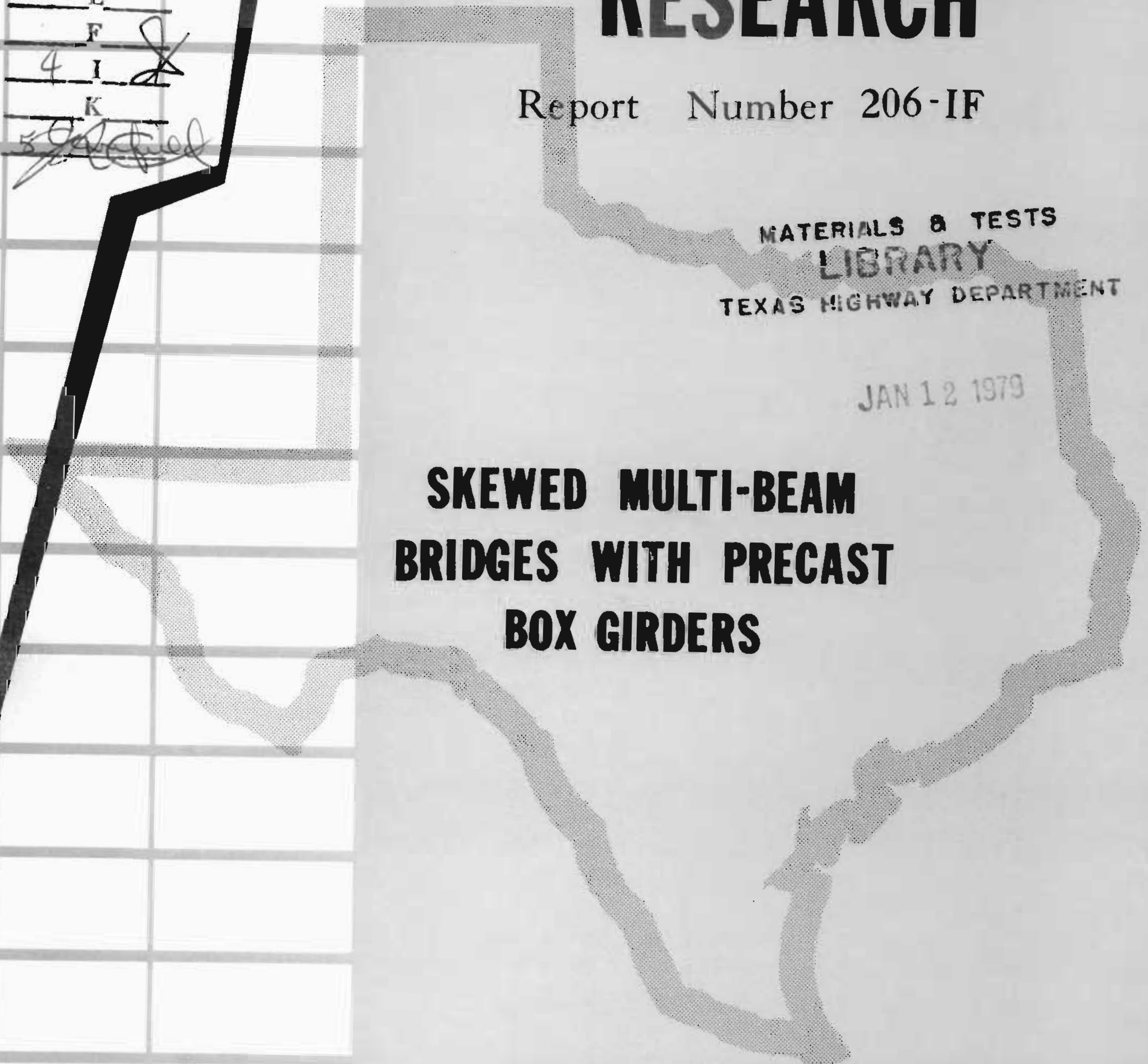
DHT-1-5-76-206-IF

2 LGW
1 KKM
GS
6 RES
CHH
3 A SWB
B
C
D
E
F
4 I
K
5

DEPARTMENTAL RESEARCH

Report Number 206-IF



SKEWED MULTI-BEAM BRIDGES WITH PRECAST BOX GIRDERS

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

TITLE PAGE

1. Report No.
FHWATX77206-1F

2. Government Accession No.

4. Title and Subtitle
SKEWED MULTI-BEAM BRIDGES WITH
PRECAST BOX GIRDERS

5. Report Date
September 1977

6. Performing Organization Code

7. Author(s)
John J. Panak

8. Performing Organization Report No.
206-1F

9. Performing Organization Name and Address
The Bridge Division
Texas State Department of Highways
and Public Transportation
Austin, Texas 78701

10. Work Unit No.

11. Contract or Grant No.
1-5-76-206

12. Sponsoring Agency Name and Address
Texas State Department of Highways
and Public Transportation
Transportation Planning Division
Box 5051, Austin, Texas 78763

13. Type of Report and Period Covered
Final
Aug 1975 - Sept 1977

14. Sponsoring Agency Code

15. Supplementary Notes Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration. Research Study Title: "Wheel Load Distribution for Precast Multi-Beam Box Girders"

16. Abstract

The research completed under this project demonstrates the reduction in required design moment that can be achieved by consideration of the skew angle and aspect ratio of a multi-beam bridge. It is primarily directed toward precast multi-beam box bridges of the type currently built in Texas. Other similiar multi-beam or solid slab structures with simple spans can also be handled.

A data generator computer input assist was written which provides the data for a previously developed program so that accurate solutions can be obtained with a minimum of input.

A field load test was performed on a full-scale skewed bridge. Comparison of the measured values with those predicted by the analysis methods was good.

17. Key Words
Highway Bridges, multi-beam precast bridges, computer analysis, load tests

18. Distribution Statement
No Restrictions. This document is available through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)
Unclassified

20. Security Classif. (of this page)
Unclassified

21. No. of Pages
101

22. Price

Form DOT F 1700.7 (8-69)

SKEWED MULTI-BEAM BRIDGES WITH PRECAST BOX GIRDERS

by

John J. Panak

Research Report Number 206-1F

Wheel Load Distribution for Precast
Multi-Beam Box Girders

Research Study 1-5-76-206

Conducted by

The Bridge Division

Texas State Department of Highways
and Public Transportation

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

September 1977

PREFACE

The report presents a study of skewed multi-beam precast box beam bridges of the types currently used in Texas. A data generator computer input assist was developed for analysis by an existing complex program. The method of analysis can be applied to most multi-beam bridges. A load test of a full-scale structure provided validation.

The work was supported by the Texas State Department of Highways and Public Transportation in cooperation with the U.S. Department of Transportation, Federal Highway Administration.

Mr. Charles C. Terry of the Bridge Division provided assistance throughout the course of the project, and his help is greatly appreciated. The advice of Mr. Robert L. Reed, of the Bridge Division, is also appreciated.

John J. Panak

September 1977

SUMMARY

This study was made to help determine more accurate design live load values for skewed multi-beam bridges constructed with precast, prestressed box beam sections of the types now in use in Texas. The results demonstrate that as much as 40 or 50 percent reduction in design live load moment is achieved by consideration of the skew angle for these structures. The span aspect ratio was also found to have an appreciable effect.

A data generator computer input assist was developed to allow simple application of the analysis method. The procedure allows any variation of skew, structure width, span, and box depth or width to be analyzed.

A field test of a full-scale skewed structure was performed which provided good correlations between predicted and measured response to a heavily loaded truck. These correlations add significant confidence to the user of the developed analysis techniques.

IMPLEMENTATION

This project has demonstrated that a significant reduction in design live load moment can be achieved in multi-beam bridges by consideration of the skew angle and span aspect ratio. It is recommended that the developed data generator computer input assist be used for future design of these structures.

DISCLAIMER

This report reflects the views of the author who is responsible for the facts presented. The contents do not necessarily reflect the views or policies of the Bridge Division, Texas State Department of Highways and Public Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

There was no invention or discovery made under this contract which is patentable.

TABLE OF CONTENTS

CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS

APPENDICES

CHAPTER 1. INTRODUCTION

The objective of this study was to determine the approximate wheel load distribution for skewed precast box beam bridges of the type currently in use in Texas. At the outset, it was anticipated that a significant reduction in the required design moment could be achieved. The effect of skew was to be incorporated in the study since it produces twisting effects which are well resisted by a multi-beam structure with large shear keys such as used in Texas.

Program Data Generator

As a part of the study, a data generator computer input assist was developed to produce the necessary mass of data needed to effectively analyze a skewed structure by the solver program which had previously been developed during the period 1966 through 1972 (Ref 8). The data generator proved to require somewhat more effort to develop than first anticipated. Documentation of the data generator and instructions for its use are included herein.

Field Load Test

A field load test was performed during July 1977 of a full-scale skewed multi-beam box structure. Comparison of the measured values with those predicted by the analysis methods developed during the project were exceptionally good. The test correlation adds significant confidence to the user of the included analysis techniques for any structure configuration using precast box beams now used in Texas.

