Compression Ratio Plotted as a Function of Polynomial Degree on Compression Data which Lack a Well-Defined Point of Maximum Curvature, Standard Test 12.



(c)

0, 28

0.35

Standard Test 12. Hence, values of P_c and CR for the sixth degree Graphical Method's determination remain fairly consistent with respect to the other degrees as shown in Figures 17 and 18 for Standard Test 12. In spite of the excellent polynomial representations of the data furnished by all degrees of three or greater on the data of Standard Test 12, the scatter obtained in the values of P_c and CR when the Analytical Method is used illustrates the difficulties involved with selecting the point of maximum curvature on data which ambiguously define curvature. Whether the data from Standard Test 12 are accurate or not is not an issue here. Instead, the problem of selecting the point of maximum curvature on certain types of curves illustrates some basic limitations inherent in the use of empirical, graphical procedures to determine properties of stress-strain consolidation data. Sometimes, use of empirical, graphical procedures may raise some questions in their applicability to the analysis of certain types of data. With this in mind, the use of the Graphical Method as opposed to the Analytical Method to determine the point of maximum curvature on the data curves from Standard Test 12 gives just as reasonable choices for this geometrical quantity and, in addition, much more consistent values of P_c and CR. This can be seen by inspection of the analyzed consolidation curves for the third, fourth, fifth, and sixth degree polynomial fits in Figures 14a, b, c, and d, respectively.

SUMMARY

Changing the degree of the polynomial has a greater effect on the shapes of the curves fitted to standard data than on those fitted to controlled consolidation data. Usually, the best curve representation of the data will be obtained when the highest polynomial degree that provides some least-squares smoothing is used. However, there is one situation where any polynomial representation may not be adequate for either standard or controlled compression data curves. In Figure 8, there are curve shapes which are difficult to produce through the use of ordinary polynomials, particularly low-degree polynomials. This difficulty results because it is hard for polynomials to make sharp turns or to go straight horizontally for any great distance, especially when there are few data points to sufficiently constrain the polynomial fit as in the case of Figure 9. Secondly, changing polynomial degree does change the location for the point of maximum curvature. At low-degree polynomial fits, changes in the polynomial degree can adversely affect both the Analytical and Graphical Methods to select the point of maximum curvature because of possible undulations in the fitted curve in the initial portions of the data and region of maximum curvature. When the curvature of the fitted curve is ambiguously defined, despite an excellent polynomial

representation of the data at most degrees, the Graphical Method to select the point of maximum curvature will be less susceptible to small variations in the fitted curve than the Analytical Method. And, considering the broad spectrum of shapes possible with most stress-strain consolidation data, the Graphical Method will give more consistent results with changing polynomial degree.

It is important to compare qualitatively the influences of polynomial degree with other external difficulties which can affect the analysis of consolidation test data irrespective of the procedures which are used. It will be shown herein that the variations incurred with different degree polynomials are usually less than the variations caused by effects external to the analysis of the data itself. For standard data, there are two significant sources of variations which can have a larger influence on the analysis than changing the polynomial degree. A very important factor is specimen disturbance, which can have a very appreciable influence on the values of P_c and CR and far outweigh any variations incurred by the curve-fitting functions. Also, such factors as load-increment ratio and load-increment duration can affect the determined values for P_c and(or) CR much more than changing polynomial degree, especially when data on highly sensitive clays are considered. (Crawford (14) showed in Figure 8 the extreme but valid case of a 50-percent reduction in the value for P_c for incremental loading programs of different durations.) In addition, Sallfors (3) pointed out that it is possible to represent the compression data with a number of different curves when there are only six or seven data points. This last type of variation accounts for most discrepancies between the values of P_c and CR for different degree polynomials. Hence, these variations in the shape of the fitted curve are just as much a result of the limitations imposed by standard consolidation tests as from the use of different polynomial degrees. For the controlled consolidation tests, this problem of choosing the appropriate curve representation of the compression data is greatly alleviated by the greater amount of data involved. However, this type of consolidation data can be influenced by some other factors external to the analysis. For instance, the effect of specimen disturbance is just as significant for the controlled consolidation tests as it is for the standard test. In addition, there are the special effects caused by pore pressure lag and strain rate which can change the nature of the compression curves and the determined values for P_c and CR. These special effects are generally far more significant than those incurred through the use of different polynomial degrees. In summary, variations incurred with the use of different degree polynomials are usually less than the inaccuracies incurred by such things as sample disturbance, few data points, loading procedures, and measurement of pore pressures.

THE COMPUTER PROGRAM

The computer program, CASAGR-O, analyzes the time-independent, one-dimensional strain consolidation data associated with consolidation tests. The program determines the preconsolidation stress and the in situ compressibility characteristics. The results derived from this program are used in the time-independent, one-dimensional strain analysis of settlement. The main characteristics of the program to be discussed herein include a description of its methods of solution, capabilities and limitations, data inputs, program options, program output, flow-chart outline, and sample runs.

METHOD OF SOLUTION

The computer program employs a numerical curve-fitting procedure with a least-squares ordinary polynomial to facilitate the analytical application of the Casagrande (1) and Schmertmann (3) constructions. Several procedures have been developed and incorporated into the program to carry out the analytical application of these constructions. The points to be discussed herein are the application of the curve-fitting procedure, a criterion for distinguishing between compression and rebound data, the selection of the point of maximum curvature, the selection of the virgin compression curve, and constants built into the program.

Application of the Curve-Fitting Procedure - The compression and rebound curves are separated and fitted by two different polynomial functions. The compression data are fitted by a user-specified, least-squares polynomial. The rebound data are fitted by a least-squares straight line. These two functional representations provide the basis for the approach proposed in the section entitled "Algorithm to Study Time-Independent Laboratory Consolidation Test Data."

Criteria for Distinguishing between Compression and Rebound Data Curves - This criterion is predicated on the fact that compression data are read into the computer in an order such that the values of effective stress are increasing. Once this compression data have been read in, they are followed by the rebound data distinguished from compression data on the basis that there is a decrease in the value of effective stress. This criterion for distinguishing between compression and rebound data is applied differently to the data obtained from different types of consolidation tests. For standard consolidation test data, the computer program distinguishes between compression and rebound data when it encounters a data point having an effective stress less than the one previous to it. When this occurs, the computer program treats all subsequent data points as rebound data.

In contrast, controlled consolidation data are defined by a similar but less order-bound criterion. Compression data still must be entered first and in order of increasing effective stress. The difference is that small. local decreases in the values of effective stress in compression data will not cause the computer program to treat all subsequent data points as rebound data. As long as localized decreases are not greater than 0.7 tons per square foot (67 kPa), the computer program will continue to treat all subsequent data as compression data. When this amount of change occurs, all subsequent data points are treated as rebound points in the curve-fitting process. Finally, the data point which provokes this decrease in effective stress is dropped from the analysis entirely to avoid any effects it may have on the polynomial representation of the compression data.

Selection of the Point of Maximum Curvature --The Casagrande point of maximum curvature is determined by the computer program by two methods, both of which have previously been described. The Analytical Method uses the mathematical definition of the radius of curvature given in Equation 6 to find the point of maximum curvature. The location of the point depends primarily on the arithmetic ratio of the scale factors. Hence, with a different ratio for the horizontal to vertical scale factors, the point of maximum curvature will be located at a different abscissa location on a given curve. The ratio of the horizontal to vertical scale factors must be multiplied times the first and second derivatives before Equation 6 can be used to select the point of curvature based on the maximum pictorial characteristics of the fitted curve. To find the point of maximum curvature, the Analytical Method tests for a minimum value for the radius of curvature within a 90-percent midportion of the search area as defined by the user-specified, abscissa search boundaries. If a discrete minimum value for the radius of curvature is not found within this 90-percent interval, the minimum value of the radius is not considered to be unique. In such a case, the computer program will default to select the point at which the second derivative is a maximum as the point of maximum curvature.

The second method to determine the point of maximum curvature is the Graphical Method. Procedures for this method have already been described in detail in the section entitled "A Graphical Method to Select Point of Maximum Curvature". The computer program uses the Graphical Method in several steps. First, the program searches between the user-specified boundaries for a point on the compression curve having the same slope as the line representation of the rebound curve. If this point is found, the line representation of the initial portion of the compression curve will be drawn through this point. If this point is not found, the

computer program defaults and uses the first search boundary as the point through which to draw the line representation of the initial recompression curve. Note that this line will have the slope of the rebound curve line representation. Next, the pictorial appearance of the interior angle formed by the intersection of the line representations of the initial compression and virgin compression curves is bisected. Note that the pictorial appearance of this interior angle is directly related to the scale factors in the horizontal and vertical directions. Finally, having bisected this interior angle, the intersection of the angle bisector line with the compression curve is determined by comparing the incrementally generated ordinates of the angle bisector line and the polynomial representation of the compression curve. The ordinate values are computed at incrementally generated abscissae which are increasing in magnitude. When the ordinate of the angle bisector is greater than that of the compression polynomial, the point of intersection has been passed. The determination of the intersection point is refined by several iterations using the same procedure. This intersection is the graphically selected point of maximum curvature.

Selection of the Virgin Compression Curve -- The selection of an appropriate straight-line representation of the virgin compression curve uses the concept of percent difference. The percent-difference criterion is a procedure which is used to find that portion of the compression curve on which the slope is relatively constant. If the slope is relatively constant, the percent difference between slopes of consecutively generated search points will be very small and that portion of the curve will be nearly a straight line. In the use of this concept, the computer program incorporates the additional requirement that the straight-line representation of the virgin compression curve be selected at the point having the largest slope of those points whose slopes have passed the percent-differrence criterion. However, the percent-difference criterion will not always be satisfied. Hence, some kind of backup criterion is needed. The criterion to be outlined herein depends on the type of test data being analyzed. For controlled data, the computer program uses a simple default procedure when the percent-difference criterion is not satisfied. If the criterion is not satisfied for controlled data, the program selects the point at which the maximum slope occurs. This point and the slope of the curve at this point will be used to construct the straight-line representation of the virgin compression curve.

In the case of standard data when the percent-difference criterion is not satisfied, the procedures are slightly more complicated than those used on controlled data. When the percent-difference

criterion is not satisfied on standard data, the representation of the virgin compression curve will be selected on the basis of the two procedures illustrated in Figures 20 and 21. In the case of a compression curve similar to the one in Figure 20, the line representation of the virgin compression curve will be selected at the point of maximum slope. In the case of a compression curve similar to the one in Figure 21, a much different procedure will be used because use of the tangent to the compression curve at its maximum slope would lead unconservative estimate of to a very the preconsolidation stress. Also, use of a line through the last two compression points as the representation of the virgin compression curve can be inappropriate because the next to last point may not be on the straight-line portion of the virgin compression range, as indicated by the trend of compression points in Figure 21. Hence, some median is needed between these two possible extremes. A way to obtain this median is simply to select a line having a slope averaged from the two extremes just discussed and going through the last compression curve point. This line is shown as a dashed line in Figure 21.

Constant Values Built Into Program -- Several constant values are built into the computer program for use in various steps of the analysis. There are constants for the Schmertmann construction and for matching of increasing dial readings with downward deflection (decreasing specimen length). For the Schmertmann construction, the computer program takes the intersection of the line representation of the in situ compression curve with the line representation of the laboratory virgin compression curve as occurring at 42 percent of the initial void ratio, as suggested by Schmertmann (3).

Next, the program is set up to accept increasing dial readings of standard and controlled-rate-of-strain data as indicating downward deflection (decrease in specimen length). This has been accomplished by setting the variable name 'IDIAL' equal to '+1' during the data reduction for these two test types. Similarly, controlled-gradient data reduction is handled in much the same way with the exception that 'IDIAL' is set equal to '-1' when this type of data is being considered. The reason for this is that the dial gauge used for the controlled-gradient test apparatus has increasing dial readings indicating specimen lengthening:

SAMPLE HEIGHT = INI. HEIGHT - IDIAL*(DIAL RDG. - ZERO RDG.).



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Figure 21. Standard Data for which the Line Representation of the Virgin Curve Is Selected by Averaging Slopes of Two Lines: One Tangent to the Curve at Its Maximum Slope and the Other Going through the Last Two Points. By inspection of Equation 7, one can easily see that the use of this kind of procedure avoids the necessity of having different deformation equations for different types of dial gauges. The advantage of this scheme readily becomes apparent when dial gauge equipment varies within a laboratory for a given type of consolidation test. Finally, the user has the ability of overriding these built-in relationships through an option that changes the sign of the value for IDIAL in Equation 7.

PROGRAM CAPABILITIES

Ranges of Assigned Values - Quantities involved in the computer program which require certain. limitations on the range of input values fall into three basic categories: array storage space, effective stress values, and polynomial degree specification. First, the amount of array storage space limits the amount of data which can be considered at any given time. These arrays have been set up to hanue a maximum of 300 compression data values and 100 rebound data values. Next, the effective stress values are limited to stresses greater than or equal to 0.1 ton per square foot (9.6 kPa). Any data having a value of effective stress less than 0.1 ton per square foot (9.6 kPa) will be changed to 0.1 ton per square foot (9.6 kPa). As for the polynomial degree specification, the program is limited in two ways, one internal and one external. Internally, the program can not handle any polynomial degree greater than 11. Externally, the user must make sure that the polynomial degree is not larger than the number of data points being fitted minus one. Otherwise, the user will receive an error message from the curve-fitting subroutine in the program.

Limitations on the Formulation of a Test Problem – Two points must be made herein to define what constitutes a test problem. First, a given set of consolidation test data must have both compression and rebound data as shown in Figure 22. Otherwise, the program cannot analyze a data set which consists only of compression curve data as shown in Figure 23. Secondly, the program is set up to handle only one load cycle at a time. A load cycle consists of loading (compression) and unloading (rebound) as shown in Figure 22. The single load cycle illustrated in Figure 22 is considered by the computer program as one problem. Hence, the three load cycles displayed in Figure 24 will be considered as three separate problems by the computer program.

In considering the family of curves in Figure 24 as three separate problems, confusion will arise in the analysis if the initial void ratio, e₀, is not changed for load cycles two and three. First and foremost, the use of Schmertmann's construction in the later load cycles with the original initial void ratio will lead to in the in situ unjustifiably large increases compressibility, as shown by curve A in Figure 25. In addition, since the initial void ratio is not scaled by the computer in relation to the rest of the data before it is plotted, the output will become disturbed when the computer attempts to plot the determined position of the initial void ratio outside the limits of the plot page in the vertical direction. Hence, it is necessary in the analysis of load cycles two and three in Figure 24 to use different values for the initial void ratio. For load cycle two, it is suggested that the final void ratio for load cycle one, e_{fl}, be used as the initial void ratio. For load cycle three, it is suggested that the final void ratio for the load cycle two, e_{f2} , be used as the initial void ratio. Following this procedure, a more reasonable determination of the in situ compressibility can be made, as shown by curve B in Figure 25. The reader should be well aware that these problems concern both the void ratio and vertical strain deformation analyses. Results of each deformation analysis is intimately involved with the value of the initial void ratio. However' one should also realize that the vertical strain results lend readily to the comparison of the compressibility characteristics of soils having different , initial void ratios. This enables a settlement analysis without knowledge of the in situ void ratios on layers of otherwise homogeneous materials which have the same compressibility characteristics.

DATA INPUTS

The data are input from punched cards using the format shown on the coding sheet forms in Figure 26a, b, and c in APPENDIX A. Detailed instructions are also contained in APPENDIX A along with a description of the job control cards.



Figure 22. Both Compression and Rebound Data necessary for Computer Program; Single Load Cycle Shown.

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PROGRAM OPTIONS

There are several run options available to the user of the computer program, CASAGR-0. All options are user specified. The user specifies the type of consolidation data being analyzed, the type of deformation analyses to be performed, and the method to select the point of maximum curvature. No debugging options are provided since the normal output of the program provides sufficient information for debugging.

Type of Consolidation Test – The user may specify analysis on data from three different types of consolidation tests. These are the standard, controlled-gradient, and controlled-rate-of-strain consolidation tests.

Deformation Analyses -- The user may obtain results in terms of a void ratio and(or) vertical strain. Both yield essentially the same determination of the preconsolidation pressure. Also, the program enables the user to use deformation data from dial gauges with different calibration factors and directions of dial gauge movement.

Methods to Select Point of Maximum Curvature – The user can choose either the Analytical or Graphical Method to select the point of maximum curvature. Details of these two methods have already been discussed. In review, the Graphical Method generally is less susceptible to anomalies caused by undulations in fitted compression curves and by irregularities in the data. The Analytical Method is better suited to consolidation curves which have relatively well-defined and undisturbed points of maximum curvature.

OUTPUT

Printed Output – All input information and final results are printed to facilitate checking results. The user has the option of specifying whether or not the calculated radii from the analytical determination of the point of maximum curvature should be printed.

Plotted Output -- An example of plotted output is referred to in the discussion of the sample run in APPENDIX B. The plots produced by the computer program show data points, fitted curves, numerical results, and all the steps involved in the graphical analyses. The plot information is stored on 800-bytes-per-inch magnetic tape used in conjunction with the Calcomp 663 drum plotter.

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APPENDIX A

PROGRAM INPUT INSTRUCTIONS

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CASAGR-0

TIME-INDEPENDENT CONSOLIDATION

TEST DATA ANALYSIS

PROGRAM CODING SHEET

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ł	2	3	4	5	6	7	8	9	10

Number of problems, columns 1-2, right justified. If NOPROB is greater than one, all of the remaining cards must be repeated for each problem.



For NPLOTS place a '1' in column 2. IPRINT - output option for the Analytical method to determine the point of maximum curvature. CODE '0' - Calculated radii printed out '1' - Calculated radii not printed out

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NDEG . Degree of polynomial used in curve fitting.

RUNTYP	Type of consolidation	test	
	In COL. 13: CODE	'0' '1'	- standard data - controlled gradient data
		'2'	- controlled rate of strain data

ZDEPTH Approximate field depth from which sample was recovered, in feet.

 KRAD
 Option for method to select point of maximum curvature. In COL. 31 : a blank or '0' causes the Graphical method to be used. : a '2' causes the Analytical method to be used.

 KIND
 Type of deformation analysis.

Type of deformation analysis.
 In COL. 33 : '0' is for both void ratio and strain analyses.
 : '1' is for void ratio analysis only.
 : '2' is for strain analysis only.

SECOND Stress at start of secondary compression (controlled tests only). If left blank, SECOND has default value of 31.2 Tsf.

 IIDIAL Option to override the assumed dial reading-versus-deflection relationship specified by computer program for each type of consolidation test. In COLS. 50 : a blank or '0' changes none of the assumed relationships. : '1' will specify that increasing dial readings indicate specimen shortening.
 49-50 : '1' will specify that increasing dial readings indicate specimen lengthening.

BOUND1				BOUND2								BOUND3										BOUND4																			
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BOUND1, BOUND2 - search boundaries for selection of point of maximum curvature using Analytical or Graphical methods.

BOUND3, BOUND4 - search boundaries for selection of the line representation of the virgin compression curve.

CASAGR-0 LABORATORY CONSOLIDATION TEST DATA

SAMPLE AND TEST DESCRIPTION TO BE USED	AS PLOT TITLE (BCD)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 9 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 4	42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
HOLE NO. (HOL) SAMPLE NO. (SAM) TEST OPERATOR (OPR)	
LOCATION (LOC)	SAMPLE DESCRIPTON (DES)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 4	42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
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SPECIMEN WEIGHTS DEFLECTION RDGS.	
SP. GR. INI. WET FIN. WET FIN. DRY INI. (NTED) (NTED) (NTED) (NTED)	
	WATER CONTENT DATA
CALIBRATION FACTORS DIAM. SAMPLE	
DEFLECTION PORE PRESS BLANK = default	Can No.
(DCF) LOAD (LCF) (PCF) to 2.5" (DIA)	Wt. can + wet soil
r 2 3 4 5 5 7 8 9 10 rr 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	Wt. can + dry soil
	Wt. of can
	Wt. of water
BACK ZERO READINGS INI. SAMPLE HEIGHT	Wt. dry soil
PRESS. DEFL. LOAD P. P. (SAMPHI)	Mois. cont.
(BP) (DEFZ) (WRZ) (PPZ) BLANK= default to I"	
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 10 11 12 13 14 15 16 17 18 19 10 10 10 10 10 10 10	NOTE: P. P. ZERO READING should be taken after B. P. application

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CASAGR - O

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CONTROLLED GRADIENT OR CONTROLLED RATE OF STRAIN CONSOLIDATION TEST DATA FORMAT STANDARD Consolidation Test Data Format

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LAST CARD OF	DATA BLANK

LABORATORY READINGS

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Figure 26. (Continued)

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INPUT INSTRUCTIONS FOR TIME-INDEPENDENT LABORATORY CONSOLIDATION DATA ANALYSIS

COLUM 1. NI	NS NAME UMBER OF PROBLEMS	FORMAT CARD	REMARKS
1-2	NOPROB	12	This card defines the number of problem sets to be solved. The number of problems equals the number of stress-strain axes which will be used in plotting the data. If card number two has NPLOTS equal to one, the number of problems will simply be the number of consolidation tests to be analyzed.
2	OUTPUT OPTION CAL	RD	
1- 2	NPLOTS	12	For NPLOTS, place a '1' in column 2. This parameter is used only in program version CASAGR-I.
3-4	IPRINT	12	Output option for the Analytical Method's determination of the point of maximum curvature (see CARD 3). A '0' or blank in columns 3-4 will cause the calculated radii of curvature at the generated incremental search abscissae to be printed out. A '1' in column four will eliminate this printed output.
3. DES	CRIPTION OF ANALYS	IS CARD	
1-3	NDEG	13	These columns specify the degree of the ordinary, least-squares polynomial to be used in fitting the consolidation compression curve. The maximum possible degree is 11. Use the highest possible degree in most cases. For cases having few or scattered data points, a lower-degree polynomial must be used. A low polynomial degree of four or five generally provides a good fit. For data sets having less than 12 points, the maximum polynomial degree which can be used is equal to the number of data points minus 1. However, the best polynomial representation of the data will usually be obtained when the highest polynomial that provides some least-squares smoothing is used (number of data points minus 2). If this degree polynomial is found to provide an undulating representation of the data, the user can use a lower-degree polynomial in another computer run.
13	RUNTYP	I1	Place in column 13 a '0' for standard consolidation data reduction, '1' for controlled-gradient consolidation data reduction or
Note:	Repeat cards 2 through problem.	10 for each additional	'2' for controlled-rate-of-strain consolidation data reduction.

.

ZDEPTH F 10.0 Place in columns 21-30 the approximate depth in 21-30 decimal feet at which the sample was recovered in the field. This depth is used to calculate the approximate overburden pressure in tons per square foot from the wet unit weight of the laboratory test specimen. The calculation of this overburden pressure does not take into account the effects of the water table or layers of different materials. The user may compensate for these situations by using a depth which will produce the desired effective stress for a given wet unit weight of the specimen. The following relationship is used to calculate the overburden stress: Overburden stress = (DEPTH (ft)) * (1 ton/2000 lbf)* (Wet Unit weight (grams)) / (453.6 grams/lbf) * $(1728 \text{ in}^3/\text{ft}^3)/(\text{lab sample volume (in}^3)).$ 31 **I**1 KRAD This parameter determines the method used to select the point of maximum curvature in Casagrande's construction. A '2' placed in column 31 causes the program to use the Analytical Method shown in Figure 27a. A blank in column 31 will cause the program to employ the Graphical Method to determine the point of maximum curvature as shown in Figure 27b. The Graphical Method is well suited to handling anomalies in data, ill-defined points of maximum curvature, and undulations in the fitted curve. KIND **I**1 33 Option for type of deformation analysis in terms of void ratio and(or) vertical strain. A '1' placed in column 33 specifies that the analysis be performed in terms of void ratio. A '2' placed in column 33 specifies that the analysis be performed in terms of vertical strain. If a '0' or a blank is in column 33, the deformation analysis is performed in terms of both void ratio and vertical strain. 36-40 SECOND F5.0 This parameter is used to remove the secondary compression points shown in Figure 28. This is done specifying the stress in Tsf at which secondary compression begins in controlled consolidation tests. If columns 32-40 are left blank, the program will default to a value of 31.2 Tsf. Note that this parameter is not used in the analysis of the standard consolidation test data. 12 IIDIAL 49-50 Option override the assumed dial to reading-versus-deflection relationships found in the computer program for each type of consolidation test. A '1' in column 50 will specify that increasing dial readings indicate specimen shortening. A '-1' in columns 49-50 will specify that increasing dial readings indicate specimen lengthening. If columns 49-50 are left blank or filled with zeros, the program will default to use the dial reading-versus-deflection relationships specified in

A-5

the program. The program assumes, unless the above override option is used, that increasing dial readings indicate specimen shortening for standard and controlled-rate-of-strain test data. For controlled-gradient test data, the program assumes that increasing dial readings indicate specimen lengthening.

Stress search boundaries used for finding the point of maximum curvature by either the Analytical or Graphical Methods. These boundaries are especially useful in choosing the representative portions of the curve and avoiding the localized effects of poor data and undulations in the fitted curve. These kind of choices are not possible when the user lacks knowledge of data's appearance during the first computer run. In the first run of the data, the user can make rough estimates for these search boundaries. A list of suggested values for BOUND1 and BOUND2 is provided at the conclusion of these remarks. These values will usually provide acceptable results in the absence of disruptive anomalies in the data.

When these boundaries are used in conjunction with the Analytical Method shown in Figure 29, the user must have them span the expected range of locations for the point of maximum curvature. In contrast, these boundaries are used by the Graphical Method to locate a tangent to the consolidation compression curve having the same slope as the rebound curve shown in Figure 30.

BOUND1 is the most important search boundary for the graphical method. BOUND2 is of no consequence if it is located well into the steep portion of the compression curve. If a tangent to the consolidation compression curve cannot be found between BOUND1 and BOUND2, the line having the slope 'E' of the rebound curve is drawn through the compression curve at BOUND1 as shown in Figure 31.

SUC	GEST	ED PREL	.IMINA	RY
VALUES	FOR	BOUND1	AND	BOUND2

.

	ANAL Y	HCAL	GRAPH	ICAL
SPECIMEN CHARACTER	BOUNDI (tsf	BOUND2	BOUNDI (tsf	BOUND2
Very soft	0.5	4.0	0.5	16.0
Very stiff	0.5	8.0	0.5	16.0

These stress search boundaries are used to select the straight-line portion of the virgin compression curve shown in Figure 32. BOUND4 is the most important of these two search boundaries. BOUND4 usually is taken as the last or nearly last value of effective stress, but never greater than the last value of effective stress. BOUND3 is of no consequence if it is before the

4.	SEARCH	BOUNDARY	CARD
1-10		BOUND1	F10.0

11-20	BOUND2	F10.0

21-30	BOUND3	F10.0
31-40	BOUND4	F10.0

straight-line portion of the virgin compression curve. If the need arises, these search boundaries may be used to select a more representative portion of the virgin compression curve data.

5. PLOT TITLE CARD 1-80 BCD 20A4 Alphanumeric information which will serve as the plot title and description of the test. The test description should include test type and series number, borehole location and number, sample number, and any other information pertinent to the data and testing procedures. 6. PRINTOUT DATA CARD General name of site from which sample was taken. 1-16 LOC 4**A**4 17-18 HOL 12 Borehole number entered as a right justified integer. Alphanumeric identification of the sample. 19-21 SAM A3 22-25 TES **I**4 Test number in a particular consolidation testing program. OPR 26-29 A4 Initials of the consolidation test operator. Alphanumeric identification of testing period. 30-41 DAT 3**A**4 42-57 DES 4**A**4 Alphanumeric information concerning material characteristics of sample. 7. INITIAL SOIL PROPERTIES CARD Specific gravity of solids for the specimen. 1-5 SPG F5.2 6-12 Initial wet weight, in grams, of specimen. WTIW F7.2 13-19 **WTFW** F7.2 Final wet weight, in grams, of specimen at end of test. 20-26 WTFD F7.2 Final dry weight, in grams, of specimen after dessication. F5,2 Dial reading just before start of test. 27-31 DEFI Dial reading at conclusion of consolidation test. 32-36 DEFF F5.2 8. CALIBRATION FACTORS AND SAMPLE DIAMETER CARD Deflection calibration factor expressed with a decimal 1-10 DCF F10.0 (inch/division). Load calibration factor expressed with a decimal 11-20 LCF F10.0 (lbs/division). Pore-pressure calibration factor expressed with a decimal PCF 21-30 F10.0 (psi/division). Diameter of sample in inches. If these columns are left F10.0 31-40 DIA

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blank, a default value of 2.5" 13 used.

9. 1-5	ZERO INFO	RMATION CA BP	RD F5.1	Back pressure reading (psi).
6-10		DEFZ	F5.2	Dial reading taken when sample is at its initial height.
11-14		WRZ	F4.0	Load reading corresponding to zero applied load.
15-18		PPZ	F4.0	Pore-pressure reading taken after application of back pressure and before loading of specimen.
21-30		SAMPHI	F10.0	Height of sample in inches after placement in consolidation ring and placement of end platens, or previously measured height. If left blank, a default value of $1^{"}$ is assumed.
10A. CON 1-4	TROLLED-G	RADIENT OR TR()	CONTROLLED-RATE- F4.0	OF-STRAIN CONSOLIDATION DATA FORMAT Time reading.
5-9		DEFR()	F5.2	Defection reading; increasing for controlled-rate-of-strain and decreasing for controlled-gradient tests.
10-13		PPR()	F4.0	Pore-pressure reading.
14-17		WRD()	F4.0	Load reading.
(Add an a each test r	dditional care reading)	d for		NOTE: Consolidation compression points must be read in with the effective stress increasing. A drop in effective stress of greater than 0.7 tsf will cause the computer to treat all subsequent readings as rebound-expansion data.
100 00040				
10 5. STA 1-10	NDARD CON	P()	F10.0	Place in these first ten columns the effective stress in tons per square foot applied for a given load increment. Express the stress as a decimal number. Any stress less than 0.1 tsf will be automatically changed to 0.1 tsf.
11-20		E()	F10.0	Dial reading at 100-percent primary consolidation for effective stress shown in columns 1-10. Dial readings should increase with increasing deflection and describe the change in inches in the specimen height. All dial readings must be expressed with a decimal.
(Add an ac for each da	dditional caro ata point)	1		NOTE: Standard consolidation test data cards must start with compression data points and increasing effective stress. Rebound or expansion curve data cards follow the last compression data point in order of decreasing effective stress.
				EFFECTIVE STRESS ORDER (tsf)
				0.25 0.50 1.0

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32.0
1.0
0.5
0.25

11. END OF DATA SET CARD1-80BLANKF10.0

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This is the last card to be enclosed with each particular set of test data. The entire card is blank and signals to the program the end of the current set of test data.

JOB CONTROL CARDS

The following groups of job control cards apply when the University of Kentucky's IBM 370 at McVey Hall is used. These cards describe the JCL necessary for a source deck run, object deck run, source deck run with production of an object deck, and a source or object deck run in which the plot output is suppressed.

A standard JOB card which includes the waste paper option is the following:

//P74EGM JOB(1009,51001,1,,,,,W), MCNULTY,MSGLEVEL=1, REGION=268K

FOR RUN WITH SOURCE DECK	FOR RUN WITH OBJECT DECK						
//standard JOB card //P74EGM EXEC FORTGCLP //FORT.SYSIN DD *	//standard JOB card //P74EGM EXEC FORTGLP //LKED.SYSIN DD *						
•	• •						
FORTRAN SOURCE DECK	FORTRAN Object Deck						
	,						
/*	/*						
//GO.SYSIN DD *	//GO.SYSIN DD *						
• •	•						
DATA	DATA						
	•						
	•						
/*							

To produce an object deck from a source deck run, change the second JCL card to the following:

//P74EGM EXEC FORTGCLP,PARM.FORT=DECK

To run either source or object deck versions of programs without production of plotted output, add the following card before the //GO.SYSIN DD * card:

//GO.PLOTTAPE DD DUMMY

NOTE: See Figure 33

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PLOT OUTPUT NOTATION

DEG	Degree of polynomial fit						
PO	In situ vertical stress						
EQ	In situ void ratio or vertical strain						
PC	Vertical presonsolication stress, P _c						
EC	Vertical preconsolidation strain						
OCR	Overconsolidation ratio						
CC	Compression coefficient, C _c (void-ratio analysis)						
CS	Expansion coefficient, C _s (void-ratio analysis)						
CR	Compression coefficient for strain analysis, usually referred to as the compression ratio						

SR Expansion coefficient for strain analysis, usually referred to as the swell ratio

TEST DESIGNATIONS

- STD Standard consolidation
- CG Controlled-gradient consolidation
- CRS Controlled-rate-of-strain consolidation

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Figure 28. Procedure for Removing Secondary Compression Effects of Controlled Data on Curve-Fitting Process.

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Figure 29. Search Boundaries for the Analytical Determination of the Point of Maximum Curvature.

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Figure 30. Search Boundaries for the Graphical Method to Select the Point of Maximum Curvature. BOUND2 Is Located in Straight Portion of Virgin Compression Curve.



Figure 31. Special-Case Use of BOUND1 by the Graphical Method as a default Location for the Initial Tangent Line when the Initial Portion of the Compression Curve Has a Slope Greater than E.

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Figure 32. Use of Search Boundaries to Select Straight Portion of Virgin Compression Curve.

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APPENDIX B

SAMPLE PROBLEM

CASAGR-0

1.1

TIME-INDEPENDENT CONSOLIDATION

TEST DATA ANALYSIS

PROGRAM CODING SHEET



1999 - State State (1997)

Number of problems, columns 1-2, right justified. If NOPROB is greater than one, all of the remaining

cards must be repeated for each problem.



For NPLOTS place a '1' in column 2. IPRINT - output option_for.the Analytical method to determine the point of maximum curvature. CODE '0' - Calculated radii printed out '1' - Calculated radii not printed out

NDEG	F RUNTYP	ZDEPTH	⊮ ^{KRAD}	SECOND	IIDIAL
1 2 3 4 5 6 7 8	9 10 11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35	36 37 38 39 40 41 4	12 43 44 45 46 47 48 49 50
011	2	12.0	2	31.2	
			KIND)	

NDEG . Degree of polynomial used in curve fitting.

RUNTYP . Type of consolidation test In COL. 13: CODE '0' - standard data '1' - controlled gradient data '2' - controlled rate of strain data

ZDEPTH Approximate field depth from which sample was recovered, in feet.

- KRAD Option for method to select point of maximum curvature. In COL. 31 : a blank or '0' causes the Graphical method to be used. : a '2' causes the Analytical method to be used.
- Type of deformation analysis. In COL. 33 : '0' is for both void ratio and strain analyses. : '1' is for void ratio analysis only. : '2' is for strain analysis only.
- SECOND Stress at start of secondary compression (controlled tests only). If left blank, SECOND has default value of 31.2 Tsf.
- IIDIAL
 Option to override the assumed dial reading-versus-deflection relationship specified by computer program for each type of consolidation test. In COLS.
 S0 : a blank or '0' changes none of the assumed relationships. : '1' will specify that increasing dial readings indicate specimen shortening.

 49.50
 : '1' will specify that increasing dial readings indicate specimen lengthening.

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BOUND1, BOUND2 - search boundaries for selection of point of maximum curvature using Analytical or Graphical methods.

BOUND3, BOUND4 - scarch boundaries for selection of the line representation of the virgin compression curve.



SAMPLE AND TEST DESCRIPTION TO BE USED	AS PLOT TITLE (BCD)		
1 7 3 4 5 6 7 8 9 10 11 12 13 14 15 6 17 18 9 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 41	2 43 44 45 46 47 48 49 50 51 52 53 54 55 56	57 58 59 60 61 62 63 64 65 66 67 68 69 70	71 72 73 74 75 76 77 78 79 80
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HOLE NO. (HOL) SAMPLE NO. (SAM) TEST OPERATOR (OPR)			
LOCATION (LOC)	SAMPLE DESCRIPTON (DE	5)	
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ELIZABETHTOWN 3 28 13 CTG3131-4/10-25K	ED SANDY CLAY		
SPECIMEN WEIGHTS DEFLECTION RDGS.			
SP. GR. INI. WET FIN. WET FIN. DRY INI. (SPG) (WTIW) (WTFW) (WTFD) (DEFI) FIN. (DEFF)			
t 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36			
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		INITIAL	FINAL
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BACK	ZERO	READI	NGS	INI. SAMPLE HEIGHT
PRESS.	DEFL	LOAD	P.P.	(SAMPH1)
(BP)	(DEFZ)	(WRZ)	(PPZ)	BLANK= default to 1"
12305	678910 (3.0	899.	15 16 37 18 19 20 996.	21 22 23 24 25 26 27 28 29 30

0.03937 4.090 0.16667

	ļ	INITIAL	INAL	
Can No.	1			
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Wt. can + dry	soil			
Wt. of can				
Wt. of water				
Wt. dry soil				
Mois. cont.				

NOTE: P. P. ZERO READING should be taken after B. P. application,

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CONTROLLED GRADIENT OR CONTROLLED RATE OF STRAIN CONSOLIDATION TEST DATA FORMAT

LABORATORY READINGS

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TR()	DEFR ()	PPR()	WRD ()
1234	5 6 7 8 9	10 11 12 13	14 15 16 17 18 19
	13.60	996	9.0/
	13.60	9.66	902
. 3	13.59	9.96	903
F	13.58	.996	904
5	13.57	.9.9.6	80.5
6	13.56	.9.9.6	.907
	13.53	996	90.B
12	13.53	9.9.7	910
13	13.52	9.92	.9.1.1
/5	13.50	.9.9.7	9.1.4
12	13.47	99.2	.21.2
19	1.3.145	.9.9.7	920
_21	13,42	.9.9.8	92.4
. 23	13.90	9.98	<u>,928 .</u>
_ 25	13.37	.998	2.3.2
2.7	13.35	.998	9.3.6
29	18.33	.998	8.40
<u>. 3</u> /	13.30	.998	945
_ 33	13.27	.999	999
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TIME	DEFL.	PP	LOAD	
TR()	DEFR (-)	PPR()	WRD ()	
1234	5 6 7 8 9	10 11 12 13	14151617	18 19
<u>.35</u>	13.25	. 899	.959	
. 3.7	13.22	999	958	
. 40	13.18	1000	966	
43	13.14	1.002	.975	
. 50	13.02	1006	8.66	
53	12.99	1007	10.03	
56	12 95	1000	1009	
59	12.82	1010	1015	
62	12 89	1011	1010	
	12 00	1000	1025	
- 60	12 83	1010	1023	
	12.00	1011		,
	12.00	1012	10,39	<u> </u>
80	1277	1.01.2	1038	
85	12.24	1012	1092	
-90	12.21	1012	1049	
	12.68	1014	1052	
100	12.66	1.014	1054	-
1.05	12.65	1013	1.05.6	
110	12.62	1013	1062	
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STANDARD CONSOLIDATION TEST DATA FORMAT

EFF: STRESS P() (TSF)	DIAL RDG. E() (IN)
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16 17 18 9 20
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	_ <u></u>
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	-
LAST CARD OF	DATA BLANK

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CASAGR - 0 LABORATORY CONSOLIDATION TEST DATA

CONTROLLED GRADIENT OR CONTROLLED RATE OF STRAIN CONSOLIDATION TEST DATA FORMAT STANDARD CONSOLIDATION TEST DATA FORMAT

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LABORATORY READINGS

TIME	DEFL. P	PILOAD	
TR ()	DEFR () PPI	R() WRD()	
1234	5 6 7 8 9 10 ii	12 13 14 15 16 17 18 19	
115	12.6110	2131.063	ļ
125	12.58 10	12/066	1
1.30	12.5610	12/072	
195	12.5310	111079	
150	12.5110	11/0.29	
1.55	12.99 10	1.1 1081	Į
165	12.4710	1.110B3	-
1.7.5	12.4510	1.11085	4
1,85	12.4310	1.1 1.088	4
1.95	12.4110	1.01.081	4
205	12.3910	101.095	4
225	12.3610	101100	4
235	12.3310	101,103	1
245	12.3110	101106	4
265	12.281.0	101.1.1.1	4
280	12.25 10	101.1.1.6	1
295	12.2210	101119	4
310	12.19/0	101129	4
325	12.17 10	1.01.128	_
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TIME	DEFL.	P. P.	LOAD
TR()	DEFR()	PPR()	WRD()
234	56789	10 12 13	141516171819
340	12.15	1,010	1.13.1
355	12.12	1010	1135
370	12.10	1010	1139
390	12.07	1010	1.1.43
410	12.04	1011	1148
\$30	12.01	1011	1152
4.45	11.89	1011	1156
460	11. 87	1011	1159
471	11.96	1.01.1	1161
508	11.81	1011	1169
546	11.87	1011	1128
584	11.82	1011	1186
621	11.28	1011	1193
659	11.2.3	1011	1200
682	11.20	1012	1207
134	11.66	1012	1214
272	11.63	1012	1720
\$10	11.60	1012	1226
000	<u> الم الم الم الم الم الم الم الم الم الم</u>	1000	1221
		OF DAT	
LAS	UARD	UT DAT	H DLANK

EFF STRESS	DIAL RDG.
(TSF)	(IN)
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16 17 18 1920
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CASAGR - O LABORATORY CONSOLIDATION TEST DATA

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CONTROLLED GRADIENT OR CONTROLLED RATE OF STRAIN CONSOLIDATION TEST DATA FORMAT

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STANDARD CONSOLIDATION TEST DATA FORMAT

DIAL RDG.

EFR STRESS

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LABORATORY READINGS

TIME DEFL. P. P. LOAD	TIME DEFL. P. P. LOAD	P() E()
TR() DEFR() PPR() WRD()	TR() DEFR() PPR() WRD()	(TSF) (IN)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 1 7 18 19	1 2 3 4 5 6 7 6 B 10 11 12 13 14 5 16 17 8 92
8851.1.531.91.21.237	1.50.0 1.1. 1.4 1.0.1.4 1.3.22	
922 11.5010121243	151511.1310141324	
96011. 7.7 10121.249	153511.1210141327	
9.9811.4410121.254	156011.1110141330	مراجع المراجع ا
103511.4110121259	15.8511.0910141334	•• •]
1073 1.1. 39 10121264	16.001.100 1019 1.338 .	
1.1.1.1.1	163011.0710141340,	
1.1.481.1.3910121224	166011.05/0191344	- to the design of the design
118611.3210121280	168511.0410141347	- the deside of the standing of the standing between the standing of the stand
1224 11-30 10121.285	1.7.2011.01/0161361	استقدت فاستقدا فالبو مروجه فالمراجع مروجه
1262 11.28 10121290	1.7.30 11.00101.71.362	
1.2991.12610121.295	1820 10.9510161366	
1.33711.2,310121301	1870 10.92 10.161380	whent I I i i hadred I i i hadred to be be
13.75 1.1. 21 1.013 1307	19.00 1.0.90 101.61.388	
1.4001.1.201.0131.309	1937 10.88 10.16 1.390.	
142011.1.910131312	1975 10.86 1016 1394	
144011.1810131315	2013 10.87 10161.401 .	······································
141511.15101313.19	205010,0210161414	
199011.1510141321	208810.7910171420	
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CASAGR - 0 LABORATORY CONSOLIDATION TEST DATA

CONTROLLED GRADIENT OR CONTROLLED RATE OF STRAIN CONSOLIDATION TEST DATA FORMAT

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STANDARD CONSOLIDATION TEST DATA FORMAT

LABORATORY READINGS

		EFF STRESS P()	DIAL RDG. E()
1 2 3 4 5 6 7 8 9 1011 12 (3 (4)5 16 17 18)9			11 12 13 14 15 16 17 18 92
2126 10. 77 1017 1423	28401.0.67/00/1.430		
2163 10. 75 1017 1429	285510.671.00114.30		
220110.7310161428	2860 1.0.67 1.00 1 1.4.19	<u></u>	- Arriel
2239 10.72 0.15 19-29	2865/0.67 400/1909		
221710.7210141427	287010.67700012970		
235210 2010111430	288010.68 10001.2001	_ <u></u>	
239010.2010091430	2885 10.68 10001.360		
242710.691.0081.430	2,890 10.68 9991.348		hadan da a da d
246510.6910071430	2895 10.69 999 1.335		
2503/0.6810061330	290010.69 998 13.23		مىرى مەلىيە ئەرىپى مەلىيە بىرىمى مەلىيە بىرىمى مەلىيە بىرىمى مەلىيە بىرىمى مەلىيە بىرىمى مەلىيە بىرى
254110.6810051430	2905/0.70 998/309		······································
252810.6810041430	291010.70 9.981283		<u></u>
261610.68100314.30	29.15 10.70 997 1282		
265910.6810021430	292010.71 9971.221		la <u>i i i i i i i i i i i i i i i i i i i</u>
2229 10 62 1002 1430	292010.22 9961226		
296210.67/00/1430	293510.22 9951235		
280510.6710011430	29,4010. 73 9951220		
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CONTROLLED GRADIENT OR CONTROLLED RATE OF STRAIN CONSOLIDATION TEST DATA FORMAT

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LABORATORY READINGS

TIME	DEFL.	P. P. LOAD
TR()	DEFR()	PPR()WRD()
1234	56789	10 11 12 13 14 15 16 17 18 19
2945	10.23	.99.4 1208
29,50	10.74	.9.93 1.195
2955	10.75	9921183
2960	10.76	9911168
2965	10.77	9.901155
29,20	10.78	9891144
2975	10.28	8891133
2980	10.29	9.8.8 1.1.18
2.985	10.80	9871113
2990	10.81	9871107
2995	10.81	9861102
3000	10.82	986 1096
3005	10.82	9851089
3015	10.83	985 1083
30,2,5	10.84	984 10.28
30.40	10.85	983 1.020
30.55	19.86	.983 1063
30.70	10.87	9831056
30,20	10.87	98,21050
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TIME	DEFL.	P? P?	LOAD		
TR ()	DEFR()	PPR()	WRD ()		
2 3 4	56769	10 11 12 13	14 15 16 17	18 19	
3105	10.88	<u>, 98</u> 2	1.043		
31.25	10.89	1982	1.040		
<u>3 140</u>	10.89	982	1037		
<u>3 15 5</u>	10.90	982	1.03.3		
31.70	10.80	<u>982</u>	1030		
31,90	10.91	.982	1027	_1.	
3205	10.91	982	1024		
3,220	10.92	98,2	1020		
<u>3,</u> 235	10.92	<u>98,2</u>	1012	1	
3255	10.93	982	1019		
3270	10.93	982	10.10		
<u>3,2Ø5</u>	10.94	.98,2	1007		
3,3,25	10.25	.981	1003	_ L	
9440	10.99	993	995	•	
]		
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EFF STRESS	DIAL RDG.
(T SF)	(IN)
234567890	11 12 13 14 5 6 17 18 10 20
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CONTROLLED GRADIENT CONSOLIDATION TEST DATA REDUCTION

CG-13 ELIZABETHTOWN H-3 S-28 2.5 PSI

TEST NO. 13	HOLE NO. 3
LOCATION ELIZABETHTOWN	SAMPLE NO. 28
CATE 3/31-4/10/75	OPERATOR CTG
SCIL TYPE - RED SANDY CLAY	
BACK PRESSURE 10.00 PSI	,

	INITIAL	FINAL
WATER CONTENT	26.7%	23.4%
VOID RATIC	0.80	0.62
DEG. OF SATURATION	90•4%	102.3%

CEGREE POLYNOMIAL =11 PT. CF MAX. CURVATURE SELECTED BY THE ANALYTICAL METHOD SEARCH BOUNDARIES FOR PT. DF MAX. CURVATURE: 1.00 TSF 13.00 TSF SEARCH BOUNDARIES FOR VIRGIN COMPRESSION CURVE: 10.0C TSF 28.00 TSF DEPTH FOR INSITU STRESS CALCULATION: 11.00 FEET SECONDARY COMPRESSION AT 31.20 TSF

- H.C. - 1

INSITU VERTICAL STRESS = 0.653 TSF INITIAL VOID RATIO (E0) = 0.799

RANGES OF STRESS-VOID RATIO SETTLEMENT PARAMETERS

	PROBABLE	-	MINIMUM
VERTICAL PRECONSOLIDATION STRESS	9.545 TSF	-	8.112 TSF
PRECONSOLIDATION STATE'S VOID RATIC	•• 0.764	-	0•766
OVERCONSCLIDATION RATIO (OCR)	• 14.613	-	12.419
COMPRESSION INDEX (CC)	-0.291	-	-0.279
SWELL EXPANSION INDEX (CS)	-0.030		

2 C S 11 (24)

STRAIN ANALYSIS STRAIN ANALYSIS STRAIN ANALYSIS INSITU VERTICAL STRESS = 0.653 TSF INITIAL VOID RATIO (E0) = 0.799 RANGES OF STRESS-STRAIN SETTLEMENT PARAMETERS PROBABLE - MINIMUM VERTICAL PRECONSOLIDATION STRESS PRECONSOLIDATION STATE'S VERTICAL STRAIN OVERCONSOLIDATION RATIO (GCR) CCMPRESSION RATIO (CR)

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Sector Contractor

INPUT DATA

SWELL RATIG (SR) -0.017

TIME	CEFL. RCG.	P.P. RDG.	LCAD RDG.
134561235791357913570303692505050605065040555555555555550505050 111111122222233333445555556677889900011234556789023455555550505050 1111111122222233333445555555555555555555	13.455576332075284229529730741866521865319775318222297752	996 996 996 996 996 996 997 997 997 997	901. 903. 904. 907. 908. 911. 914. 9170. 924. 924. 924. 924. 935. 945. 945. 945. 945. 945. 945. 945. 94
3220	12.12	1010.	1135.

370.	12.10	1010-	1139.
370• 410• 430•	12.07 12.04 12.01	1010. 1011. 1011.	1143. 1148. 1152.
445. 400. 471.	11.99 11.97 11.96	1011. 1011. 1011.	1156。 1159。 1161。
508. 546. 584.	11.91 11.37		1169. 1178. 1186-
621 • 659 •	11.78 11.73	1011.	1193. 1200.
734.	11•70 11•66 11•63	1012• 1012• 1012•	1214.
810 • 848 • 885 •	11.60 11.56 11.53	1012 • 1012 • 1012 •	1226. 1231. 1237.
922.	11.50 11.47		1243. 1249. 1254.
1035.	11•44 11•41 11•39	1012.	1259.
1111• 1148• 1186•	11•37 11•34 11•32	1012.	1269• 1274• 1280•
1224 • 1262 • 1299 •	11.30 11.28 11.26	1012 • 1012 • 1012 •	1285. 1290. 1295.
1337. 1375.	1 1 • 2 3 1 1 • 2 1 1 1 • 2 1	1012 • 1013 •	1301. 1307.
1420.	11.19	1013.	1312.
1475• 1490• 1500*	11.15 11.15 11.14	1013 • 1014 • 1014 •	1319. 1321. 1322.
1515. 1535. 1560.	11.13 11.12	1014 • 1014 • 1014 •	1324• 1327• 1330•
1585.	11.09 11.08	1014 • 1014 •	1334. 1338.
1660.	11.05	1014 • 1014 • 1014 •	1344. 1347.
1720• 1730• 1820•	11•01 11≈00 10•95	1016• 1017• 1016•	1361. 1363. 1366.
1870. 1900. 1937.	10.92 10.90 10.88	1016 • 1016 • 1016 •	1380. 1388. 1390.
1975.	10•86 10•84	1016.	1394. 1401.
2088. 2088. 2088.	10.79	1017.	1414. 1420. 1423.
2088. 2088. 2088.	10,75 10,73 10,72	1017. 1016. 1015.	1427• 1428• 1429•
2088. 2082. 2088.	10.72 10.71 10.70	1014 • 1013 •	1429. 1429. 1430.
2088	10.70	1009.	1430.

2088 2088 2088 2088 2088 2088 2088 2088	10.59 10.59 10.68 10.68 10.68 10.68 10.67 10.67 10.67 10.67 10.67 10.67 10.67 10.68 10.68 10.68 10.68 10.68 10.68 10.68 10.68 10.68 10.68 10.68 10.68 10.69 10.69 10.70 10.70 10.71 10.72 10.73 10.73 10.75	1003 1007 1006 1005 1004 1003 1002 1002 1002 1001 1001 1001 1001 1000	1430 1430 1430 1430 1430 1430 1430 1430
2965 2975 2980 2985 2985 2985 2990 2995 3000 3005 3015 3025 3025 3070 3105 3125 31455 31455 31455 31455 31455 31455 3170 3220 32255 3225 3225 3255 3225 325 3	10.76 10.77 10.78 10.79 10.80 10.81 10.82 10.82 10.82 10.82 10.83 10.84 10.85 10.87 10.87 10.88 10.87 10.887 10.889 10.899 10.90 10.91 10.92	990 989 989 988 987 987 986 986 985 985 985 983 983 983 982 982 982 982 982 982 982 982 982 982	1158 1155 1144 1133 1118 1113 1107 1096 1089 1083 1078 1070 1063 1056 1050 1043 1056 1050 1043 1033 1033 1033 1027 1024 1020 1017 1024 1020 1017 1024 1020 1017 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1020 1027 1024 1027 1024 1027 1026 1033 1030 1027 1024 1027 1024 1027 1024 1027 1023 1027 1028 1027 1028 1027 1028 1027 1028

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CTDECC	VUID KATIO		TIME(MTN)
			1.1.4.00.1.1.1.1.1
(1)5F7			
0.11998 0.23996 0.29995 0.35995 0.47993 0.53992 0.65190 0.71189 0.89186 1.07183 1.25181 1.48377 1.72374 1.96370 2.20366 2.44363 2.74358 2.97555 3.51547 3.9873912 6.15106 6.50301 6.84695 7.07891 7.32688 7.3787891 7.326881 7.3787891 7.326881 7.9707891 7.326881 7.9707891 7.326881 7.9707892 9.03462 9.15460 9.282552 9.702552 9.89048 10.25041 10.37838 10.91829 11.037838 10.91829 11.037838 10.91829 11.037838 10.67833 10.91829 11.037838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.25041 10.37838 10.91829 11.037838 10.25041 10.37838 10.91829 11.038597 13.38594	0.79869 0.79800 0.79731 0.79592 0.79385 0.79385 0.79316 0.79316 0.79177 0.78970 0.78831 0.78624 0.78485 0.78278 0.78140 0.73001 0.77586 0.77586 0.77586 0.775867 0.75857 0.75649 0.755857 0.75649 0.755857 0.75857 0.74819 0.74819 0.74819 0.74542 0.74335 0.74819 0.743505 0.73297 0.73089 0.73297 0.73089 0.73297 0.73089 0.73297 0.73089 0.72674 0.72467 0.72328 0.72467 0.72328 0.72190 0.72052 0.71913 0.71291 0.71033 0.70737 0.70530 0.70322 0.70115	$\begin{array}{c} 0.0000\\ 0.00038\\ 0.00077\\ 0.00115\\ 0.00154\\ 0.00269\\ 0.00269\\ 0.00308\\ 0.00385\\ 0.00500\\ 0.00577\\ 0.00692\\ 0.00769\\ 0.00962\\ 0.00769\\ 0.00962\\ 0.0138\\ 0.01154\\ 0.01269\\ 0.01346\\ 0.01462\\ 0.01615\\ 0.01769\\ 0.02346\\ 0.02500\\ 0.02615\\ 0.02731\\ 0.02808\\ 0.02962\\ 0.030192\\ 0.03192\\ 0.03192\\ 0.03192\\ 0.03192\\ 0.03654\\ 0.03654\\ 0.03769\\ 0.03654\\ 0.03769\\ 0.03808\\ 0.03923\\ 0.03654\\ 0.03769\\ 0.03808\\ 0.03923\\ 0.03654\\ 0.03769\\ 0.03808\\ 0.03923\\ 0.03654\\ 0.03769\\ 0.03808\\ 0.03923\\ 0.04000\\ 0.04115\\ 0.04269\\ 0.04346\\ 0.04423\\ 0.04569\\ 0.04346\\ 0.04423\\ 0.04569\\ 0.04346\\ 0.04423\\ 0.04569\\ 0.04346\\ 0.04423\\ 0.04569\\ 0.04346\\ 0.04423\\ 0.04569\\ 0.04346\\ 0.04423\\ 0.04569\\ 0.04346\\ 0.04423\\ 0.04569\\ 0.04365\\ 0.04962\\ 0.05192\\ 0.05192\\ 0.05308\\ 0.05423\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ 0.0552\\ $	$\begin{array}{c} 1 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 4 & 0 & 0 & 0 & 0 \\ 6 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\$

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ADDITIONAL INPUT DATA			
CALIƏRATION FACTORS: DEFLECTION = C.03937	LÜAD = 4.09000	PRESSURE = 0.16	667
EQUIPMENT ZERG READINGS	:		00/ 0000
UEFLECTION = 13.000	EUAD = 899.000	PORE PRESSURE =	996.0000
DIAMETER OF SPECIMEN # .	2.5JU INCHES	TRIFIAE REIGEL OF S	AMPLE = I.OUU INCHES

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CCRE USAGE DEJECT CODE= 59952 EVTES+ARRAY AREA= 116648 PYTES+TOTAL AREA AVAILABLE= 190464 BYTES DIAGNOSTICS NUMBER OF ERRORS= 0+ NUMBER OF WARNINGS= 0+ NUMBER OF EXTENSIONS= 0 CCMPTLE TIME= 1.50 SEC+EXECUTION TIME= 4.12 SEC+ 8.35.03 FRIDAY 18 MAR 77 WATFIV - JAN 1976 V1L5 BSTOP

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CG-13 ELIZABETHTOWN H-3 S-2B 2.5 PSI



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APPENDIX C

COMPUTER SYSTEM DESCRIPTION

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COMPUTER SYSTEM DESCRIPTION

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Computer

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IBM
System/370 Model 165 II
Single Precision - 4 bytes, 32 bits
Double Precision - 8 bytes, 64 bits
700 nano seconds
16 mega bytes (maximum)
IBM/3211 Chain Printers
IBM/2821-5 I/O Control Unit
IBM/3505 Card Reader
IBM/029 Card Key Punch
IBM Tape Unit 2401 processes tapes at 75 inch

IBM 7ape Unit 2401 processes tapes at 75 inches/second Uses 800 bytes per inch density magnetic tape Processes 60,000 bytes/second Uses either 9 or 7 track tapes Calcomp 663 Digital Incremental Drum Plotter

Plotters

Source Program's Storage Requirements

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Total storage requirements of program around 268^k 42556 MAIN ANARAD 44760 GRARAD 4490 CASPLT 15308 CONSGRA 5858 958 FLSQFY 1904 FGEFYT FCODA 928 Plot buffer - up to 74^k

 A statistic 		 가장 아이들이 가지 못했다. 그 가지 아이들이 가지 않는 것이 하는 것이 없다.	A STATE AND A STAT	· · · · · · · · · · · · · · · · · · ·
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APPENDIX D

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APPENDIX E

CASAGR-O COMPUTER PROGRAM

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*		*	0020
		*	0030
*	CASAGR - O	:	0040
2.5		2.7	0050
3,0		2:	0060
2 5	IST VERSION, MAY 1976	210	0070
*		*	0080
2.	UPDATES, VERSIONS: NONE	**	0090
2.2		1 /2	0100
2,2		*	0110
***	***************************************	*****	0120
**		*	0130
27		*	0140
*	COMPUTER APPLICATION	**	0150
		<i>\$</i> }	0160
14	OF THE	\$	0170
*	01 112		0180
*	CASAGRANDE AND SCHMERTMANN	*	0190
*		х х	0200
*		*	0200
*		*	0210
2,2		*	0220
*	BY	*	0250
:::		ň	0250
<i></i>		*	0250
*	EDMUND GREGORY MONULTY		0200
*		ż	0210
*		*	0200
****	*************		0290
*			0310
**	THIS COMPLITED DROCDAM ENDLOVS A		0310
*			0320
	THE SEMI-LOCADITUMIC DEDDESENTATION	••• ••	0350
	OF THE TIME INDEDENDENT STORS-	**	0340
	DEFORMATION CHRYES FOR THE CON	-1-	0350
	VENTIONAL CONTROLLED CRADIENT	**	0360
 	VENTIONAL, CUNTRULLED GRACIENT,	**	0370
**	AND LUNIRULLED RATE OF STRAIN LUN-	1,	0380
	SULIDATION TESTS. THE CASAGRANDE	145 - No	0390
-1 -1	AND SCHMERTMANN CUNSTRUCTIONS ARE	1,1 -1-	0400
 	EMPLOYED TO DETERMINE THE PRECON-	44 	0410
	SULIDATION PRESSURE AND THE CUEFFI-	**	0420
	CIENIS OF COMPRESSIBILITY FOR THE	2,2	0430
545 314	CUMPRESSION AND EXPANSION-REBUUND	*	0440
ياري مار	UATA LUKVES+	2.	0450
ېږد د مان مان مان	اسه اسه سام سام سام وی	23 	0460
	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	r nr nr nr nr nr	0470
2 <u>.</u> 2		26	0480
21		*	0490

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с	1 /2	*	0500
С	*	**	0510
С	********	******	0520
С			0530
С	THIS PROGRAM IS WRITTEN IN FORTE	AN IV AND PRODUCES PLCT-	0540
С	TED OUTPUT USING THE IBM 370/165 II A	D CALCOMP 663 DRUM PLOTTER.	0550
С	THIS PROGRAM WAS DEVELOPED BY		0560
С			0570
С	THE KENTUCKY DEPARTMENT (F TRANSPORTATION	0580
С			0590
С			0600
С	BUREAU OF HIGH	IWAYS	0610
С			0620
С	DIVISION OF RES	EARCH	0630
С	SOLLS SECTI	ON	0640
С	533 S. LIMESTON	IE ST.	0650
C	LEXINGTON, KEN	UCKY	0660
C	40508		0670
Ċ	PH• 606 254-447	5 EXT 28	0680
L C			0640
c c			0700
c c		a na na 22 na	0710
r			0720
r	AVAILABLETY OF THE PROCEAMIS CARD	DECK AND/OR LISTING ATL	0750
r	RE CONSIDERED ON THE MERITS OF FACH IN	DIVIDUAL INCUIRY, THE USER	0740
ř	IS TATALLY RESPONSIBLE FOR THE RESULTS	DERIVED FROM THIS	0760
č	PROGRAM'S USE.		0770
č			0780
č	THIS PROGRAM HAS THE CAPABILITY OF	EMPLOYING A VOID RATIO	0790
Ċ	AND/OR VERTICAL STRAIN DEFORMATION AND	ALYSIS. ALSD. THE PROGRAM	0800
С	PROVIDES FOR THE SPECIFICATION OF CAL	BRAION FACTORS COMMONLY USED	0810
С	AND A MEANS OF MATCHING A DIAL GAUGE !!	S INCREASING DIAL READINGS	0820
С	WITH INCREASING DOWNWARD DEFLECTION.		0830
С			0840
C	THE PROGRAM ALSO DETERMINES THE IN	ITIAL AND FINAL TEST	0850
C	PROPERTIES OF THE CONSULIDATION TEST S	PECIMEN.	0860
L C			0870
C C	THE METHUD UF ANALYSIS IS BASED UN	A LEAST SQUARES LURVE	0880
c c	DATA IS EITTED WITH A USED SDECIELED (DOLANCWINE OF THE TO THE	0890
c c	ELEVENTH DECREE THE EXDANSION-DEBOIN	ID CHOVE DATA IS EITTED	0900
r	WITH A LEAST SQUARES STRAIGHT LINE.	ISING THE MATHEMATICAL	0920
r	CHARACTERISTICS OF THESE TWO FUNCTION	SA THE CASAGRANDE AND	0930
r	SCHMERTMANN CONSTRUCTIONS ARE EMPLOYED		0940
č			0950
č	THE POINT OF MAXIMUM CURVATURE FOR	CASAGRANDE®S CONSTRUCTION	0960
č	MAY BE DETERMINED BY TWO COMPLETELY D	FFERENT METHODS. THE	0970
č	ANALYTICAL METHOD USES THE MATHEMATIC	AL DEFINITION OF THE RADIUS	0980
č	OF CURVATURE TO SELECT THE POINT OF M	XIMUM CURVATURE. THE	0990
С	GRAPHICAL METHOD IS A NEWLY PROPOSED /	TETHOD WHICH USES THE	1000
С	GEOMETRICAL CHARACTERISTICS OF THE CO	NSCLIDATION CURVES TO	1010
С	SELECT THE POINT OF MAXIMUM CURVATURE		1020
С			1030
С	DATA POINTS, FITTED CURVES, AND THE	INTERMEDIATE	1040
С	CONSTRUCTIONS INVOLVED IN THE CASAGRA	DE AND SCHMERTMANN	1050
С	PROCEDURES ARE SHOWN IN THE PLOTTED OU	JTPUT ALONG WITH THÉ	1060
С	FINAL RESULTS.		1070
С			1080
С			1090

E-2

C C	***************************************	1100
C C	THE PROGRAM USES THE FOLLOWING SUBROUTINES AND COMPUTER SUPPLIED BUFFERS:	1120 1130
C C	1. MAIN PROGRAM	1140 1150
C C	2. SUBROUTINE CONGRA - INPUT AND REDUCTION OF	1160 1170
C C	CONTROLLED CONSCLIDATION DATA.	1180 1190
C C	3. SUBRCUTINE FLSQFY ~ LEAST SQUARES CURVE	1200 1210
C	FITTING BY CRDINARY	1220
C		1240
C	4. SUBRUUTINE GRARAD - GRAPHICAL METHOD TO DETERMINE POINT OF MAX	1250
C	CURVATURE.	1270
C C	5. SUBRCUTINE ANARAD - ANALYTICAL METHOD TO DETERMINE POINT OF MAX	1 290 1 300
C C	C UR VATUR E.	1310 1320
Č	6. SUBROUTINE CASPLT - PLOTTING OF RESULTS	1330
Č	7. SUBROUTINE PLOTS - SETS UP PLOT LIBRARY	1 350
C	COMPUTER.	1360
C C	8. PLOT LIBRARY SUBROUTINES: AXIS	1 380 1 390
C C	DASHLN LINE	1400 1410
C C		1420 1430
C	PLUT SCALE	1440
C	SYMBOL	1460
C	9. LIBRARY FUNCTIONS: ABS	1470
C	ATAN ASIN	1490
C C	DSQRT SIN	1510 1520
C C	ΤΑΝ	1530 1540
Č	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	1550
C	POSSIBLE DIFFICULTIES WITH RESULTS:	1570
C	11 IF UNDULATIONS PRESENT IN FITTED CURVE;	1590
C	POSSIBLE CAUSES: - LOW DEGREE POLYNOMIAL LIMITATION DUE	1610
C	THE CASE, THE ONLY POSSIBLE COURSE	1620 1630
C C	OF ACTION IS TO TRY A LOWER Degree Polynomial.	1640 1650
Ċ	HARD TO FIT DATA. FITHER SCATTERED	1660
C	DATA OR SHAPE CHARACTERISTICS OF DATA	1680
L	IUU EXIKEME IU BE FIIIED BY A PULYNUMIAL.	1040

C C 1700 - TOO LOW A DEGREE POLYNOMIAL, USE HIGHEST 1710 С POSSIBLE DEGREE. 1720 С 1730 2) IF POINT OF MAXIMUM CURVATURE DOES NOT EXIST WHEN ANALYTICAL 1740 С С METHOD IS USED; 1750 С 1760 С POSSIBLE CAUSES: - SEARCH BOUNDARIES NEED TO BE CHANGED. 1770 С 1780 С - POINT OF MAX CURVATURE NOT WELL ENOUGH 1790 С DEFINED TO BE AMALYTICALLY DETERMINED. 1800 С 1810 С - SIMPLY DOES NOT EXIST. 1820 С POSSIBLE SOLUTION IS TO USE GRAPHICAL 1830 С METHOD. 1840 С 1850 С 1860 С 1870 С 1880 С 1890 С 1900 С 1910 С VARIABLE DEFINITIONS 1920 С 1930 1940 С 1950 С Α 1960 HORIZONTAL PEN POSITION AT WHICH LETTER "A" IS PLOTTED. THIS С 1970 С VARIABLE IS COMPUTED IN SUBROUTINE CASPLT. 1980 С 1990 ALPHA() С 2000 SCRATCH ARRAY FOR SUBROUTINE FLSQFY. С 2010 С 2020 С AR 2030 С AREA OF TEST SPECIMEN IN INCHES. 2040 С 2050 С ΑY 2060 SEE CEPTA. С 2070 С 2080 С 8 2090 С HORIZONTAL PEN POSITION AT WHICH LETTER 'B' IS PLOTTED. 2100 С 2110 B() С 2120 INCREMENTAL ABSCISSAE GENERATED ON THE FITTED POLYNOMIAL IN C 2130 С SEARCHING FOR THE VIRGIN COMPRESSION CURVE. 2140 С 2150 С PCD 20A4 2160 PLOT TITLE AND COMPUTER PRINTOUT HEADING. 2170 С 2180 С С BETA() 2190 С SCRATCH ARRAY FOR SUBROUTINE FLSQFY. 2200 С 2210 С BISECT() 2220 С STORAGE LOCATION OF GENERATED INCREMENTAL ORDINATES USED IN 2230 PLOTTING THE LINF REPRESENTING THE ANGLE DISECTOR USED IN THE С 2240 С GRAPHICAL METHOD TO SELECT THE POINT OF MAXIMUM CURVATURE. 2250 С 2260 C BIG 2270 С THE SELECTED SLOPE FOR THE LINE REPRESENTATION OF THE VIRGIN COM-22.90

2290

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PRESSION CURVE.