Application to Design

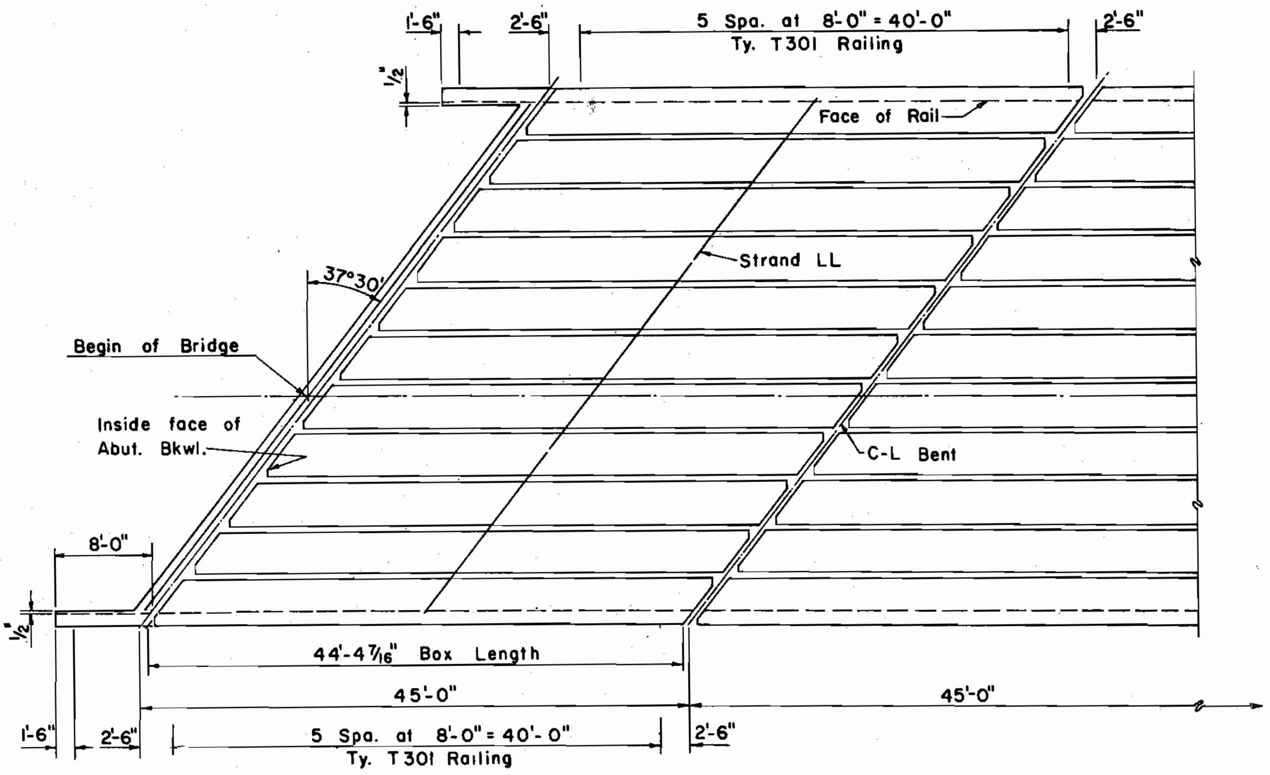
The project proposal indicated that charts or graphs might be prepared so that a designer could enter directly with his box beam structure configuration and obtain the required live load design moment. This has proven very difficult to do and still retain accuracy. The design moment per box is almost impossible to predict accurately especially when a mixture of box widths exists. Therefore, it was decided during later stages of the project to direct the emphasis toward demonstrating the beneficial effect of skew which significantly reduces the longitudinal live load design bending moment. Emphasis was also placed on making the data generator easy to use so that with as little data as possible, design moments for a particular structure can be obtained directly. As will be shown, this objective has been accomplished. A significant reduction in the required design moment can be achieved by using the proven analysis methods presented within this report.

CHAPTER 2. MULTI-BEAM BRIDGES

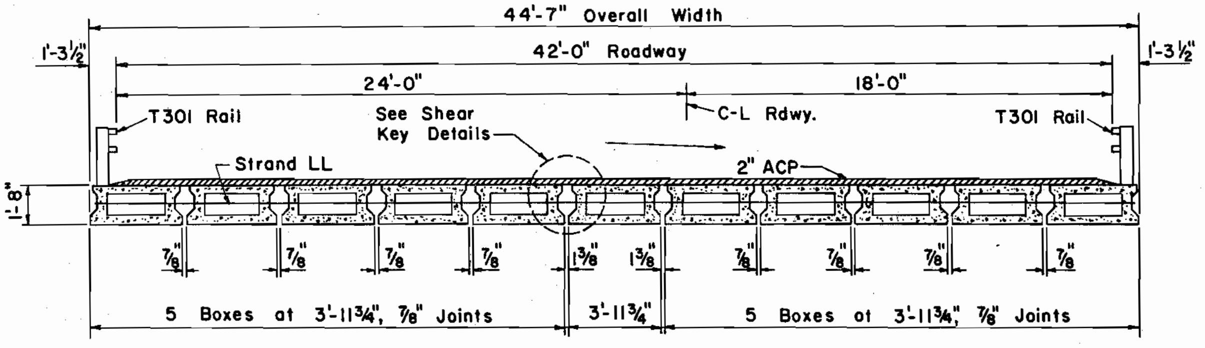
A typical skewed multi-beam precast concrete bridge as currently constructed in Texas is shown in Fig 1. The Texas State Department of Highways and Public Transportation (hereafter referred to as DHT) began building these precast multi-beam structures in 1969 and their use has increased steadily since then. The general cross-sections are as shown in Fig 2. The beams are cast with the sides formed using the same or similar configurations that have been used for precast beams in the state since about 1958. The beams are placed side by side and a cast-in-place shear key is placed in the resulting space left between beams. As can be seen in Figs 2, 3, and 4, the final cross-section has large effective webs between the voids. The direct cost of these bridges is currently about fifty percent higher than comparable precast beam and slab structures, but offsetting this added cost is the reduction in approach roadway earthwork due to the more shallow overall structure depth. The construction schedule can also be greatly accelerated, thus reducing public inconvenience. These bridges are considered more durable than cast-in-place bridges due to the use of high-strength precast concrete. It is hoped that increased usage in the future will reduce the direct cost of these bridges.

AASHTO Design Equations

The design of multi-beam precast concrete box girders was, until 1974, done with little regard to their inherently different behavior under live loading as compared to customary beam and slab structures. The AASHTO 1965 specifications (Ref 3) provided that the distribution for multi-beam bridges should not exceed that for a reinforced slab. This provision implied that pre-

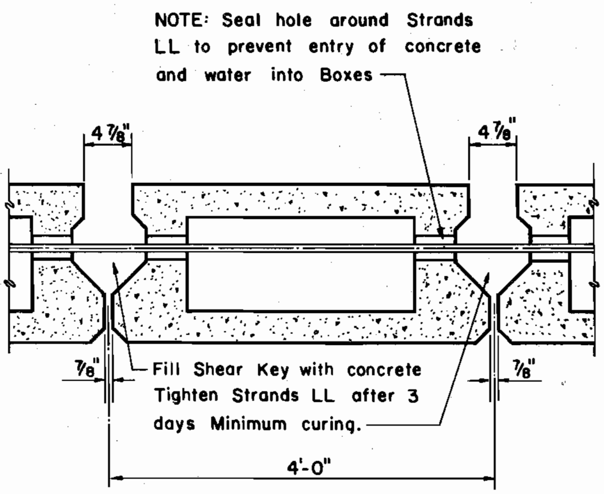


PLAN

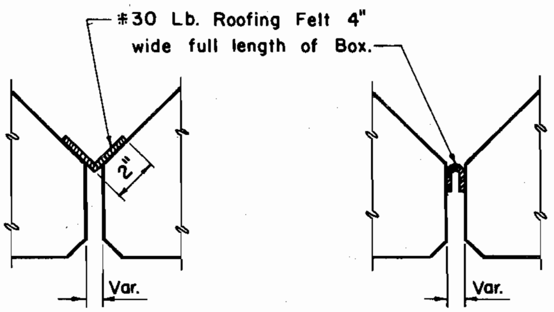


TRANSVERSE SECTION

Fig 1. Typical skewed multi-beam bridge using eleven Type 4-20 precast box sections.



SHEAR KEY DETAILS



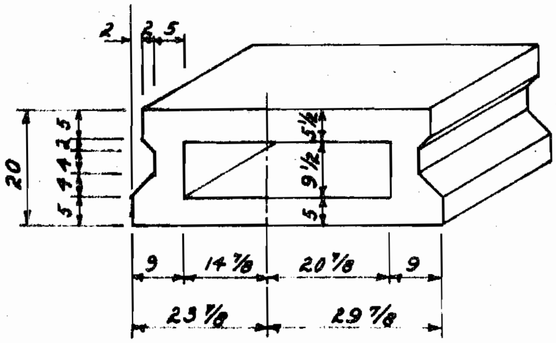
OPTION 1

OPTION 2

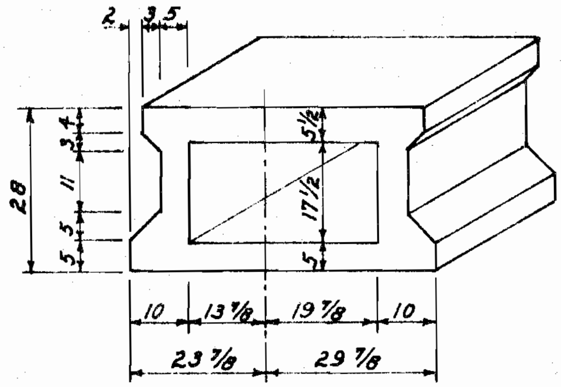
JOINT DETAILS

*Caulking compound or other Joint Sealer may be used if approved by the Engineer.

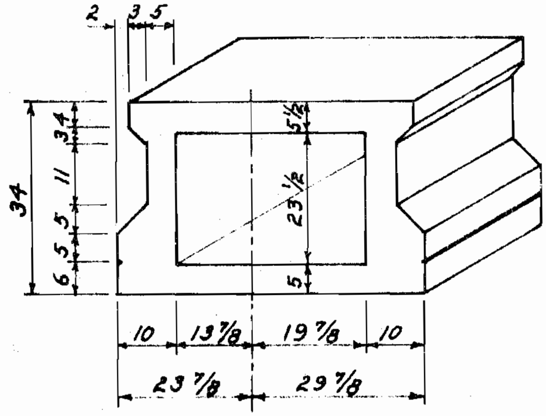
Fig 2. Shear key and joint details



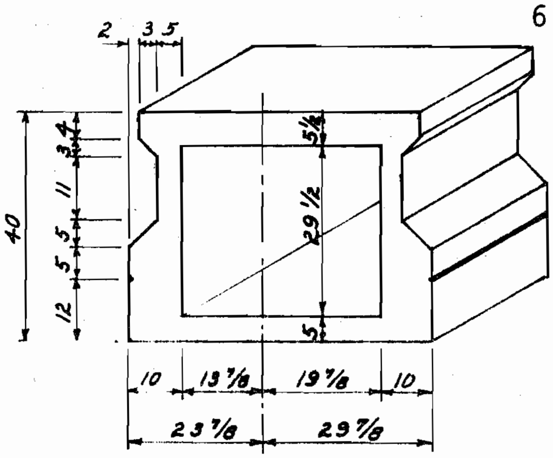
4-20 5-20
(30-60 Ft Spans)



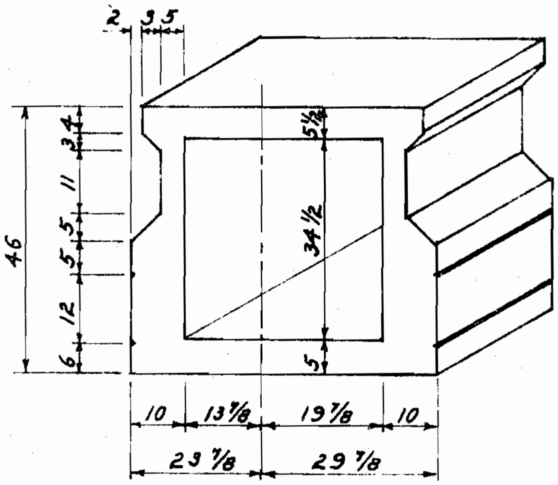
4-28 5-28
(45-80 Ft Spans)