ы. Эк. Sector and a sector of the

```
2300
C
C BOUND
                                                                                2310
      TEMPORARY STORAGE LOCATION FOR BOUNDI IN SUBROUTINE GRARAD.
                                                                                2320
С
С
                                                                                2330
C BOUND1, B1
                                                                                2340
C BOUND2, B2
                                                                                2350
C BOUND3, B3
                                                                                2360
                                                                                2370
C BOUND4, B4
C BOUNDS, B5
                                                                                2380
С
 BOUND6, B6
                                                                                2390
      BOUNDARIES 1 AND 2 ARE ABSCISSA SEARCH BOUNDARIES FCR POINT OF
C
                                                                                2400
      MAXIMUM CURVATURE. BOUNDARIES 3 AND 4 ARE ABSCISSA SEARCH BOUND-
С
                                                                                2410
С
      ARIES FOR THE SELECTION OF LINE REPRESENTATION OF THE VIRGIN COM-
                                                                                2420
      PRESSION CURVE. BOUNDARIES 5 AND 6 ARE GENERALLY USED AS
С
                                                                                2430
      TEMPORARY STORAGE LOCATIONS FOR BOUND1 AND BOUND2 IN SUBROUTINE
С
                                                                                2440
С
      ANARAD.
                                                                                2450
                                                                                2460
C
С
 BOVER()
                                                                                2470
      STORAGE VARIABLE FOR THE LOGARITHM. BASE TEN. OF THE OVERBURDEN
С
                                                                                2480
      PRESSURE AND THE ARGUMENTS NEEDED IN PLOTTING THE OVERBURDEN
С
                                                                                2490
С
      PRESSURE.
                                                                                2500
                                                                                2510
C
 ΒP
С
                                                                                2520
      BACK PRESSURE.
С
                                                                                2530
С
                                                                                2540
C BY
                                                                                2550
С
      VERTICAL INTERCEPT AT THE ZERO ABSCISSA OF LINE 'B'.
                                                                                2560
                                                                                2570
С
C B1 = B()
                                                                                2580
                                                                                2590
C B2 = B( )**2
C B3 = B() **3
                                                                                2600
C B4 = B() ***4
                                                                                2610
C B5 ≠ B( )≎∻5
                                                                                2620
C B6 = B( )***6
                                                                                2630
C B7 = B()**7
                                                                                2640
C BB = B() \approx 8
                                                                                2650
                                                                                2660
C B9 = B() **9
C B10 = B() \approx 10
                                                                                2670
      VARIABLES USED TO SET UP THE TERMS OF THE SPECIFIED POLYNOMIAL FOR
                                                                                2680
С
      PAIRING WITH THEIR RESPECTIVE COEFFICIENTS. THE RESULTANT
                                                                                2690
С
      EQUATION IS USED TO COMPUTE THE SLOPE AT EACH OF THE GENERATED
                                                                                2700
С
С
      ABSCISSA.
                                                                                2710
                                                                                2720
C
C C ()
                                                                                2730
C
      COEFFICIENT VARIABLE USED FOR SETTING UP ALL POLYNOMIAL EQUATIONS.
                                                                                2740
                                                                                2750
С
C CC( )
                                                                                2760
      COEFFICIENT ARRAY USED FOR STORING THE COEFFICIENTS OF THE COM-
                                                                                2770
С
С
      PRESSION DATA'S FITTED POLYNOMIAL.
                                                                                2780
                                                                                2790
С
 CCl
                                                                                2800
С
      COMPRESSION INDEX AS DETERMINED BY SCHMERTMANN'S CONSTRUCTION.
                                                                                2810
C
С
                                                                                2820
C CEPTA
                                                                                2830
C CEPTB
                                                                                2840
C CEPTBI
                                                                                2850
C CEPTC
                                                                                2860
C CEPTD
                                                                                2870
                                                                                2880
C CEPTE
C CEPTF
                                                                                2890
```

12.1

Annual state of a

C CEPTG 2900 C CEPTAN 2910 VERTICAL INTERCEPTS AT THE ZERO ABSCISSA FOR LINES A. B. BISCECT. С 2920 C, D, E, F, G, AND TANGEN RESPECTIVELY. C 2930 ٢ 2940 C CHECK 2950 USED TO CHECK IF PERCENT DIFFERENCE CRITERIA FOR SLOPE CONSTANCY C 2960 HAS BEEN SATISFIED. IF CHECK IS NOT SET EQUAL TO ONE, THE PERCENT С 2970 DIFFERENCE CRITERIA HAS NOT BEEN SATISFIED AND THE MAXIMUM SLOPE С 2980 FOUND IS USED. 2990 ſ С 3 00Ü C C R 3010 С COMPRESSION RATIO. 3020 С 3030 C CRMIN 3040 MINIMUM VALUE OF COMPRESSION RATIO OR COMPRESSION INDEX (I.E. C 3050 ſ THE SLOPE OF LABORATORY VIRGIN CURVE, LINED). 3060 С 3070 C C S 3080 SWELL-EXPANSION-REBOUND COEFFICIENT. 3090 C С 3100 C CSEVT() 3110 DUMMY VARIABLE USED PRIMARILY FOR STORAGE OF VOID RATIOS OF COMſ 3120 ſ PRESSION CURVE DATA PUINTS PRIOR TO CUTPUT. 3130 С 3140 C CSEVTE() 3150 DUMMY VARIABLE USED PRIMARILY FOR STORAGE OF VOID RATIOS OF C 3160 REPOUND-EXPANSION DATA POINTS PRIOR TO CUTPUT. ſ 3170 С 3180 C CURVE() 3190 COMPUTED ORDINATES AT THE GENERATED ABSCISSA LOCATIONS ALONG THE ſ 3200 COMPRESSION CURVE'S FITTED POLYNOMIAL. С 3210 С 3220 C CURVET() 3230 COMPUTED ORDINATES OF THE FITTED POLYNOMIAL WHICH ARE USED FOR С 3240 С PLOTTING PURPOSES. 3250 С 3260 С C X 3270 HORIZONTAL PEN POSITION AT WHICH THE LETTER *C* IS PLOTTED. THIS С 3290 VARIABLE IS COMPUTED IN SUBROUTINE CASPLE. 3290 С 3300 С C CY 3310 С VERTICAL INTERCEPT OF LINE *C* AT THE ZERO ABSCISSA. 3320 С 3330 С D 33,40 HORIZONTAL PEN POSITION AT WHICH THE LETTER 'D' IS PLOTTED. THIS С 3350 С VARIABLE IS COMPUTED IN SUPRCUTINE CASPLT. 3360 С 3370 C DASH() 3390 GENERATED ABSCISSA VALUES WHICH WILL BE USED IN PLOTTING DASHED C. 3390 ſ LINES. 3400 С 3410 C DASHY() 3420 GENERATED ORDINATE VALUES WHICH WILL BE USED IN PLOTTING DASHED ٢ 3430 С LINES. 3440 С 3450 C DAT() 3A4 3460 С TEST DATE. 3470 C 3480 C DATA() 3490

14 B.C.

C C	PRINCIPLE SCRATCH ARRAY USED FOR PLOTTING PURPOSES.	3500 3510
C UC C C	DEFLECTION CALIBRATION FACTOR.	3520 3530 3540
C DE C	FF FINAL DEFLECTION READING TAKEN AT END OF TEST.	3550 3560 3570
C DE C	FI INITIAL DEFLECTION READING TAKEN JUST REFORE START CF TEST.	3580 3590 3600
C DE C C	FR() DEFLECTION READING ARRAY OF COMPRESSION DATA FROM CONTROLLED CON- SCLIDATION TESTS.	3610 3620 3630
C DE C C	FRE() DEFLECTION READING ARRAY OF EXPANSION-REBOUND DATA FROM CONTROLLED CONSOLIDATION TESTS.	3650 3660 3670
C DE	FZ DIAL READING TAKEN WHEN SAMPLE IS AT ITS INITIAL HEIGHT.	3690
C DE C C C	LLOG PORTION OF LGG CYCLE PER INCH OF PLOT PAPER. IN PLCTTING SUB- PROGRAM CASPLT, DELLOG IS SET EQUAL TO 0.300 FOR THREE LOG CYCLES OVER TEN INCHES OF PAPER.	3720 3720 3730 3740 3750
C DE	LTA INCREMENT TO BE USED IN GENERATION OF EVENLY SPACED VALUES OF A GIVEN PARAMETER.	3770 3770 3780 3790
C DE	S 4A4 SAMPLE DESCRIPTION.	3810
C DF	LI() CALCULATED DEFLECTION IN INCHES FOR CONTROLLED CONSOLIDATION TEST COMPRESSION DATA.	3850 3840 3850 3860
C DF C C	LIE() CALCULATED DEFLECTION IN INCHES FOR CONTROLLED CONSCLIDATION TEST EXPANSION-REBOUND DATA.	388(389(390(390(
	A DIAMETER OF CONSOLIDATION TEST SPECIMEN IN INCHES.	3920
C DT	FF	3946
	PERCENT DIFFERENCE BETWEEN CONSECUTIVE SLOPES ON THE COMPRESSION DATA'S POLYNCMIAL REPRESENTATION.	3960
	FF, DIFF1 DIFFERENCE IN EFFECTIVE STRESS BETWEEN CONSECUTIVE CONTROLLED CONSELIDATION TEST COMPRESSION DATA POINTS.	3990 3990 4000 4010
C DY C	SEE CEPTD	4030 4040 4040
C E(C C C) VARIABLE WHICH STURES DIAL READINGS, VOID RATIOS, AND VERTICAL STRAIN OF COMPRESSION DATA POINTS AT VARIOUS TIMES DURING THE PROGRAM'S EXECUTION.	4060 4070 4080 4080

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C EI C EI C	VOID RATIO OR VEPTICAL STRAIN AT THE PRECONSOLIDATION STATE AS IDEALIZED BY THE SCHMERTMANN CONSTRUCTION.	41 41 41 41
C C EI	IN DODINATE NALVE OF VOID DATIO OF VEDTICAL STRAIN AT THE	414
	MINIMUM PRECENSOLIDATION STATE.	41
C EI C C) VARIABLE WHICH STORES DIAL READINGS, VOID RATIOS, AND VERTICAL STRAIN OF EXPANSION-REBOUND DATA POINTS AT VARIOUS TIMES DURING PROGRAM'S EXECUTION.	419 419 42 42 42
E	VOID RATID FCR FIRST DATA POINT ON STANDARD TEST'S EXPANSION- REPCUND CURVE.	42 42 42 42
E	FINAL VOID RATIO.	42 42 42
E	INITIAL VOID RATIO.	43 43 43
E	INITIAL VOID RATID.	434 431 431
F	TOR THE CORRECTION NEEDED TO TAKE INTO ACCOUNT THE SCALE FACTORS THAT MODIFY THE APPEARANCE OF ANGLES ON THE PLOT OUTPUT.	43 43 43 43
F	LOG THE INITIAL STARTING EXPONENT OF TEN FROM WHICH THE LOG AXIS WILL BE DRAWN IN PLOTTING SUBPROGRAM CASPLT. (I.E., FIRLOG IS EQUAL TO +1.0)	44 44 44 44
F	VERTICAL INTERCEPT OF LINE 'F' AT THE ZERO ABSCISSA.	44 44 44
G	VERTICAL INTERCEPT OF LINE 'G' AT THE ZERO ABSCISSA.	44 45 45
Н) HEIGHT OF SPECIMEN FOR CONTROLLED COMPRESSION DATA. STGRAGE VARIABLE FOR INPUT DIAL READINGS FOR STANDARD TEST COMPRESSION DATA.	45 45 45 45
H) HEIGHT OF SPECIMEN FOR CONTROLLED EXPANSION-REBOUND DATA. STORAGE VARIABLE FOR INPUT DIAL READINGS OF STANDARD TEST EXPANSION- RERCUND DATA.	45 45 45 45
	INITIAL HEIGHT OF SPECIMEN AT START OF TEST.	46 46 46
нı Н	IZ BORE HOLE NUMBER.	46
: H! :	HEIGHT OF SOLIDS.	46

- "A" С C HV С INITIAL HEIGHT OF VOIDS. С ΓJ С DO LCOP PARAMETER. С С IBIG ARRAY LOCATION FOR THE ABSCISSA VALUE CORRESPONDING TO THE С LOCATION OF THE LARGEST RADIUS OF CURVATURE. C С

4790 4800 С ICHECK 4810 THIS VARIABLE IS SET EQUAL TO ONE IN SUBROUTINE ANARAD WHEN A 4820 С DISCRETE LOCALIZED POINT OF MAXIMUM CURVATURE HAS BEEN FOUND. IF С 4830 A DISCRETE POINT OF MAXIMUM CURVATURE HAS NOT BEEN FOUND, ICHECK С 4840 С HAS A VALUE CF ZERO AND THIS CAUSES A DEFAULT TC SELECT THE 4850 POINT WHERE THE SECOND DERIVATIVE IS A MAXIMUM. С 4860 4870 С С I DE RV 2 4880 ARRAY LOCATION FOR THE ABSCISSA VALUE WITH THE LARGEST VALUE OF С 4890 THE SECOND DERIVATIVE. 4900 С С 4910 IDIAL С 4920 VARIABLE TO SPECIFY WHETHER DIAL READINGS INCREASE OR DECREASE 4930 С WITH INCREASING DOWNWARD DEFLECTION. IDIAL EQUALS +1 FCR DIAL С 4940 READINGS WHICH INCREASE WITH INCREASING DOWNWARD DEFLECTION. 4950 С IDIAL EQUALS -1 FOR DIAL READINGS WHICH DECREASE WITH INCREASING 4960 С С DOWNWARD DEFLECTION. 4970 С 4980 4990 C TIDIAL OPTION VARIABLE WHICH CAN BE USED TO OVERRIDE PROGRAM'S C 5000 BUILT IN VALUES FOR IDIAL. С 5010 5020 C 5030 С IMIN ARRAY LOCATION FOR THE ABSCISSA VALUE OF THE POINT OF MAXIMUM С 5040 С CURVATURE. 5050 С 5060 С ΤN 5070 COMPUTER INPUT UTILITY DEVICE NUMBER FOR READ STATEMENTS. С 5080 С 5090 5100 С INUM DUMMY ARGUMENT IN SUBROUTINE GRARAD THAT ASSIGN CORRECT ARRAY С 5110 5120 LOCATION FOR THE GRAPHICALLY SELECTED POINT OF MAXIMUM CURVATURE. C C 5130 С типт 5140 COMPUTER OUTPUT UTILITY DEVICE NUMBER FCR WRITE STATEMENTS. С 5150 C 5160 С IPRINT 5170 OPTION PARAMETER FOR REDUCING THE AMOUNT OF OUTPUT PRODUCED IN 5180 С С SELECTING THE POINT OF MAXIMUM CURVATURE BY THE ANALYTICAL METHOD. 5190 С 5200 C ISTR 5210 С DO LOOP PARAMETER WHICH IS MANIPULATED TO GIVE EITHER A VOID RATIO 5220 OR VERTICAL STRAIN ANALYSIS. IF KIND EQUALS 1, ISTR EQUALS 1. 5230 С IF KIND EQUALS 2, ISTR EQUALS 2. 5240 С 5250 С IVOID 5260 С DO LCOP PARAMETER WHICH IS MANIPULATED TO GIVE EITHER A VOID RATIO С 5270 OR VERTICAL STRAIN ANALYSIS. IF KIND EQUALS 1, IVOID DQUALS 1. 5280 С С IF KIND EQUALS 2, IVOID EQUALS 2. 5290

4700

4710

4720

4730

4740

4750 4760

4770

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С
                                                                             5 300
C. J
                                                                             5310
С
     CO LCOP PARAMETER.
                                                                             5320
С
                                                                              5330
C JPRINT
                                                                             5340
     OPTION PARAMETER FOR OUTPUT WHICH IS PRESENTLY NOT USED.
С
                                                                             5350
С
                                                                             5360
С
 KIND
                                                                             5370
     OPTION VARIABLE FOR SPECIFYING EITHER VOID RATIC OR VERTICAL
С
                                                                             5380
С
      STRAIN ANALYSIS.
                                                                              5390
С
                                                                             5400
C KK
                                                                              5410
      DO LCOP PARAMETER FOR DISTINGUISHING SETWEEN VOID RATIO AND
С
                                                                             5420
С
      VERTICAL STRAIN MODES OF ANALYSIS.
                                                                             5430
С
                                                                             5440
С
 KRAD
                                                                             5450
     OPTION PARAMETER FOR SELECTION OF DESIRED METHOD TO SELECT POINT
С
                                                                             5460
С
      OF MAXIMUM CURVATURE. IF KRAD IS NOT EQUAL TO "2", PROGRAM
                                                                             5470
      DEFAULTS TO USE THE GRAPHICAL METHOD TO SELECT THE POINT OF
С
                                                                             5480
      MAXIMUM CURVATURE.
                                                                             5490
С
С
                                                                             5500
С
 KSLOPE
                                                                             5510
      PARAMETER USED IN TELLING THE PROGRAM HOW THE VIRGIN CURVE LINE
С.
                                                                             5520
      REPRESENTATION WAS SELECTED FÜR STANDARD CONSOLIDATION DATA.
                                                                             5530
С
С
      IF KSLOPE IS NOT EQUAL TO 'O', THE LINE WAS SELECTED ON THE BASIS
                                                                             5540
      OF AN AVERAGE SLOPE BETWEEN THE TANGENT OF MAXIMUM SLOPE AND A
ſ
                                                                             5550
      LINE GOING THROUGH THE LAST TWO COMPRESSION DATA POINTS.
С
                                                                              5560
С
                                                                             5570
СL
                                                                             5580
С
      DUMMY PARAMETER PRESENTLY NOT USED.
                                                                              5590
С
                                                                              5600
C LCF REAL
                                                                             5610
     LENGTH CALIBRATION FACTOR.
ſ
                                                                             5620
                                                                             5630
ſ
C LINEA( ) REAL
                                                                             5640
C LINEB( ) REAL
                                                                              5650
C LINEC( ) REAL
C LINED( ) REAL
                                                                              566U
                                                                              5670
C LINEE( ) REAL
                                                                              5680
                                                                              5690
C LINEF( ) REAL
C LINEG( ) REAL
                                                                              5700
      REAL VARIABLES WHICH ARE USED IN SUBROUTINE CASPLE TO STORE THE
С
                                                                              5710
С
      INCREMENTALLY GENERATED ORDINATES VALUES USED IN PLOTTING LINES A,
                                                                             5720
                                                                              5730
C.
      8, C, ...G.
      LINEA - MURIZONTAL LINE THROUGH POINT OF MAXIMUM CURVATURE.
C.
                                                                             5740
С
      LINE8 - TANGENT TO COMPRESSION CURVE AT POINT OF MAXIMUM
                                                                             5750
С
      CURVATURE.
                                                                             5760
     LINEC - LINE BISECTING ANGLE BETWEEN LINES 'A' AND 'B'.
С
                                                                              5770
      LINED - LINE REPRESENTATION OF VIRGIN COMPRESSION CURVE.
С
                                                                             5780
     LINEE - LINE REPRESENTATION OF EXPANSION-REBOUND CURVE.
                                                                             5790
С
      LINEF - LINE IN SCHMERTMANN'S CONSTRUCTION USED TO REPRESENT
                                                                             5800
С
      INITIAL COMPRESSION CURVE. IT HAS THE SLOPE OF LINEE AND GOES
С
                                                                             5810
      THREUGH THE POINT HAVING ITS ABSCISSA AT THE INSITU VERTICAL
С
                                                                             5820
      STRESS AND URDINATE AT THE INITIAL VOID RATIO OR VERTICAL STRAIN.
С
                                                                             5830
      LINEG - LINE DERIVED FROM SCHMERTMANN'S CONSTRUCTION AS REP-
С
                                                                             5840
      RESENTATION OF THE INSITU VIRGIN COMPRESSION CURVE.
                                                                             5850
С
С
                                                                             5860
C LL
                                                                             5870
      DU LCOP PARAMETER USED IN DUING THE SPECIFIED NUMBER OR PROBLEMS.
С
                                                                             5880
C.
                                                                              5890
```

 $\{(x_i, \dots, x_i) \in \mathcal{X}\}$

C LOC() 4A45900 GENERAL LOCATION OR NAME OF SITE FROM WHICH SAMPLE WAS TAKEN. 5910 C С 5920 C MDC **593**0 WATFIVE PARAMETER THAT REPRESENTS THE CCMPRESSION CURVE'S NUMBER C 5940 С OF DATA POINTS, PLUS THE DEGREE OF POLYNOMIAL, AND PLUS ONE. 5950 5960 С MDE С 5970 С SAME AS MDC, BUT FOR EXPANSION-REBOUND CURVE DATA. 5980 С 5990 6000 С NC С NUMBER OF COMPRESSION CURVE DATA POINTS. 6010 6020 С С NDC 6030 WATFIVE PARAMETER WHICH SPECIFIES THE NUMBER OF POLYNOMIAL CO-С 6040 С EFFICIENTS NEEDED FOR THE POLYNOMIAL FITTED THROUGH THE COM-6050 С PRESSION CURVE DATA. 6060 С 6070 С NDE 6080 SAME AS NDC BUT FOR EXPANSION-REBOUND CURVE DATA. 6090 С 6100 С С NDEG 6110 DEGREE POLYNCMIAL FOR COMPRESSION CURVE. 6120 С 6130 С C NDEGE 6140 EQUALS ONE AND IS DEGREE POLYNOMIAL FOR EXPANSION-REBOUND CURVE C 6150 С DATA. 6160 С 6170 6180 C NF NUMBER OF EXPANSION-REBOUND DATA POINTS. С 6190 С 6200 С NOPROB 6210 THE NUMBER OF PROBLEM SETS TO BE SOLVED. IN PROGRAM VERSION С 6220 CASAGR-I, THIS QUANTITY IS SYNOMOUS WITH THE NUMBER OF STRESS-6230 C С STRAIN AXES WHICH WILL BE USED IN THE PLOTTING OF THE DATA. 6240 С 6250 6260 C NPLOTS IN PROGRAM VERSION CASAGR-0, NPLOTS IS A DUMMY INPUT PLACE HOLDER. С 6270 IN THE PROGRAM VERSION CASAGR-I, THIS QUANTITY IS THE NUMBER OF 6280 С PLOTS TO APPEAR ON ONE SET OF STRESS-STRAIN AXES. С 6290 C 6300 C NUMPTC 6310 NUMBER OF COMPRESSION CURVE DATA POINTS. 6320 C С 6330 C NUMPTE 6340 ſ NUMBER OF EXPANSION-REBOUND CURVE DATA POINTS. 6350 С 6360 C ORCMIN 6370 MINIMUM POSSIBLE OVERCONSOLIDATION RATIG. 6380 C 6390 C C OPR() A4 6400 INITIALS OF TEST OPERATOR. 6410 C С 5420 С ORDINA 6430 VARIABLE USED IN PLOTTING SUBROUTINE CASPLT TO CHANGE LINES WHILE 6440 С THE REDUCED STANDARD TEST DATA IS BEING PLOTTED IN TABULAR FORM. С 6450 C 6460 C P() 6470 EFFECTIVE STRESS OF COMPRESSION DATA POINTS. С 6480 С 6490

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6500 C PC PRECONSOLIDATION PRESSURE. С 6510 С 6520 C PCF 6530 PRESSURE CALIBRATION FACTOR (PSI/DIV). С 6540 С 6550 C PDUMMY() 6560 DUMMY VARIABLE FOR PLOTTING THE TABLE OF EFFECTIVE STRESS VALUES. С 6570 С 6580 C PE() 6590 EFFECTIVE STRESS OF EXPANSION-REBOUND DATA POINTS. С 6600 С 6610 С ΡI 6620 3.141592 6630 С С 6640 C PINSTU 6650 OVERBURDEN PRESSURE. С 6660 C 6670 C PO(), POVE, POVER 6680 С (SEE PINSTU) 6690 С 6700 C PPP() 6710 PORE PRESSURE IN PSI FOR COMPRESSION DATA. С 6720 С 6730 C PPPE() 6740 PORE PRESSURE IN PSI FOR EXPANSION-REBOUND DATA. 6750 С С 6760 С PPR() 6770 С PORE PRESSURE READING FOR COMPRESSION DATA. 6780 C 6790 C PPRE() 6800 PORE PRESSURE READING FOR EXPANSION-REBOUND DATA. 6810 С С 6820 C PPT() 6830 PORE PRESSURE IN TSF FOR COMPRESSION DATA. С 6840 С 6850 С PPTE() 6860 С PORE PRESSURE IN TSF FOR EXPANSION-REBOUND DATA. 6870 С 6880 PPZ С 6890 PORE PRESSURE READING TAKEN AFTER BACK PRESSURE APPLICATION AND C 6900 BEFCRE LOADING OF SPECIMEN. С 6910 C 6920 C PRECON 6930 С PRECONSOLIDATION PRESSURE. 6940 С 6950 C PREMIN 6960 MINIMUM POSSIBLE PREDCONSOLIDATION STRESS DETERMINED BY EXTENDING С 6970 THE LABORATORY VIRGIN SLOPE UNTIL IT INTERSECTS EITHER THE INITIAL С 6980 С THE INITIAL VOID RATIO OR ZERO STRAIN LINE CR LINEAR 6990 С REPRESENTATION OF RECOMPRESSION CURVE (LINE F). 7000 C 7010 C RAD() 7020 CALCULATED RADIUS OF CURVATURE. 7030 С С 7040 C RADMIN 7050 MINIMUM RADIUS OF CURVATURE. С 7060 С 7070 C RADMX 7080 ABSCISSA AT POINT OF THE MINIMUM RADIUS OF CURVATURE (I.E., POINT C 7090

A standard to the

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```
С
      OF MAXIMUM CURVATURE:.
                                                                                7100
                                                                                7110
C
C RUNTYP INTEGER
                                                                                7120
      TYPE OF CONSCLIDATION DATA:
                                                                                7130
С
С
      CODE O: - STANDARD
                                                                                7140
      CODE 1: - CONTROLLED GRADIENT
                                                                                7150
С
С
      CODE 2: - CONTROLLED RATE OF STRAIN
                                                                                7160
С
                                                                                7170
                                                                                7180
C S()
С
      SCRATCH ARRAY FOR SUBROUTINE FLSQFY.
                                                                                7190
С
                                                                                7200
C SAM A3
                                                                                7210
      IDENTIFICATION OF SAMPLE.
С
                                                                                7220
С
                                                                                7230
С
  SAMPHI
                                                                                7240
С
      INITIAL HEIGHT OF SAMPLE IN INCHES.
                                                                                7250
С
                                                                                7260
С
  SB
                                                                                7270
      SEE SLOPEB
С
                                                                                7280
С
                                                                                7290
С
  SC
                                                                                7300
С
      SEE SLOPEC
                                                                                7310
С
                                                                                7320
С
  SD
                                                                                7330
      SEE SLOPED
                                                                                7340
С
С
                                                                                7350
С
  SE
                                                                                7360
      SEE SLOPEE
С
                                                                                7370
С
                                                                                7380
С
  SECOND
                                                                                7390
      STRESS IN TSF AT WHICH SECONDARY COMPRESSION BEGINS IN CONTROLLED
                                                                                7400
С
С
      CONSCLIDATION TEST DATA.
                                                                                7410
                                                                                7420
С
С
 SEVT()
                                                                                7430
      VERTICAL EFFECTIVE STRESS FOR COMPRESSION DATA POINTS.
                                                                                744Û
С
С
                                                                                7450
С
  SEVTE()
                                                                                7460
      VERTICAL EFFECTIVE STRESS FOR EXPANSION-REBCUND DATA POINTS.
                                                                                7470
С
С
                                                                                7480
С
  SF
                                                                                7490
      SEE SLOPEF
С
                                                                                7500
С
                                                                                7510
C SFAC INTEGER
                                                                                7520
С
      ARRAY LOCATION OF THE COMPRESSION DATA'S SCALE FACTORS.
                                                                                7530
С
      SFAC = NUMPTC + 2
                                                                                7540
С
                                                                                7550
C SFACUR INTEGER
                                                                                7560
С
      ARRAY LOCATION FOR THE SCALE FACTOR FOR VARIABLES WHICH ARE USED
                                                                                7570
                                                                                7580
С
      IN PLOTTING THE FITTED POLYNOMIAL CURVE SFACUR = 101 + 2.
                                                                                7590
C
С
  SFAE INTEGER
                                                                                7600
      ARRAY LOCATION FOR THE EXPANSION-REBOUND DATA'S SCALE FACTORS.
                                                                                7610
С
С
      SAFE = NUMPTE + 2
                                                                                7620
С
                                                                                7630
C SG
                                                                                7640
      SEE SLOPEG
С
                                                                                7650
С
                                                                                7660
C SGMSQ( )
                                                                                7670
      SCRATCH ARRAY USED BY SUBROUTINE FLSQFY.
                                                                                7680
C
С
                                                                                7690
```

```
C SI
                                                                               7700
С
      INITIAL DEGREE OF SATURATION.
                                                                               7710
С
                                                                               7720
С
  SLOPBI
                                                                               7730
      SLOPE OF ANGLE BISECTOR LINE USED BY THE GRAPHICAL METHOD TO
                                                                               7740
ſ.
C
      DETERMINE POINT OF MAXIMUM CURVATURE.
                                                                               7750
С
                                                                               7760
С
 SLOPE
                                                                               7770
      SLOPE OF LINE GOING THROUGH LAST TWO POINTS OF THE STANDARD TEST'S
С
                                                                               7780
C
      CONSOLIDATION COMPRESSION CURVE.
                                                                               7790
                                                                               7800
C
C SLOPE1()
                                                                               7810
     FIRST DERIVATIVE OR SLOPE AT GENERATED ABSCISSA VALUES ALONG THE
                                                                               7820
C
      COMPRESSION DATA'S FITTED POLYNOMIAL CURVE.
С
                                                                               7830
C
                                                                               7840
C SLOPE2()
                                                                               7850
С
      SECOND DERIVATIVE AT GENERATED ABSCISSA VALUES ALONG THE COM-
                                                                               7860
С
      PRESSION DATA'S FITTED POLYNOMIAL CURVE.
                                                                               7870
C
                                                                               7880
 SLOPEB
                                                                               7890
C
     SLOPE OF LINEB.
                                                                               7900
C
                                                                               7910
C
C SLOPEC
                                                                               7920
C
    SLOPE OF LINEC.
                                                                               7930
                                                                               7940
C
C SLOPED
                                                                               7950
    SLOPE OF LINED.
                                                                               7960
C
С
                                                                               7970
C SLOPEE
                                                                               7980
С
    SLOPE OF LINEE.
                                                                               7990
С
                                                                               8000
C SLOPEF
                                                                               8010
С
     SLOPE OF LINEF.
                                                                               8020
C
                                                                               8030
C SLOPEG
                                                                               8040
С
     SLOPE OF LINEG.
                                                                               8050
C
                                                                               8060
C SLOPEM
                                                                               8070
      AVERAGE OF TWO LINES, ONE TANGENT TO THE CURVE AT ITS MAXIMUM
С
                                                                               8080
      SLOPE AND THE OTHER GDING THROUGH THE STANDARD COMPRESSION
C
                                                                               8090
С
      CURVE'S LAST TWO DATA POINTS.
                                                                               8100
С
                                                                               8110
С
  SPG
                                                                               8120
      SPECIFIC GRAVITY OF SOLIDS.
С
                                                                               8130
                                                                               8140
С
C SR
                                                                               8150
С
      SWELL RATIO.
                                                                               8160
С
                                                                               8170
 STARE INTEGER
                                                                               8180
С
     ARRAY LOCATION OF THE STARTING VALUE THAT WILL BE USED IN PLOTTING
C
                                                                               8190
С
      THE ABSCISSA AND ORDINATE POSITIONS OF THE EXPANSION-REBOUND
                                                                               8200
C
      CURVE'S DATA POINTS.
                                                                               8210
      STARE = NUMPTE + 1
С
                                                                               8220
С
                                                                               8230
C START INTEGER
                                                                               8240
      ARRAY LOCATION OF THE STARTING VALUE THAT WILL BE USED IN PLOTTING
С
                                                                               8250
С
      THE ABSCISSA AND ORDINATE POSITIONS OF THE COMPRESSION CURVE'S
                                                                               8260
С
      DATA POINTS.
                                                                               8270
С
      START = NUMPTC + 1
                                                                               8280
٢
                                                                               8290
```

 $\mathbb{C}^{n} = \{ (x_{1}, y_{2}), (y_{2}, y_{3}) \in \mathbb{C}^{n} \}$

C STARX INTEGER 8300 ARRAY LOCATION OF THE STARTING VALUE THAT WILL BE USED IN PLOTTING 8310 C. THE ABSCISSA AND ORDINATE POSITIONS OF THE GENERATED SEGMENTS OF 8320 C THE POLYNOMIAL CURVE. 8330 С C STARX = 101 + 18340 8350 С C STR() 8360 VERTICAL STRAIN ARRAY FOR COMPRESSION DATA POINTS. 8370 C С 8380 С STRE() 8390 VERTICAL STRAIN ARRAY OF THE EXPANSION-REBOUND DATA POINTS. 8400 C С 8410 C. STVT() 8420 TOTAL VERTICAL STRESS ARRAY FOR COMPRESSION DATA POINTS. 8430 C C. 8440 С STVTE() 8450 TOTAL VERTICAL STRESS ARRAY FOR EXPANSION-REBOUND DATA POINTS. C 8460 С 8470 C T() 8480 TIME AT WHICH COMPRESSION DATA POINT WAS ACQUIRED DURING CON-8490 С C. TROLLED CONSCLIDATION TEST. 8500 С 8510 TANGEN() C. 8520 STORAGE LOCATION OF THE GENERATED INCREMENTAL ORDINATES USED IN С 8530 PLOTTING THE LINE TANGENT TO THE COMPRESSION CURVE AT THE POINT C 8540 C (XTAN, YTAN). 8550 C 8560 C TE() 8570 TIME AT WHICH EXPANSION-REBOUND DATA POINT WAS ACQUIRED DURING 8580 C CONSOLIDATION TEST. C 8590 C. 8600 C TES A3 8610 С TEST NUMBER IN A PARTICULAR CONSOLIDATION TESTING PROGRAM. 8620 C 8630 С TR() 8640 TIME READING AT WHICH A COMPRESSION DATA POINT WAS ACQUIRED DURING C 8650 С A CONTROLLED CONSOLIDATION TEST. 8660 С 8670 C TRE() 8680 TIME READING AT WHICH AN EXPANSION-REBOUND DATA POINT WAS ACQUIRED С 8690 DURING A CONTROLLED CONSOLIDATION TEST. ſ 8700 8710 С С VOIDC 8720 THE VOID RATIO AT THE PRECONSOLIDATION STATE AS IDEALIZED BY C 8730 С SCHMERTMANN'S CONSTRUCTION. 8740 8**7**50 С VOIDEO() C 8760 INITIAL VOID RATIO VARIABLE USED FOR PLOTTING. 8770 C С 8780 8790 C k() ARRAY IN WHICH THE WEIGHTS OF INDIVIDUAL DATA POINTS ARE PLACED С 8800 FOR SUBSEQUENT USE BY SUBROUTINE FLSQFY. ALL DATA POINTS ARE MADE С 8810 С TO HAVE EQUAL WEIGHTS (I.E., w() = 1.0). 8320 С 8830 С W۶ 8840 С FINAL WATER CONTENT. 8850 С 8860 8870 C WI INITIAL WATER CONTENT. С 8880 C 8890

1

```
C WRD()
                                                                               8900
      LOAD READING FOR CONTROLLED TEST COMPRESSION DATA.
C
                                                                               8910
С
                                                                               8920
C WRDE( )
                                                                               8930
C
     LOAD READING FOR CONTROLLED TEST EXPANSION-REBOUND DATA.
                                                                               8940
С
                                                                               8950
C WRZ
                                                                               8960
     LOAD READING CORRESPONDING TO ZERO APPLIED LOAD.
С
                                                                               8970
С
                                                                               898ū
C WTFD
                                                                                8990
     FINAL DRY WEIGHT OF CONSOLIDATION SPECIMEN.
С
                                                                               9000
С
                                                                              9010
C
  WTFW
                                                                               9020
С
     FINAL WET WEIGHT OF CONSOLIDATION SPECIMEN.
                                                                               9030
С
                                                                                9040
C WIIW
                                                                               9050
С
     INITIAL WET WEIGHT OF CONSOLIDATION SPECIMEN.
                                                                               9060
С
                                                                               9070
C X( , )
                                                                               9080
      ARRAY VARIABLE IN WHICH THE INCREMENTALLY GENERATED ABSCISSA
С
                                                                               9090
С
      VALUES ARE STORED.
                                                                                9100
С
                                                                                911ŭ
C XANGLE
                                                                                9120
      ABSCISSA OF THE POINT OF INTERSECTION BETWEEN THE GRAPHICAL
С
                                                                               9130
С
      METHOD'S INITIAL TANGENT LINE AND THE VIRGIN COMPRESSION LINE.
                                                                               9140
C
                                                                                9150
C XB
                                                                                9160
С
      ABSCISSA THROUGH WHICH THE LINE REPRESENTION OF VIRGIN CURVE WILL
                                                                                9170
С
     BE CRAWN (I.E., LINED).
                                                                                9180
С
                                                                                9190
C XBIG
                                                                                9200
    SAME AS XB.
С
                                                                                921Ū
С
                                                                                9220
C \times B1 = X B
                                                                                9230
C XB2 = XB≅XB
                                                                                9240
C XB3 = X8 + 3
                                                                                9250
C XB4 = XB**4
                                                                                9260
C X85 = X8**5
                                                                                9270
C XB6 = XB***6
                                                                                9280
C \times B7 = XB \approx 7
                                                                                9290
C XB8 = XB**8
                                                                                9300
C X89 = X8**9
                                                                                9310
C XB10 = XB**10
                                                                                9320
C \times B11 = XB = 11
                                                                                9330
      THESE VARIABLES SET UP POLYNOMIAL TERMS FROM THE ABSCISSA VALUE
С
                                                                               9340
      OF A POINT ON REPRESENTATIVE PORTION OF VIRGIN COMPRESSION CURVE.
C
                                                                               9350
      THESE TERMS WILL BE PAIRED WITH APPROPRIATE COEFFICIENTS TO
С
                                                                                9360
      COMPUTE AN ORDINATIE VALUE AT A PUINT ON THE REPRESENTATIVE
С
                                                                                9370
      PORTION OF VIRGIN COMPRESSION CURVE.
С
                                                                               9380
С
                                                                               9390
C X S
                                                                                9400
      ABSCISSA OF THE POINT OF MAXIMUM CURVATURE.
С
                                                                                9410
С
                                                                                9420
C \times S1 = XS
                                                                                9430
C \times S2 = XS \approx 2
                                                                                9440
C XS3 = XS**#3
                                                                                9450
C XS4 = XS * 4
                                                                                9460
\begin{array}{rcl} C & XS5 &=& XS \pm \pm 5 \\ C & XS6 &=& XS \pm \pm 6 \end{array}
                                                                                9470
                                                                                9480
C XS7 = XS = x
                                                                                9490
```

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9500 $C XS8 = XS \approx 8$ C XS9 = XS**9 9510 $C \times S10 = XS * 10$ 9520 $C \times SII = \times S * * II$ 9530 THESE VARIABLES SET UP THE POLYNOMIAL TERMS FROM THE ABSCISSA 9540 C VALUE OF THE POINT OF MAXIMUM CURVATURE. THESE TERMS WILL BE 9550 ٢ PAIRED WITH THE APPROPRIATE COEFFICIENTS TO COMPUTE THE ORDINATE 9560 C С OF THE SELECTED POINT OF MAXIMUM CURVATURE. 9570 9580 C 9590 C XSLP2 С SAME AS XS. 9600 9610 С 9620 С XTAN ABSCISSA OF THE POINT OF TANGENCY ON THE INITIAL PORTION OF THE 9630 C COMPRESSION CURVE AND IS DETERMINED BY SUBROUTINE GRARAD. 9640 C 9650 С 9660 C XVIRGI ABSCISSA OF THE POINT OF INTERSECTION BETWEEN LINE "D" AND THE 9670 C. С ORDINATE VALUE OF 0.42 * EO. 9680 9690 C $C \times 1(,,) = \times (,,)$ 9700 C X2(,) = X(,)**2 9710 $C \times 3(,) = \times (,) **3$ 9720 9730 $C X4(9) = X(9) \pm 4$ 9740 C X5(,) = X(,)**5 C X G(+) = X(+) + + G9750 9760 $C \times 7(, ,) = X(, ,) = 7$ $C \times 8(,) = X(,) = 3$ 9770 9780 $C \times 9(,) = X(,) = 3 \pm 9$ $C \times 10(, ,) = \times (, ,) + 10$ 9790 $C \times 11(,) = X(,) \approx 11$ 9800 THESE VARIABLES SET UP THE POLYNOMIAL TERMS FROM THEIR INCREMENTAL 9810 C C. ABSCISSAE SO THAT THEY MAY BE PAIRED WITH THEIR RESPECTIVE CO-9820 EFFICIENTS. 9830 ٢ С 9840 C Y(,) 9850 DUMMY SCRATCH ARRAY. 9860 C. C. 9870 С YLINE() 9880 INCREMENTALLY GENERATED ORDINATE VALUES OF THE ANGLE BISECTOR 9890 C LINE USED IN SUBROUTINE GRARAD. 9900 С С 9910 9920 С YSLP2 ORDINATE OF THE POINT OF MAXIMUM CURVATURE. 9930 C. С 9940 9950 C YTAN С ORCINATE OF THE POINT OF TANGENCY ON THE INITIAL PORTION OF THE 9960 COMPRESSION CURVE AND IS DETERMINED BY SUBROUTINE GRARAD. С 9970 9980 C YVIRGI 9990 С EQUALS 0.42 * EO. 0010 C 0020 С C ZDEPTH 0030 APPROXIMATE FIELD DEPTH AT WHICH SAMPLE WAS RECOVERED. C 0040 C 0050 C ZERO 0.060 С DIAL READING CORRESPONDING TO FIRST DATA POINT ON THE EXPANSION-0070 С REBOUND CURVE. 0080 0090 C 0100

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C C		0110
	COMMON /BLOK1/ P(303), E(303), PE(103), EE(103), CC(103)	0130
	DOUBLE PRECISION CC	0140
	LUMMUN /BLUKZ/ LEPIA,SLUPEB,LEPIB,SLUPEL,LEPIL,SLUPED,LEPID,	0150
		0150
	3SR+NDEG+TN+TCUT+TDTAL	0190
	COMMON /BLOK3/ POVE, PRECON, PREMIN, VOIDC, ECMIN, OCRMIN, CRMIN	0190
	COMMON /BLOK4/ TR(303),TRE(103),DEFR(303),DEFRE(103),PPR(303),	0200
	1PPRE(103),WRD(303),WRDE(103),L,STVT(303),	0 21 0
	2STVIE(103), PPP(303), PPPE(103), PPT(303), PPTE(103),	0220
	3CSEVT(303), CSEVTE(103), DFLI(303), DFLIE(103), STR(303),	0230
	451KE(103)9H(303)9HE(103)9UL9LLL9PLL COMMON: /FLOKE/ LOC(4), HCL, SAM, TES, ODD(1), DAT(2), DES(4), HCD(20)	0240
	1KK RUNTYP	0260
	COMMON / PLOK6/ SPG.WTIW.WTEW.WTED.DEEI.DEEE.BP.DEEZ.WR7.PPZ.HS.HI.	0200
	1HV,SI,EI,EF,SF,WI,WF,SECOND,AR	0280
	COMMON /BLOK8/ RAD(103),RADMIN,RADMX,IMIN,IPRINT,JPRINT,KIND	0290
	COMMON /BLOK9/ X(103, 4),SLOPE1(103),SLOPE2(103)	0300
	COMMON = X1(103, 4), X2(103, 4), X3(103, 4), X4(103, 4), X5(103, 4),	0310
	$1 \times 6 (103, 4), \times 7 (103, 4), \times 8 (103, 4), \times 9 (103, 4), \times 10 (103, 4), \times 11 (103, 4)$	0320
	2) DOURLE DRECTSTON M(202) ((12), ALDHA(214), GETA(214), S(214),	0330
	15GMS((314), PR(3)4), PD(3)4), P(3)4),	0340
	REALLCE	0360
	INTEGER RUNTYP, TES, HOL	0370
	INTEGER START, SFAC	0380
	DIMENSION CATA(1024)	0390
	CALL PLGTS (DATA,4096)	0400
	$\begin{array}{c} CALL PLOT & (0 \bullet 0, -11 \bullet, -3) \\ CALL PLOT & (0 \bullet 0, -11 \bullet, -3) \end{array}$	0410
c	$LALL PLUI (U_{\bullet} U_{\bullet} I_{\bullet} U_{\bullet} - S)$	0420
r	INPUT AND OUTPUT UTILITY DEVICE CODE NUMBERS.	0430
č		0450
	IN=5	0460
	IOUT≈6	0470
С		0480
c		0490
L	NUPRUS - NUMBER UF PRUBLEMS TO BE ANALYZED	0500
100	READ (1N(1000) NOPROB	0510
100	DO 400 LL=1•NDPROB	0530
С	NPLOTS IS EQUAL TO ONE ALWAYS FOR THIS PROGRAM VERSION.	0540
С	IPRINT - OUTPUT OPTION FOR CALCULATED RADII FROM SUB ANARAD.	0550
	READ (IN.100C) NPLOTS, IPRINT	0560
	IF (NPLOTS.EQ.O) NPLOTS=1	0570
C		0580
C C	READ DATA FUR LUMPRESSIUN LURVES.	0400
c r	NDEG - PULTNUMIAL DEGREE 2007 TVDE DE CONSCILIDATION VEST DATA	0600
č	ZDEPTH = DEPTH FOR CALCULATION OF INSITU STRESS BASED ON SPECIMEN	0620
č	wET UNIT WEIGHT.	0630
С	INSERT BULLOWING IN COL. 31 FOR RADIUS METHOD	0640
С	GRAPHICAL RADIUS METHOD - SET KRAD=0	0650
С	ANALYTICAL RADIUS METHOD - SET KRAD=2	0660
С		0670
C	KIND - OPTION VARIABE FOR SPECIFYING EITHER A VOID RATIC OR	0680
с с	VERTICAL STRAIN ANALYSIS. PLACE IN COL.33 UNE OF THE	0700
L L	LAFFAMING AMPAFA LAK . VINA .8	0.100

C C C	KIND=C, DDES BOTH VOID RATIO AND VERTICAL STRAIN ANALYSES. KIND=1, ONLY VOID RATIO ANALYSIS PERFORMED. KIND=2, ONLY VERTICAL STRAIN ANALYSIS PERFORMED.	0710 0720 0730
C C C	SECOND - PRESSURE AT WHICH SECONDARY COMPRESSION OCCURS.	0740 0750 0760
	IIDIAL - OPTION VARIABLE TO OVERRIDE PROGRAM'S BUILT-IN VALUES FOR IDIAL. IIDIAL MUST BE MADE EQUAL TO EITHER '+1' OR '-1' TO OVERRIDE BUILT-IN VALUES OF IDIAL. SEE DESCRIPTION OF IDIAL BELOW.	0770 0780 0790 0800 0810
1010	READ(IN+1010) NDEG,RUNTYP,ZDEPTH,KRAD,KIND,SECOND,IIDIAL FORMAT(2(I3,7X),F10+0,I1,1X,I1,2X,F5+0,8X,I2) IF (SECOND+LT+0+001) SECOND=31+2	0820 0830 0840 0850
C C C	IDIAL IS USED TO MATCH DIAL GAUGE READINGS WITH DEFLECTION.	0860 0870 0880
	NOTE: INCREASING DEFLECTION IS SPECIMEN SHORTENING. IDIAL IS EQUAL TO +1 WHEN DIAL READINGS INCREASE WITH DEFLECTION. IDIAL IS EQUAL TO -1 WHEN DIAL READINGS DECREASE WITH DEFLECTION. IF THE RELATIONSHIP BETWEEN DIAL READING AND DEFLECTION IS CHANGED FOR A PARTICULAR TEST TYPE, THE TEST'S RESPECTIVE ARGUMENT FOR IDIAL WILL BE SET EQUAL TO THE VALUE OF IIDIAL.	0890 0900 0910 0920 0930 0940
C	<pre>STD. DIAL RDGS. INCREASING WITH INCREASING DEFLECTION (DEFI-DEFZ). IF (RUNTYP.EQ.0) IDIAL = +1</pre>	0950
C **	CONTROL. GRAD. DIAL RDGS. DECREASING W/ INCR. DEFL. (DEFZ-DEFI). IF (RUNTYP.EQ.1) IDIAL = -1	0980 0990 1000
c c	CONTROL. RATE OF STRAIN RDGS. INCR. W/ INCR. DEFL. (DEFI-DEFZ). IF (RUNTYP.EQ.2) IDIAL = +1	1010 1020 1030
	CHECKING IF PROGRAM IS TO OVERRIDE BUILT-IN VALUE OF IDIAL. IF (IIDIAL.NE.O) IDIAL=IIDIAL	1040 1050 1060 1070 1080 1090
	READ IN SEARCH BOUNDARIES FOR SELECTION OF POINT OF MAXIMUM CURVATURE AND LINE REPRESENTATION OF VIRGIN COMPRESSION CURVE.	1 100 1 1 1 0 1 1 2 0
1020	READ(IN+1020) BOUND1+BOUND2+BOUND3+BOUND4 FORMAT(4F10+0)	1140
C C C	THE FOLLOWING ARGUMENTS ARE THE DIAMETER AND AREA OF THE SAMPLE BEING SPEICIFIED IN INCHES AND INCHES SQUARED. DIA=2.50 AR=4.9087	1 180 1 170 1 180 1 190 1 200
C C C	READ PLOT TITLE	1 210 1 220 1 230
1030 C	READ (IN,103C) BCD FORMAT (2044)	1 240 1 250 1 260 1 270
C C C	READ LOCATION, HOLE, SAMPLE, TEST, OPERATOR, DATE AND SAMPLE Description.	1 280 1 290 1 300