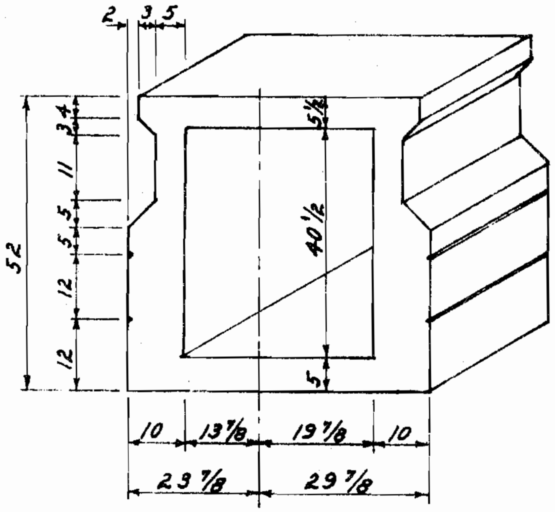
4-34 5-34
(70-100 Ft Spans)



4-40 5-40
(80-120 Ft Spans)

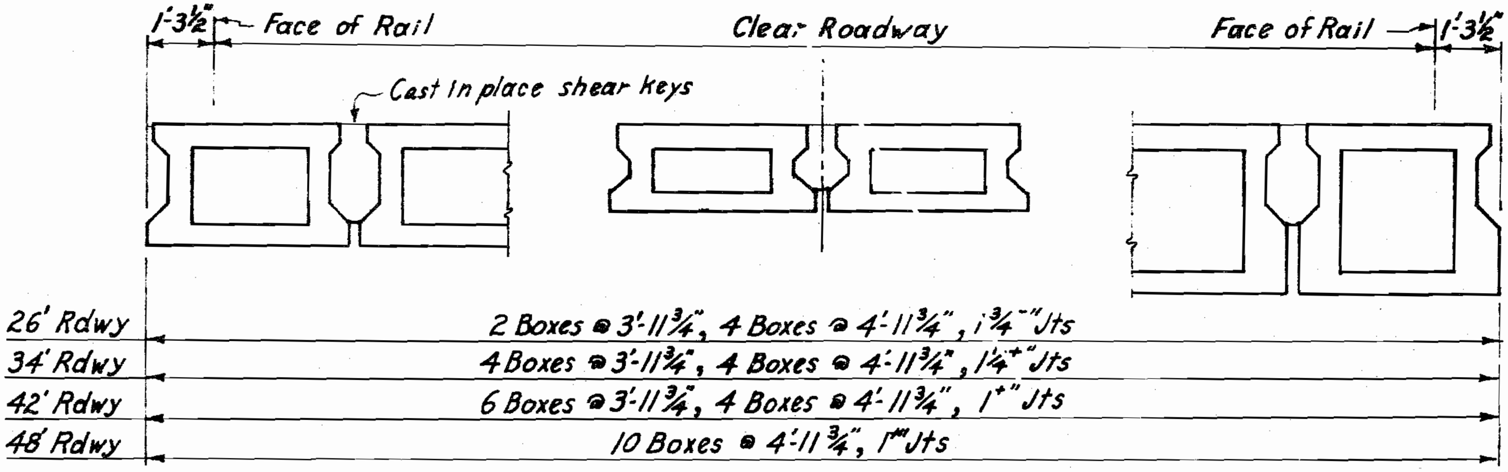


4-46 5-46
(100-140 Ft Spans)

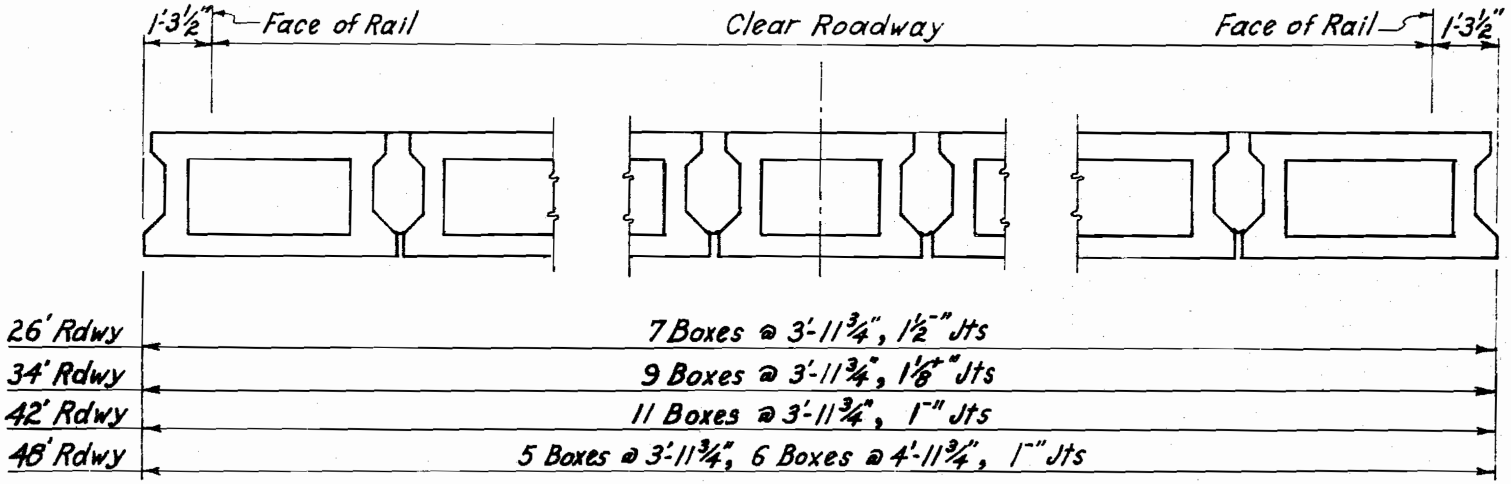


4-52 5-52
(120-160 Ft Spans)

Fig 3. Typical precast multi-beam box sections.



JOINT AT CENTERLINE OF BRIDGE



NO JOINT AT CENTERLINE OF BRIDGE

Fig 4. Typical bridge cross-sections.

cast multi-beams were as good as solid slabs for distribution. The distribution formula at that time and still current for slabs is given by

$$E = 4 + 0.6S \tag{1}$$

where E is the distribution in feet and S is the span. For bridges with spans of 30 to 50 feet and longer, the resulting distribution is 5.8 to a maximum of 7.0 feet. This formula has remained since it was changed from an even more conservative formula in 1961 (Ref 4) which was

$$E = \frac{10N + W}{4N} \tag{2}$$

where N and W were numbers of lanes and bridge width respectively. For uniform 12 foot increments of lanes and widths, Eq 2 gave approximately a 5.5 foot slab distribution.

In 1970, as a result of extensive analytical investigations at Iowa State University by Sanders, Elleby, and Watanabe (Refs 10 and 12), a revised series of equations was proposed to AASHTO in 1974 (Ref 2). This interim specification is directed particularly toward multi-beam bridges, and for the first time in the history of the AASHTO bridge specifications, the torsional stiffness of the beam members and the aspect ratio of the structure were included in the effective distribution. These parameters were known to influence load distribution for many years, but simple methods to include them had not been available. The amount of bending moment for a multi-beam structure as now incorporated in Ref 2 is computed by applying the following fraction of a wheel load (line of wheels) to each beam

$$\frac{(12\,N_L + 9)\;/\;N_g}{5 + N_L/10 + (3 - 2N_L/7)\;(1 - C/3)^2} \tag{3}$$

where N_L is the whole number of design 12 foot lanes, N_g is the number of beams, and C is a stiffness parameter given by

$$C = K\,W/L \tag{4}$$

where K is a constant varying from 0.7 to 2.2 with 1.0 recommended for box section multibeams, W is the overall width of the structure, and L is the span. The last term in the denominator of Eq 3 is neglected if C exceeds 3 which is only true for extremely wide structures with short spans. The K stiffness factor is supposed to help account for the variations in torsional rigidity (Ref 10), but as can be seen by Eq 3, the factor C has very little effect on the resulting distribution. This study will show that for orthognal structures, the torsional stiffness does in fact have little effect on the maximum bending moments, but for skewed structures it is a significant parameter. This has also recently been observed by Kennedy and Gupta (Ref 6). Unfortunately, of the three general structural types investigated in Ref 10(beam and slab, multi-beams, and cast-in-place concrete box girders), the multi-beam formulas were the least verified by comparison to experimental data. In addition, they were developed for only simple span and non-skewed structures.

Background for the Current AASHTO Equations

The current multi-beam distribution equations given above were developed by Sanders, Elleby, and Watanabe (Refs 10 and 12). Various bridge configurations over a range of spans and widths were studied by selectively varying the bending and twisting stiffness. The resulting equations are a best fit to a series of curves developed for several different multi-beam sections including channel (weak in torsion) cross-sections. Thus, the equations do not specifically suit the case of closed-box cross-sections which are almost as strong in torsion as solid slabs.

The method of analysis used by Watanabe (Ref 12) was an articulated plate analysis with limiting assumptions: (1) that the structure was orthogonal (no skew), (2) that the shear key connections were assumed completely hinged (see further comment below), (3) that the wheel loads were assumed at mid-span, and (4) that Poisson's ratio was neglected.

The computational technique used assumed, (1) that the plate was of the same uniform bending stiffness in the longitudinal direction at all transverse locations, (2) that the transverse stiffness was taken as zero not only at the location of the shear keys but also at the areas in between, and (3) that the load was represented as a harmonic series.

Limiting assumption (2) and computational assumption (2) above disregard the effect of transverse bending and stiffness characteristics between the shear keys. This area can be proportionately quite large if the box depth is shallow in relation to the box width. The Texas DHT uses box width modules of 4 and 5 feet which are combined to achieve the desired total structure width. Thus, for the multi-beam box girders of the type shown in Figs 1 thru 5, if the distribution equations (Ref 2) or analysis procedure (Ref 12) are used, significant omissions in transverse structural strength result.

Therefore, as a partial result of the limitations in the current AASHTO distribution equations, and recognizing that many structures are built with skewed geometry as shown in Figs 1 and 5, the research described in this report is deemed to be of significant importance to the Texas DHT.