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С
                                                                              1310
      READ (IN, 1040) LOC, HOL, SAM, TES, OPR, DAT, DES
                                                                              1320
 1040 FORMAT (4A4, I2, A3, I4, A4, 3A4, 4A4)
                                                                              1330
С
                                                                              1 340
С
                                                                              1 3 5 0
С
      READ SPECIFIC GRAVITY, INITIAL WET WEIGHT, FINAL WET WEIGHT,
                                                                              1360
                                                                              1370
      FINAL DRY WEIGHT, INITIAL DEFLECTION, AND FINAL DEFLECTION.
С
С
                                                                              1 380
      READ (IN, 105C) SPG, WTIW, WTFW, WTFO, OEFI, DEFF
                                                                              1390
 1050 FORMAT (F5.2.3F7.2.2F5.2)
                                                                              1400
С
                                                                              1410
С
                                                                               1420
С
      DEFL. CAL. FACTOR - DCF (INCH/DIV)
                                                                              1430
С
      LOAD CAL. FACTOR - LCF (LSS/DIV)
                                                                              1440
С
      PRESSURE CAL. FACTOR - PCF (PSI/DIV)
                                                                              1450
С
      OIA - DIAMETER OF SOIL SAMPLE (INCHES)
                                                                              1460
С
      READ IN CALIBRATION FACTORS FOR DEFLECTION, LOAD, PRESSURE,
                                                                              1470
      AND DIAMETER OF SOIL SPECIMEN IF IT IS NOT EQUAL TO 2.5".
C
                                                                              1480
С
                                                                              1490
      READ (IN, 106C) DCF, LCF, PCF, DIA
                                                                              1500
 1060 FORMAT (4F10.2)
                                                                              1510
С
                                                                              1520
      IF (DIA.LT.0.001) DIA=2.5
                                                                               1530
      AR=(355•/113•)*(DIA/2•0)**2
                                                                              1540
С
                                                                              1550
С
                                                                              1560
С
      READ BACK PRESSURE, ZERO DEFLECTION, ZERO LCAD, ZERC PORE, AND
                                                                              1570
      INITIAL HEIGHT OF SAMPLE IF NOT EQUAL TO ONE INCH.
С
                                                                              1580
С
                                                                              1590
      READ (IN. 107C) BP, DEFZ, WRZ, PPZ, SAMPHI
                                                                              1600
 1070 FORMAT (F5.1, F5.2, 2F4.0, 2X, F10.0)
                                                                              1610
С
                                                                              1620
      IF (SAMPHI.LT.0.001) SAMPHI=1.000
                                                                              1630
С
                                                                              1640
С
      COMPUTE INITIAL AND FINAL SOIL PROPERTIES
                                                                              1650
С
                                                                              1660
      HS=wTFO/(SPG*AR*16.3871)
                                                                              1670
      HI=SAMPHI-IDIAL*((DEFI-DEFZ)*DCF)
                                                                              1680
      HV=HI-HS
                                                                              1690
      SI = (WTIW - WTFC) \approx 100 \cdot / (HV \approx AR \approx 16 \cdot 3871)
                                                                              1700
      EI=HV/HS
                                                                              1710
      EO=EI
                                                                              1720
      EF=(HV+IDIAL*(DEFF-DEFI)*OCF)/HS
                                                                              1730
      SF=(WTFW-WTFC)*100./((HV-IDIAL*(DEFF-DEFI)*DCF)*AR*16.3871)
                                                                              1740
      WI=(WTIW-WTFD)/WTFD*100
                                                                              1750
      WF=(WTFW-WTFC)/WTFD*100
                                                                               1760
      PINSTU=(WTIW*1728*ZDEPTH)/(AR*HI*453.6*2000.0)
                                                                              1770
С
                                                                              1780
С
                                                                              1790
С
      CONTROLLED TEST DATA INPUT AND REDUCTION.
                                                                              1800
С
      ****************
                                                                              1310
      IF (RUNTYP.EQ.1) CALL CONGRA
                                                                              1820
      IF (RUNTYP.EG.2) CALL CONGRA
                                                                              1830
С
      ******************
                                                                               1840
                                                                              1850
С
      IF (RUNTYP.EQ.1) GO TO 50
                                                                               1860
      IF (RUNTYP.EQ.2) GC (0.50
                                                                               1870
С
                                                                              1880
С
      ***********
                                                                               1890
С
      STANDARD TEST DATA INPUT
                                                                              1900
```

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```
********
                                                                              1910
С
     STANDARD TEST DIAL READINGS ARE BEING PLACED IN PROPER ARRAY
                                                                              1920
٢
С
      LOCATIONS.
                                                                               1930
                                                                              1940
      DO 10 I =1,20
C
                                                                               1950
                                                                               1960
      COMPRESSION CURVE DIAL READINGS.
C
                                                                               1970
      READ (IN, 102C) P(I), E(I)
      STR(I) = F(I)
                                                                               1980
      H(I) = E(I)
                                                                               1990
      IF (I.EQ.1) GJ TG 10
                                                                               2000
С
                                                                              2010
C
      HAS EFFECTIVE STRESS DECREASED BETWEEN CONSECUTIVE DATA POINTS?
                                                                              2020
      IF SC, CONSIDER ALL SUBSEQUENT DATA AS EXPANSION-REBOUND DATA.
                                                                              2030
C
      IF (P(I).LT.P(I-1)) GO TO 20
                                                                              2040
   10 CONTINUE
                                                                               2050
   20 CONTINUE
                                                                               2060
С
                                                                               2070
      NUMPTC=I+1
                                                                               2080
      DO 30 I=3,20
                                                                               2090
С
                                                                               2100
      READ IN REBOUND-EXPANSION DATA
                                                                               2110
С
С
      DIAL READINGS ARE BEING PLACED IN PROPER ARRAY LOCATIONS.
                                                                              2120
С
                                                                              2130
      READ (IN, 102C) PE(I), EE(I)
                                                                               2140
      STRE(I)=EE(I)
                                                                               2150
      HE(I) = EE(I)
                                                                               2160
      PE(1)=P(NUMPTC)
                                                                               2170
      EE(1) = E(NUMPTC)
                                                                               2180
                                                                               2190
      STRE(1) = E(NUMPTC)
     HE(1) = E(NUMPTC)
                                                                               2200
      Z \in R \subset E \in (1)
                                                                               2210
      PE(2) = P(NUMPTC+1)
                                                                               2220
      EE(2) = E(NUMPTC+1)
                                                                               2230
      STRE(2) = E(NUMPTC+1)
                                                                               2240
      HE(2) = E(NUMPTC+1)
                                                                               2250
     IF (PE(I).LT.0.001) GOTO 40
                                                                               2260
   30 CONTINUE
                                                                               2270
   40 CONTINUE
                                                                               2280
                                                                               2290
      NUMPTE=I-1
                                                                               2 300
С
   50 CONTINUE
                                                                               2310
      IF (RUNTYP.EG.O) WRITE (IOUT,1080)
                                                                               2320
      IF (RUNTYP.EQ.1) WRITE (IDUT,1090)
                                                                               2330
      IF (RUNTYP.EQ.2) WRITE (IOUT,1100)
                                                                               2340
      WRITE(IOUT+1210) BCD
                                                                               2350
      WRITE (IOUT, 1110) TES, HOL, LOC, SAM, DAT, OPR
                                                                               2360
      WRITE (IOUT+1120) DES,BP
                                                                               2370
      WRITE (IOUT,1130) WI,WF,EI,EF,SI,SF
                                                                               2380
С
                                                                               2390
      IF(BOUND1.EQ.J.O) BOUND1=0.1
                                                                               2400
      IF(BOUND2.EQ.0.0) BOUND2=0.1
                                                                               2410
      IF(80UND3.EQ.0.0) BOUND3=0.1
                                                                               2420
      IF(80UND4.EQ.0.0) BOUND4=0.1
                                                                               2430
      IF(PINSTU.EQ.0.0) PINSTU=0.1
                                                                               2440
      BOUND1=ALOG10(BOUND1)
                                                                               2450
      BOUND2 = ALOGIC(BOUND2)
                                                                               2460
      BOUND3=ALOG10(BOUND3)
                                                                               2473
      BOUND4=ALOG10(BOUND4)
                                                                               2480
      PINSTU=ALOG10(PINSTU)
                                                                               2490
      IF (RUNTYP.EQ.C) SECOND = 99999
                                                                               2500
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81=10.***80UNC1 2510 82=10. **80UNC2 2520 83=10.**BOUNC3 2530 84=10.**80UNC4 2540 IF (KRAD.EQ.2) WRITE(IOUT,1140) NDEG.B1,82,83,84,20EPJH,SECONU 2550 IF (KRAD.NE.2) WRITE(IOUT,1150) NOEG,B1,B2,B3,B4,ZDEPTH,SECOND 2560 С 2570 DO 60 I=1,NUMPTC 2580 W(I) = 1.02590 60 CONTINUE 2600 С 2610 С 2620 С 2630 С 2640 С 2650 * SEMI-LOGARITHMIC STRESS DEFORMATION ANALYSIS * С 2660 ******************* С 2670 С 2680 VOID RATIO AND STRAIN ANALYSIS OF CONSOLIDATION DATA TO BE С 2690 С PERFORMED IF SPECIFIED PREVIOUSLY BY USER. 2700 IVOID=1 2710 ISTR=22720 С 2730 IF (KINC.EQ.1) 1V01D=1 2740 IF (KIND.EQ.1) ISTR=1 2750 IF (KIND.EQ.2) IVDID=2 2760 IF (KIND.EC.2) ISTR=2 2770 DO 390 KK = IVCID, ISTR 2780 1 Ċ 2790 С REDUCE DEFORMATION DATA. 2800 С 2810 С COMPRESSION DATA POINTS. 2820 DO 100 I=1,NUMPTC 2830 IF (RUNTYP.EQ.1) GO TO 80 2840 IF (RUNTYP.EQ.2) GO TO 80 2850 IF (KK.EQ.2) GO TO 70 2860 E(I)=EO - IDIAL*(E(I)-DEFI)/HS 2870 70 CONTINUE 2880 IF (KK.EQ.1) GO TO 80 2890 CONVENTIONAL DEFLECTION READINGS ARE INCREASING. С 2900 E(I)=IDIAL*(STR(I)-DEFI)*DCF/HI 2910 С 2920 С PURPOSES. 2930 С VALUES OF VERTICAL STRAIN ARE MADE NEGATIVE FOR CURVE FITTING 2940 E(I) = -E(I)2950 GO TO 90 2960 80 CONTINUE 2970 IF (KK.EQ.1) GC TO 90 2930 VALUES OF VERTICAL STRAIN ARE MADE NEGATIVE FOR CURVE FITTING С 2990 C PURPOSES. 300Ú E(I) = -STR(I)3010 90 CONTINUE 3020 IF $(KK \cdot EQ \cdot 1) \quad CSEVT(I) = E(I)$ 3030 IF (P(I).LE.C.1) P(I)=0.1 3040 P(I) = ALOCIO(P(I))3050 100 CONTINUE 3060 С 3070 С 3080 С NOW CALLING FLSQFY FOR NUMERICAL 3090 С ANALYSIS BY LEAST SQUARES CURVE 3100

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FITTING TO DETAIN POLYNOMIAL COEFFICIENTS.
                                                                                  3110
С
                                                                                  3120
С
С
                                                                                   3130
      MUST INITIALIZE VALUES FOR COEFFICEINTS
С
      TO AVOID UNDEFINED VARIALBE ERROR UV-O
                                                                                  3140
С
      UPON RETURN FORM SUBROUNTINE FLSQFY.
                                                                                  3150
С
                                                                                  3160
      DO 110 I = 1 + 12
                                                                                  3170
      C(I) = 0 \cdot 0
                                                                                  31.90
  110 CONTINUE
                                                                                  3190
С
                                                                                  3200
      NDC=NDEG+1
                                                                                  3210
      MDC=NDEG+NUMPTC+1
                                                                                  3220
С
                                                                                  3230
С
                                                                                  3240
С
      FIT SPECIFIED LEAST SQUARES POLYNOMIAL TO SEMI-LOG REPRESENTATION
                                                                                  3250
С
      OF COMPRESSION DATA.
                                                                                  3260
С
                                                                                  3270
      CALL FLSQFY(NDEG, NUMPTC+P, E, W, C, ALPHA, BETA, S, SGMSQ, PR, PC, NDC, MDC)
                                                                                  3280
С
                                                                                  3290
                                                                                  3300
С
      DO 120 I=1,12
                                                                                  3310
      CC(I)=C(I)
                                                                                  3320
  120 CONTINUE
                                                                                  3330
С
                                                                                   3340
                                                                                  3350
С
С
      REBOUND-EXPANSION DATA POINTS.
                                                                                  3360
С
                                                                                  3370
      FIND THE SLOPE OF THE SWELL-RECOMPRESSION CURVE
С
                                                                                  3380
С
      AND CALL IT SLOPEE.
                                                                                  3390
С
                                                                                  3400
      DO 130 I=1.NUMPTE
                                                                                  3410
      W(I) = 1 \cdot 0
                                                                                   3420
  130 CONTINUE
                                                                                  3430
С
                                                                                  3440
                                                                                  3450
С
      DO 170 I=1, NUMPTE
                                                                                  3460
      IF (RUNTYP.EQ.1) GO TO 150
                                                                                  3470
      IF (RUNTYP.EQ.2) GO TO 150
                                                                                   3480
      IF (KK.EQ.2) GD TO 140
                                                                                  3490
      EEO=E(NUMPTC)
                                                                                  3500
      EE(I)=EEO -IDIAL*( EE(I)-ZERO )/HS
                                                                                  3510
      CSEVTE(I) = EE(I)
                                                                                   3520
      GOTC 160
                                                                                  3530
                                                                                  3540
  140 CONTINUE
      EE(I)=IDIAL*(STRE(I)-DEFI)*DCF/HI
                                                                                  3550
      EE(I) = -EE(I)
                                                                                  3560
      GG TO 160
                                                                                  3570
  150 CONTINUE
                                                                                   3580
      IF (KK • EQ • 1) CSEVTE(I) = EE(I)
                                                                                  3590
      IF (KK \cdot EQ \cdot 2) = E(I) = -STRE(I)
                                                                                  3600
  160 CONTINUE
                                                                                  3610
      IF (PE(I).LE.0.1) PE(I) = 0.1
                                                                                  3620
      PE(I) = ALOGIO(PE(I))
                                                                                   3630
  170 CONTINUE
                                                                                  3640
С
                                                                                  3650
С
                                                                                  3660
      CALLING FLSQFY TO OBTAIN LINEAR COEFFICEINTS.
С
                                                                                  3670
С
                                                                                  3680
      NDEGE≈1
                                                                                  3690
      NDE=2
                                                                                  3700
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MDE=NUMPTE+2 3710 С 3720 FIT LEAST SQUARES STRAIGHT LINE TO EXPANSION REBOUND DATA. С 3730 С 3740 CALL FLSQFY(NDEGE,NUMPTE, PE, EE, W, C, ALPHA, BETA, S, SGMSQ, PR, PO, NDE, MD 3750 1 F) 3760 С 3770 С $LINEE=C(1)+C(2) \approx XP$ 3780 С 3790 SLOPEE=C(2) 3900 CEPTE=C(1)3810 С 3820 С FIND SLOPE OF VIRGIN COMPRESSION CURVE. 3830 С 3840 С 3850 С 3860 С 3870 * SELECT STRAIGHT LINE REPRESENTATION OF VIRGIN COMPRESSION CURVE* С 3880 С 3890 С 3900 CHECK=0.0 3910 XBIG=0.0 3920 BIG=0.03930 DELTA=(BOUND4-BOUND3)/100. 3940 B(1)=BOUND3 3950 DD 200 J=1+101 3960 С 3970 B1=B(J) 3980 B2=8(J)*8(J) 3990 $B3=B(J) \approx B(J) \approx B(J)$ 4000 B4=B(J)*B(J)*B(J)*B(J)4010 $B5=B(J) \approx B(J) \approx B(J) \approx B(J) \approx B(J)$ 4020 $B6=B(J) \approx B(J) \approx B(J) \approx B(J) \approx B(J) \approx B(J)$ 4030 B7=2(J)*B(J)*B(J)*B(J)*B(J)*B(J)*B(J)4040 4050 B9=B(J) & B(J) & 4060 4070 С 4080 С 4090 С 4100 SLCPE1(J)=CC(2)+2*C(3)*B1 +3*C(4)*B2 +4*C(5)*83 + 4110 15*C(6)*B4 +6*C(7)*B5 +7*C(8)*B6 +3* 29*C(10)*B8 +10*C(11)*89 +11*C(12)*B10 +3*C(9)*B7 + 4120 4130 С 4140 IF (J.EQ.1) GD TO 190 4150 DIFF=ABS((SLGPE1(J)-SLOPE1(J-1))/SLOPE1(J)) 4160 IF(DIFF.LE.0.00019) CHECK=1.0 4170 IF (DIFF.LE.C.00019) GO TO 180 4180 IF ((RUNTYP.EQ.2).AND.(DIFF.LE.0.0025)) CHECK = 1 4190 IF ((RUNTYP.EQ.2).AND.(DIFF.LE.0.0025)) GO TO 180 4200 GO TO 190 4210 180 IF(ABS(SLDPE1(J)).GT.ABS(BIG)) XBIG=B(J) 4220 IF(ABS(SLOPE1(J)).GT.ABS(BIG)) BIG=SLOPE1(J) 4230 190 CONTINUE 4240 С 4250 B(J+1)=B(J)+DELTA4260 200 CIONTINUE 4270 IF(CHECK.GT.C.50) GD TO 230 4280 С 4290 00 220 I=1+101 4300

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		IE (ABS(SLOPE)(I)).GE.ABS(BIG)) G0 TO 210	4310
			4320
	210	SIG = ABS(SLAPE)(I))	4330
	L 1 0	X3IG=B(I)	4340
	220	CONTINUE	4350
	_	GU TO 240	4360
	230	CONTINUE	4370
	240	CONTINUE	4380
		XB=XBIG	4390
С			4400
		X E1 = X B	4410
		X82=X8+X8	4420
		XB3=X3+X2+XB	4430
		XB4=XB*XB*XB	4440
		X85=X5*X0*X0*X8*X8	4450
		X85=X6*X8*X8*X8*X8*X8	4460
		XB / = XB	4470
			4480
			4490
			4500
r		AS11-AL#AS#AD#AD#AS#AD#AS#AD#AD#AD#AD	4510
r		CALCHLATE A LINE TOT REPRESENTING THE	4530
r		STRAIGHT PORTION DE VIRGIN COMPRESSION CURVE.	4540
č			4550
č			4560
С			4570
С			4580
		YBIG=CC(1)+CC(2)*XB1+ C(3)*XB2 +C(4)*XB3 +C(5)*XB4 +	4590
		1C(6)☆XB5 +C(7)☆XB6 +C(8)☆XB7 +C(9)☆XB8 +	4600
		2C(10)∻X39 +C(11)∻X310 +C(12)∻XB11	4610
С			4620
С			4630
C		FOR STANDARD TEST DATA ONLY!!!!	4640
C		IF MAXIMUM SLOPE TANGENT IS BETWEEN LAST TWC COMPRESSION CURVE	4650
C		POINTS AND HAS A GREATER SLOPE THAN A LINE GDING THROUGH LAST TWO	4660
C c		CUMPRESSION CURVE POINTS, TAKE THE AVERAGE SLOPE OF THE TWO	4670
C c		AND DRAW THE LINE THROUGH THE LAST COMPRESSION CORVE POINT.	4680
L			4690
		NSLUPE-U TE JOUNTYO NE A) CA TA 250	4700
		$I = (V_0) (T_0 + 0) = (0 + 0) (0 + 0) (2)$	4710
		$f = \{f \in [f \in [f \in [f \cap [f \in [f \cap [f \cap [f \cap [$	4720
		TE (ARS(SLOPE), IT, ARS(RIG)) SLOPEMESLOPE-ARS(SLOPE-RIG)/2	4740
		$F = \{APS(S) OPE(-) T_AAS(PIG)\} S OPE = 999$	4750
	25 0		4760
		SLOPED=BIG	4770
		IF (KSLCPE.EQ.999) SLOPED=SLOPEM	4780
		IF (KSLOPE.EQ.999) YBIG=E(NUMPTC)	4790
		IF (KSLOPE.EQ.999) XBIG=P(NUMPTC)	4800
		CEPTD=YBIG-SLJPED*(XBIG)	4810
С			4820
С		LINED=SLOPED*X+ CEPTD	4830
C		```	4840
C			4850
C c			4860
C r		☆ CALL USER SPECIFIED METHUD IU SELECT PUINT UF MAXIMUM CURVATURE☆	4370
r r		***************************************	4880
r		ΤΕΣΤΙΝΩ ΝΟΨ ΕΟΡ ΡΟΙΝΤ ΟΕ ΜΑΧΙΜΗΜ	4090
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С CURVATURE BETWEEN X VALUES OF BOUNDI AND BOUND2. 4910 С 4920 ******************* 4930 С С 4940 IF (KRAD.EQ.2) CALL ANARAD 4950 IF (KRAD.NE.2) CALL GRARAD 4960 С 4970 С ********************* 4980 С 4990 5000 XS=RADMX XSLP2=RACMX 5010 X22 = RADMX5020 С 5030 C DETERMINE ORDINATE VALUE AT POINT OF MAXIMUM CURVATURE. 5040 5050 XS1*≠*XS XS2=XS∜XS 5060 XS3=XS*XS*XS 5070 XS4=XS*XS*XS*XS 50.80 X S 5 = X S * X S * X S * X S * X S 5090 XS6=XS*XS*XS*XS*XS*XS 5100 X S 7 = X S * X S 5110 XS8=XS*XS*XS*XS*XS*XS*XS*XS 5120 XS9=XS*XS*XS*XS*XS*XS*XS*XS*XS*XS 5130 X S 1 C = X S * X 5140 X S l l = X S * 5150 С 5160 С 5170 С 5180 5190 С +C(4)*XS3 +C(5)*XS4 YSLP2=CC(1)+CC(2)*XS1 +C(3)*XS2 5200 1+C(6)*XS5 +C(7)*XS6 +C(8)*XS7 +C(9)*XS8 5210 +C(12)*XS11 2+C(10)*XS9 +C(11)*XS10 5220 С 5230 5240 С 5250 С 5260 С С ::: 5270 С \$ CASAGRANDE'S CONSTRUCTION 4 5280 С * 12 5290 С 5300 С 5310 CALCULATE A HORIZONTAL LINE CALLED "A" THROUGH 5320 С С (XSLP2, YSLP2), POINT OF MAX CURVATURE. 5330 CEPTA = YSLP25340 С 5350 LINEA=YSLP2 С 5360 С 5370 CALCULATE A LINE TANGENT TO CURVE AT 5380 С С (XSLP2, YSLP2), POINT OF MAX CURVATURE, 5390 С AND CALL IT LINE '8". 5400 С 5410 С 5420 5430 С С 5440 С 5450 SLOPEB=CC(2)+2*C(3)*XS1+3*C(4)*XS2 +4*C(5)*XS3+ 5*C(6)*XS4 + 546û 16*C(7)*XS5 +7*C(8)*XS6 +8*C(9)*XS7 +9*C(10)*XS8 + 5470 110*C(11)*XS9 +11*C(12)*XS10 5480 С 5490 CEPTB=YSLP2-SLOPEB*(XSLP2) 5500

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5510 С С LINEB=SLOPEB#XP+CEPTB 552U С 5530 С BISECT DIFFERENCES IN SLOPE BETWEEN 5540 LINE 'A' AND LINE 'B' AND CALCULATE С 5550 LINE 'C' THROUGH POINT OF MAX CURVATURE. С 5560 5570 С SLOPEC=SLOPEB/2 5580 CEPTC=YSLP2-SLOPEC*(XSLP2) 5590 С 5600 LINEC=SLOPEC*XP+CEPTC С 5610 С 5620 С FIND INTERSECTION OF LINES 'D' AND 'C' TO GET 5630 С THE VALUE FOR PRECONSOLIDATION PRESSURE. 5640 С 5650 PC=(CEPTC-CEPTC)/(SLOPED-SLOPEC) 5660 С 5670 5680 С С 5690 5700 С \$ 4 ٠ SCHMERTMANN'S CONSTRUCTION \$ С 5710 С ** \$ 5720 С 5**7**30 С 5740 5 **7**50 С COMPUTE A LINE 'F' THAT HAS A SLOPE OF *SLOPEE* AND GOES THROUGH INTIAL PRESSURE С 5760 AND INITIAL VOID RATIO OR ZERO PERCENT STRAIN. С 5770 5**7**80 C IF (KK.EQ.2) GO TO 260 5790 CEPTF=EO-SLOPEE≈(PINSTU) 5800 GO TC 270 5810 260 CEPTF = -SLOPEE*PINSTU 5820 270 CONTINUE 5830 SLOPEF=SLOPEE 5840 С 5850 С LINEF=SLOPEE*XP+CEPTF 5860 С 5870 COMPUTE PRECONSOLIDATION VOID RATIO CR PRECONSOLIDATION VERTICAL С 5880 STRAIN TO DEFINE INSITU PRECONSOLIDATION STATE. 5890 С 5900 С EC=SLOPEE*PC+CEPTF 5910 5920 С NOW COMPUTE A LINE 'G' THAT WILL REPRESENT 5930 С С TRUE VIRGIN COMPRESSION LINE. 5940 5950 C YVIRGI=0.42≈E0 5960 IF (KK.EQ.1) GO TO 280 5970 YVIRGI=-(EO-0.42*EO)/(1+E0) 5980 280 CONTINUE 5990 XVIRGI=(YVIRGI-CEPTO)/SLOPED 6000 SLOPEG=(YVIRGI -EC)/(XVIRGI -PC) 6010 С 6020 С 6030 CEPTG=EC-SLOPEG*PC 6040 С 6050 LINEG=SLOPEG*XP+CEPTG С 6060 С 6070 С 6080 С OUTPUT OVER CONSOLIDATION RATIO AND PRECONSCLIDATION VERTICAL 6090 EFFECTIVE PRESSURE WITH EITHER THE VOID RATIO OR VALUE OF STRAIN. С 6100

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С
                                                                               6110
      POVE=10.**PINSTU
                                                                               6120
      PRECON=10.0**PC
                                                                               6130
      CC1=SLOPEG
                                                                               6140
      CS=SLOPEE
                                                                               6150
      VOIDC=EC
                                                                               6160
      CCR=PRECON/PGVE
                                                                               6170
      IF (KK \bullet EQ\bullet1) CR = CC1
                                                                               6180
      IF (KK \cdot EQ \cdot 1) SR = CS
                                                                               6190
      IF (KK.EQ.1) CRMIN=SLOPED
                                                                               6200
      PCMIN=(CEPTD-CEPTF)/(SLOPEF-SLOPED)
                                                                               6210
      ECMIN=SLOPEE*PCMIN+CEPTF
                                                                               6220
      IF (KK.EQ.1.AND.ECMIN.GT.EC) PCMIN=(CEPTD-EC)/(-SLOPEO)
                                                                               6230
      IF (KK.EQ.1.AND.ECMIN.GT.EO) ECMIN=ED
                                                                               6240
      IF (KK.EQ.2.ANC.ECMIN.GT.O) PCMIN=-CEPTD/SLOPED
                                                                               6250
      IF (KK.EQ.2.AND.ECMIN.GT.O) ECMIN=0.0
                                                                               6260
      PREMIN=10.**PCMIN
                                                                               6270
      OCRMIN=PREMIN/POVE
                                                                               6280
                                                                               6290
      IF (KK \bullet EQ \bullet 2) CR = CC1
      IF (KK.EQ.2) SR = CS
                                                                               6300
      IF (KK.EQ.2) CRMIN=SLOPED
                                                                               6310
С
                                                                               6320
С
                                                                               6330
С
      CALL PLOTTING SUBROUTINE CASPLT
                                                                               6340
С
                                                                               6350
      *****
С
                                                                               6360
С
                                                                               6370
      CALL CASPLT
                                                                               6380
С
                                                                               6 39 0
С
      ******
                                                                               6400
С
                                                                               6410
      PINSTU=10≉*PINSTU
                                                                               6420
      DO 290 I=1,NUMPTC
                                                                               6430
      P(I)=10.0**P(I)
                                                                               6440
  290 CONTINUE
                                                                               6450
      DO 300 I=1,NUMPTE
                                                                               6460
      PE(I)=10.0**PE(I)
                                                                               6470
  300 CONTINUE
                                                                               6480
С
                                                                               6490
 1080 FORMAT ('1',//14X, 'STANDARD CONSOLIDATION TEST'/20X,
                                                                  DATA RE
                                                                               6500
     1DUCTION //)
                                                                               6510
 1090 FORMAT ('1',//14X, CONTROLLED GRADIENT CONSCLIDATION TEST'/25X,
                                                                               6520
     1DATA REDUCTION //)
                                                                              , 6530
 1100 FORMAT ('1',//14X, CONTROLLED RATE OF STRAIN CONSOLIDATION TEST'
                                                                               6540
     1/28X, DATA REDUCTION //)