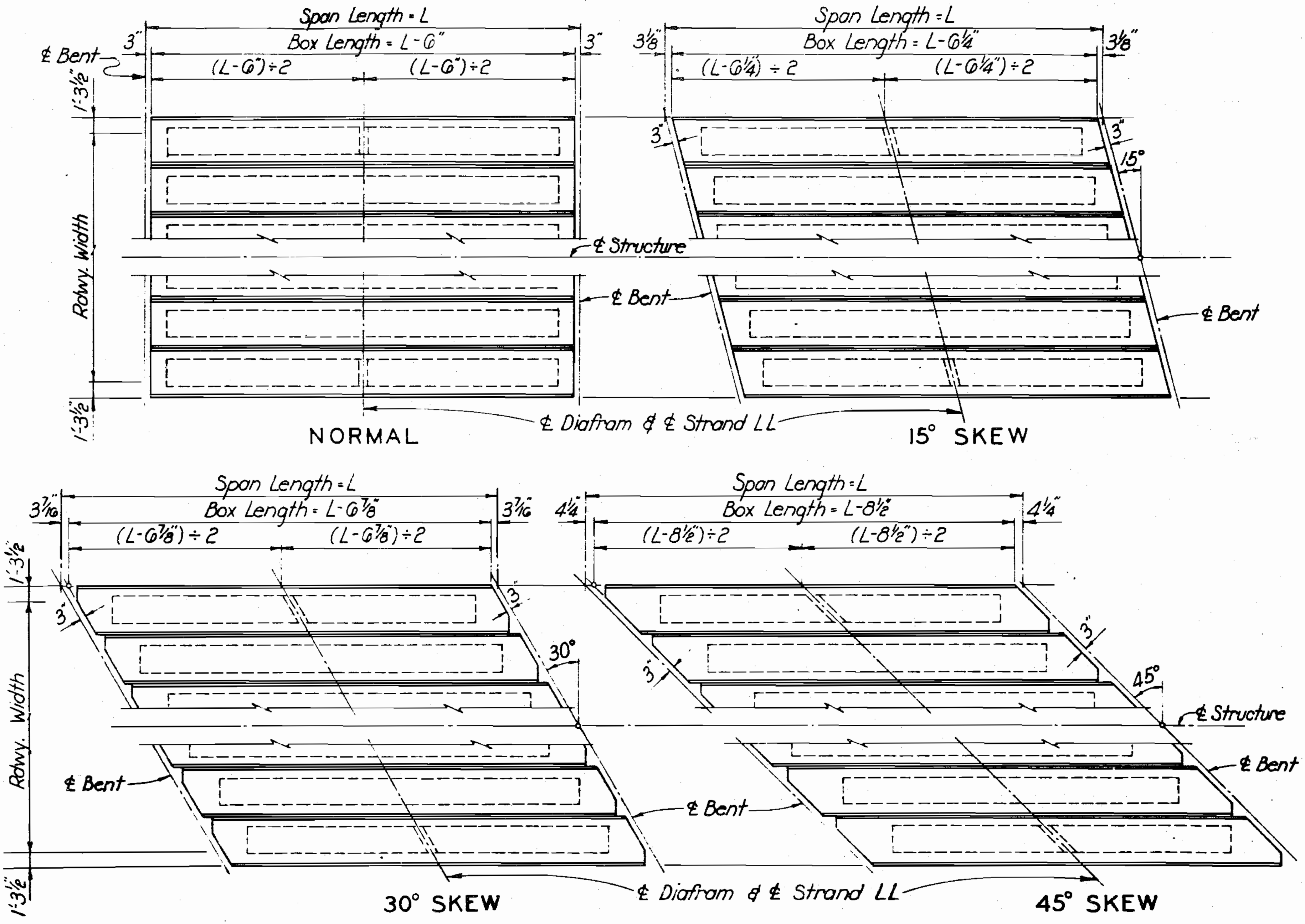


Fig 5. Typical span details. Longer spans have more diaframs.

CHAPTER 3. THE ANALYSIS METHOD

The method of analysis used throughout the study was developed on another research project during the period from 1966 through 1972. That project was "Development of Methods for Computer Simulation of Beam-Columns and Grid-Beam and Slab Systems," the major results of which are summarized in its final report (Ref 9). The specific analysis method used was one documented in Ref 8 which presents a computer program for the discrete-element analysis of isotropic or orthotropic slabs and plates on elastic supports. The program has been in successful day-to-day use by engineers of the DHT and by other agencies and organizations for several years. The program allows for the free variation of stiffness, supports, and loads. Skewed support conditions can be easily handled by appropriate definition of the support locations which procedure is described below. Another similar analysis procedure (Ref 11) was also available which was formulated specifically for the skewed anisotropic discrete-element plate solution. The selection of the first method (Ref 8) was made because of limitations of the second (Ref 11) when applied to this particular type of problem. The methods had been previously demonstrated (Ref 1) to give extremely good correlations with experimental data for the various types of beam and slab bridges considered prior to this study. The field load test performed with this study also correlated extremely well with values computed by the analysis method.

As a consequence of the generality of the analysis method (Ref 8), the SLAB 49 program requires that a significant amount of data be coded. Due to the numerous variables of this precast box girder study, it was necessary to modify the program slightly to accept the data generated by the data generator.

Skewed Supports

The SLAB 49 program allows supports to be placed at any grid intersection. Due to the geometry of most skewed spans, the support locations and grid increment sizes cannot usually be selected to properly represent the skewed support line. A substitute support system can be achieved by manipulating the program's support spring and axial thrust stiffness terms as will be described below for the support system model.

Data Generated

The data generated by SLBDG 2 for use by the SLAB 49 program solver is comprised of bending stiffnesses in both orthogonal directions, twisting stiffnesses, support springs and axial thrusts for the support systems, and loads which are allocated to the surrounding joints from any type of load pattern.

Bending stiffness is computed in the span direction on the basis of the input cross section moment of inertia of each box beam, the input modulus of elasticity, and Poisson's ratio. The transverse stiffness is based on the sum of the bending stiffness of the top and bottom slabs of the box beams with full depth stiffness used from void edge to void edge except in the center of the joint between boxes. The SLBDG 2 program allows input of any degree of transverse shear key bending stiffness, but it was found that nearly zero was appropriate. A series of problems was run with a much greater transverse void stiffness which was equal to the transformed inertia of the top and bottom slabs. This modeling approximation did not match the test data from the test loadings nearly as well as the first assumption. The first procedure of summed slab stiffness was used from the beginning of the project and is still considered to be the better approximation of the transverse stiffness. Sanders, Elleby, and Watanabe (Refs 10 and 12) assumed a zero stiffness in the transverse direction completely across the full width of the bridge. This model is obviously only correct for articulated multi-beams which are very narrow in width. Texas box beams are four or five feet wide with nearly two feet between each void. These widths provide a significant amount of transverse stiffness in the lateral direction.

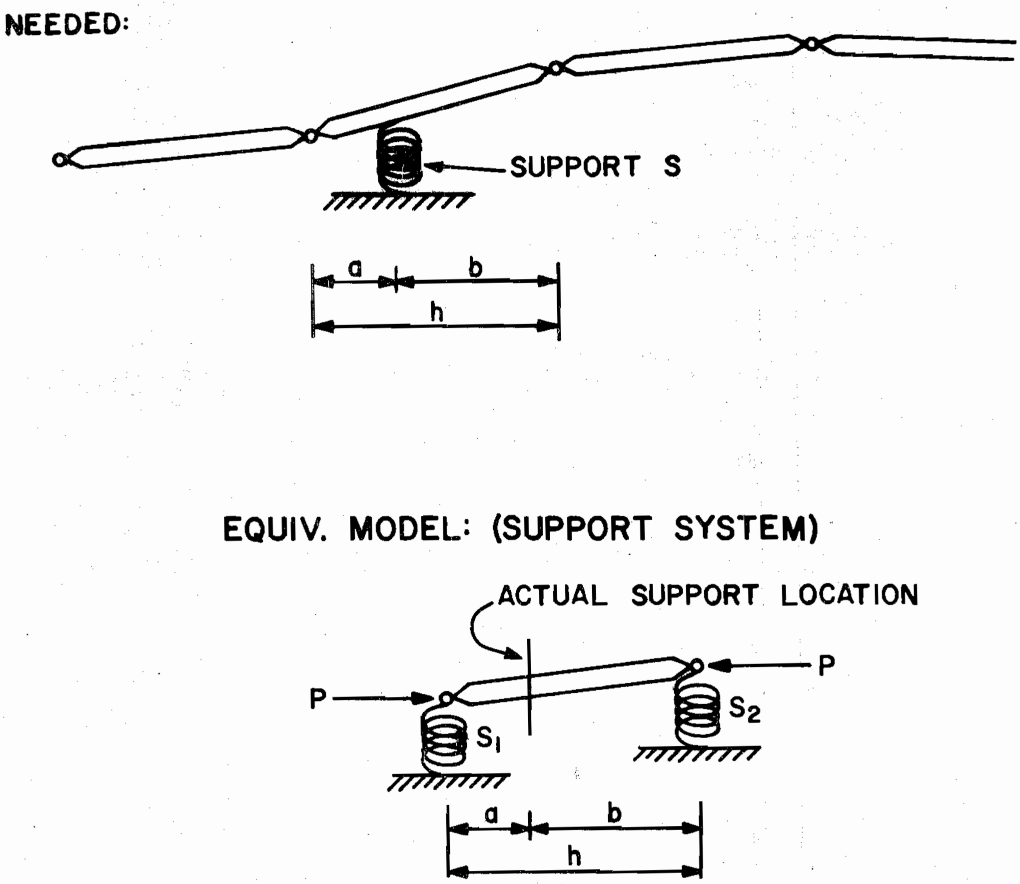
Twisting stiffness for the multi-beam boxes is computed by using the input value of estimated St. Venant torsion constant for the beam and computing the equivalent distributed twisting stiffness. As will be shown, the twisting stiffness is not a sensitive parameter for orthogonal structures, but becomes very important for skewed structures.

Sanders and Elleby (Ref 10) assumed, for a solid multi-beam cross section, that the torsional stiffness was related to a St. Venant constant of 1/6. They stated that this value corresponds to the torsional stiffness of a small transverse section of slab and further stated that most multi-beam bridges are composed of sections with b (the width) over t (thickness) ratios of between 1.0 and 1.5. They used this as justification for the value of 1/6 which gave them a K parameter of 0.5. This was inexplicably incorporated in the AASHTO equations as 0.7 with proportionately larger values for sections with voids up to a value of 1.0 for box sections. This investigator believes that the K of 1/6 for solid multi-beam cross sections is incorrect and should in fact be closer to 1/3 thus doubling the effective twisting stiffness. As stated above, the twisting stiffness has little effect on the behavior of an orthogonal structure, and since Sanders and Elleby did not investigate any skewed structures, the discrepancy therefore was not readily apparent.

The twisting stiffness of the articulated box system may be compared to that of a slab or plate which has hinges in one of the orthogonal directions. A continuous plate with no hinges subjected to a pure twist has predictable behavior which can be solved both by SLAB 49 and in closed form. The orthogonol bending moments for a pure twist case are zero. If the plate has hinges introduced along one or both orthogonal directions, then the moments for the pure twist case remain at zero with the same twisting moment as before. In addition, the deflections of the plate are also exactly the same as when there were no hinges. This analytic test then demonstrates that introducing bending hinges in a system, such as shear keys between multi-beams, has absolutely no effect on the twisting behavior of the system. Sanders and Elleby (Ref 10) and Watanabe (Ref 12) chose to reduce the effective twisting stiffness of the system solely because of the articulation. They did this by comparing the twisting stiffness to that of a narrow beam rather than the twisting stiffness of the equivalent slab. As stated previously, and also as demonstrated by Watanabe when he compared solutions with only longitudinal torsional stiffness to solutions with both torsional stiffnesses, the effect of torsional stiffness is small for structures which are rectangular. Therefore, the apparent error in considering torsional stiffness made in Refs 10 and 12 does not effect their results appreciably. For a skewed structure however, it is extremely important that the effective twisting stiffness be properly used in the analysis.