                                                                               6550
 1110 FORMAT (1H0,9X, 'TEST NO.', I4, 19X, 'HOLE NO. ', I2/1H0,9X, 'LOCATION '
                                                                               6560
     1.444.6X, SAMPLE NO. *, A3/1HU, 9X, DATE *, 3A4, 14X, OPERATOR *, A4)
                                                                               6570
 1120 FORMAT (1H0,5X, SOIL TYPE - ',4A4/1H0,9X, BACK PRESSURE ',F6.2,1X,
                                                                               6580
    1*PSI*///,1H0,34X,*INITIAL*,9X,*FINAL*)
                                                                               6590
 1130 FORMAT (1H0,9X, WATER CONTENT *, 14X, F4.1, *%*, 10X, F4.1, *%*/1H0,9X, *V
                                                                               6600
     1CID RATIO ',17X, F4.2,11X, F4.2/1H0,9X, 'DEG. OF SATURATION', SX, F5.1, '
                                                                               6610
     2%',9X,F5.1,'%')
                                                                               6620
 1140 FORMAT(1H0///25X, DEGREE POLYNOMIAL = , I2/1HC,5X,
                                                                               6630
     1'PT. OF MAX. CURVATURE SELECTED BY THE ANALYTICAL METHOD'/1HO,
                                                                               6640
     25X, SEARCH BOUNDARIES FOR PT. OF MAX. CURVATURE: *,
                                                                               6650
     A2X, F5.2, * TSF', 2X, F5.2, * TSF*
                                                                               6660
     3/1H0,5X, SEARCH BOUNDARIES FOR VIRGIN COMPRESSION CURVE: +, F6.2, + T
                                                                               6670
     4SF',2X,F5.2,' TSF'/1H0,5X, 'DEPTH FOR INSITU STRESS CALCULATION: ',
                                                                               6680
     52X,F5.2, FEET',4X, SECONDARY COMPRESSION AT',1X,
                                                                               6690
     6F5.2, TSF )
                                                                               6700
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1150 FORMAT(1H0///25X.*DEGR	EE POLYNOMIAL	=',I2/1H0,5X	•	6710
1 PT. DF MAX. CURVATURE	SELECTED BY	THE GRAPHICAL	METHUD /1HO,	6720
25X, SEARCH BOUNDARIES	FOR INITIAL TA	ANGENT: , ZX . F	5.2, TSF , 2X	•F5•2 6730
3, TSF /1H0,5X, SEARCH	BOUNDARIES FO	OR VIRGIN COM	PRESSION CURV	'E:", 6740
AZX, F5.2, ISF, 2X, F5.2				6750
4, 15F / 1H0, 5X, UEPIH	FUR INSTIU STR	RESS CALCULAT	184:**	6760
52X9F5•29* FEEL*94X•*SE	LUNDARY LUMPRI	ESSION AT IX	,	6770
				6780
IF (KIND DO 2 AND KKEE	U = I • A NO KRAU • I O - 7 AND KRAU • I	NE•21 WKILE(6190
IF ININUSEQSZANUSANSE	Qezeanuerkauei Tilool	NE•2) WRITE(I)	UOI (LICU)	6300
IF (KK EQ D) WRITE(IUU	1,11907			0010
IF (KK®EQ®Z) WRITE (IU)	UI ALZUUI			082U
IF(KK+EQ+I) WKIIE(100)	12201 PINSIU	9 EU 9 PRELLN 9 PR	EMINOVUIULOEU	MIN9 0000
TE IVV EO 21 VOTOC- VO	Tor.			6040
				6840
IF (KK = 0.2) = UMIN = -	EUMIN T 12201 DINET			CMTN: 6970
IF (NN+LU+Z) ARTIELIUU	1912507 PINSIN	JEUFREUUNF	REPTINOVLIDUOE	CHINE 0010
TE (KK ED 2) VOIDCVO	T OC			6800
$I = \{KK \in G \ge \} = CMIN = -$				6000
$IF (NN \bullet EW \bullet Z) = CMIN =$				6010
	ט וי כ הייס חוו כח דו	1 330		6920
UPITE (ICHT.)IAO)		000		6030
1160 EDRAAT (141.201. INDUT	DATA # //1 HO.9	Y TIME	SEEL RDG	14.1P. 6940
10. 206.1.4Y.1 0AD 206	•/14 \	AV TIBL VOAV		6950
DO 310 I=1.AUMPTC	/16 /			0.000
WRITE (TOUT.1170) TR(T).DEFR(I).PPR	(T) . WRD (T)		6970
1170 EDRMAT (1H .9X.E5.0.5X	*E6.2.10X.E5.	0.10X.E5.0)		6980
310 CONTINUE	,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			6990
DO 320 I=1.NUMPTE				7000
WRITE (IOUT+1170) TRE(I), DEFRE(I), P	PRE(I) + WRDE(I)	7010
320 CONTINUE				7020
WRITE(IGUT+1180)				7030
1180 FORMAT(•1 •)				7 040
330 CONTINUE				7050
1190 FORMAT (1X//1X+ '	್ಯ ಸಂಘ ಸೇರ್ಪ್ ಸೇರ್ಪ್ ಪೇರ್ಪ್ ಪೇರ್	******	*********	****** 7060
1*************	•/ 1X,•			7 0 7 0
2	-25	°/ 1X•*	*	7080
3 VOID RATIO ANALYSI	S	*		•/ 7090
41X,• *				7100
5 * •/ LX,•	ale ste ste ste ste ste ste ste ste ste	ala na na na mining na na na na na na na	ala da seran se de verde de de de de se	·****** /110
	* /)	وار ماد بار وار بار وار وار وار وار وار وار وار وار	والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع	/120
1200 FURMAT (IX//IX) *				······································
] <i>***********************</i> *************	•/ 1X••	**		7140
		·/ 1X•·	ñ.	7150 7150
3 STRAIN ANALYSI	2	50 S		·/ /100
	وال وال وال وال وال وال وال	وی ماد باد ماد وی وار بای وار وار باد وار وار وار و	که داد داد داد داد داد داد باد داد داد داد	/1/U
フ ** 「/ 1×9* といいかかかのできたためののののの。	• /)	داد داد داد باد باد باد باد باد باد باد	an a	······································
	•/1			7 190
$\frac{1210}{10} = \frac{160}{10} = $				7200
1220 EDRMAT(10/)2044//		LCC -1.66 3.1	TSE1.0Y.	7210
ITAL VOID BATIO (S		HOLIOX PRANCE	S DE STRESS-	7230
2 VOID RATIO SETTLEMENT	PARAMETERS!/	1H0.50X.10208	ASIF	7240
3 MINIMUM / / HC_ VERTICA	PRECONSCITO	TUDA CISECC		7 240
4F8.3.* TSF -**F8.3.*	TSE!/1H0. 3	SHPRECONSOLID	ATION STATE'S	VCID 7260
5 RATIO 15(***)	F8.3.2×	E8.3/1H0.10VF	RCONSCLIDATIO	IN'. 727
6' RATIO (OCR) '•21('-') • F8 • 3 • 2X • ! - !	•E8.3/1HC. •CC	MPRESSION !-	7280
7'INDEX (CC) '+28('-')		• * 8 • 3 • 2X • * -	•F8•3/1H0••	WELL 7290
REVEANSTON INDEX (CS)	•24(•• •) •E8•	3.2X//)		7300

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1230 FORMAT(1H0,/1X , INSITU VERTICAL STRESS = ', F6.3, TSF', 9X, 7310 1'INITIAL VOID RATIO (EO) = '.F6.3//1H0,13X, 'RANGES OF STRESS-STRAIN 7320 2 SETTLEMENT PARAMETERS */1HC,50X,*PROBABLE - MINIMUM*/1HO, 7 3 3 0 7340 4F8.3, * TSF */1H0,41HPRECONSOLIDATION STATE *S VERTICAL STRAIN ,10(* 7350 5.*),F8.3+2X+'-',F8.3/1HC+'OVERCONSOLIDATION RATIO (GCR) ',21('.'), 7360 F3.3.2X, '- ', F8.3/1H0, 'COMPRESSION RATIO (CR) ', 6 7370 728('.'),F8.3.2X,'-',F8.3/1H0,'SwELL RATIO (SR) ', 7380 834('•'),F8.3,2X ///) 7390 IF ((KIND.EQ.0).AND.(KK.EQ.1)) GO TO 380 7400 IF (KIND.EQ.O.AND.RUNTYP.EQ.O.AND.KRAD.EQ.2) GO TO 350 7410 IF (KIND.EQ.G.AND.RUNTYP.EQ.O) wRITE(IDUT,1180) 7420 350 CONTINUE 7430 IF ((KK.EQ.2).AND.(RUNTYP.NE.O)) WRITE (IUUT,1250) 7440 IF ((KK.EQ.2).AND.(RUNTYP.EQ.0)) WRITE (IDUT,1240) 7450 IF ((KK.EQ.1).AND.(RUNTYP.NE.O).AND.(KIND.NE.O)) wRITE(IDUT.1250) 7460 IF ((KK.eQ.1).AND.(RUNTYP.EQ.0).AND.(KIND.NE.0)) WRITE(IDUT,1240) 7470 1240 FORMAT (8X, 'EFF. VERT. ', 9X, 'VOID RATID', 9X, 'VERT. STRAIN'/ 7480 11H0,8X,*STRESS',34X,*(IN/IN)*,13X,*DIAL RDG.*/1H0,8X,*(TSF)*//) 7490 1250 FORMAT (8X, 'EFF. VERT. ', 9X, 'VOID RATIO', 9X, 'VERT. STRAIN'/ 7500 11H0,8X, *STRESS*,34X,*(IN/IN)*,13X,*TIME(MIN)*/1H0,8X,*(TSF)*//) 7510 DS 360 I=1,NUMPTC 7520 IF (NUMPTC.GT.10) E(I) = -E(I)7530 IF((KIND+EQ+1)+AND+(RUNTYP+EC+O))WRITE(IDUT+1270)P(I)+CSEVT{I}+H(I 7540 7550 1) IF((KIND, EQ.1).AND.(RUNTYP.NE.O))WRITE(IOUT, 1270)P(I), CSEVT(I), TR(7560 7570 1I) IF((KIND.EQ.2).AND.(RUNTYP.EQ.0))WRITE(IOUT,1280)P(I),E(I),H(I) 7580 IF((KIND.EQ.2).AND.(RUNTYP.NE.O))WRITE(IOUT,1280)P(I),E(I),TR(I) 7590 IF (KIND.NE.0) GO TO 360 7600 IF (RUNTYP.EQ.O) WRITE (IOUT,1260) P(I),CSEVT(I),E(I),H(I) 7610 IF (RUNTYP.NE.O) WRITE (IOUT,1260) P(I),CSEVT(I),E(I),TR(I) 7620 1260 FORMAT (1H ,5X,6(F10.5,10X)) 7630 1270 FORMAT (1H ,5X,2(F10.5,10X),20X,F10.5) 7640 1280 FOR MAT (1H ,5X,F10.5,30X,2(F10.5,10X)) 7650 360 CONTINUE 7660 DO 370 I=1,NUMPTE 7070 IF (NUMPTC.GT.10) EE(I)=-EE(I) 7680 IF((KIND.EQ.1).AND.(RUNTYP.EQ.0))WRITE(IDUT,1270)PE(I),CSEVTE(I), 7690 1 HE(I) 7700 IF((KIND.EQ.1).AND.(RUNTYP.NE.O))WRITE(IDUT,1270)PE(I),CSEVTE(I), 7710 0577 1 TRE(I)IF((KIND.EQ.2).AND.(RUNTYP.EQ.O))WRITE(IDUT,1280)PE(I),EE(I),HE(I) 7730 IF((KIND-EC-2)-AND-(RUNTYP-NE-O))WRITE(IOUT,1280)PE(I),EE(I), 7740 1 TRE(I)7750 IF (KIND.NE.C) GO TO 370 7760 IF (RUNTYP.EQ.O) WRITE (IDUT,1260) PE(I),CSEVTE(I),EE(I),HE(I) IF (RUNTYP.NE.O) WRITE (IDUT,1260) PE(I),CSEVTE(I),EE(I),TRE(I) 0777 7780 370 CONTINUE 7790 380 CONTINUE 7800 С 7810 IF THE PT. OF MAX. CURVATURE HAS GREATER ABSCISSA VALUE THAN THE 7820 С С PRECONSOLIDATION STRESS BY CASAGRANDE'S CONSTRUCTION, THE PROCEDUR 7830 С HAS FAILED. 7840 С 7850 IF (PC.LT.XSLP2) WRITE (IOUT,1290) 7860 1290 FORMAT(1X///1X, ***** ATTENTION **** ANALYTICAL PROCEDURE WITH 7'870 ICASAGRANDE CONSTR. HAS FAILED. CHECK DATA AND ASSUMPTIONS!!! ** A 7880 2 ***///) 7890 7900 PINSTU=AL G10(PINSTU)

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7910
  390 CONTINUE
      WRITE (IOUT+1300) DCF, LCF, PCF
                                                                                7920
 1300 FORMAT(1H0,5X, ADDITIONAL INPUT DATA //6X, CALIBRATION FACTORS: //
                                                                                7930
     16X+'DEFLECTION =',F8.5,5X,'LOAD =',F8.5,5X,'PRESSURE =',F8.5)
                                                                                7940
      WRITE (IOUT, 1310) DEFZ, WRZ, PPZ
                                                                                7950
 1310 FORMAT(1H0,5%, 'EQUIPMENT ZERO READINGS: '/6%, 'DEFLECTION = ',
                                                                                7960
     1F8.3,5X,*LOAD = +,F8.3,5X,*PORE PRESSURE = +,F8.4)
                                                                                7970
      WRITE (IOUT,1320) DIA, SAMPHI
                                                                                7980
 1320 FORMAT(1H0,5X, DIAMETER OF SPECIMEN =*, F6.3, INCHES*, 5X,
                                                                                7990
     1'INITIAL HEIGHT OF SAMPLE =', F6.3,' INCHES')
                                                                                8000
  400 CONTINUE
                                                                                8010
      WRITE (IOUT,1180)
                                                                                8020
      CALL PLOT (15.0,0.0,-3)
                                                                                8030
      CALL PLOT(C.C,0.0,999)
                                                                                8040
      STOP
                                                                                8050
      FND
                                                                                8060
      SUBROUTINE CONGRA
                                                                            CONG0010
                                                                            CONGOOZO
С
С
      THIS SUBROUTINE READS AND REDUCES THE TEST DATA FOR THE CONTROLLEDCONGOO30
      GRADIENT AND RATE OF STRAIN CUNSCLIDATION TESTS.
С
                                                                            CONG0040
С
                                                                            CONG0050
      COMMON /BLOK1/ SEVT(303), E(303), SEVTE(103), EE(103), C(103)
                                                                            C GNG 0060
                                                                            CONG0070
      DOUBLE PRECISION C
      COMMON /BLOK2/ CEPTA ,SLOPEB,CEPTB,SLOPEC,CEPTC,SLOPED,CEPTD,
                                                                            CONG0080
     1SLCPEE+CEPTE+SLOPEF+CEPTF+SLOPEG+CEPTG+BOUND1+BOUND2+BOUND3+BOUND4CONG0090
     2,BOUND5,BOUND6,NUMPTC,NUMPTE,PINSTU,XSLP2,PC,EC,EC,EC,CC1,CS,CR, CONGO100
     3SR,NDEG, IN, ICUT, IDIAL
                                                                            CONGOILO
      COMMON /8LOK4/ TR(303), TRE(103), DEFR(303), DEFRE(103), PPR(303),
                                                                            CONG0120
     1PPRE(103), WRD(303), WRDE(103), L, STVT(303),
                                                                            CONG0130
     2STVTE(103), PPP(303), PPPE(103), PPT(303), PPTE(103),
                                                                            CONGC140
                                                                            CONG0150
     3CSEVT(303), CSEVTE(103), DFLI(303), DFLIE(103), STR(303),
     4STRE(103), H(303), HE(103), DCF, LCF, PCF
                                                                            CONG0160
      COMMON /BLOK5/ LOC(4),HOL,SAM,TES,OPR(1),DAT(3),DES(4),BCO(20),
                                                                            CONG0170
     1KK .RUNTYP
                                                                            CONG0180
      COMMON /BLOK6/ SPG,WTIW,WTFW,WTFD,DEFI,DEFF,BP,DEFZ,WRZ,PPZ,HS,HI,CONG0190
     1HV, SI, EI, EF, SF, WI, WF, SECOND, AR
                                                                            CONG0200
      DIMENSION - T(503), T2(503)
                                                                            CONG0210
                                                                            CONG0220
      REAL LCF
      INTEGER RUNTYP
                                                                            CONG0230
                                                                            C 6NG0240
С
                                                                            CONG0250
С
      READ IN CONTROLLED TEST COMPRESSION DATA -- TIME, DEFLECTION,
      PORE PPESSURE, AND LOAD.
                                                                            CONG0260
С
С
                                                                            CONG0270
                                                                            CONG0280
С
      00 30 I=1,30C
                                                                            CONG0290
      READ (IN,1000) TR(I), DEFR(I), PPR(I), WRD(I), L
                                                                            CON60300
 1000 FORMAT (F4.0,F5.2,2F4.0,I2)
                                                                            CONG0310
                                                                            CONG0320
С
      COMPUTE ALL CUTPUT
                                                                            CONG0330
С
C
                                                                            CONG0340
      T(I)=TQ(I)-TR(1)+1.0
                                                                            CONG0350
      STVT(I)=((WRC(I)-WRZ)*LCF*144.0)/(2000.0*AR)
                                                                            C ONGO 360
      PPP(I) = ((PPR(I) - PPZ) * PCF)
                                                                            CONG0370
      PPT(I) = PPP(I) #0.072
                                                                            C ONGO 380
      SEVT(I)=STVT(I)-(0.666667; PPT(I))
                                                                            CONG0390
      CSEVT(I)=SEVT(I)
                                                                            CGNG0400
      OFLI(I)=IDIAL*(UEFR(I)-DEFI)*DCF
                                                                            CGNG0410
      STR(I) = OFLI(I)/HI
                                                                            C GNG 0420
      H(I)=HI-OFLI(I)
                                                                            CONG0430
      E(I)=(HV-OFLI(I))/HS
                                                                            C0NG0440
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in Electric Constants (Children)

IF (SEVT(I).GT.SECOND) TR(I)=TR(I-1) CONG0450 IF (SEVT(I).GE.SECOND) STR(I)=STR(I-1) CONG0460 IF (SEVT(I).GE.SECOND) E(I)=E(I-1) CONG0470 IF (SEVT(I).GE.SECOND) SEVT(I) = SEVT(I+1) CONG0480 IF $(KK \cdot EC \cdot I) \cdot CSEVT(I) = E(I)$ CONG0490 С MUST DETERMINE WHEN EXPANSION POINTS START. CUNG0500 IF(I.EQ.1) GOTO 20 CGNG0510 С CONG0520 HAS EFFECTIVE STRESS DECREASED MORE THAN 0.7 TSF BETWEEN С CONG0530 С CONSECUTIVE DATA POINTS? IF SO, CONSIDER ALL SUBSEQUENT CÜNG0540 С DATA AS EXPANSION-REBOUND DATA. CONG0550 IF(SEVT(1).GT.1.0) GO TO 10 CONG0560 Ω IFF = SEVT(I) - SEVT(I-1) CONG0570 IF(I.EQ.2) GC TO 10 CONG0580 DIFFI=SEVT(I-I)-SEVT(I-2)CONG0590 **10 CONTINUE** CONG0600 IF (SEVT(I).LT.(SEVT(I-1)-0.7)) GO TO 40 CONG0610 IF (SEVT(1).LT.0.1) SEVT(I)=0.1 CONG0620 С CONTINUE TO READ COMPRESSION DATA. CONG0630 20 CONTINUE C ©NG0640 **30 CONTINUE** CONG0650 С CONG0660 **40 CONTINUE** CONG0670 С CONG0680 C *** IGNCRING LAST POINT (SECONDARY COMPRESSION PROBABLY) TO AVOID CONG0690 C *** FITTED CURVE BENDING BACK TRYING TO FIT IT. CONG0700 NUMPTC≃I-1 CONG0710 C 🚓 THIS POINT HAS NOW BEEN MADE INVISIBLE TO ANALYSIS. CONG0720 С CONG0730 С CONG0740 С READ IN CONTROLLED TEST EXPANSION-REBOUND DATA -- TIME, DEFLECTION, CONG0750 С PORE PRESSURE, AND LOAD. CONG0760 С CONG0770 00 50 I=1,103 CONG0780 READ (IN,100C) TRE(I), DEFRE(I), PPRE(I), WRDE(I),L C ONGO 790 С CONG0800 С HAS A BLANK CARD BEEN ENCOUNTERED? IF NOT, CONTINUE TO LOOK FOR CONGOBIO С MORE DATA. CONG0820 IF(TRE(I).EQ.0) GOTO 60 CONG0830 TE(I)=TRE(I)-TRE(1)+1.0 CONG0840 TE(I)=TRE(I)-TR(1)+1.0 CONG0850 $TRF(I) \approx TF(I)$ CONG0860 STVTE(I)=((WRDE(I)-WRZ)*LCF*144.0)/(2000.0*AR) CONG0870 PPPE(I)=((PPRE(I)-PPZ)*PCF) CONG0880 PPTE(I)=PPPE(I)*0.072 CONG0890 NUMPTE≕I CONG0900 SEVTE(I)=STVTE(I)-(0.666667 *PPTE(I)) CONG0910 CSEVTE(I) = SEVTE(I)CONG0920 DFLIE(I)=IDIAL*(DEFRE(I)-DEFI)*DCF CONG0930 STRE(I) = DFL1E(I)/HI CONG0940 HE(I)=HI-DFLIE(I) CONG0 950 EE(I)=(HV-DFLIE(I))/HS CONG0960 IF (KK • EQ • 1) CSEVTE(I) = EE(I) CON60970 50 CONTINUE CONG0980 60 CONTINUE CONG0990 RETURN CONG1000 FND CONG1010 С GRAR0010 С GRAR0020 ſ ***************** **GRAR0030**

C C	* GRAPHICAL METHOD * **************	GRAR0040 GRAR0050
c	SUBROUTINE GRARAD	GRAR0070 GRAR0080
C C	THIS VERSION EMPLOYS MCNULTY'S CONSTRUCTION TO DETERMINE THE POINT OF MAXIMUM CURVATURE. COMMON /BLOKI/ P(303).F(303).PE(103).FE(103).C(103)	GR AR 0090 GR AR 0100 GR AR 0110
	DOUBLE PRECISION C COMMON /BLGK2/ CEPTA ,SLOPEB.CEPTB,SLOPEC.CEPTC.SLOPED.CEPTD,	GRAR0120 GRAR0130
	1SLOPEE,CEPTS,SLOPEF,CEPTF,SLOPEG,CEPTG,BOUND1,BOUND2,BOUND3,BOUND4 2,BOUND5,BOUND5,NUMPTC,NUMPTE,PINSTU,XSLP2,PC,EC,ED,CCR,CC1,CS,CR,	GRAR0140 GRAR0150
	COMMON /BLOK5/ LOC(4),HOL,SAM,TES,OPR(1),DAT(3),DES(4),BCD(20), IKK,RUNTYP	GRARO180 GRARO170 GRARO180
	COMMON /BLOK8/ RAD(103),RADMIN,RADMX,IMIN,IPRINT,JPRINT,KIND COMMON /BLOK9/ X(103, 4),SLOPE1(103),SLOPE2(103)	GRAR0190 GRAR0200
	COMMON X1(103, 4),X2(103, 4),X3(103, 4),X4(103, 4),X5(103, 4), 1X6(103, 4),X7(103, 4),X3(103, 4),X9(103, 4),X10(103, 4),X11(103, - 2)	GR AR 0 210 4GR AR 0 220 GR AR 0 230
	COMMON /BISEC/ XTAN,YTAN,CEPTAN,XANGLE,SLUPBI,CEPTBI INTEGER RUNTYP	GRARO240 GRARO250
c	INTEGER START,SFAC DIMENSION CURVE(101),YLINE(101)	GRAR0260 GRAR0270
C	BOUND IS USED AS TEMPORARY STORAGE LOCATION FOR BOUNDI. BOUND=BOUND1	GRAR0290 GRAR0300
C	BOUND5=BOUND2	GRAR0310 GRAR0320
C	BOUNDS IS SET EQUAL TO 0.0 SO THAT PLUTTING SUBROUTINE CASPLE WILL USE APPROPRIATE STATMENTS WHICH WILL PLGT MCNULTY'S CONTRUCTION. BOUNDS=0.0	GRAR0330 GRAR0340 GRAR0350
С		GRAR0360 GRAR0370
С	RADMX=0.0	GRAR0390 GRAR0400
C C	FIND A LINE TANGENT TO INITIAL COMPRESSION CURVE HAVING SLOPE OF EXPANSION-REBOUND CURVE.	GRAR0410 GRAR0420
	DELTA=ABS(BOUND2-BOUND1)/100.0 RADMIN=100.0	GRAR0440 GRAR0440 GRAR0450
c	DC 10 I=1,101 X(1,J)=BOUND1	GRAR0460 GRAR0470
L	X1(I•J)≠X(I•J)∻1.0 X2(I•J)=X(I•J)∻X(I•J)	GRAR0480 GRAR0490 GRAR0500
	X3(I,J)=X(I,J)∻X(I,J)∻X(I,J) X4(I,J)÷X(I,J)∻X(I,J)∻X(I,J)	GRAR0510 GRAR0520
	X5(I,J)=X(I,J)#X(I,J)#X(I,J)#X(I,J)#X(I,J) X6(I,J)=X(I,J)#X(I,J)#X(I,J)#X(I,J)#X(I,J)#X(I,J) X7(I,J)=X(I,J)#X(I,J)#X(I,J)#X(I,J)#X(I,J)#X(I,J)#X(I,J)	GRAR0530 GRAR0540 GRAR0550
	<pre>(L,I)X*(L,I</pre>	GRAR0560 GRAR0570
C	(L+I)X*(L+J) X1C(I+J)X*(L+J)X*(L+J)X*(L+J)X*(L+J)X*(L+J)X*(L+J)X*(L+J)X*(L+J)	GRAR0580 GRAR0590 GRAR0600
C	SEOPE1(I)=C(2)+2*C(3)*X1(I+J) + 3*C(4)*X2(I+J) + 4*C(5)*X3(I+J)+	GRARO610 GRAR0620 GRAR0630

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K5++C(6)++X4(I+J)+ 6++C(7)++X5(I+J)+ 7++C(8)++X++(I+J)++
                                                                          GRAR0640
                                                                          GRAR0650
     K9*C(10)*X8(I,J)+ 10*C(11)*X9(I,J) +11*C(12)*X10(I,J)
С
                                                                          GRAR0660
С
                                                                          GRAR0670
      TRYING TO FIND TANGENT TO CURVE WITH SLCPE OF REBOUND-EXPANSION
С
                                                                          GRAR0680
С
      CURVE.
                                                                          GRAR0690
      IF (SLOPE1(I).LT.SLOPEE) GO TO 20
                                                                          GR AR 0 700
С
                                                                          GRAR0710
   10 X(I+1,J)=X(I,J)+DELTA
                                                                          GRAR0720
   20 CONTINUE
                                                                          GRAR0730
      IF (I.EQ.1) GO TO 40
                                                                          GRAR0740
      BOUND2=X(I,J)
                                                                          GRAR0750
      BOUND1 = X(I-1, J)
                                                                          GRAR0760
   30 CONTINUE
                                                                          GRAR0770
C.
                                                                          GRAR0780
      J = 3
                                                                          GRAR0790
      XB = X(I,J)
                                                                          GRAROBOO
   40 CONTINUE
                                                                          GRAR0810
С
                                                                          GRAR0820
      IF A TANGENT TO INITIAL COMPRESSION CURVE IS NOT FOUND, DEFAULT
С
                                                                          GRAR0830
С
      TO USE FIRST SEARCH BOUNDARY (BOUNDI) AS ABSCISSA VALUE CN
                                                                          GRAR0840
С
      COMPRESSION CURVE THROUGH WHICH LINE HAVING THE SLOPE WILL BE
                                                                          GRAR0850
C
      DRAWN.
                                                                          GRAR0860
      IF (I.EQ.1) X8=BGUND
                                                                          GRAR0870
С
      **********
                                                                          GRAR0880
C
                                                                          GRAR0890
      XTAN=XB
                                                                          GRAR0900
      X81=X8
                                                                          GRAR0910
      XB2=XB≑XB
                                                                          GRAR0920
      XB3=XB*XB*XB
                                                                          GR AR 0930
      XB4=XB#XB#XB#XB
                                                                          GRAR0940
      X85=X3*X8*X8*X8*X8
                                                                          GRAR0950
      XB6=XB*XB*XB*XB*XB*XB
                                                                          GRAR0960
      XB7=XB*X8*X8*X8*X8*X8*X8
                                                                          GRAR0970
      XB8=XB*XB*XB*XB*XB*XB*XB*XB
                                                                          GRAR0980
      X69=X8*X8*X8*X8*X8*X8*X8*X8*X8*X8
                                                                          GR AR 0990
      XB1C=XB*X8*XE*X8*X8*X8*X8*X8*X8*X8*X8
                                                                          GRAR1000
      XB11=XB*XB*XB*XB*XB*XB*XB*XB*XB*XB*XB*XB*XB
                                                                          GRAR1010
С
                                                                         'GRAR1020
С
                                                                          GRAR1030
С
                                                                          GRAR1040
                                      +C(4)*XB3 +C(5)*X84
      YTAN=C(1)+C(2) \approx XB1+C(3) \approx XB2
                                                                          GRAR1050
                                                                  +
     1C(6)*X85 +C(7)*X86 +C(8)*X87 +C(9)*X88 +
                                                                          GRAR1060
     2C(1C)*XB9
                   +C(11)*XB10 +C(12)*XB11
                                                                          GRAR1070
С
                                                                          GRARIC80
      CEPTAN=YTAN-SLOPEE*XB
                                                                          GRAR1090
      TANGENT LINE HAS BEEN DEFINED.
С
                                                                          GRAR1100
С
      FIND INTERSECTION WITH LINE 'D' (VIRGIN COMPRESSION LINE).
                                                                          GRAR1110
С
                                                                          GRAR1120
      XANGLE=(CEPTAN-CEPTD)/(SLOPED-SLOPEE)
                                                                          GRAR1130
      YANGLE=SLOPEE#XANGLE+CEPTAN
                                                                          GRAR1140
      PI=355./113.
                                                                          GRAR1150
      SFAC=NUMPTC+2
                                                                          GRAR1160
      IF (KK.EQ.1) E(SFAC)=0.04
                                                                          GRAR1170
      IF (KK.EQ.2) E(SFAC)=0.02
                                                                          GRAR1180
      DELTA=E(1)-E(NUMPTC)
                                                                          GRAR1190
      IF (KK.EQ.1.AND.ABS(DELTA).GT.O.32) E(SFAC)=0.08
                                                                          GRAR1200
      IF (KK.E0.2.AND.ABS(DELTA).GT.0.16) E(SFAC)=0.04
Call SCALE (5.9.0.NUMPTC.1)
                                                                          GRAR1210
                                                                          GRAF1220
      P(SFAC)=0.3000
                                                                          ORAR1230
      FACTOR=P(SFAC)/E(SFAC)
                                                                          GRAR1240
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GR AR 1250 С С BISECT PICTORIAL REPRESENTATION OF INTERIOR ANGLE FORMED GRAR1260 BY INTERSECTION OF INITIAL TANGENT AND VIRGIN COMPRESSION С GRAR1270 С CURVE LINE REPRESENTATION. GRAR1280 SLOPBI=TAN(PI-ABS(ATAN(SLOPED#FACTOR))-ABS(ABS(ATAN(SLOPEE# GRAR1290 1FACTOR))-ABS(ATAN(SLOPED*FACTUR))+PI)/2.0) GRAR1300 С GRAR1310 SLOPBI = SLOPBI/FACTOR GRAR1320 CEPTBI=YANGLE-SLOPBI*XANGLE GRAR1330 С LINE JF ANGLE BISECTOR HAS BEEN DEFINED. GRAR1340 BOUND1 = BOUND GRAR1350 BOUNO2 = P(NUMPTC)GRAR1360 С GRAR1370 FIND INTERSECTION OF ANGLE BISECTOR LINE WITH COMPRESSION CURVE'S GRAR1380 С С POLYNOMIAL REPRESENTATION. GRAR1390 00 70 J=1.3 GRAR1400 DELTA=ABS(BOUND2-BOUND1)/100.0 GRAR1410 DO 50 I = 1, 101GRAR1420 X(1,J) = BOUND1GRAR1430 X1(I,J)=X(I,J)*1.0GRAR1440 X2(I,J)#X(I,J)#X(I,J) GRAR1450 X3(I,J)=X(I,J)*X(I,J)#X(I,J) GRAR1460 X4(I,J)=X(I,J)*X(I,J)*X(I,J)*X(I,J)* GRAR1470 X 5(I , J) = X (I , J) * X (I , J) GRAR1480 X6(I,J)X4(L,I)X4(L,I)X4(L,I)X4(L,I)X4(L,I)X4(L,I)X2(L,I)X2(L,I))X4(L,I)X GRAR1490 X7(I,J)≈X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J) GR AR 1 500 ×8(I+J)=X(I+J)∻X(I+J)∻X(I+J)∻X(I+J)∻X(I+J)∻X(I+J)∻X(I+J)÷X(I+J) ─ GRAR1510 X (I • 1) = X (I • 1) ☆ X (I • 1) ☆ X (I • 1) ☆ X (I • 1) ☆ X (I • 1) ☆ X (I • 1) ☆ X (I • 1) ↔ X 1*X(I,J) GRAR1530 $X10(I,J)=X(I,J)\oplus X(I,J)\oplus X(I$ 1≠X(I,J)××(L,I)X×1 GRAR1550 $X11(I,J)=X(I,J) \times X(I,J) = GRAR1560$ 1☆X(I•J)☆X(I•J)☆X(I•J) GRAR1570 С GRAR1580 С GRAR1590 С GRAR1600 $\begin{array}{rcl} C(2) & & \times 1(I,J) + & C(3) & & \times 2(I,J) + & C(4) & & \times 3(I,J) + \\ C(6) & & & \times 5(I,J) + & C(7) & & \times 6(I,J) + & C(8) & & \times 7(I,J) + \end{array}$ CURVE(I)=C(1)+GRAR1610 1C(5)*X4(I,J)+ GRAR1620 $C(10) \approx X9(I,J) + C(11) \approx X10(I,J) + C(12) \approx X11(I,J) GRAR1630$ 2C(9)*X8(I,J)+ С GRAR1640 YLINE(I)=SLOPBI#X(I,J)+CEPTBI GRAR1650 С GRAR1660 INUM=J GRAR1670 С GRAR1680 С FINDING THE INTERSECTION OF ANGLE BISECTOR WITH COMPRESSION CURVE GRAR1690 PY COMPARING DRDINATES OF COMPRESSION CURVE'S POLYNOMIAL AND C GRAR1700 С ANGLE BISECTOR LINE WITH INCREASING ABSCISSA VALUES. INTERSECTIONGRAR1710 С IS FOUND WHEN THE ORDINATE VALUE OF THE ANGLE BISECTOR LINE IS GRAR1720 GREATER THAN THE CORRESPONDING CRDINATE VALUE OF THE COMPRESSION GRAR1730 C С CURVE POLYNOMIAL. GRAR1740 С POINT OF INTERSECTION IS GRAPHICALLY SELECTED POINT OF MAXIMUM GRAR1750 CURVATURE. C GRAR1760 С GRAR1770 IF (YLINE(I).GT.CURVE(I)) GO TO 60 GRAR1780 С GRAR1790 X(I+1,J) = X(I,J) + DELTAGRAR1800 50 CONTINUE GRAR1810 60 CONTINUE GRAR1820 IF (I.LE.1) GO TO 70 GRAR1830 BOUND2=X(I,J) GRAR1840

and the second second

BOUND1 = X(I-1,J)GRAR1850 70 CONTINUE GRAR1860 IF (I.NE.1) J=3GRAR1870 IF ((INUM.EQ.1).AND.(I.LE.1)) J=1 GRAR1880 IF ((INUM.EQ.2).AND.(I.LE.1)) J=2 GR 4 81 890 IF ((INUM.EQ.3).AND.(I.LE.1)) J=3 GRAR1900 BOUND1=BOUND GRAR1910 BOUND2=BOUND5 GRAR1920 GRAR1930 THE GRAPHICALLY SELECTED POINT OF MAX. CURVATURE. GRAR1940 RADMX=X(I,J) GRAR1950 GRAR1960 GRAR1970 RETURN END **GRAR1980** SUBROUTINE ANARAD ANAR0001 ANAR0010 ANAR0020 ANAR0030 *************** . * ANALYTICAL METHOD * ANAR0040 ***************** ANAR0050 ANAR0060 ANAR0061 THIS VERSION EMPLOYS THE MATHEMATICAL DEFINITION OF THE AN AR0062 RACIUS OF CURVATURE IN SEARCHING FOR THE POINT OF MAXIMUM ANAR0063 CURVATURE . ANAR0064 ANAR0070 THE PICTORIAL LOCATION OF THE POINT OF MAXIMUM CURVATURE DEPENDS ANAROOSO PRIMARILY ON THE ARITHMETIC RATIO OF THE SCALE FACTORS USED IN 4NAR0090 THE HORIZONTAL AND VERTICAL DIRECTIONS. HENCE, WITH A DIFFERENT ANAR0100 RATIO FOR THE HORIZONTAL TO VERTICAL SCALE FACTORS, THE POINT OF ANARO110 MAXIMUM CURVATURE WILL BE LOCATED AT A DIFFERENT ABSCISSA LOCATIONANAR0120 ON A GIVEN CURVE. THE RATIO OF THE HORIZONTAL TO VERTICAL SCALE ANARO130 FACTORS MUST BE MULTIPLIED TIMES THE FIRST AND SECOND DERIVATIVES ANARO140 BEFORE THE MATHEMATICAL DEFINITION OF THE POINT OF MAXIMUM CUR- ANARO150 VATURE CAN BE USED TO SELECT THE POINT OF MAXIMUM CURVATURE BASED ANARO160 ON THE PICTORIAL CHARACTERISTICS OF THE FITTED CURVE. ANAR0170 ANAR0180 REAL≉8 DSQRT ANAR 0190 COMMON /BLOK1/ P(303),E(303),PE(103),EE(103),CC(103) ANAR0200 DOUBLE PRECISION CC ANAR0210 ANAR0220 COMMON /BLOK2/ CEPTA, SLOPEB, CEPTB, SLOPEC, CEPTC, SLOPED, CEPTD, 1SLOPEE, CEPTE, SLOPEF, CEPTF, SLOPEG, CEPTG, BOUND1, BOUND2, BOUND3, BOUND4ANAR0230 2, BOUND5, BOUND6, NUMPTC, NUMPTE, PINSTU, XSLP2, PC, EC, EO, CCR, CC1, CS, CR, ANAR0240 ANAR0250 3SR,NDEG,IN,IGUT,IDIAL COMMON /BLOK5/ LOC(4),HOL,SAM,TES,OPR(1),DAT(3),DES(4),BCD(20), ANAR0260 ANAR0270 1KK • RUNTYP COMMON /BLOK8/ RAO(103),RACMIN,RADMX,IMIN,IPRINT,JPRINT,KIND ANAR0280 DOUBLE PRECISION C(12), X(103, 4), SLOPE1(103) ANAR0290 DIMENSION SLCPE2(103) ANAR0300 DUUBLE PRECISION X1(103, 4), X2(103, 4), X3(103, 4), X4(103, 4), ANAR0310 1X5(103,4),X6(103, 4),X7(103, 4),X8(103, 4),X9(103, 4),X10(103, 4),ANAR0320 ANAR0330 KX11(103.4) DO 10 I = 1, 12ANAR0340 C(I)=0.0 ANAR0350 C(I)=CC(I)ANAR0360 10 CONTINUE ANAR0370 ANARC 380 ANAR0390 BOUND5=BOUND1 ANAR0400 BOUND6=BOUND2 ANAR0410

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DERIV2=0.0ANAR0420 IMIN=7 ANAR0430 IDERV2=7 ANAR0440 RADBIG=0.0ANAR0450 ІСнеск≠о ANAR0460 J = 1 ANAR0470 IF (KK.EQ.1) E(NUMPTC+2)=0.04 ANAR0480 IF (KK.EQ.2) E(NUMPTC+2)=0.02 ANAR0490 DELTA=E(1)-E(NUMPTC)ANAR0500 IF (KK.EQ.1.AND.ABS(DELTA).GT.0.32) E(NUMPTC+2)=0.08 ANAR0510 IF (KK.EQ.2.AND.ABS(DELTA).GT.O.16) E(NUMPTC+2)=0.04 ANAR0520 CALL SCALE(E,8.0,NUMPTC,1) AN ARO 530 FACTOR=0.3000/E(NUMPTC+2) ANAR0540 С ANAR0550 C COMPUTE RADII OF CURVATURE AT GENERATED ABSCISSA BETWEEN SEARCH ANAR0560 С BOUNDARIES. ANAR0570 DO 40 J=1,2 ANAR0580 IF (IPRINT.EQ.O) WRITE(IOUT,1030) ANAR0590 IF ((IPRINT.EQ.1).AND.(J.EQ.2)) WRITE(ICUT,1030) ANAR0600 DELTA=ABS(BOUND2-BOUND1)/100.0 ANAR0610 RADMIN=100.0 ANAR0620 00 30 I =1,101 ANAR0630 X(1,J) = BOUND1ANAR0640 С ANAR0650 X1(I,J)=X(I,J)≈1.0 ANAR0660 X2(I,J)=X(I,J)*X(I,J)ANAR0670 X3(I,J)=X(I,J)*X(I,J)*X(I,J) ANAR0680 X4(I,J)=X(I,J)*X(I,J)*X(I,J)*X(I,J) ANAR0690 X5(I,J)=X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J) ANAR0700 X6(I,J)≈X(I,J)*X(I,J)X*(I,I)X*(I,J)*X(I,J)*X(I,J) ANAR0710 X7(I,J)=X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J)*X(I,J) ANAR0720 (L,I)X*(L,I)X*(L,I)X*(L,I)X*(L,I)X*(L,I)X*(L,I)X*(L,I)X*(L,I)X* ANAR0730 (L+I)X*(L+I)X*(L+I)X*(L+I)X*(L+I)X*(L+I)X*(L+I)X*(L+I)X*(L+I)X=(L+I)X ANAR0740 1*X(I,J) A NARO 750 X10(I,J)X*(I,J)X*(I,J)X*(I,J)X*(I,J)X*(I,J)X*(I,J)X*(I,J)X*(I,J)X*(I,J) X*(I,J) X*(I,J 1☆X(I,J)☆X(I,J) ANAR0770 С ANAR0780 С ANAR0790 С ANAR0800 SLOPE1(I)=C(2)+2.*C(3) x1(I,J)+3.*C(4) x2(I,J) + 4.*C(5)*X3(I,J)+ ANAROBIO K5•*C(6)*X4(I,J)+6•*C(7)*X5(I,J)+7•*C(8)*X6(I,J)+8•*C(9)*X7(I,J)+ ANARO820 K9*C(10)*X8(I,J)+ 10*C(11)*X9(I,J) +11*C(12)*X10(I,J) ANAR0830 С ANAR0840 С ANAR0850 С ANAR0860 SLOPE2(I)=2*C(3)+6*C(4)*X1(I,J)+12*C(5)*X2(I,J)+20*C(6)*X3(I,J) ANAR0870 1+30*C(7)*X4(I,J)+42*C(8)*X5(I,J)+56*C(9)*X6(I,J) ANAR0 890 2+72*C(10)*X7(I,J)+90*C(11)*X8(I,J)+110*C(12)*X9(I,J) ANAR0890 С ANAR0900 SLOPE1(I) = SLOPE1(I) * FACTOR ANAR0910 SLOPE2(I) = SLOPE2(I) * FACTOR ANAR0 920 THIS NEXT EQUATION IS USED TO CALCULATE. ANAR0930 С С THE MINIMUM RADIUS OF CURVATURE. ANAR0940 С THESE RADII ARE THEN COMPARED TO OBTAIN THE ANAR0950 С SMALLEST ONE PRESENT. ANAR0960 ANAR0970 С RAD(I)=DSQRT((1+SLOPE1(I)+SLOPE1(I))*(1+SLOPE1(I)+SLOPE1(I))*(1+ ANAR0980 1SLOPE1(I)*SLCPE1(I)))/SLOPE2(I) ANAR0 990 IF (IPRINT.EQ.O) WRITE(IOUT,1000) I,X(I,J),RAD(I),SLDPE2(I) ANAR 1 000 1000 FORMAT (1X,I3,2X,'X =',G15.5,5X,'RAD =',G15.5,5X,'SLOPE2 =',F10.5)ANAR1010