Support systems were placed along each station line in the span direction at the ends of the span. Figure 6 shows the equivalent support system which is an exact mathematical substitute for a spring which may occur between joints in either of the major grid directions. The substitute support system model is composed of two springs at adjacent joints on each side of the actual support location, the sum of whose modulii is equal to the actual spring support value as shown in Fig 6. These two springs if acting alone would provide a restraint to rotation. This restraint is exactly countered by an axial thrust acting between the two joints whose magnitude is a function of the spring value and the geometry also as shown in Fig 6.

A spring which may be located randomly within a grid area cannot, however, be represented by this simple substitute model. This case would require the



$P = \frac{abS}{h}$ $\qquad h = a + b$ $\qquad S = S_1 + S_2$

$S_1 = \frac{bS}{h}$ $\qquad S_2 = \frac{aS}{h}$

Fig 6. Computer model for support systems interaction of a counter to the additional twisting stiffness which is offered by four springs surrounding a supported grid area. The modeling relationships for this have not been formulated as yet, but it is anticipated that the countering effect may be modeled by introducing negative springs of the appropriate values.

The magnitude of the support spring S was selected to be approximately 1.0×10^6 which is large enough to represent a pinned support with nearly no base movement. If the spring value is selected much larger, solution difficulties are encountered since the axial thrust P terms are introduced in the off-diagonal terms of the SLAB 49 stiffness matrix. A spring at a grid intersection can have any arbitrarily large value since support S terms are entered in the main diagonal of the stiffness matrix.

Loads to the SLAB 49 program are assigned by SLBDG 2 to the joints surrounding the actual load placement in proportion to the relative distances from the load to the joints. Any loads falling outside the boundaries of the skewed slab are disregarded. A message is printed with the output for the sums of all loads on or off the structure which allows a check to be made on load input. Loads input within one increment of the skewed ends are assumed all on the structure even if the allocated partial load may be assigned to a joint outside the boundary. These joints are necessary to allow the support systems described above to operate correctly.

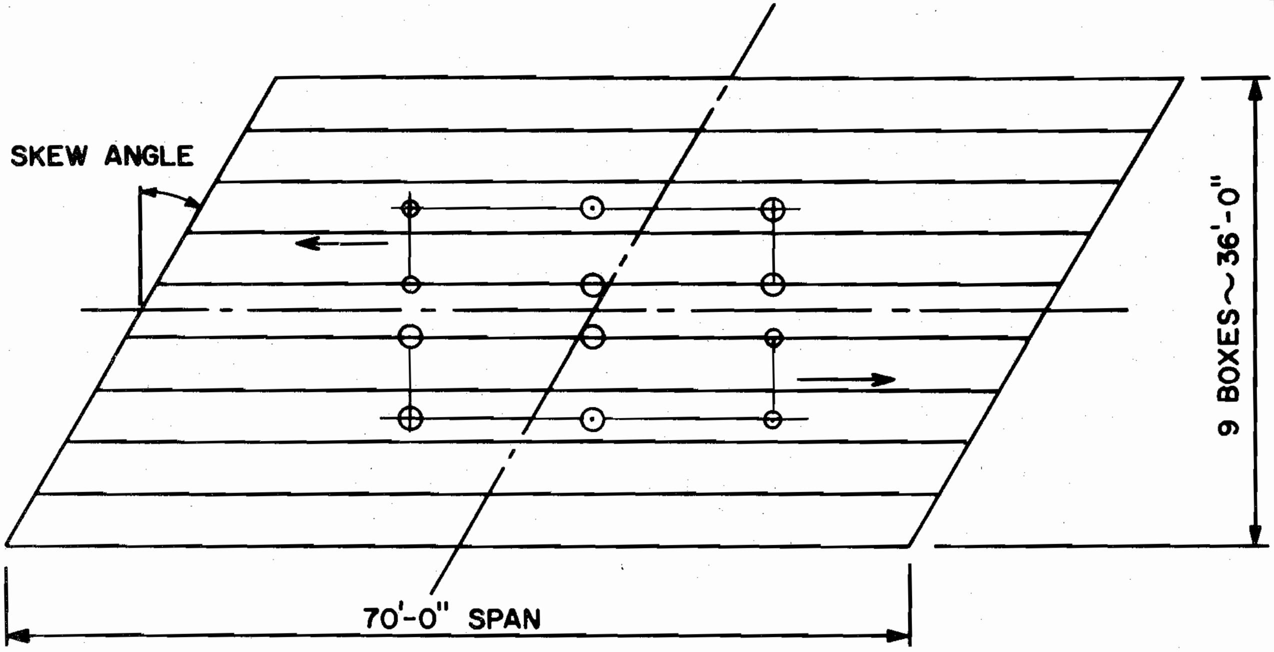
CHAPTER 4. PARAMETER STUDIES

At the beginning of the project, it was anticipated that by studying the various parameters and their individual effects on the resulting distribution, a series of relationships could be established which would allow a designer to properly account for them. Unfortunately, the complexity of the interactive effects has made it almost impossible to relate them into a usable design tool. It has been found that skew angle has the largest effect with twisting stiffness and load placement also contributing significantly. Therefore, emphasis has been placed on demonstrating the relative effects of skew angle, aspect ratio, twisting stiffness, etc., and making the developed analysis technique as simple to apply as possible.

Skew Angle

As originally anticipated prior to beginning the project, skew angle was to have a significant effect on the computed longitudinal bending moments of the individual box beams making up a multi-beam bridge. Chen, Siess, and Newmark (Ref 5), and Kennedy and Gupta (Ref 6) observed this same effect in their studies of skewed bridges. An I-beam or T-beam bridge is much more flexible in twisting stiffness so the effect of skew on reducing moment isn't as much as it is on a slab or articulated slab type structure. A multi-beam bridge composed of relatively stiff box sections with large areas of solid concrete between the voids such as shown in Fig 1 is almost as stiff in torsion as a solid slab of the same depth. Slabs have the highest torsional stiffness in comparison to bending stiffness of any bridge structure.

A particular structure was selected to demonstrate the effect of skew angle as shown in Fig 7. The span was 70 feet with 9 four foot boxes 34 inches



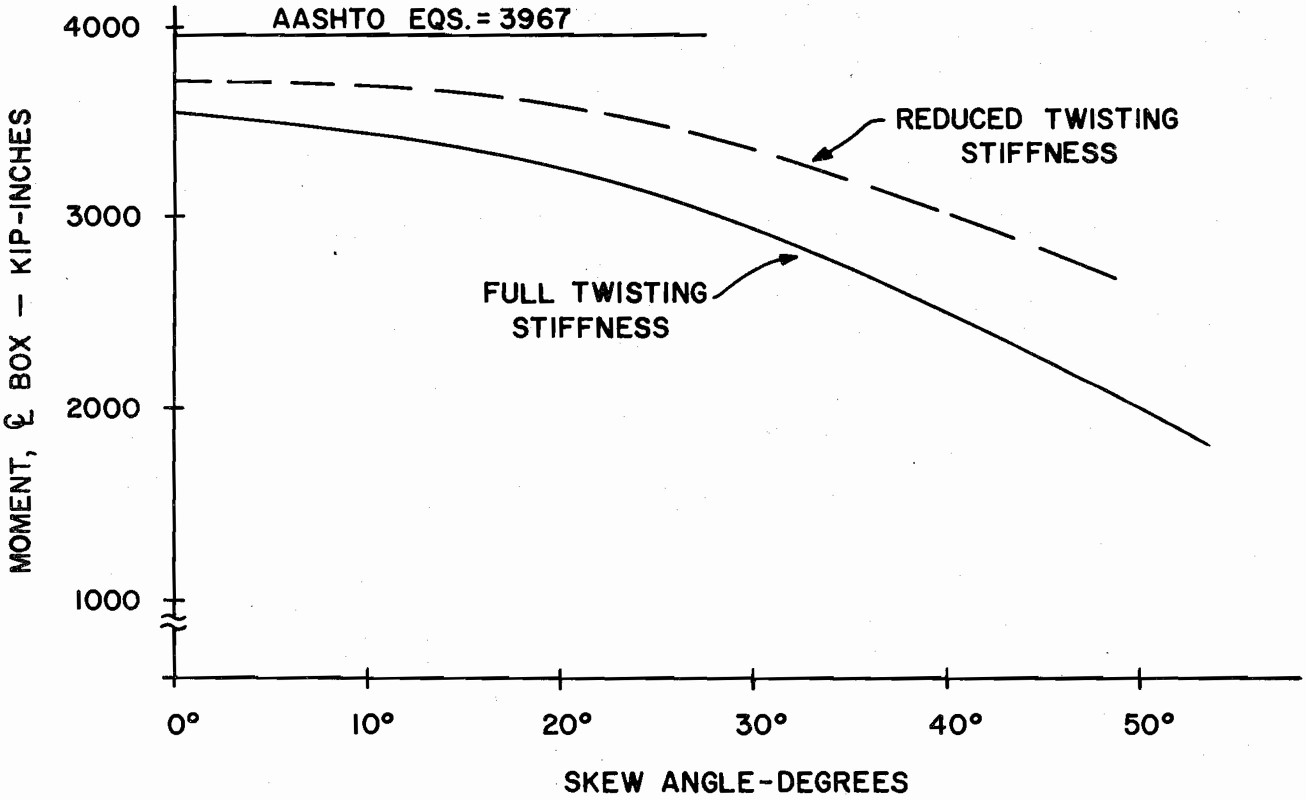


Fig 7. Showing effect of skew and twisting stiffness on bending moments for the center box. Boxes are 34 inches deep.

deep giving a 36 foot total structure width. Two HS20 trucks 4 feet apart with 25.6 percent impact were placed as shown in the plan view. The maximum bending moments for the center box are shown in the plot for various skew angles. As can be seen, there is a significant reduction in live load bending moment as the skew angle increases. At zero degree skew, the moment is about 90 percent of that as computed by using the AASHTO equations which were developed in Refs 10 and 12. This 10 percent reduction is believed to be due to the use of the transverse stiffnesses in the included method of analysis. Also, the torsional stiffness is greater than assumed in Ref 10. At a skew angle of about 50 degrees, the moment is only half of that computed by the AASHTO equations. Therefore, it is obvious that for skewed multi-beam structures, the skew must be included in the analysis. There has been some difficulty with excessive cambers due to the prestress forces in this type of bridge. By reducing the required design live load moment, there will be less prestress force and consequently less camber.

Twisting Stiffness

A supplementary study was made for the same box depth, span, and width with a variation of the twisting stiffness. This twisting stiffness was one-half that in the study described above for skew. The half value of twisting stiffness corresponds to the value used in Refs 10 and 12 which is believed to be somewhat in error as previously discussed. As shown in Fig 7, the effect of this change in twisting stiffness is small for a zero degree skew and changes the computed moment from 90 percent of AASHTO to about 94 percent of AASHTO. However, at larger skew angles, the reduced twisting stiffness causes a significantly greater effect. For instance, at a 50 degree skew, the moment is increased from 50 percent of AASHTO to 67 percent which corresponds to an actual increase in moment of about 34 percent. Therefore, it can be seen that twisting stiffness is more significant for skewed spans.

Aspect Ratio

The aspect ratio of a bridge is the measure of its span to width. For the same bridge width, a doubling of the span doubles the aspect ratio. This effect can be seen in Fig 8 which shows the computed moment as it varies with span and skew angle for a nine box arrangement with two trucks. The plot of moment is as a percent of the computed AASHTO moment (Ref 2). The zero degree skew line is nearly horizontal and therefore verifies that the AASHTO equations properly account for aspect ratio and the increase in moment with span. As the skew angle increases, the moment lines are still nearly horizontal and actually increase with longer spans for this case. Fig 9 shows the effect of aspect ratio more directly. The plot is of the amount of load carried by a central beam as it varies with span and skew angle. As can be seen, the effect of aspect ratio is very small. The zero degree skew has the largest effect. The plot of load carried by a central beam was computed by comparing one fourth of the simple beam moment for a line member subjected to two HS20 trucks with impact (four lines of wheels) to the moment computed by the discrete-element analysis procedure for the central beam of a nine box arrangement with the same two trucks. Again, as was seen in Fig 8, the skew angle is the predominant effect. The AASHTO equations give values which are about 11 to 12 percent higher than the zero degree skew solution by discrete-element analysis.

Load Placement and Skew Arrangement

A number of studies were made with different positions of two and three truck load placements for various skew angles and spans. It was found that in general, for any square or skewed multi-beam span (at least through a skew of 50 degrees) that the maximum bending moment for an HS loading occurs with the central heavy axles of two or more trucks aligned with each other perpendicular to the longitudinal centerline. The second heavy axle of each truck is then

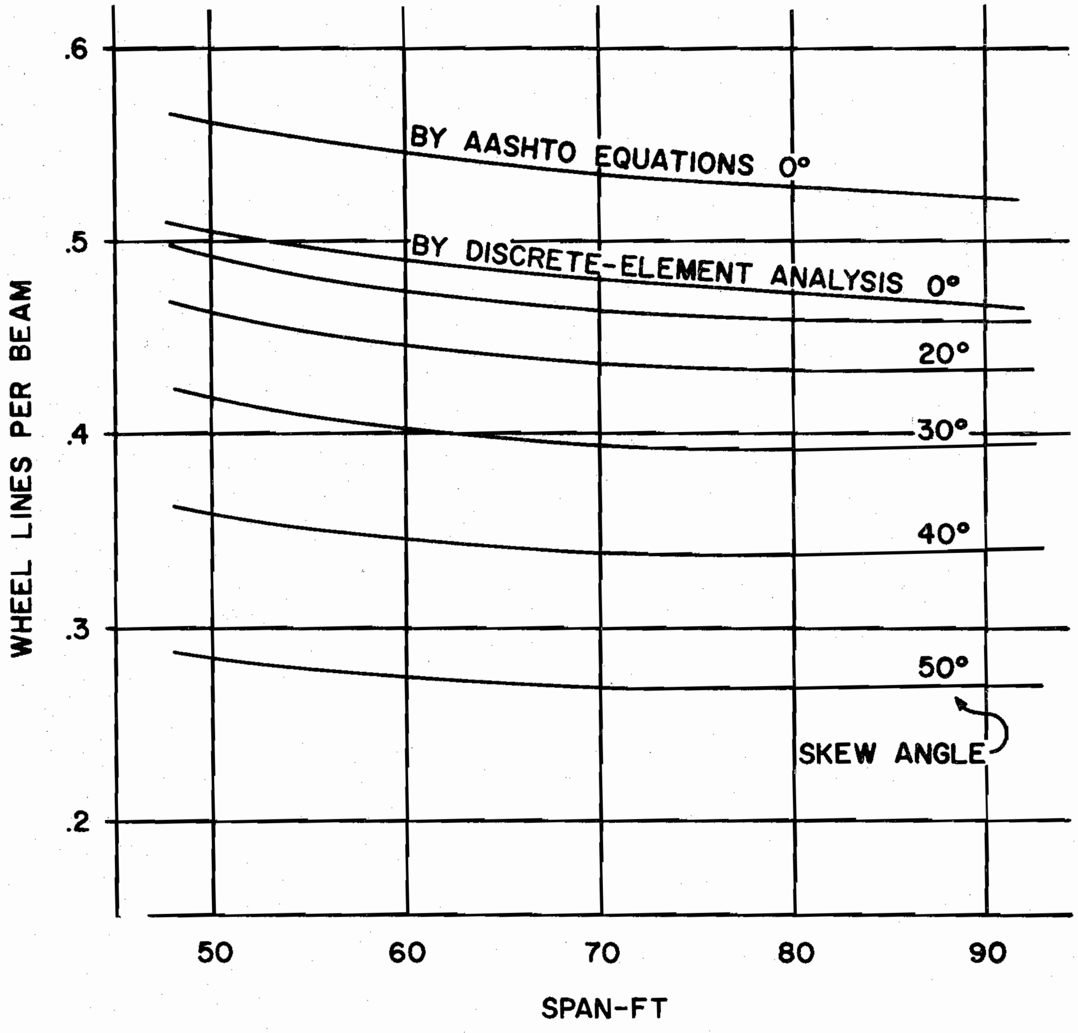


Fig 8. Effect of skew angle and span on computed maximum bending moment.

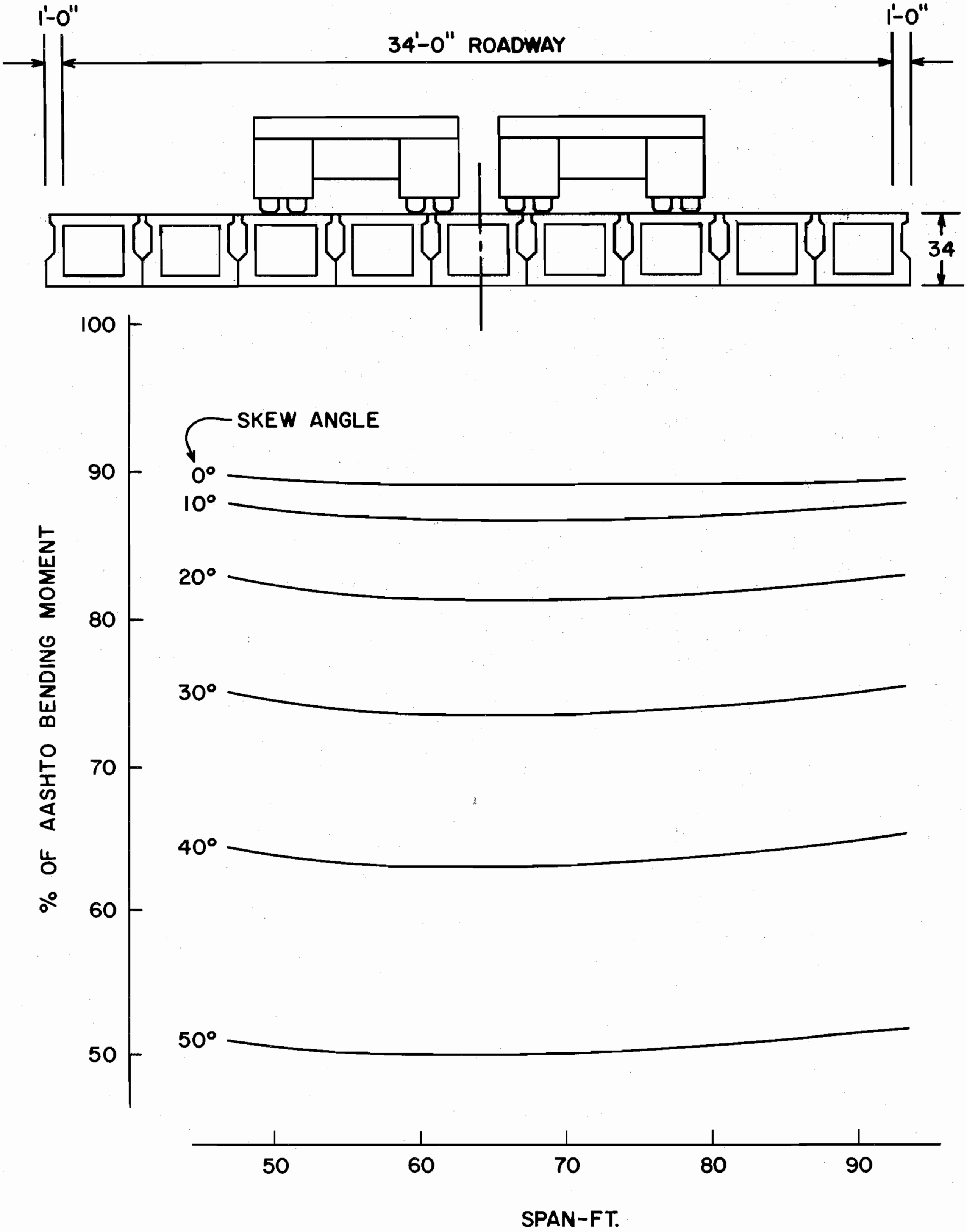


Fig 9. Effect of skew angle and span on load carried by central beams. Two trucks on nine 34 inch by 4 foot boxes.

placed on the side which puts it nearest the skew centerline as shown in Fig 7. Remaining loads (front axles) are placed on the opposite side of the central axle.

Due to the above effect of load placement, it can be seen that for spans with two lanes of traffic proceeding in opposite directions, the maximum will occur with a left forward skew. A right forward skew would have somewhat less maximum bending moment. In addition, spans with traffic proceeding in the same direction would also have slightly less moment. For these two reasons, the included studies were for two and three truck loads with the individual truck directional orientations such that they produced the maximum. Left forward skews were also always used.

CHAPTER 5. THE DATA GENERATOR PROGRAM

Program SLABDG 2 is written to essentially generate data card images which are used by program SLAB 49 (Ref 8) for analysis of multi-beam spans. As described in Chapter 3, support systems are created at the beam ends to properly account for the effect of the skewed supports.

Data Input

The procedure for input of data for analysis of a specific skewed multi-beam bridge is outlined in the following description and in The Guide for Data Input which is included as Appendix B. The guide is designed so that additional copies may be made and used for routine reference. A parallel study of the guide will help the reader understand the following discussion.

The first two cards of a problem series are for identification purposes. The Problem Series File No. (PSF No.) is for data card filing purposes. The County, Route, Control, Section, etc should usually be coded along with the date and the selected units. The complete card including spaces between the fields may be optionally used in which case the County, Route, etc heading is not printed on the output. If the date field is left blank, the current day's date is automatically printed. A consistent system of units must be used for all input data. Kips and feet or kips and inches are usually the most convenient. The second identification card must always be included. The next card is the Problem Number card with a brief description of the particular problem. The problem number may contain alphanumeric characters if desired. Successive problems in the run begin with their own Problem Number card. A final card in the run with CEASE as the Problem No. indicates the end of the data.