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С ANAR1020 IF(ABS(RAD(I)).GE.ABS(RADBIG)) RADBIG=RAD(I) ANAR1030 IF(ABS(RAD(I)).GE.ABS(RADBIG)) IEIG=I ANAR1040 IF(ABS(RAD(I)),GE,ABS(RADBIG)) XBIG=X(I,J) ANAR1050 IF(ABS(SLOPE2(I)).GT.ABS(DERIV2)) IDERV2=1 ANAR1060 IF(ABS(SLOPE2(I)).GT.ABS(DERIV2)) DERIV2=SLCPE2(I) ANAR1070 IF (I.EQ.1) GO TO 30 ANAR1080 IF (ABS(RAD(I)) .GT.ABS(RAD(I-1))) GO TO 20 ANAR1090 GO TO 30 ANAR1100 20 CONTINUE ANAR1110 IF (1.EQ.2) GO TO 30 ANAR1120 IF (ABS(RADMIN) • LE • ABS(RAD(I-1))) GO TO 30 ANAR1130 IF (ABS(RAD(I-2)).LE.ABS(RAD(I-1))) GO TO 30 ANAR1140 ICHECK=1 ANAR1150 IMIN = I - 1ANAR1160 IF(IMIN.LE.5) GD TO 30 ANAR1170 IF(IMIN.GE.96) GO TO 30 ANAR1190 RADMIN=RAD(I-1) ANAR1190 ANAR1200 RADMX = X(I - 1, J)30 X(I+1,J)=X(I,J)+DELTAANAR1210 ANAR 1220 IF (IMIN.EQ.7) GO TO 40 IF (IMIN.EQ.1) GO TO 40 ANAR1230 IF (IMIN.EQ.101) GO TO 40 ANAR1240 BOUND1=X(IMIN-1,J) ANAR1250 $BOUND2 = X \{ IMIN + 1, J \}$ ANAR1260 40 CONTINUE ANAR1270 1=2 ANAR1280 С ANAR1290 IS THERE A DISCRETE POINT OF MAXIMUM CURVATURE IN 90(MIOPORTION ANAR1300 С OF SEARCH BOUNDARIES? IF THERE IS NOT, DEFAULT TO USE LOCATION С ANAR1 310 С OF THE MAXIMUM VALUE FOR THE SECOND DERIVATIVE AS CHOSEN POINT ANAR1320 С OF MAXIMUM CURVATURE. ANAR1330 IF (ICHECK.EQ.O) IMIN=IDERV2 ANAR1340 IF (ICHECK.EQ.O) RADMX=X(IMIN,J) ANAR1350 IF(IMIN.LE.6) RAOMX=X(IDERV2,J) ANAR1360 IF(IMIN.GE.94) RADMX=X(IDERV2.J) ANAR1370 IF(IPRINT.EQ.O) WRITE(IOUT,1010) X(IMIN,J),IMIN,DERIV2,IDERV2 ANAR1380 1010 FORMAT(5X, *XMIN = *, F10.5, 5X, *IMIN = *, I3, 9X, *DERIV2 = *, F10.5, 5X, ANAR1390 K*IDERV2 ≠*,I3) ANAR1400 IF(ICHECK.EQ.0) WRITE(IOUT,1020) ANAR1410 ANAR1420 IF(IMIN.LE.6) WRITE(IDUT,1020) IF(IMIN.GE.94)WRITE(IDUT,1020) AN AR 1430 1020 FORMAT(*0*,5X,***WARNING**: PT. MAX. CURVATURE NOT WITHIN 90(* ANAR1440 1, MIDPORTION OF BOUND1 AND BOUND2. 1/1H0, 5x, LOCATION OF MAXIMUM . ANAR1450 2, SECOND DERIVATIVE TAKEN AS DEFAULT FOR PT. OF MAX. CURVATURE!//)ANAR1460 IF(ICHECK.EQ.O) WRITE(IOUT,1030) ANAR1470 IF(ICHECK.NE.O.AND.IPRINT.EQ.O) WRITE(ICUT,1030) ANAR1480 1030 FORMAT (•1•) ANAR1490 ANAR1500 BOUND1=BOUND5 ANAR1510 BOUND2=BOUND6 С ANAR 1520 BOUND6 IS SET EQUAL TO 999 SO THAT PLOTTING SUBROUTINE С ANAR1530 CASPLT WILL SKIP ARGUMENTS RELATING TO THE GRAPHICAL С ANAR1540 С METHOD. ANAR1550 BOUND6=999.0 ANAR1560 С ANAR1570 RETURN ANAR1580 END ANAR1 590 С 0000010 C 00000020

NUMALIB 0000007 UNIVERSITY OF KENTUCKY 0000011 CGMPUTER CENTER 0000012 MCVEY HALL 0000013 LEXINJTON, KENTUCKY 0000014 MCVEY HALL 0000015 LEXINJTON, KENTUCKY 0000014 MCVEY HALL 0000015 MCVEY HALL 0000014 DIMENSION CONTINE FLSQFY(N+M+X+Y+W+C+ALPHA+BETA+S+SGMSG-PR-PO+M+MN1) 0000017 MMILLER LEXGEY(N+M+X+Y+W+C+ALPHA+BETA+S+SGMSG-PR-PO+M+MN1) 0000016 GANDAFL 0000021 MODED CALL FGGDA(N+C+PO+PR+ALPHA+BETA+GMCA+S+NN1) 0000023 GANDAFL 0000023 0000023 GALL FGGDA(N+C+PO+PR+ALPHA+BETA+GMCA+S+NN1) 0000023 GUBROUTINE FCUDA(N+C+PO+PR+ALPHA+BETA+GMCA+S+NN1) 0000023 MENDUTINE FCUDA(N+C+PO+PR+ALPHA+BETA+GMCA+S+NN1) 0000023 MIENDUTINE FCUDA(N+C+PO+PR+ALPHA+BETA+GMCA+S+NN1) 00000023 MENDUTINE FCUDA(N+C+PO+PR+ALPHA+BETA+GMCA+S+NN1) 00000023 MENDUTINE FCUDA(N+C+PO+PR+ALPHA+BETA+GMCA+S+NN1) 00000023 MENDUTINE FCUDA(N+C+PO+PR+ALPM+A+BETA+GMCA+S+NN1) 00000023 MENDUTINE FCUDA(N+C+PO+PR+ALPM		<pre>\$ LEAST SQUAPES CRDINARY POLYNOMIAL CURVE FITTING SUBROUTINE.\$ \$</pre>	00000030 00000040 00000050
AUMALIA 0000007 UNIVERSITY OF KENTUCKY 0000010 CGMPUTER CENTER 0000012 MCVEY HALL 0000012 LEXINGTUN, KENTUCKY 0000014 0000017 0000016 SUBROUTINE FLSGPY(N+W,X+Y+W+C+ALPHA+BETA+S+SGMSG+PR+PO+N1+MN1) 0000014 01PENSION C(AL)+ALPHA(MN1)+BETA(MN1)+SGMSG(NN1)+PR(MN1)+PG(000019 0000012 01PENSION C(AL)+ALPHA(MN1)+BETA(MN1)+SGMSG(NN1)+PR(MN1)+PG(0000193 0000021 0AUMALIA 0000021 0000021 0AUMALIA 0000021 0000021 CALL FGGFYT(N,NG+X+Y+W+BETA+S+SGMSG+ALPHA+BETA+GMPA+PD+M+ML1) 00000221 CALL FGGFYT(N,NG+X+Y+W+BETA+S+SGMSG+ALPHA+BETA+S+NN1) 00000221 CALL FGGFYT(N,NG+X+Y+W+BETA+SETA+GAMPA+S+N+1) 00000221 CALL FGGFYT(N,NG+X+Y+W+BETA+SETA+GAMPA+S+N+1) 00000221 DIFMESTON C(N)+ALPHA(MN1)+BETA(NN1+PM(NN1)+PR(NN1+S(NN1) 00000021 IMPLICIT REAL®B (A+H-U-W+2) 00000021 DIFMESTON C(N)+ALPHA(MN1)+BETA(NN1+PM(NN1)+PR(NN1+S(NN1) 00000000 N1=N+1 00000000 DIFMESTON X(N)+ALPHA(MN1)+BETA(NN1+PM(NN1)+PR(NN1+S(NN1) 00000000 N1=N+1 000000	2		0000050
UNIVEPSITY OF KENTUCKY 0000000 CCMPUTER CENTER 0000011 MCVEY HALL 0000013 LEXINGTUN, KENTUCKY 0000013 UEXINGTUN, KENTUCKY 0000014 OCCUPIC SUBROUTINE FLSGFY(N,M,X,Y,W,C+ALPHA,BETA,S,SGMSG,PR,PD,N1,MN1) 000017 OCCUPIC DIMENSION C(LN),ALPHA(MN1),BETA(MN1),SGMSG(MN1),PR(MN1),PR(00017 MN1),W(M),X(Y),Y(M) 0000023 CALL FGGFYT(N,NO,X,Y,W,GFTA,S,SGMSG,ALPHA,PR,PO,M,MN1) 0000023 CALL FGGFYT(N,NO,X,Y,W,GFTA,SGMSG,ALPHA,PR,PO,M,MN1) 0000023 DIMENSION C(N),ALPHA(MN),PGTA(NN),PF(NN),PR(NN),SINN) 0000003 NIFN-1 0000000 DI IE=1,N1 00000007 C(IP)=0. 0000007 C(IP)=0.	_	NUMALIB	00000070
UNIVERSITY OF KENTUCKY 0000000 CCMPUTER CENTER 0000012 MCVEY MALL 0000013 LEXINSTON, KENTUCKY 0000014 0000015 SUBROUTINE FLSCFY(N,M,X,Y,W,C,ALPHA,BÉTA,S,SGMSC,PR,PD+N1,MN1) 000017 OD00016 DIMENSIGN C(N,1),ALPHA(MN1),BETA(MN1),SGMSC(NN1),PR(MN1,PD(C000195 SNN1),W(M),X(M),Y(M) 0000023 CALL FGEFYT(N,NC,X,Y,W,CFALPHA,BETA,S,SGMSC,ALPHA,PR,PO,W,MN1) 0000023 CALL FGEFYT(N,NC,X,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000024 CALL FGEFYT(N,NC,Z,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000025 CALL FGEFYT(N,NC,Z,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000026 CALL FGEFYT(N,NC,Z,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000026 CALL FGEFYT(N,NC,Z,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000026 CALL FGEFYT(N,NC,Z,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000026 CALL FGEFYT(N,NC,Z,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000026 CALL FGEFYT(N,NC,Z,Y,W,CFALPHA,BETA,GAMCA,S,NN) 0000026 CALL FGEFYT(N,ALPHA,EN,Y,W,CFALPHA,BETA,GAMCA,S,NN) 00000026 CALL FGEFYT(N,ALPHA,EN,Y,W,CFALPHA,BETA,GAMCA,S,NN) 00000026 CALL FGEFYT(N,ALPHA,EN,Y,W,CFALPHA,BETA,GAMCA,S,NN) 00000026 CALL FGEFYT(N,ALPHA,EN,Y,W,CFALPHA,BETA,GAMCA,S,NN) 00000026 CALF,SIDP C(N,Y,ALPHA,EN,Y,W,SETA,S,SGMSO,ALPHA,PR,FO,M,NI,SINN) 00000006 PM(IF1=0, 0000016 C(1)=5(1) 0000015 C(1)=5(1) 0000016 C(1)=5(1) 0000016 C(1)=5(1) 0000016 C(1)=5(1) 0000016 C(1)=5(1) 0000016 C(1)=5(1) 0000016 C(1)=5(1) 0000016 C(1)=5(1) 0000016 C(1)=1,N1	_		06000000
CCMPUTER CENTER 0000010 CCMPUTER CENTER 0000112 MCVEY HALL 0000012 LEXINSTON, KENTUCKY 0000014 OCMOUSE SUBROUTINE FLSGFY(N,M,X,Y,W,C,ALPHA,SGKSG,PA,PO,N1,MN1) 0000117 IMPLICIT REAL® (A+H,O-W,Z) 0000145 OCMOUSE CIMENSIGN C(L) ALPHA(MN1)+SETA(MN1)+SGMSQ(MN1)+PR(MN1)+OD(000116 GAMDA=1. 0000026 CALL FGEFYT(N,NG,X,Y,W,SETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 0000225 CALL FGEFYT(N,NG,X,Y,W,SETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000225 CALL FGEFYT(N,NG,X,Y,W,SETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000225 CALL FGEFYT(N,NG,X,Y,W,SETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000225 CALL FGEFYT(N,NG,X,Y,W,SETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000225 CALL FGEFYT(N,NG,X,Y,W,SETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000225 CALL FGEFYT(N,NG,X,Y,W,SETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000255 END 0000026 SUPROUTINE FCUDA(N,C,PM,PR,ALPHA,SETA,GAMDA,S,NN1) 00000025 OU000025 DIMENSION C(NN)+ALPAA(NN)+PETA(NN)+PM(NN)+PR(NN)+S(NN) 00000035 C(19)=0. 0000005 C(19)=0. 0000007 OD 01 E1-N1 00000007 OD 01 E1-N1 00000007 OD 01 E1-N1 00000007 OD 000011 TZ=CC. 0000017 D PR(19)=0. 0000016 OD 000016 C(1)=S(L) 0000014 D 1=(1,S(L) 0000014 D 1=(1,S(L) 0000014 D 20 [E1,N] 0000014 C(1)=S(L) 0000014 D 20 [E1,N] 0000016 D MI(E1)=FN1 00000016 D MI(E1)=FN1 000000000000000000000000000000000000	-	UNIVERSITY OF RENTUCKY	00000090
CUMPTIER LENTER CUUDDIER MCVEY HALL 0000013 LEXINGTUN, KENTUCKY 00000143 SUBROUTINE FLSCEY(N,MEX,Y,W.C.ALPHA, BETA,S,SGMSC,PR,PO,NI,MN1) 00000167 SUBROUTINE FLSCEY(N,MEX,Y,W.C.ALPHA, BETA,S,SGMSC,PR,PO,NI,MN1) 00000176 SUBROUTINE FLSCEY(N,MEX,Y,W.C.ALPHA,BETA,S,SGMSC,PR,PO,NI,MN1),PR(MN1),PD(C00001157 00000126 SUBROUTINE FLSCEY(N,MEX,Y,W.GETA,S,SGMSO,ALPHA,PR,PO,M,MN11 00000226 CALL FGEPYTIN,NO,X,Y,W.GETA,S,SGMSO,ALPHA,PR,PO,M,MN11 00000226 CALL FGEDON(N,C-PO,PR,ALPHA,SETA,GAMDA,S,N*1) 00000265 COLL FGEDON(N,C-PO,PR,ALPHA,SETA,GAMDA,S,N*1) 00000265 SUBROUTINE FCODAIN,C.PM,PR,ALPHA,BETA,GAMDA,S,N*1) 00000026 SUBROUTINE FCODAIN,C.PM,PR,ALPHA,BETA,GAMDA,S,N*1) 00000026 SUBROUTINE FCODAIN,C.PM,PR,ALPHA,BETA,GAMDA,S,NN) 000000027 OL IBELNI 00000027 CI IBELNI 00000027 CI IBELNI 00000026 CI IBELNI 00000027 CI IBELNI 00000027 CI IBELNI 00000027 CI IBELNI 00000027 CI IBELNI 000000017 CI IBELNI	-		00000100
MCVEY HALL 0000012 LEXINGTON, KENTUCKY 0000014 SUBROUTINE FLSQFY(N,M*X,Y,W*C+ALPHA,BÉTA+S+SGMSG+PR,PO+N1+MN1) 0000016 OUDOUTINE FLSQFY(N,M*X,Y,W*C+ALPHA,BÉTA+S+SGMSG+PR,PO+N1+MN1) 0000016 OUDOUTINE FLSQFY(N,M*X,Y,W*C+ALPHA,BÉTA+S+SGMSG+PR,PO+N1+MN1) 0000016 OUMONTALL 00000180 OUNDATL 00000180 OLADATL 00000220 CALL FCODA(N,C+PO+PR+ALPHA+STA+S+SGMSG+ALPHA,PR,PO,M,MN1) 00000226 CALL FCODA(N,C+PO+PR+ALPHA+3ETA+GAMGA+S+NN1) 00000226 SUBROUTINE FCODA(N,C+PM+PR+ALPHA+3ETA+GAMGA+S+NN1) 000000226 SUBROUTINE FCODA(N,C+PM+PR+ALPHA+3ETA+GAMGA+S+NN1) 000000226 DIVENSION C(N'1)+ALPHA(NN1)+ETA(NN1+PM'NN)+PM(NN)+S(NN1) 00000027 DIVENSION C(N'1)+ALPHA(NN1)+ETA(NN1+PM'NN)+PM(NN)+S(NN1) 00000026 OUTINE FCODA(N,C+PM+PR+ALPHA+3ETA+GAMGA+S+NN1) 000000000 IMPLICIT REALB 00000026 SUBROUTINE FCODA(N,C+PM+PR+ALPHA+3ETA+GAMGA+S+NN1) 00000026 OUTINE FCODA(N,C+PM+PR+ALPHA+3ETA+GAMGA+S+NN1) 000000000 OUD (ITTREALBS) 000000126 OUD (ITTREALBS) 000000126 OUD (ITTREALBS)	-	COMPOTER CENTER	0000110
LexINSTUN, KENTUCKY 0000014 0000014 0000014 0000014 0000016 SUBROUTINE FLSQFY(N,MX,Y,W,C,ALPHA,BETA,S,SGMSG,PR,PO,N1,MN1) 0000117 DIMENSION C(AL)+ALPHA(MN1)+BETA(MN1)+S(MN1)+SGMSG(MN1)+PR(MN1)+PD(000192 000020 GAVDA=1. 000021 000022 CALL FGEFYT(N,NG,X,Y,W,dETA,S,SGMSG,ALPHA,PR,PO,M,MN1) 000020 CALL FGEFYT(N,NG,X,Y,W,dETA,S,SGMSG,ALPHA,PR,PO,M,MN1) 000023 CALL FGEDA(N,C,PO,PR,ALPHA,BETA,GAMDA,S,N+1) 0000024 CALL FGUDA(N,C,PO,PR,ALPHA,BETA,GAMDA,S,N+1) 0000025 CALL FGUDA(N,C,PM,PR,ALPHA,BETA,GAMDA,S,N+1) 0000025 CALL FGUDA(N,C,PM,PR,ALPHA,BETA,GAMDA,S,N+1) 0000025 CALL FGUDA(N,C,PM,PR,ALPHA,BETA,GAMDA,S,N+1) 0000025 CALL FGUDA(N,C,PM,PR,ALPHA,BETA,GAMDA,S,N+1) 0000003 NI=N1 000002 DIMENSION C(N),ALPHA(NN),PETA(NN)+PK(NN),PR(NN),S(NN) 0000003 NI=N1 0000005 C(19)=0. 0000007 DIMENSION C(N),ALPHA(NN),PETA(NN)+PK(NN),PR(NN),S(NN) 0000003 NI=N1 0000007 DIPR(19)=0. 0000007 DOUD 1B=1,N1 0000012 DOUD 20 1=1,N 0000012 DOUD 20 10 0000012 DOUD 20 10 0000012 DOUD 20 10 000012 DOUD 20 10 000011N FGEFYT(N,NO+X,Y,W,BETA,S,SGMSO,ALPHA,PR,PD,M,N11 0000014 DOUD 20 10 0000012 DIMENSION X(K),Y(M),DETA(I),ALPHA(N1),S(N1],SGMSQ(N),PR(M), 0000002 DOUD 20 000000 DOUD 20 0000000 DOUD 20 0000000000000000000000000000000000	-		00000120
LEAINGTONT RENTOCKT 00000150 SUBROUTINE FLSQFY(N,M,X,Y,W,C,ALPHA,BETA,S,SGMSG,PQ,PO,N1,MN1) 00000150 ODUMENSION CINI),ALPHA(MN1),BETA(MN1),SGMSG(MN1),FR(MN1),FR(MN1),PO(00000175 00000170 NMN1,W(M),X(M),Y(M) 00000170 00000170 GAVDALL 00000170 00000170 NG=0 00000210 00000220 CALL FGEFYT(N,NG,X,Y,W,BETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000221 CALL FGEFYT(N,NG,X,Y,W,BETA,S,SGMSQ,ALPHA,PR,PO,M,MN1) 00000221 CALL FGEFYT(N,NG,X,Y,W,BETA,S,GMSQ,ALPHA,PR,PO,M,MN1) 00000221 CALL FGEFYT(N,NG,X,Y,W,BETA,SGMSG,ALPHA,PR,PO,M,MN1) 00000221 CALL FGEFYT(N,NG,X,Y,W,BETA,SGMSG,ALPHA,PR,PO,M,MN1) 00000221 CALL FGEFYT(N,NG,X,Y,W,BETA,SGMSG,ALPHA,PR,PO,M,MN1) 00000124 RETURN 00000124 CALL FGEFYT(N,NG,X,Y,W,BETA,SGMSG,ALPHA,PR,PO,M,N1) 00000124 DIMENSION C(NN),ALPHA(NN),PETA(NN),PR(NN),FR(NN),S(NN) 00000000 DIMENSION C(NN),ALPHA(NN),PETA(NN),PP(NN),PR(NN),S(NN) 00000000 CITEST,N 0000015 0000015 CITEST,N 00000016 0000016 CITEST,N 0000016 0000016	-		00000150
SUBROUTINE FLSGFY(N,M,X,Y,W,C,ALPHA,BETA,S,SGMSC,PR,PO,N,MN1) 0000160 SUBROUTINE FLSGFY(N,M,X,Y,W,C,ALPHA,BETA,S,SGMSC,PR,PO,N,MN1) 0000180 OIMENSION C(N,I),ALPHA(MN1),BETA(MN1),S(MN1),SGMSC(MN1),PR(MN1),PD(0000197 000020 GAVDA=1. 0000020 GAVDA=1. 0000020 CALL FGGFY(N,NG,X,Y,W,BTA,S,SGMSO,ALPHA,PR,PO,M,MN1) 00000220 CALL FGGFY(N,NG,X,Y,W,BTA,S,SGMSO,ALPHA,PR,PO,M,MN1) 0000026 CALL FGGTA(N,C,PO,PR,ALPHA,BETA,GAMDA,S,N+1) 0000026 SUBROUTINE FCODA(N,C,PM,PR,ALPHA,BETA,GAMDA,S,N) 0000020 IMPLICIT REAL®8 (A-H,J-M,Z) 0000020 DIMENSION C(N), ALPHA(MN),BETA(NN),PR(NN),PR(NN),S(NN) 00000000 NI=N+1 00000000 OI IB=1,N1 00000000 C(1)=S(1) 00000000 NI=N+1 0000010 D0 20 I=1,N1 0000010 T1=(T2-ALPHA(I)=PR(IB)-BETA(I)=PM(IB))/GAMDA 00000120 OO00110 PR(IB)=T1=N1 00000120 T1=(T2-ALPHA(I)=PR(IB)-BETA(I)=PM(IB))/GAMDA 00000120 OO000110 DIVENSION X(N),NO,X,Y,W,BETA,S,GMSO,ALPHA,PR,PO,M,NI1 00000120 OI IB=1,N1 00000120 <td>-</td> <td>ELAINS BAY RENTOCKY</td> <td>00000140</td>	-	ELAINS BAY RENTOCKY	00000140
SUBROUTINE FLSGFY(N,M,X,Y,W,C,ALPHA,BETA,S,SGMSG+PR,PO+N1,MN1) 0000110 IMPLICIT REAL®8 (A=H,U=K,2) 0000110 DIMENSION C(N1)+ALPHA(MN1)+BETA(MN1)+S(MN1)+SGMSQ(MN1)+PR(MN1)+PC(0000193 00000201 GAY0A=1. 00000210 NO=0 00000210 CALL FGEFYTIN,NO,X,Y,W+0ETA,S,SGMSO,ALPHA,PR,PO,M,MN11 00000230 CALL FGEFYTIN,NO,X,Y,W+0ETA,S,SGMSO,ALPHA,PR,PO,M,MN11 00000230 CALL FGEFYTIN,NO,X,Y,W+0ETA,S,SGMSO,ALPHA,PR,PO,M,MN11 00000250 CALL FGEFYTIN,NO,X,Y,W+0ETA,SASGMSO,ALPHA,PR,PO,M,MN11 00000250 CALL FGEFYTIN,NO,X,Y,W+0ETA,SASGMSO,ALPHA,PR,PO,M,MN11 00000250 CALL FGEFYTIN,NO,X,Y,W+0ETA,SASGMSO,ALPHA,PR,PO,M,MN11 00000250 SUBROUTINE FCODA(N,C,PM,PR,+ALPHA+BETA,GAMCA,S,NN1 000000250 SUBROUTINE FCODA(N,C,PM,PR,+ALPHA+BETA,GAMCA,S,NN1 000000000000000000000000000000000000	-		00000160
IMPLICIT REAL®8 (A-H,U-H,2) 000018 DIMENSION C(H,1)+ALPHA(M,1)+BETA(M,1)+S(M,1)+SGMSQ(M,1)+PR(M,1)+PO(000013) 000020 GAVDA=1. 0000020 NO=0 0000220 CALL FGEFYT(N,NO,X,Y,W+0ETA,S,SGMSQ,ALPHA,PR,PO,M,MA1) 00000230 CALL FGEFYT(N,NO,X,Y,W+0ETA,S,SGMSQ,ALPHA,PR,PO,M,MA1) 00000240 CALL FGEAVT(N,NO,X,Y,W+0ETA,S,SGMSQ,ALPHA,PR,PO,M,MA1) 00000240 CALL FGEAVT(N,NO,X,Y,W+0ETA,S,SGMSQ,ALPHA,PR,PO,M,MA1) 00000250 CALL FGEAVA(A,C,PM,PR,ALPHA,BETA,GAMDA,S,NN1) 00000250 COUDDITE FCDDA(N,C,PM,PR,ALPHA,BETA,GAMDA,S,NN1) 00000250 DIMENSION C(N)+ALPHA(MN)+DETA(NN)+PR(NN)+PR(NN)+S(NN) 00000030 N1=N+1 00000050 DIMENSION C(N)+ALPHA(MN)+DETA(NN)+PR(NN)+S(NN) 00000050 C(119=0, 00000050 PM(19=0, 00000050 C(119=0, 00000000 PM(1)=1. 00000010 OD 20 IB=1,N1 00000110 C2=C,N 00000117 OD 100 IB=1,N1 00000120 OD 20 IB=1,N1 00000120 OD 20 IB=1,N1 00000120 OD 20 IB=1,N1 00000120 C(111)=2(IB)=2(IB)=2(IB)=2(IB)=2	-	SUBROUTINE FLSQFY(N+M+X+Y+W+C+ALPHA+PETA+S+SGMSQ+PR+PO+N1+MN1)	00000170
DIFENSION C(A, I) + ALPHA(MN1) + BETA (MN1) + SGMSQ(MN1) + PR(MN1) + PO(000070) BMN1 + W(M) + X(M) + Y(M) 00000200 GANDA=1 - 00000200 ND=0 00000200 CALL FGEFYT(N+N0, X, Y, W+BETA + S, SGMSQ, ALPHA+PR, PD, M, MA1) 00000200 CALL FGEFYT(N+N0, X, Y, W+BETA + S, SGMSQ, ALPHA+PR, PD, M, MA1) 00000200 CALL FGEFYT(N+N0, X, Y, W+BETA + S, SGMSQ, ALPHA+PR, PD, M, MA1) 00000200 CALL FGEAVT(N, C, PM + PR, +ALPHA+BETA + GAMDA + S, NN1) 00000200 SUBROUTINE FCODA(N, C, PM + PR, +ALPHA+BETA + GAMCA + S + NN1) 00000000 DIMENSION C(NN) + ALPHA(NN) + PETA(NN) + PM (NN) + PR (NN) + S(AN) 00000000 DIMENSION C(NN) + ALPHA(NN) + PETA(NN) + PM (NN) + PR (NN) + S(AN) 00000000 DIMENSION C(NN) + ALPHA(NN) + PETA(NN) + PM (NN) + PR (NN) + S(AN) 00000000 DIMENSION C(NN) + ALPHA(NN) + PETA(NN) + PM (NN) + PR (NN) + S(AN) 00000000 DIMENSION C(NN) + ALPHA(NN) + PETA(NN) + PM (NN) + PR (NN) + S(AN) 00000000 DIMENSION C(NN) + ALPHA(NN) + PETA(NN) + PM (NN) + PR (NN) + S(AN) 00000000 C(1) = S(I) 00000000 000000000 C(1) = S(I) 00000010 00000010 D2 0 I= I + N1 00000010 00000110 T2 = C 00000011 <td< td=""><td></td><td>IMPLICIT REAL#8 (A+H+Q+h+Z)</td><td>00000180</td></td<>		IMPLICIT REAL#8 (A+H+Q+h+Z)	00000180
SMN1 x (M) x (M) x (M) 00000200 GAMDA=1. 00000210 ND=0 0000210 CALL FGEFYT(N,NO,X Y ***BETA,S,SGMSO,ALPHA,PR,PO,M,MN1) 00000230 CALL FGDDA(N,C,PPC,ALPHA,BETA,GAMDA,S,N*1) 00000240 RETURN 00000250 SUBROUTINE FGUDA(N,C,PM,PR,ALPHA,BETA,GAMCA,S,NN1) 00000260 DIMENSION C(N) *ALPHA(NN) *PETA(NN) *PR(NN) *S(NN) 00000000 N1=N*1 00000000 OO 1 IE=1,N1 00000000 C(1 F)=0. 00000000 PR(1P)=0. 00000000 PR(1P)=0. 00000011 OP (1P)=0. 00000011 OD (1E=1,N1 00000011 C(1 F)=0. 00000011 OD 20 IE=1,N1 00000011 T2=C 0000011 N1=T1: 00000120 DD 20 IE=1,N1 0000014 T1=(T2-ALPHA(I))*PR(IB)-BETA(I)*PM(IB))/GAMDA 00000164 T1=(T2-ALPHA(I))*PR(IB)-BETA(I)*PM(IB))/GAMDA 00000164 D1=RETURN 00000164 00000164 C0 (II)=C(II)*T1*S(I + 1) 00000164 000000164 PR(IB)=PR(IB) CONO11 000000164 000		DIMENSION C(N1) + ALPHA(MN1) + BETA(MN1) + S(MN1) + SGMSQ(MN1) + PR(MN1) + PO(00000190
GAMDA=1. 0000021 NG=0 0000221 CALL FGEFYT(N+NG,X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO,M+MN1) 0000225 CALL FCDDA(N+C+PO,PR+ALPHA+BETA+GAMDA+S+N+1) 00000256 SUBROUTINE FCUDA(N+C+PM+PR+ALPHA+BETA+GAMCA+S+NN) 00000266 SUBROUTINE FCUDA(N+C+PM+PR+ALPHA+BETA+GAMCA+S+NN) 00000266 OIMENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+PR(NN)+S(NN) 00000066 OI TENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+PR(NN)+S(NN) 00000066 OI TENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+PR(NN)+S(NN) 00000066 OI TENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+S(NN) 00000066 OD TENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+S(NN) 00000066 OD TENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+PR(NN)+S(NN) 00000066 OD TENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+PR(NN)+S(NN) 00000066 OD TENSION C(NN)+ALPHA(TENS)+PR(NN)+PR(NN)+PR(NN)+S(NN) 00000010 OD C(TI)=S(T) 0000010 0000011 OD C(TI)=S(T) 00000126 00000126 OD C(TI)=S(T) 0000011 0000015 OD C(TI)=S(T) 0000015 0000016 OD C(TI)=S(T)+NTENS(T+1) 00000016 0000016 SUPROUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMSO+ALPHA+PR+PO,M+N1)		\$MN1)•w(M)•X(M)•Y(M)	00000200
NO=0 C000022 CALL FGEFYTIN,NO.X.Y.W.BETA.S.SGMSO.ALPHA.PR.PO.M.MN1) 0000230 CALL FCODA(N.C.PO.PR.ALPHA.BETA.GAMDA.S.N.1) 0000230 CALL FCODA(N.C.PO.PR.ALPHA.BETA.GAMDA.S.N.1) 00000250 END 0000220 SUPROUTINE FCUDA(N.C.PM.PR.ALPHA.BETA.GAMDA.S.N.1) 00000250 IMPLICIT REAL®8 (A-H.D-W.2) 0000020 DIMENSION (CNV) ALPALMANN) PETA(NN) PR(NN).S(NN) 00000040 N0=0 0000020 OU TBEI.N1 00000040 OU TBEI.N1 00000000 OU TBEI.N1 000000000 OU TBEI.N1 00000000 OU TBEI.N1 00000000 OU TBEI.N1 000000000 OU TBEI.N1 00000011 OD 20 TEI.N 0000011 D2 20 TEI.N 0000012 OD 20 TEI.N 0000012 OD 20 TEI.N1 0000012 DTERSTON		GAMOA=1.	00000210
CALL FGEFYT(N,NQ,X,Y,W,BETA,S,SGMSD,ALPHA,PR,PD,M,MN1) 000023 CALL FGEFYT(N,NQ,X,Y,W,BETA,S,EAK,GAMDA,S,N,1) 000025 END 000025 END 000025 END 000025 DIVENSION C(N),ALPHA,BETA,GAMDA,S,NN1) 0000002 DIVENSION C(N),ALPHA(N),PETA(N),PR(N),PR(N),S(N) 000003 N1=N+1 0000005 C(I)=10, 0000005 C(I)=10, 0000005 PM(1)=10, 0000005 PM(1)=10, 0000005 C(I)=10, 0000005 PM(1)=10, 0000005 C(I)=10, 0000005 C(I)=10, 0000005 C(I)=10, 0000005 C(I)=10, 0000005 D) 20 I=1,N 0000005 D) 20 I=1,N 0000001 D) 20 I=1,N 0000015 D) 20 I=1,N 0000005 D) 20 I=1,N 000005 D) 20 I=1,N 00000		NO=0	00000220
CALL FCODA(N+C+PC+R+ALPHA+9ETA+GAMDA+S+N+1) 0000025 RED SUPROUTINE FCODA(N,C+PC+R+ALPHA+9ETA+GAMDA+S+NN) 0000025 SUPROUTINE FCODA(N,C+PC+R+ALPHA+9ETA+GAMDA+S+NN) 00000025 SUPROUTINE FCODA(N,C+PC+PC+ALPHA+9ETA+GAMDA+S+NN) 00000025 DIVENSION C(NN)+ALPHA(NN)+PETA(NN)+PR(NN)+PR(NN)+S(NN) 0000003 N1=N+1 0000005 C(19]=0. 0000005 C(19]=0. 0000005 C(19]=0. 0000007 10 PR(19]=0. 0000007 C(1)=S(1) 0000012 0000010 00 20 I=1+N 0000001 TZ=C. 0000001 N1=I+1 0000001 00 20 I=1+N 0000013 00 20 I=1+N 0000013 00 20 I=1+N 0000013 00 20 I=1+N 0000013 0000015 TZ=PR(IB) 0000015 TZ=PR(IB) 0000015 0000016 PM(IB)=PR(IB) 0000016 0000017 RETURN 00000025 SUBROUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+F0+M+NI) 0000014 IMPLICIT REAL®8 (A-H+J=N+Z) 0000025 IMPNSION X(N)+Y(N)+BETA+S+SGMS0+ALPHA+PR+F0+M+NI) 0000021 SUBROUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+F0+M+NI) 0000021 CO00020 ENN 0000000 SUBROUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+F0+M+NI) 0000021 CO00020 CO00000 SUBROUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+F0+M+NI) 0000021 CO000000 SUBROUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+F0+M+NI) 0000021 CO000020 CO000004 CO000004 CO000000 CO000004 CO000004 CO000004 CO000004 CO000004 CO0004 CO00004 CO004 CO0		CALL FGEFYT(N+NO+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+MN1)	00000230
RETURN 0000026 END 0000026 SUBROUTINE FEODA(N,C,PM,PR,ALPHA,BETA,GAMCA,S,NN) 0000001 IMPLICIT REAL%8 (A-H,D-%,Z) 0000003 DIMENSION C(NN),ALPHA(NN),PETA(NN),PR(NN),S(NN) 0000004 N1=N+1 0000006 DIMENSION C(NN),ALPHA(NN),PETA(NN),PR(NN),S(NN) 0000004 DO IO IB=1,N1 0000006 PR(19)=0. 0000007 OP R(19)=0. 0000007 C(1)=S(1) 0000001 OO I = 1,N 0000012 I = (T2-ALPHA(I))#PR(IB)-BETA(I)#PM(IB)/GAMCA 0000016 OO I = 1,N 0000016 I = (T2-ALPHA(I))#PR(IB)-BETA(I)#PM(IB)/GAMCA 0000016 O I = 1,N 0000015 I = (T2-ALPHA(I))#PR(IB)-BETA(I)#PM(IB)/GAMCA 0000016 O I = (IB)=NI 0000016 O I = (IB)=PR(IB) 0000016 PR(IB)=PR(IB) 0000016 O E I = (II)		CALL FCODA(N+C+PO+PR+ALPHA+9ETA+GAMDA+5+N+1)	00000240
END 0000226 SUBROUTINE FCUDA(N,C,PM,PR,ALPHA,BETA,GAMCA,S,NN) 0000010 IMPLICIT REAL®A (A-H,U-x,2) 0000010 OD 10 IB=1,N1 0000066 OD 10 IB=1,N1 0000066 PM(IB)=0. 0000067 (1)=5(1) 0000007 OD 20 I=1,N 000000 OD 20 I=1,N 0000000 OD 20 I=1,N 0000012 N1=1+1 00000012 OD 20 I=1,N 0000012 N1=1+1 00000012 OD 20 I=1,N 0000012 OD 20 I=1,N 0000012 OD 20 I=1,N 0000012 OD 20 I=1,N 0000012 N1=1+1 0000012 OD 20 I=1,N 0000012 OD 20 I=1,N 0000012 OD 20 I=1,N 0000012 N1=1+1 0000012 OD 20 I=1,N 0000012 OD 000014 (ID 20 I=1,N 1] OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 000015 OD 00015 OD 000015 OD 0000015 OD 0000015 OD 0000015 OD 0000005 OD 0000005 OD 000005 OD		RETURN	00000250
SUBROUTINE FECTORINA, C.PM.PR.ALPHAABETA, GAMCAA, S.NNT 0000002 IMPLICIT REAL#84 (A-H, D-*, Z) 0000002 DIMENSION C(NN), ALPHA(NN), BETA(NN), PR(NN), PR(NN), S(NNT) 0000003 N1=N+1 0000004 00 TBET, NI 0000005 C(19)=0. 0000007 PM(19)=0. 0000007 10 PR(19)=0. 0000007 00 20 TET, N 00000010 00 20 TET, N 0000011 T2=0. 0000011 00 20 TET, N 0000011 T2=0. 0000014 N1=1+1 0000014 00 20 TET, N 0000014 T1=(T2=ALPHA(T)#PR(TB)=BETA(T)#PM(TB))/GAMCA 0000016 00 20 TET, N 0000016 PR(TB)=R(TB) 0000016 PR(TB)=RT1 0000016 20 C(TE)=C(TG)+TT#S(T+1) 0000017 20 C(TE)=TTA 0000017 20 C(TE)=TTA 0000017 20 C(TE)=TTA 0000016 SURROUTINE FGEFYT(N, ND +X+Y+W+BETA+S+SGMS0+ALPHA+PR+PO+M+N1) 00000017 20 C(TE)=CTTSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M),		END	00000260
IMPLICIT REAL®S (A=H, J=K, Z) 0000002 DIMENSION C(NN), ALPHA(NN), GETA(NN), PR(NN), PR(NN), S(NN) 00000040 N1=N+1 00000040 DU 10 IB=1,N1 00000040 C(T9)=0. 00000070 PR(1)=1- 00000000 C(1)=S(1) 00000100 DO 20 I=1,N 00000100 D2 0 I=1,N 00000110 T2=0. 0000013 N1=1+1 00000140 D2 0 IB=1,N1 00000160 D3 20 IB=1,N1 00000160 T2=PR(IB) 00000160 PM(IB)=PR(IB) 00000160 PM(IB)=R(IB) 00000160 PM(IB)=R(IB) 00000160 PM(IB)=R(IB) 00000160 PM(IB)=R(IB) 00000170 PM(IB)=R(IB) 00000170 PM(IB)=R(IB) 00000170 PM(IB)=R(IB) 00000171 DMEDON X(M),Y(M),BETA(I)+ALPHA(NI),S(MI),SGMSQ(NI),PR(M), 00000020 DIMENSION X(M),Y(M),BETA(NI)+ALPHA(NI),S(NI),SGMSQ(NI),PR(M), 00000021 DIMENSION X(M),Y(M),BETA(NI)+ALPHA(NI),S(NI),SGMSQ(NI),PR(M), 00000020 DIMENSION X(M),Y(M),BETA(NI)+ALPHA(NI),S(NI),SGMSQ(NI),PR(M),		SUBROUTINE FLUDA (N, C, PM, PR, ALPHA, BETA, GAMUA, S, NN)	00000010
N1=K+1 0000004 D1 0 10 18=1,N1 000004 D1 0 10 18=1,N1 000004 PM(18)=0. 0000006 PM(18)=0. 0000007 10 PR(19)=0. 0000001 D2 0 1=1,N1 0000010 C(1)=S(1) 0000011 T2=C. 0000014 N1=T+1 0000014 D2 0 18=1,N1 0000014 T1=T2=ALPHA(1)#PR(1B)=2ETA(1)#PM(1B))/GAMCA 0000016 PM(1B)=PR(1B) 0000016 PM(1B)=PR(1B) 0000016 PM(1B)=PR(1B) 0000016 PR(1B)=T1 0000016 20 C(12)=C(13)+T1#S(1+1) 0000016 SUBRDUTINE FGEFYT(N,N0+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+N1) 00000020 0000021 0000021 DIMENSION X(M)+Y(M)+BETA(N1)+ALPHA(N1)+S(N1)+SGMSQ(N1)+PR(M)+ 00000021 SUBRDUTINE FGEFYT(N,N0+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+N1) 00000021 DIMENSION X(M)+Y(M)+BETA(N1)+ALPHA(N1)+S(N1)+SGMSQ(N1)+PR(M)+ 00000021 DIMENSION X(M)+Y(M)+BETA(N1)+ALPHA(N1)+S(N1)+SGMSQ(N1)+PR(M)+ 00000021 OD(MOD010 0000020 00000021 DIMENSION X(M)+Y(M)+BETA(N1)+ALPHA(N1)+S(N1)+SGMSQ(N1)+		IMPLICIE REAL®O (AFHOJEW,Z) DIMENSION CONSULATERIA (AFHOJEW, CITATAN), DMANA DOANNA SANA)	00000020
N1-N1 0000005 00 10 IB=1+N1 0000005 C(IB)=0. 0000005 PM(IB)=0. 0000007 10 PR(IP)=0. 0000007 00 20 IE1+N 0000010 00 20 IE1+N 0000012 N1=1+1 0000014 00 20 IE1+N 0000014 T1=(T2-ALPHA(I)*PR(IB)-BETA(I)*PM(IB))/GAMDA 0000015 T2=PR(IB) 0000015 PM(IB)=PR(IB) 0000016 PM(IB)=PR(IB) 0000016 20 C(IB)=C(IB)+TI*S(I+1) 0000016 20 C(IB)=C(IB)+TN*S(I+1) 0000016 20 C(IB)=C(IB)+TN*S(I+1) 0000016 20 C(IB)=C(IB)+TN*S(I+1) 0000016 20 C(IB)=C(IB)+TN*S(I+1) 0000020 20 C(IB)=C(IB)+TN*S(I+1) 00000210 SUBROUTINE FGEFYT(N,ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+PO,M+NI) 000000210 SUBROUTI		DIPENSIUM CONVERLEMATING THE FACTORS OPPORTS OPPORTS (NOT STONE)	00000030
00000000 00000000 PM(IB)=0. 00000000 PR(I)=1. 00000000 PR(I)=1. 00000100 D20I=1,N 00000120 T2=C. 00000130 D2 CIB=1,NI 00000140 T1=(T2=ALPHA(I)*PR(IB)=BETA(I)*PM(IB))/GAMDA 00000160 D2 CIB=1,NI 00000140 T2=PR(IB) 00000160 PR(IB)=PR(IB) 00000180 PR(IB)=RIBD 00000180 CIB=C(IS)+TI*S(I+1) 00000180 SURRDUTINE FGEFYT(N,NO+X+Y+W+BETA+S+SGMS0+ALPHA+PR+PO+M+NI) 00000200 END 00000180 SURRDUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMS0+ALPHA+PR+PO+M+NI) 00000200 SURRDUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMS0+ALPHA+PR+PO+M+N+P(M+H)+D 00000200 SURRDUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMS0+ALPHA+PR+PO+M+N+P(M+H)+D 0000020 SURRDUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMS0+ALPHA+PR+PO+M+N+P(M+H)+			00000040
C(1)=0. 0000007 10 PR(1)=0. 0000007 10 PR(1)=1. 0000007 00 20 1=1. 0000010 00 20 1=1. 0000010 00 20 1=1. 0000010 00 20 1=1. 0000011 T2=C. 0000012 0000014 01=(T2=ALPHA(I))*PR(IB)=BETA(I)*PM(IB))/GAMDA 0000016 T2=PR(IB) 0000016 PM(IB)=PR(IB) 0000017 PR(IB)=T1 0000017 20 C(I)=C(IB)+T1*S(I+1) 0000016 SUBROUTINE FGEFYT(N,NU,X,Y,W,BETA,S,SGMS0,ALPHA,PR,PO,M,NI) 0000020 0000021 0000021 0000020 END 0000021 0000020 SUBROUTINE FGEFYT(N,NU,X,Y,W,BETA,S,SGMS0,ALPHA,PR,PO,M,NI) 0000020 0000021 0000021 0000021 SUBROUTINE FGEFYT(N,NU,X,Y,W,BETA,S,SGMS0,ALPHA,PR,PO,M,NI) 00000021 0000021 0000021 0000021 0000021 0000021 0000021 0000021 000001 00000021 0000001 0			000000000000000000000000000000000000000
10 PR(1 ²)=0. 0000010 0000010 00000111 T2=0. N1=1+1 0000012 0000012 0000012 0000012 0000012 0000012 0000012 0000012 0000012 0000012 0000012 0000012 0000012 0000015 0000015 0000016 0000016 0000016 0000017 0000007 00000007 0000007 0000007 00000007 0000007 00000007 00000000		PM(TP)=0	00000000
PR(1)=1. 0000000 C(1)=S(1) 0000010 PO 20 I=1,N 0000010 T2=C. 0000012 N1=I+1 0000014 D2 0 IB=1,N1 0000014 T1=(T2-ALPHA(I)#PR(IB)-BETA(I)#PM(IB))/GAMCA 0000150 T2=PR(IB) 0000016 PR(IB)=T1 0000019 20 C(I2)=C(I3)+T1*S(I+1) 0000016 RETURN 0000019 SUPROUTINE FGEFYT(N,ND+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO,M,NI) 00000210 SUPROUTINE FGEFYT(N,ND+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO,M,NI) 000000210 SUPROUTINE FGEFYT(N,ND+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO,M,NI) 000000210 SUPROUTINE FGEFYT(N,ND+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO,M,NI) 000000210 SUPROUTINE FGEFYT(N,ND+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO,M,NI) 000000210 SUPROUTINE FGEFYT(N,ND+X+Y+W+BETA(I)+S(NI)+SGMSQ(NI)+PR(M)+ 00000030 SUPROUTINE FGEFYT(N,ND+X+Y+W+BETA(I)+S(NI)+SGMSQ(NI)+PR(M)+ 000000210 SUPROUTINE FGEFYT(N+ND+X+Y+W+BETA(I)+S(NI)+SGMSQ(NI)+PR(M)+ 000000210 SUPROUTINE FGEFYT(N+ND+X+Y+W+BETA(I)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ 00000030 SUPROUTINE FGEFYT(N+ND+X+Y+W+BETA(I)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ 00000000 SUPROUTINE FGEFYT(N+ND+X+Y+W		$10 PR(1^{-1}) = 0$	00000090
C(1)=S(1) 0000100 C(1)=S(1) 0000110 T2=C. 00000120 D2 20 IB=1,N1 00000120 D2 20 IB=1,N1 00000140 T1=(T2=ALPHA(I)#PR(IB)=2ETA(I)#PM(IB))/GAMCA 00000156 T2=PR(IB) 00000166 PM(IB)=PR(IB) 00000166 PM(IB)=T1 00000166 20 C(IB)=C(IB)+T1#S(I+1) 00000167 CUPRDUTINE FGEFYT(N,ND,X,Y,W,BETA,S,SGMS0,ALPHA,PR,PD,M,NI) 00000160 SUPRDUTINE FGEFYT(N,ND,X,Y,W,BETA,S,SGMS0,ALPHA,PR,PD,M,NI) 000001210 SUPRDUTINE FGEFYT(N,ND,X,Y,W,BETA,S,SGMS0,ALPHA,PR,PD,M,NI) 000000210 DIMENSION X(M),Y(M),BETA(NI)+ALPHA(NI),S(NI)+SGMSQ(NI)+PR(M), 00000035 SPO(M),W(M) 00000040 10 IF(N=N0-M) 10,30+20 0000006 01 IF(N=N0-M) 10,30+20 0000006 00000006 00 FGNAT(32H THERE IS AN ERROR IN YOUR DATA) 00000006 01 IF(N=N0-M) 10,30+20 0000006 00 SC=0. 0000006 00 SC=0. 0000000 00 SC=0. 00000120 VACT=0 00000120 CO000120 VACT=1 000000000000000000000000000000000000		PR(1) = 1.	00000090
90 20 I=1,N 00000110 T2=0. 00000120 N1=I+1 00000140 0J 20 IB=1,N1 00000140 T1=(T2-ALPHA(I)#PR(IB)-BETA(I)#PM(IB))/GAMDA 00000160 PM(IB)=PR(IB) 00000160 PM(IB)=PR(IB) 00000160 PM(IB)=T1 00000190 20 C(I2)=C(I3)+T1#S(I+1) 00000160 RETURN 00000190 SUBRDUTINE FGEFYT(N,N0+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0,M,NI) 00000210 DIMENSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ 00000020 SPO(M)+W(M) 00000000 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 000000000 10 IF(N=NO)20+30+30 00000000 00 RINT 1000 00000000 00 GOTC 210 00000000 00 SE=0. 0000010 WPP=0. 0000012 LXACT=0 0000012 IF(N=NO-M+1)50+40+40 0000012		C(1)=S(1)	00000100
T2=C. 00000120 N1=1+1 00000130 0J 20 IB=1,N1 00000140 T1=(T2=ALPHA(I)*PR(IB)=BETA(I)*PM(IB))/GAMDA 00000160 PR(IB)=PR(IB) 00000160 PR(IB)=T1 00000190 20 C(IB=C(IB)+T1*S(I+1) 00000190 RETURN 00000200 ENO 00000100 SUBROUTINE FGEFYT(N,N0+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0,M,NI) 00000200 ENO 00000200 ENO 00000200 SUBROUTINE FGEFYT(N,N0+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0,M,NI) 00000020 DIMENSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMS0(NI)+PR(M)+ 00000020 SPO(M)+W(M) 00000000 00000000 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 000000000 IF (N = NO = M) 10+30+20 000000000000000000000000000000000000		00 20 I=1,N	00000110
N1=I+1 C0000133 03 20 IB=1+N1 00000143 T1=(T2-ALPHA(I)#PR(IB)-BETA(I)#PM(IB))/GAMCA 00000163 T2=PR(IB) 00000163 PM(IB)=PR(IB) 00000163 PR(IB)=T1 00000163 20 C(IE)=C(I3)+T1*S(I+1) 00000163 RETURN 00000230 END 00000230 SUBRDUTINE FGEFYT(N+N0+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 000000230 DIMENSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ 00000024 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000056 10 IF(N-N0)20+30+30 00000000 00000000 20 BETA(N0+1)=0. 00000000 00000000 00000000 00000000 00000000 10 IF(N-N0)20+30+30 00000000 00000000 30 BETA(N0+1)=0. 00000000 00000000 0SQ=0. 00000100 00000010 WPP=0. C0000123 C0000123 LXACT=0 C0000134 C0000134 IF (N-N0-M+1)50+40+40 C0000134 C0000134		T 2 = C.	00000120
DJ 20 IB=1,N1 00000140 T1=(T2-ALPHA(I)#PR(IB)-BETA(I)#PM(IB))/GAMDA 00000160 T2=PR(IB) 00000160 PM(IB)=PR(IB) 00000180 PR(IB)=T1 00000190 20 C(IE)=C(IB)+T1*S(I+1) 00000120 RETURN 00000210 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+N1) 00000210 DIMENSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ 000000240 SPO(M)+W(M) 00000040 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 000000060 IF (N =NO =M) 10+30+20 00000000 10 IF(N=NO)20+30-30 00000000 30 BETA(NO+1)=0+ 00000100 0SQ=0+ 00000100 WPP=0+ C0000120 LXACT=0 C0000124 IF (N=NO=M+1)50+40+40 C0000130		N l = I + l	0000130
11=(12-ALPHA(1)%PR(1B)-BETA(1)%PM(1B))/GAMDA 00000150 T2=PR(IB) 00000160 PM(IB)=PR(IB) 00000180 PR(IB)=T1 00000190 20 C(IB)=C(I3)+T1*S(I+1) 00000200 RETURN 00000200 SUBRDUTINE FGEFYT(N+N0+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 00000200 DIMENSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ 00000020 SPO(M)+W(M) 00000000 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000050 IF (N =NO =M) 10+30+20 00000000 10 IF(N=NO)20+30+30 00000000 20 PRINT 1000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000100 000000100		0.5 20 IB=1,N1	00000140
12=PR(1B) 00000160 PM(IB)=PR(IB) 00000160 PR(IB)=T1 00000180 20 C(I2)=C(I3)+T1*S(I+1) 00000180 RETURN 00000200 END 00000010 SUBRDUTINE FGEFYT(N,ND,X,Y,W,BETA,S,SGMSQ,ALPHA,PR,PO,M,NI) 0000020 DIMENSION X(M),Y(M),BETA(NI),ALPHA(NI),S(NI),SGMSQ(NI),PR(M), 00000020 DIMENSION X(M),Y(M),BETA(NI),ALPHA(NI),S(NI),SGMSQ(NI),PR(M), 00000000 SPO(M),W(M) 00000000 00000000 1C00 FORMAT(32H) 00000000 01 IF (N =NO =M) 10;30;20 00000000 10 IF (N =NO =M) 10;30;20 00000000 00 BETA(NO+1)=0. 00000000 00 DSQ=0. 00000100 00 DSQ=0. 00000100 WPP=0. C0000120 C0000130 LXACT=0 C0000130 C0000130 IF (N=NO=M+1		1I=(T2-ALPHA(1)%PR(1B)-8ETA(1)%PM(1B))/GAMDA	00000150