Table 1 is used to input the problem control data and is always comprised of two data cards that include the keep options, multiple load option, number of cards input for this problem, an option to print the generated SLAB 49 data card images, and the skew angle of the span. The skew angle is measured between a perpendicular to the span centerline and the support centerline. A left forward skew is positive. In the current version of the program, a negative skew angle is disallowed, since there has been insufficient time to verify that a negative skew angle operates properly.

Table 2 is used to specify the constants for the span. These are the number of increments in the X (span) and Y (transverse) directions. The increments in the span are along the structure centerline from support to support. A skewed span may have the same input value of number of span increments, but more total increments are generated for the SLAB 49 computer model for skewed spans. The increment lengths are also input in Table 2. The increment lengths and numbers of increments should be chosen so that there are at least 4 to 5 transverse Y increments available for each box beam and at least 12 to 14 span X increments. More increments (especially transverse) will give more accurate solutions, although increasing them to more than 6 transverse per beam or 20 in the span doesn't increase accuracy more than a fraction of a percent. Poisson's ratio is also entered which is usually 0.15 to 0.20 for concrete. The Modulus of Elasticity may be any generally accepted value for concrete such as 3,500 to 6,000 kips per square inch. This value only affects the deflections. The computed bending moments are indepedent of the Modulus of Elasticity.

Table 3 is used to input the data for each type of box beam in the span. Only one card is necessary if the span is made up of a single box type. Up to 10 different types may be used. The number of Y increments used for each box must be consistent with the desired width and the Y increment length defined in Table 2. The box depth, void width, and top and bottom slab thicknesses are also entered. These four fields are decimal; a 5½ inch dimension is input as 5.5.

The shear key transverse stiffness factor may be used to define the degree of remaining transverse stiffness at the shear key between beams. It has been determined that a value of 0.0 is usually most appropriate for the types of multi-beam spans herein studied. The small amount of transverse post-tensioning (Fig 2) in Texas box beam spans is practically negligible in offering resistance to bending across a shear key.

The longitudinal box beam moment of inertia and torsional inertia are also entered. The moment of inertia is the value for the entire box cross-section about its neutral axis. The input torsional inertia is the value usually known as the St. Venant torsion constant for the same cross-section. This value is used by the program to compute equivalent slab twisting stiffnesses for both directions of the articulated slab.

Table 4 is a one card input which defines the arrangement of boxes in the span. The span must be assumed symmetrical about the longitudinal centerline. The arrangement is input by Type No. up to and including the box at centerline if it straddles the center-line. The first box type entered in column 5 is for the right-most box type with the last one the box type adjacent to or at the center.

Table 5 is for the input of the load patterns to be placed on the structure. If multiple AASHTO HS20 trucks are to be used for instance, then only one truck needs to be defined. Up to 10 different patterns may be used if desired. Each pattern is identified by a pattern number (beginning with 1). There may be from 1 to 6 loads in each pattern. If the desired pattern has more than 6 loads, then multiple patterns may be used which can be overlapped by their placement in Table 6. Each load in the pattern is referenced to a local pattern coordinate system, the origin of which may be one of the loads or a central point within the pattern with no load. This local pattern coordinate origin is the point by which the pattern is placed by Table 6. The coordinates for the individual loads are in an F5.0 format. For instance, the number 12345 would be interpreted as 12345.0. The number 67.89 is interpreted as input. The loads are also decimal values with a negative sign implying a downward load.

Table 6 is for input of the placement of the load patterns defined by Table 5. Each pattern may be placed at as many as 6 different locations on the span for each problem. This allows for instance, definition of one truck pattern by Table 5 with up to 6 like trucks placed simultaneously. The placement is by pattern number. The coordinate placement reference is to the span geometry. The centerline of the span at the intersection with the first support is considered to be the structure origin as shown on the sketch included on the fifth page of the input guide.

Table 7 defines the locations in each box for which the total longitudinal bending moment will be tabulated. The box numbers to be summed may be any box across the transverse width of the structure. For instance, if the span had 9 boxes, the first 5 would have been defined by the arrangement input in Table 4, but sums could be made for all 9 boxes. The sum is made at the nearest X-increment in the SLAB 49 computer model to the X-distance input in Table 7 from the structure origin.

Table 8 is essentially identical to the Table 8 used by SLAB 49 with the exception that the profile input areas have from and thru distances referenced to the structure origin rather than by station numbers. The profile output however, is referenced to the nearest X or Y station of the computer model.

Table 9 is to allow the user to eliminate the majority of the detailed SLAB 49 output if desired. It is exactly analogous to the Table 9 used by SLAB 49 with the exception that the Y-bounded areas are by distances to the structure origin rather than by station. Again, as in Table 8, the nearest station to the distance is used in presenting the output.

Parent and Offspring Problems

The SLBDG 2 program provides the user with the necessary ability to study the span with different arrangements and numbers of load patterns. As described in Chapter 4, the load placement which usually creates the maximum bending moment for a center box is one with the central heavy axles of the load patterns aligned perpendicular to the span centerline. It is sometimes advantageous however to study different placements. This is best done by a series of problems. The first is the Parent problem defined as a +1 in Table 1 input with all the required geometry and stiffness data input in subsequent tables. The second and succeeding problems in the series are Offspring problems defined as a -1 in Table 1. All the data in Tables 2 through 4 must be kept for an Offspring problem. Tables 5,7,8,or 9 may also be kept or new data input as desired. A new Table 6 is required for each Offspring problem wherein the new arrangement of loading is input.

Data Errors

All data is automatically checked for the common types of possible data errors. A count is made of the number of data errors in each table and the problem is then terminated with a message showing the number of data errors. The errors are (1) misuse of the multiple load option such as a -1 following a 0 in the preceeding problem; (2) improper sequence of keep options for an Offspring problem; (3) mispunching of the keep options so that numbers greater than 1 are read; (4) more cards input than the maximum permitted for each table; (5) entering a zero or leaving blank necessary data such as Modulus of Elasticity, increment lengths, or numbers of increments; (6) incompatibility between the total number of Y-increments and the summation of Y-increments as defined by Tables 3 and 4; and entering a zero or leaving blank any necessary number of loads, placements, sums, etc in Tables 5 thru 7.

Computed Results

Computed results begin by echo-print of the data in the same order and with essentially the same data table headings. This then allows the user to easily verify that his span was correctly coded and punched.

Generated Data. Data generated by the SLBDG 2 program is stored in the same data arrays as originally set up in the SLAB 49 program (Ref 8). If the user exercises the option in Table 1 to print the generated data, then all the generated card images that would have been required to directly solve the problem with SLAB 49 are printed. This option should be used until the user has confidence in the results obtained by SLBDG 2.

Tabulated Results. The computed results are listed in Y-station groups for the areas designated by Table 9. The results are deflection, bending moments in X (span) and Y (transverse) directions, the twisting moment, the largest principal moment, the angle to that value, and the support reaction. It should be noted that the largest principal moment is usually of little interest since it is a result of a large longitudinal moment and relatively small lateral and twisting moments. The longitudinal moment is the one with the primary importance for multi-beam box designs. The support reactions are also almost meaningless since they reflect the values in the springs of the support systems described in Chapter 3. The actual support reaction is the sum of the support system's two spring values. The reader should refer to Ref 8 for a detailed description of the SLAB 49 solution process and results if he so desires.

Following the tabulated results is a final value of the summation of the support reactions. This value, in addition to the maximum statics check error, should always be checked to verify that the total desired load was input properly. It should be equal in magnitude to the summation of loads applied on the structure which is printed immediately after the echo-print of the SLBDG 2 data. The maximum statics check error should always be a remnant or zero value. The user can determine if the errors are significant by visualizing the effect that loads of approximately the same magnitude would have when placed at all locations on the structure.

Box Moment Summations. Following the above results (which may be abbreviated to a single Y-station group by Table 9) are printed the summations of the longitudinal bending moments across each box at the nearest station to the X-distance input in Table 7. The equivalent computed X-distance is also printed. The moment is the total bending moment in the box. The above detailed results have moments which are given in for instance, K-in./in. units, but the summations are in total K-in. units (if kips and inches are the chosen consistent units). These summations may be inspected to determine the maximum moment and that value may be confidently used to design the appropriate prestressing for the live load.

Profile Output. If profile plots are specified by Table 8, these follow the above output. Profile plots are helpful in visualizing the behavior of the span for the given loading. The arrangement of plots is the same as for SLAB 49 and the reader is again referred to Ref 8 for a detailed description.

Typical output from program SLBDG 2 which includes results from the field load test are included as Appendix D.

CHAPTER 6. THE FIELD TEST

A field test was performed on the 7th of July, 1977 of a skewed precast box beam structure on US 181 over Dry Creek, 5.5 miles South of Beeville. The structure is part of a then almost complete construction project in the area. It was not open to traffic which was one of the reasons for selecting this structure for test. Figures 10 and 11 show views of the structure and location.

The Test Structure

The structure is composed of three 45 ft spans, skewed $37^{\circ}30'$, with a total bridge width of 44 ft 7 in. Eleven standard precast boxes 20 inches in depth and nominally 4 ft wide are set side by side in each span. The structure was on a slight $0^{\circ}45'$ curve, but was built with each span straight. The bent caps are slightly tapered so that all boxes in each span are the same length. The structure geometry is shown in Fig 12. The second span was selected for test purposes to avoid any slight unsymmetrical behavior due to the abutment. The railing on this structure is an open type which did not provide any significant added restraint to the span response from the test loading. A view of the Type 301 bridge rail which was still unconnected to an approach railing is shown in Fig 13.