PR(18)=T1 00000180 20 C(12)=C(13)+T1*S(1+1) 00000190 RETURN 00000200 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0,M+N1) 00000210 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0,M+N1) 00000020 DIMENSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ 00000020 SPO(M)+W(M) 00000000 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000000 10 IF (N-NO -M) 10+30+20 00000000 10 IF (N-NO 20+30+30 00000000 20 PRINT 1000 00000000 GJTC 210 00000000 30 BETA(N0+1)=0+ 00000100 WPP=0+ C0000120 LXACT=0 C0000120 IF (N-NO-M+1)50+40+40 C0000140 40 LXACT=1 00000150		12=PK(18)	00000150
20 C(IE)=C(IS)+T1*S(I+1) 00000190 RETURN 00000200 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 00000200 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 00000020 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 000000020 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 000000020 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 000000000 SUBRDUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMS0+ALPHA+PR+P0+M+NI) 000000000 SUBRDUTINE FGEFYT(N+ND+N+1)50+40+40 00000100 SUBRDUTINE FGEFYT(N+ND+N+1)50+40+40 00000150			00000170
RETURN 00000200 SUPROUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+NI) 00000210 SUPROUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+NI) 000000210 SUPROUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+NI) 0000000210 SUPROUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+NI) 000000000 SUPROUTINE FGEFYT(N+NO+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+NI) 000000000000000000000000000000000000		(1) = (1)	00000180
END SUBROUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+NI) O0000210 SUBROUTINE FGEFYT(N+ND+X+Y+W+BETA+S+SGMSQ+ALPHA+PR+PO+M+NI) O0000020 DIMENSION X(M)+Y(M)+BETA(NI)+ALPHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+ O0000030 SPO(M)+W(M) 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) O0000040 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) O0000050 O0000000 10 IF (N -NO -M) 10+30+20 10 IF (N -NO -M) 10+30+20 10 IF (N -NO -M) 10+30+20 10 O000000 00 O000000 00 BETA(N0+1)=0+ 00000000 00 BETA(N0+1)=0+ 00000120 CO00		RETURN	00000200
SUBROUTINE FGEFYT(N,ND,X,Y,W,BETA,S,SGMSQ,ALPHA,PR,PD,M,NI) 0000010 IMPLICIT REAL#8 (A-H,D-W,Z) 00000020 DIMENSION X(M),Y(M),BETA(NI),ALPHA(NI),S(NI),SGMSQ(NI),PR(M), 00000030 \$PO(M),W(M) 00000040 1C00 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000050 IF (N -NO -M) 10,30,20 00000000 00 FORMAT (32H THERE IS AN ERROR IN YOUR DATA) 00000000 00 FORMAT (32H THERE IS AN ERROR IN YOUR DATA) 000000000 00 FORMAT (32H THERE IS AN ERROR IN YOUR DATA) 000000000000000000000000000000000000		END	00000210
IMPLICIT REAL#8 (A-H, 0-W, 2) 00000020 DIMENSION X(M),Y(M),BETA(NI),ALPHA(NI),S(NI),SGMSQ(NI),PR(M), 00000030 \$PO(M),W(M) 00000040 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000050 IF (N -NO -M) 10,30,20 00000070 10 IF(N-NO)20,30,30 00000000 20 PRINT 1000 00000000 GDTC 210 00000000 30 BETA(N0+1)=0. 00000100 DSQ=0. 00000120 WPP=0. 00000120 LXACT=0 0000120 IF (N-ND-M+1)50,40,40 00000130		SUBROUTINE FGEFYT(N,NO,X,Y,W,BETA,S,SGMSQ,ALPHA,PR,PO,M,NI)	00000010
DIMENSION X(M),Y(M),BETA(NI),ALPHA(NI),S(NI),SGMSQ(NI),PR(M), \$PO(M),W(M) 00000040 00000000 1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000050 00000000 10 IF(N-NO)20,30,30 0000000 00000000 00000000 00000000		IMPLICIT REAL#8 (A−H,0−h,Z)	0000020
\$PO(M),W(M) 0000040 1C00 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000050 IF (N -NO -M) 10,30,20 00000050 10 IF (N-NO)20,30,30 00000070 20 PRINT 1000 00000090 GDTC 210 00000090 30 BETA(N0+1)=0. 00000100 DSQ=0. 00000120 WPP=0. C0000120 LXACT=0 C0000140 IF (N-ND-M+1)50,40,40 00000150		DIMENSION X(M)+Y(M)+BETA(NI)+A&PHA(NI)+S(NI)+SGMSQ(NI)+PR(M)+	0000030
1000 FORMAT(32H THERE IS AN ERROR IN YOUR DATA) 00000050 IF (N -NO -M) 10+30+20 00000000 10 IF(N-NO)20+30+30 00000000 000000000 20 PRINT 1000 00000000 000000000 GDTC 210 00000000 000000000 000000000 30 BETA(N0+1)=0. 00000100 00000100 DSQ=0. 00000120 00000120 WPP=0. 00000120 00000120 IF(N-ND-M+1)50+40+40 00000130 00000130 40 LXACT=1 00000150		\$PQ(M),W(M)	00000040
IF (N -N0 -M) 10,30,20 0000000 10 IF (N-N0)20,30,30 00000070 20 PRINT 1000 00000090 GDTC 210 00000090 30 BETA(N0+1)=0. 00000100 DSQ=0. 00000120 WPP=0. C0000120 LXACT=0 C0000130 IF (N-ND-M+1)50,40,40 00000130	100	DO FORMAT(32H THERE IS AN ERROR IN YOUR DATA)	00000050
10 14 (N=N0)20+30+30 00000000 20 PRINT 1000 00000000 GDTC 210 00000000 00000000 30 BETA(N0+1)=0. 00000100 00000100 DSQ=0. 00000120 00000120 LXACT=0 00000130 00000140 1F (N=N0+M+1)50+40+40 00000130 00000130		IF (N - NQ - M) IO 30 20	00000060
20 PRINT 1000 0000000 GDTC 210 00000000 30 BETA(N0+1)=0. 00000100 DSQ=0. 00000100 WPP=0. 00000120 LXACT=0 00000130 IF(N=N0=M+1)50+40+40 00000140 40 LXACT=1 00000150			00000070
30 BETA(N0+1)=0. 00000000 DSQ=0. 00000100 WPP=0. 00000120 LXACT=0 00000130 IF(N=N0=M+1)50+40+40 00000140 40 LXACT=1 00000150	4		00000030
DSQ=0. 00000100 WPP=0. 00000120 LXACT=0 00000130 IF(N=N0=M+1)50+40+40 00000140 40 LXACT=1		30 BETAIN0+1)=0.	00000090
WPP=0. 00000120 LXACT=0 00000130 IF(N+N0+M+1)50+40+40 00000140 40 LXACT=1			00000110
LXACT=0 C0000130 IF(N+N0+M+1)50+40+40 C0000140 40 LXACT=1		WPP=0.	00000120
IF (N=ND=M+1)50+40+40 0000140 40 LXACT=1 00000150		LXACT=0	0000130
40 LXACT=1 00000150		IF(N-NO-M+1)50+40+40	00000140
	4	40 LXACT=1	00000150

	50	00 80 J=1.M	00000160
		PR(J)=1.	00000170
		P D (J) = 0 •	00000180
	60	WPP=WPP+W(J)	00000190
		IF(LXACT)80,70,80	00000200
	70	OSQ=DSQ+W(J)∻Y(J)∻Y(L)	00000210
	80	CONTINUE	00000220
		NON=NO+1	00000230
		NN=N+1	00000240
		DD 200 I=NDN, NN	00000250
		LREEDD=M-I+NO	00000260
		WYP=0.	00000270
		WXPP=0.	00000280
		DO 120 J=1.4M	00000290
		TEMP=w(J)*PR(J)	00000300
		IF(I-NN)90,100,100	00000310
	90	₩XPP=₩XPP+TEMP≈X(J)≈PR(J)	00000320
	100	IF(LREEDO)120,110,110	00000330
	110	WYP=WYP+TEMP*Y(J)	00000340
	120	CONTINUE	00000350
		IF(LREEDC)14C,130,130	00000360
	130	S(I)=WYP/WPP	00000370
	140	IF(LXACT)160,150,160	000003B0
	150	DSC=(SC) - S(I) + S(I) + WPP	00000390
		BRELREEDC	00000400
		SGMSQ(1)=DSQ/BR	00000410
	140		00000420
	100	2042A11=0	00000430
	190		00000440
	100		00000450
			00000400
		DD 190 J=1•M	00000490
		TEMP = (X(J) - A(PHA(I)) * PR(J) - BETA(I) * PD(J)	00000490
		WPP=WPP+W(J) *TEMP**2	00000500
		PD(J)=PR(J)	00000510
	190	PR(J)=TEMP	00000520
		BETA(I+1)=WPP/WPPO	00000530
	200	CONTINUE	00000540
	210	RETURN	00000550
		END	00000560
С			CASP0010
С		**********************	CASPOOZO
С		* PLOTTING SUBROUTINE *	CASP0030
С		*****************	CASP0040
С			CASP0050
		SUBROUTINE CASPLT	C A SP0060
С			CASP0070
C			C A SP 0 0 8 0
C			- CASP0090
C			CASP0100
L C			CASP0110
L C		THIS SUBRUTINE PLUIS THE RESULTS OF THE ANALYTICAL APPLI-	LASP0120
с с		I CATIONS OF THE MUNULIY, CASAGRANDE, AND SUMMERIMANN CON-	LASPUISO
c r		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
r			- CASPOISO
r			CASP0100
C		COMMON /PLOK1/ PLACA1.F(303).PE(103).FE(103).C(103)	

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COMMON /BLOK2/ AY+SB+BY+SC+CY+SD+DY+SE+EY+SF+FY+SG+GY+B1+B2+B3+B4+CASP0200
2B5,BGUND6,NC,NE,POVER,XSLP2,PC,EC,EO,OCR,CC1,CS,CR,SR,NDEG,IN CASP0210
                                                                      CASP0220
3.ICUT, IDIAL
COMMON /BLOK3/ PO, PRECON, PREMIN, VOIDC, ECMIN, OCRMIN, CRMIN
                                                                      CASP0230
COMMON /BLOK5/ LOC(4),HOL,SAM,TES,OPR(1),DAT(3),DES(4),BCD(20),
                                                                      CASP0240
1KK,RUNTYP
                                                                      CASP0250
COMMON /BLOK8/ RAD(103),RADMIN,RADMX,IMIN,IPRINT,JPRINT,KIND
                                                                      CASP0260
COMMON /BISEC/ XTAN, YTAN, CEPTAN, XANGLE, SLUPBI, CEPTBI
                                                                      CASP0270
DIMENSION DATA(1024), X(103), CURVFT(103)
                                                                      CASP0280
DIMENSION BOVER(3), VOIDEO(3), DASH(13), DASHY(13), PDUMMY(103)
                                                                      CASP0290
REAL LINEA(103), LINEB(103), LINEC(103), LINED(103), LINEE(103),
                                                                      CASP0300
1LINEF(103),LINEG(103)
                                                                      CASP0310
DIMENSION TANGEN(103), BISECT(13)
                                                                      CASP0320
 INTEGER START, SFAC
                                                                      CASP0330
 INTEGER STARE, SFAE, STARX, SFACUR
                                                                      CASP0340
 INTEGER RUNTYP
                                                                      CASP0350
                                                                      CASP0360
                                                                      CASP0370
CALL SCALE (E,8.0,NC.1)
                                                                      CASP0380
BOVER(1)=POVER
                                                                      CASP0390
 V0I0E0(1)=E0
                                                                      CASP0400
 IF (KK.EQ.2) VOIDED(1)=0.0
                                                                      CASP0410
DASHY(1) = PC \approx SD + DY
                                                                      CASP0420
 VOIDPC=DASHY(1)
                                                                      CASP0430
                                                                      CASP044
 SETTING UP STARTING AND SCALE FACTOR POSITIONS
                                                                      CASP0450
FOR EACH OF THE RESPECTIVE PLUT VARIABLES.
                                                                     CAS20460
                                                                      CASP0470
 START=NC+1
                                                                      CASP0480
 STARE=NE+1
                                                                      CASP0490
 STARX=101+1
                                                                      CASP0500
 SFAC=NC+2
                                                                      CASP0510
 SFAE=NE+2
                                                                      CASP0520
 SFACUR=101+2
                                                                      CASP0530
                                                                      CASP0540
P(START) = -1.000
                                                                      CASP0550
PE(STARE)=P(START)
                                                                      CASP0560
IF (KK.EQ.2) E(STAPT)=0.0
                                                                      CASP0570
EE(STARE) = E(START)
                                                                      CASP0580
X(STARX) = P(START)
                                                                      CASP0590
CURVFT(STARX)≈E(START)
                                                                      CASP0600
LINEA(STARX) = E(START)
                                                                      CASP0610
LINEB(STARX) = E(START)
                                                                      CASP0620
LINEC(STARX) = E(START)
                                                                      CASP0630
LINED(STARX) = E(START)
                                                                      CASP0640
LINEE(STARX) = E(START)
                                                                      CASP0650
LINEF(STARX) = E(START)
                                                                      CASP0660
LINEG(STARX) = E(START)
                                                                      CASP0670
BOVER(2) = P(START)
                                                                      CASP0680
 VOIDED(2) = E(START)
                                                                      CASP0690
DASH(12) = P(START)
                                                                      CASP0700
DASHY(12) \approx E(START)
                                                                      CASP0710
TANGEN(STARX)=E(START)
                                                                      CASP0720
BISECT(12)=E(START)
                                                                      CASP0730
                                                                      CASP0740
P(SFAC)=0.3000
                                                                      CASP0750
PE(SFAE) = P(SFAC)
                                                                      CASP0760
EE(SFAE) = E(SFAC)
                                                                      CASP0770
X(SFACUR) = P(SFAC)
                                                                      CASP0780
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CURVET(SEACUR)=E(SEAC)

CASP0790

CASP0800 LINEA(SFACUR)=E(SFAC) LINEB(SFACUR) = E(SFAC)CASP0810 LINEC(SFACUR) = E(SFAC)CASP0820 CASP0830 LINED(SFACUR)=E(SFAC) CASP0840 LINEF(SFACUR) = E(SFAC)CASP0850 CASP0860 CASP0870 LINEF(SFACUR)=E(SFAC) LINEG(SFACUR) = E(SFAC)BOVER(3) = P(SFAC)VOIDEO(3) = F(SFAC)CASP0880 DASH(13) = P(SFAC)CASP0890 CASP0900 DASHY(13) = E(SFAC)TANGEN(SFACUR) = E(SFAC)CASP0910 BISECT(13) = E(SFAC)CASP0920 С CASP0930 FIRLOG = -1.000C A SP 0 940 DELLOG=0.30000 CASP0950 CALL LOGAXS(G.0,8.0,*LOG(VERTICAL EFF. STRESS, TSF)*,31,10.0,0.0,CASP0960 1-1.000,0.30000) CASP0970 IF (KK.EQ.2) GO TO 10 CASP0980 CALL AXIS(0.0,0.0, VOID RATIO (E) 14,8.00,90.0, E(START), E(SFAC)) CASP0990 GO TO 20 CASP1000 С CASP1010 10 CONTINUE CASP1020 CALL PLOT (0.0,8.0,-3) CASP1030 CALL AXIS (0.0,0.0, VERTICAL STRAIN (IN/IN) ,-23,8.0,270.0,0.0 CASP1040 1 ,E(SFAC)) CASP1050 20 CONTINUE CASP1060 С CASP1070 GENERATE THE PLOTS С CASP1080 С CASP1090 С CASP1100 COMPRESSION CURVE.J=1. ONLY SYMBOLS FOR EACH PCINT PRODUCED. С CASP1110 CALL LINE(P,E,NC,1,-1,1) CASP1120 CALL LINE(PE,EE,NE,1,-1,1) CASP1130 EXPANSION CURVE, J=1, ONLY SYMBOLS FOR EACH POINT PRODUCED. С CASP1140 CASP1150 С С CASP1160 X(1) = P(1)CASP1170 DELTA=(P(NC)-P(1))/100 CASP1180 DO 30 I=2,101 CASP1190 . 30 X(I)=X(I-1)+DELTA CASP1200 DO 40 I=1,101 CASP1210 С CASP1220 X1 = X(I)CASP1230 $X \ge X(I) \otimes X(I)$ CASP1240 X3=X(I)*X(I)*X(I) CASP1250 CASP1260 $X4=X(I) \Rightarrow X(I) \Rightarrow X(I) \Rightarrow X(I)$ X = X (I) = X (I) = X (I) = X (I) = X (I)CASP1270 $X6 = X(I) \Leftrightarrow X(I) \Rightarrow X(I) \Rightarrow X(I) \Leftrightarrow X(I) \Rightarrow X(I)$ CASP12.90 $X7 = X(I) \approx X(I) \approx X(I) \approx X(I) \approx X(I) \approx X(I) \approx X(I)$ CASP1290 CASP1300 X 9= X(I) *X(I) *X(I) *X(I) *X(I) *X(I) *X(I) *X(I) *X(I) CASP1310 CASP132D X11=X(I) *X(I) *X(CASP1330 CURVFT(I)=C(1)+ C(2)*X1+ C(3)*X2+ C(4)*X3+ C(5)*X4+ C(6)*X5 CASP1340 1+C(7)*X6+ C(8)*X7+ C(9)*X8+ C(10)*X9+ C(11)*X10+ C(12)*X11 CASP1350 С CASP1 360 40 CONTINUE CASP1370 С CASP1380 FITTED CURVE, J=0. ONLY A LINE PLOT PRODUCED, NO SYMBOLS. С CASP1390

 $\mathcal{A}_{\mathcal{A}}$

CALL LINE(X,CURVFT,101,1,0,0) CASP1400 С CASP1410 С NOW PLOTTING EXPANSION-REBOUND CURVE LINE REPRESENTATION. CASP1420 С CASP1430 X(1) = PE(1)CASP1440 DELTA=(PE(NE)-PE(1))/100 CASP1450 DO 50 I=2,101 CASP1460 X(I) = X(I-1) + DELTACASP1470 50 CONTINUE CASP1480 DO 60 I=1,101 CASP1490 CASP1500 $LINEE(I) = SE \stackrel{\text{\tiny $\$$}}{\times} X(I) \stackrel{\text{\tiny \bullet}}{\times} EY$ 60 CONTINUE CASP1510 CALL LINE (X, LINEE, 101, 1, 0, 0) CASP1520 С CASP1530 IF (BGUND6.GT.998) GO TO 110 CASP1540 С CASP1550 С CASP1560 С С * MCNULTY'S GRAPHICAL CONSTRUCTION TO DETERMINE PT. OF MAX. CURV.*CASP1580 С X(1) = XTAN - 0.1CASP1600 DELTA=ABS(XANGLE-X(1))/100.0 CASP1610 00 70 I=2:101 CASP1620 CASP1630 $X(I) = X(I-1) + O \in LTA$ 70 CONTINUE CASP1640 DO 80 I=1,101 CASP1650 TANGEN(I)=SE≈X(I)+CE₽TAN CASP1660 80 CONTINUE CASP1670 CALL LINE (X, TANGEN, 101, 1, 0, 0) CASP1680 DASH(1) = XSLP2 - 0.05CASP1690 CASP1700 DELTA=ABS(XANGLE-DASH(1))/10.0 DO 90 I=2,11 CASP1710 DASH(I)=DASH(I-1)+DELTA CASP1720 90 CONTINUE CASP1730 00 100 I=1.11 CASP1740 BISECT(I)=SLCPBI*DASH(I)+CEPTBI CASP1750 100 CONTINUE CASP1760 CALL DASHLN (DASH, BISECT, 11, 1) CASP1770 С CASP1780 110 CUNTINUE CASP1790 С CASP1800 С CASP1810 С ******** CASP1820 С CASP1830 С CASAGRANDE'S CONSTRUCTION CASP1840 С CASP1850 С CASP1860 С CASP1870 X(1) = XSLP2CASP1880 DELTA=ABS(PC+0.05-XSLP2)/100 CASP1890 DO 120 I=2,101 CASP1 900 X(I) = X(I-1) + CELTACASP1910 120 CONTINUE CASP1920 С CASP1930 DO 130 I=1,101 CASP1940 $LINEA(I) = AY + C \cdot O^{::} X (I)$ CASP1950 130 CONTINUE CASP1960 CALL LINE(X, LINEA, 101, 1, 0, 0) CASP1970 A = (X(101) - X(102)) / X(103) + 0.1CASP1980 LINEA(101)=(LINEA(101)-LINEA(102))/LINEA(103) CASP1990

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С
                                                                           CASP2000
      CALL SYMBOL(A, LINEA(101), 0.14, *A*, 0.0, 1)
                                                                           CASP2C10
С
                                                                           CASP2020
      LINE TANGENT TO CURVE AT POINT OF MAX CURVATURE.
С
                                                                           CASP2030
C
                                                                           CASP2040
      DO 140 I=1,101
                                                                           CAS22050
      LINEB(I)=SB \approx X(I)+BY
                                                                           CASP2060
  140 CONTINUE
                                                                           CASP2070
      CALL LINE(X, LINEB, 101, 1, 0, 0)
                                                                           CASP2080
С
                                                                           CASP2090
      B = (X(101) - X(102)) / X(103) + 0.10
                                                                           CASP2100
      LINEB(101)=(LINEB(101)-LINEB(102))/LINEB(103)
                                                                           CASP2110
      CALL SYMBOL(B,LINEB(101),0.14, 'B',0.0,1)
                                                                           CASP2120
С
                                                                           CASP2130
С
      BISECT LINES 'A' AND 'B'.
                                                                            CASP2140
С
                                                                            CASP2150
      DO 150 I=1,101
                                                                           CASP2160
      L INEC(I) = SC \approx X(I) + CY
                                                                           CASP2170
  150 CONTINUE
                                                                           CASP2180
      CALL LINE(X,LINEC, 101, 1, 0, 0)
                                                                           CASP2190
      CX = (X(101) - X(102)) / X(103) + 0.10
                                                                           CASP2200
      LINEC(101) = (LINEC(101) - LINEC(102))/LINEC(103)
                                                                           CASP2210
      CALL SYMBOL(CX,LINEC(101),0.14, °C°,0.0,1)
                                                                           CASP2220
С
                                                                           CASP2230
С
                                                                           CASP2240
£
                                                                           CASP2250
      PROJECT LINE 'D' BACK FROM STRAIGHT PORTION
С
                                                                           CASP2260
      OF VIRGIN COMPRESSION CURVE TO GET AN INTERSECTION
WITH LINE "C" TO SHOW THE PRECONSOLIDATION PRESSURE.
С
                                                                           CASP2270
С
                                                                           CASP2280
С
                                                                           CASP2290
      X(1) = XANGLE
                                                                           CASP2 300
      IF (BOUND6.GT.998) X(1)=PC
                                                                           CASP2310
      DELTA=(P(NC)-X(1))/100.0
                                                                            CASP2320
      DO 160 I=2,101
                                                                           CASP2330
      X(I) = X(I-1) + DELTA
                                                                            CASP2340
  160 CONTINUE
                                                                           CASP2350
С
                                                                            CASP2360
      DO 170 I=1,101
                                                                            CASP2370
      LINED(I)=SD≉X(I)+DY
                                                                           CASP2380
  170 CONTINUE
                                                                           CA SP2 390
      CALL LINE(X,LINED,101,1,0,0)
                                                                           CASP2400
      X(1) = (X(1) - X(102)) / X(103)
                                                                           CASP2410
      LINED(1)=(LINED(1)-LINED(102))/LINED(103) + 0.1
                                                                           CASP2420
      CALL SYMBOL(X(1),LINED(1),0.14, °D*,0.0,1)
                                                                           CASP2430
С
                                                                           CASP2440
С
                                                                            CASP2450
С
                                                                            CASP2460
С
      ******
                                                                            CASP2470
С
                                                                            CASP2480
      SCHMERTMANN'S CONSTRUCTION
С
                                                                           CASP2490
С
                                                                           CASP2500
С
      *************************
                                                                           CASP2510
С
                                                                           CASP2520
      PLOT OVERBURCEN PRESSURE (BOVER,VOIDEO).
С
                                                                           CASP2530
      CALL LINE(BOVER, VOIDED, 1, 1, -1, 0)
                                                                           CASP2540
С
                                                                           CASP2550
      PLOT PRECONSCLIDATION COMPRESSION CURVE 'F'.
С
                                                                           CASP2560
С
                                                                           CASP2570
      X(1)=BOVER(1)
                                                                            CASP2580
      DELTA=(PC-BOVER(1))/100
                                                                            CASP2590
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101,2=1 081 00
                                                                           CASP2600
      X(I) = X(I-1) + CELTA
                                                                           CASP2610
  180 CONTINUE
                                                                           CASP2620
C.
                                                                           CASP2630
      00 190 I=1,101
                                                                           CASP2640
      LINEF(I) = SF \neq X(I) + FY
                                                                           CASP2650
  190 CONTINUE
                                                                           CASP2660
      CALL LINE(X+LINEF,101,1,0,0)
                                                                           CA$22670
С
                                                                           CASP2680
C.
                                                                           CASP2690
      PLOT THE STEPS EMPLOYED IN THE DETERMINATION OF A MINIMUM
С
                                                                          CASP2700
      PRECONSOLIDATION PRESSURE.
С
                                                                           CASP2710
      DASH(1) = ALOG10 (PREMIN)
                                                                           CASP2720
      DASH(11)=XANGLE
                                                                           CASP2730
      IF (BOUND6.GT.998) DASH(11)=PC
                                                                           CASP2740
      DELTA=(DASH(11)-DASH(1))/10.00
                                                                           CASP2750
      00 200 I=2,11
                                                                           CASP2760
      DASH(I)=DASH(I-1)+DELTA
                                                                           CASP2770
  200 CONTINUE
                                                                           CASP2780
      DO 210 I=1.11
                                                                           CASP 2790
      DASHY(I)=SD*CASH(I)+OY
                                                                           CASP2300
  210 CONTINUE
                                                                           CASP2810
      CALL DASHLN(CASH, DASHY, 11, 1)
                                                                           CASP2820
      DASHY(1) = ECMIN
                                                                           CASP2830
      DASH(1)=ALOG10(PREMIN)
                                                                           CAS22840
      DELTA=(VOIDEO(1)-ECMIN)/10.0
                                                                          CASP2850
      IF (ABS(DELTA).LT.0.000001.AND.KK.EQ.1) DELTA=0.0015
                                                                          CASP2860
      IF (ABS(DELTA).LT.0.0G001.AND.KK.EQ.2) DELTA=0.C0075
                                                                          CASP2870
      IF (ECMIN.EQ.VOIDEO(1)) DELTA=-DELTA
                                                                           CASP2890
      DO 220 I =2,11
                                                                           CASP2890
      DASH(I)=ALOG10(PREMIN)
                                                                           CASP2900
      DASHY(I)=DASHY(I-1) + DELTA
                                                                           CASP2910
  220 CUNTINUE
                                                                           CASP2920
      CALL DASHLN(DASH, DASHY, 11, 1)
                                                                           CASP2930
      PLOT TRUE VIRGIN COMPRESSION LINE "G".
С
                                                                          CASP 2940
С
                                                                          CASP2950
      X(1) = PC
                                                                          CASP2960
      DELTA=(P(NC)+.13-PC)*SG/LINEG(103)
                                                                           CASP2970
      B5=EC+DELTA
                                                                           CASP2980
С
                                                                           CASP2990
C.
                                                                           CASP3000
С
      CHECKING ARGUMENTS TO MAKE SURE LINEG IS NOT DRAWN TOO FAR.
                                                                           CASP3010
      IF (ABS(B5).GT.8.0) DELTA=8.0-ABS(EC)
                                                                           CASP 3020
С
                                                                           CASP3030
      DELTA=A8S((DELTA*LINEG(103))/SG)/100.0
                                                                           CASP3040
С
                                                                           CASP3050
      DO 230 I=2,101
                                                                           CASP3060
      X(I) = X(I-1) + OELTA
                                                                           CASP3070
  230 CONTINUE
                                                                           CASP3080
      DD 240 I=1,101
                                                                           CASP3090
      LINEG(I) = SG = X(I) + GY
                                                                           CASP3100
  240 CONTINUE
                                                                           CASP 3110
      CALL LINE(X+LINEG+101+1+0+0)
                                                                           CASP3120
      DELTA=ABS(V0IDED(1)-V0IDPC)/10
                                                                           CASP3130
      DASH(1) = PC
                                                                           CASP3140
      DASHY(1)=VOICPC
                                                                           CASP3150
      DO 250 I=2,11
                                                                           CASP3160
      DASH(I)=PC
                                                                           CASP3170
      DASHY(I) = DASHY(I-1) + DELTA
                                                                           CASP3180
  250 CONTINUE
                                                                           CASP3190
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CALL DASHLN(DASH, DASHY, 11, 1) CASP3200 IF (KK.EQ.2) CALL PLOT (0.0,-8.0,-3) CASP3210 CALL SYMBOL(2.5,9.0,0.14,8CD,0.0,80) CASP3220 CASP3230 FPN=NDEG+0.01 CASP 3240 CALL NUMBER (10.,7.0,0.10, FPN,0.0,-1) CALL SYMBOL (9.4,7.0,0.10, DEG = ',0.0,6) CALL SYMBOL (9.4,6.5,0.10, PD = ',0.0,5) CASP3250 CASP3260 CALL NUMBER (9.9,0.5,0.10,PD,0.0,3) CASP3270 CALL SYMBUL (10-5,6-5,0-10, TSF*,0-0,3) CASP3280 CALL SYMBOL (11.3,6.5,0.10, E0 = ',0.0,5) CASP3290 CALL NUMBER (11.8,6.5,0.10,E0,0.0,4) CASP3300 CALL SYMBOL (10.3,6.0,0.10, RANGE OF VALUES',0.0,15) CALL SYMBOL (10.1,5.75,C.10, PROBABLE - MINIMUM',0.0,18) CASP3310 CASP3320 TSF - TSF*,0.0,27) CALL SYMBOL (9.4,5.4,0.10, PC CASP3330 CALL NUMBER (10.,5.4,0.10, PRECON,0.0,2) CASP3340 CASP3350 CALL NUMBER (11.2,5.4,0.10, PREMIN,0.0,2) CALL SYMBOL (9.4,5.0,0.10, EC ,0.0,27) CASP3360 IF (KK.EQ.2) VOIDC=-VOIDC CASP3370 IF (KK.EQ.1) CALL NUMBER (10.4,5.0,0.10,VOIDC,0.0,3) CASP3380 IF (KK.EQ.2) CALL NUMBER (10.3,5.0,0.10,V0IDC,0.0,4) CASP3390 IF (KK.EQ.2) VOIDC=-VOIDC CASP3400 IF (KK.EQ.2) ECMIN=-ECMIN CASP3410 IF (KK.EQ.1) CALL NUMBER(11.2,5.0,0.10, ECMIN,0.0,3) CASP3420 IF (KK.EQ.2) CALL NUMBER (11.2,5.0,0.10,ECMIN,0.0,4) CASP3430 IF (KK.EQ.2) ECMIN=-ECMIN CASP3440 **'**,0.0,27) CALL SYMBOL (9.4,4.6,0.10, OCR CASP 3450 CALL NUMBER (10.5,4.6,0.10,0CR,0.0,1) CASP3460 CASP3470 CALL NUMBER (11.2,4.6,0.10,0CRMIN,0.0,1) IF (KK.EQ.2) GD TO 260 CASP3480 °,0.0,27) CALL SYMBOL (9.4,4.2,0.10, CC CASP3490 CALL SYMBOL (9.4,3.8,0.10, CS',0.0,2) CASP3500 260 CONTINUE CASP3510 IF (KK.EQ.1) GD TO 270 CASP3520 **',**0**.**0**,**27) CALL SYMBOL (9.4,4.2,0.10, CR CASP3530 CALL SYMBOL (9.4,3.8,0.10, 'SR',0.0,2) CASP3540 CASP3550 270 CONTINUE CALL NUMBER (10.3,4.2,0.10,CR,0.0,3) CASP3560 CASP3570 CALL NUMBER (11.2,4.2,0.10,CRMIN,0.0,3) CALL NUMBER (10.2,3.8,0.10,SR,0.0,4) CASP3580 IF(NC.GT.10) GO TO 320 CASP3590 IF (KK.EQ.2) GO TO 280 CASP3600 CALL SYMBOL (9.4,3.5,0.10, 'EFF. STRESS VOID RATIO (E)',0.0,30)CASP3610 IF (KK.EQ.1) GD TD 290 CASP3620 280 CONTINUE CASP3630 CALL SYMBOL (9.4,3.3.0.10, 'EFF. STRESS VERT. STRAIN',0.0,27) CASP 3640 290 CONTINUE CASP3650 ORDINA=3.0 CASP3660 CASP3670 DO 300 I=1,NC $PDUMMY(I) = 10 \cdot 0 \approx P(I)$ CASP3680 CASP3690 CALL NUMBER (9.7, ORDINA, 0.10, PDUMMY(I), 0.0, 3) IF $(KK \cdot EQ \cdot 2) = (I) \approx -E(I)$ CASP3700 CALL NUMBER (11.3,0RDINA,0.10,E(I),0.0,4) CASP3710 CASP3720 ORDINA=ORDINA-0.2 CASP3730 300 CONTINUE CASP3740 DO 310 J=1,NE PDUMMY(J)=10.0**PE(J) CASP3750 CALL NUMBER (9.7, ORDINA, 0.10, PDUMMY(J), 0.0, 3) CASP3760 IF $(KK \bullet EQ \bullet 2) = EE(J) = -EE(J)$ CASP3770 CALL NUMBER (11.3, ORDINA, 0.10, EE(J), 0.0,4) CASP3780 ORDINA=ORDINA-0.2 CASP3790

310	CONTINUE
320	CONTINUE
	CALL PLOT(15.0,0.0,-3)
	RETURN
	END

CASP3800 CASP3810 CASP3820 CASP3830 CASP3840

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