The Test Loading

A three axle standard dump truck shown in Fig 14 with a nominal capacity of about 9 cubic yards was overloaded with about 13 cubic yards to a total gross weight of 70,060 lbs. The front axle alone and rear axles together were weighed separately on the contractor's scales available within two miles of the test site. The sum of the individual axle weights were within about 600 pounds

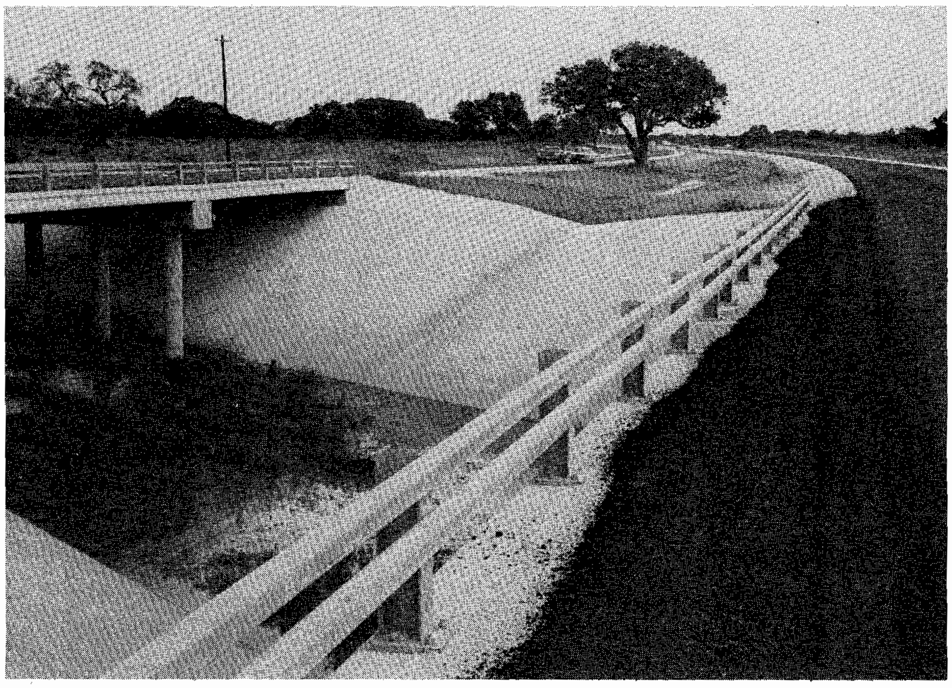


Fig 10. The test location on US 181, looking north. The test structure is on right.

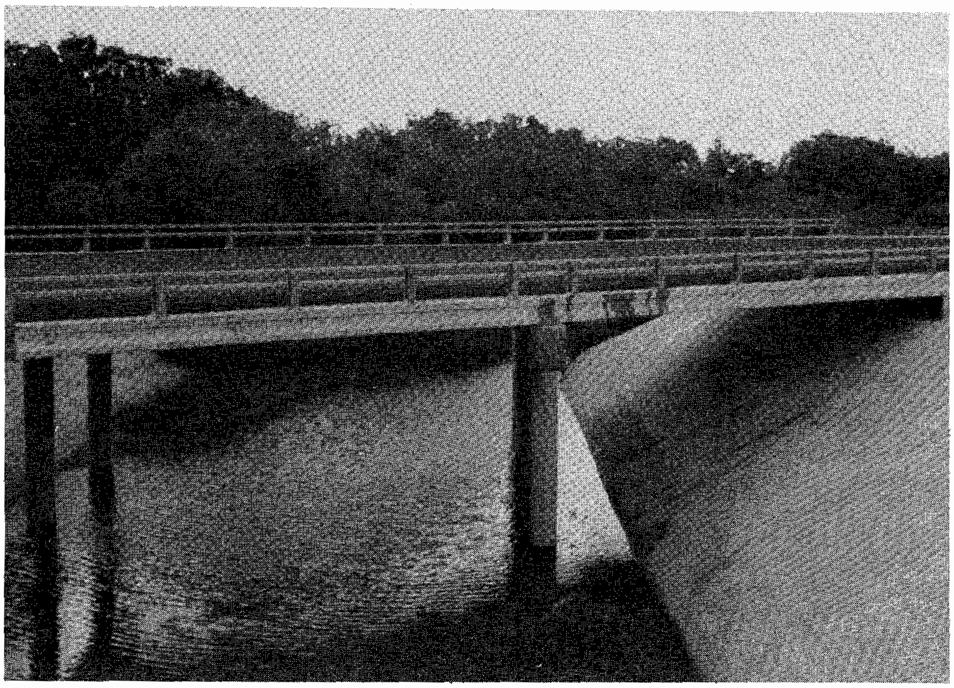
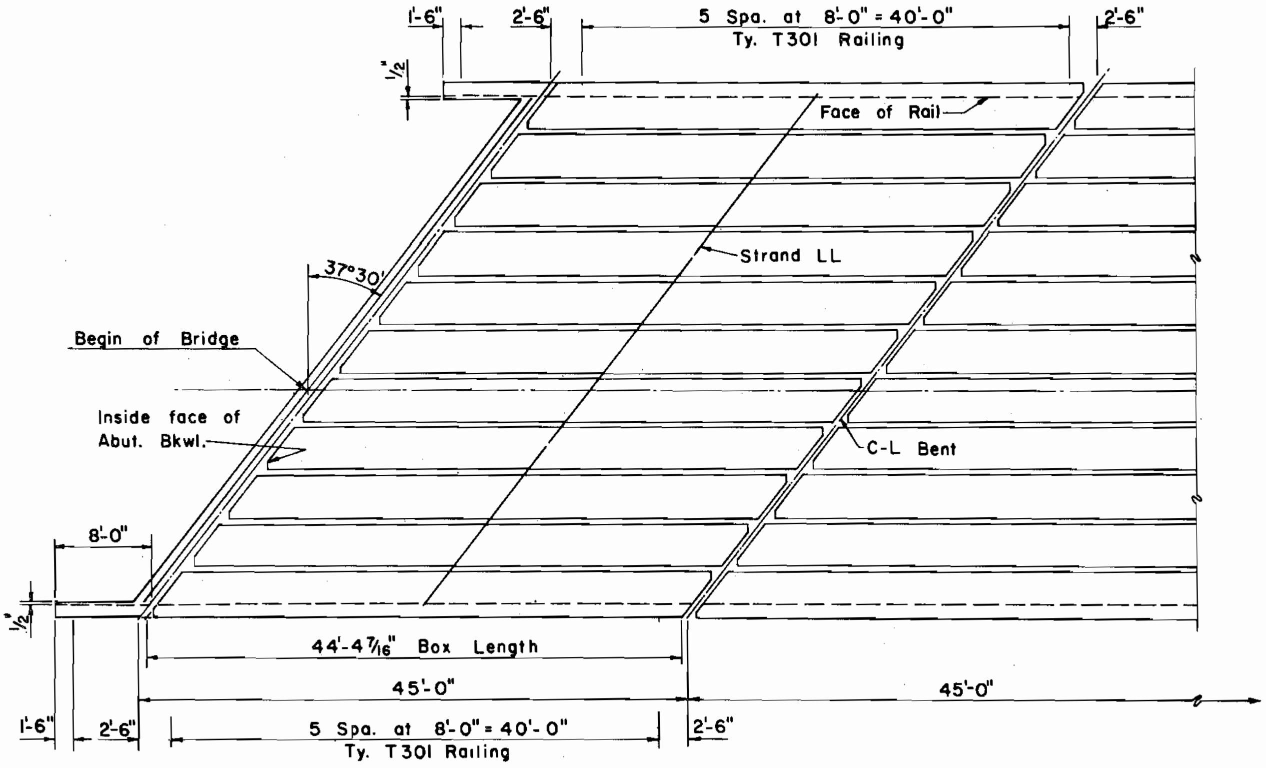
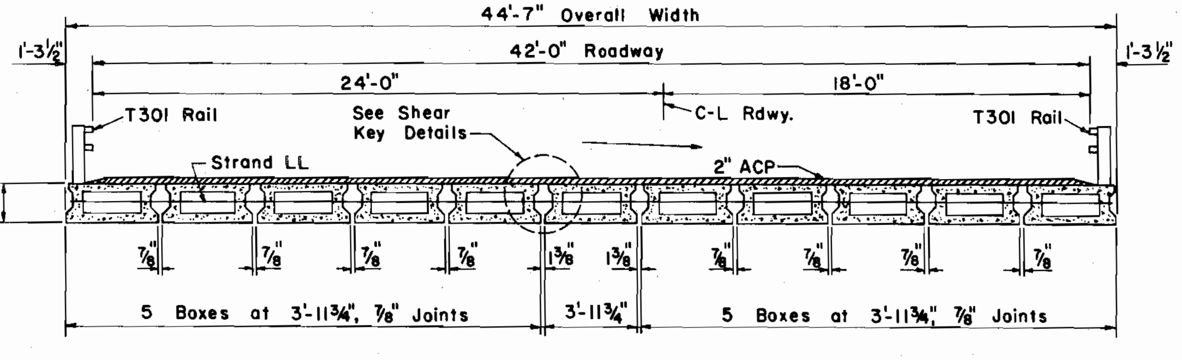


Fig 11. The test structure, looking east.



PLAN



TRANSVERSE SECTION

Fig 12. The test structure

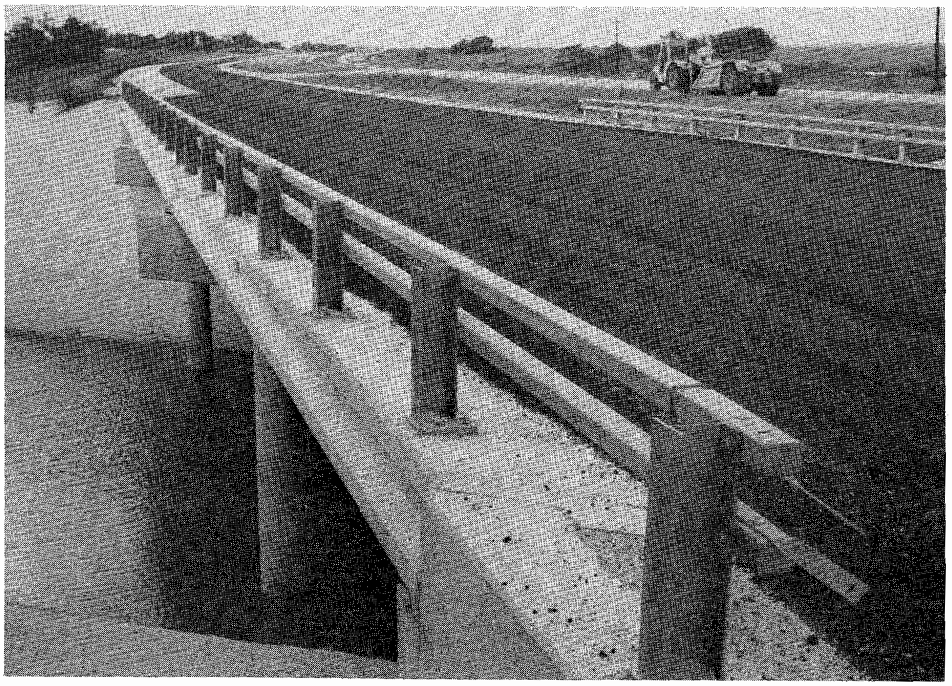


Fig. 13. The test structure looking south.

Fig 14. The test vehicle in load position 2.

of the total gross of 70,060 pounds. The slight discrepancy of less than 1 percent was most likely due to the fact that the truck was necessarily situated on a slight slope when weighing the individual axles.

The test load configuration is shown in Fig 15. The total gross of 70,060 pounds was apportioned to the wheels by means of the individual axle weights and also by assuming that the axle weight was equally shared by the two or four wheels on that axle. This load pattern was then used in the verification analyses of the test structure using the SLBDG 2 computer program.

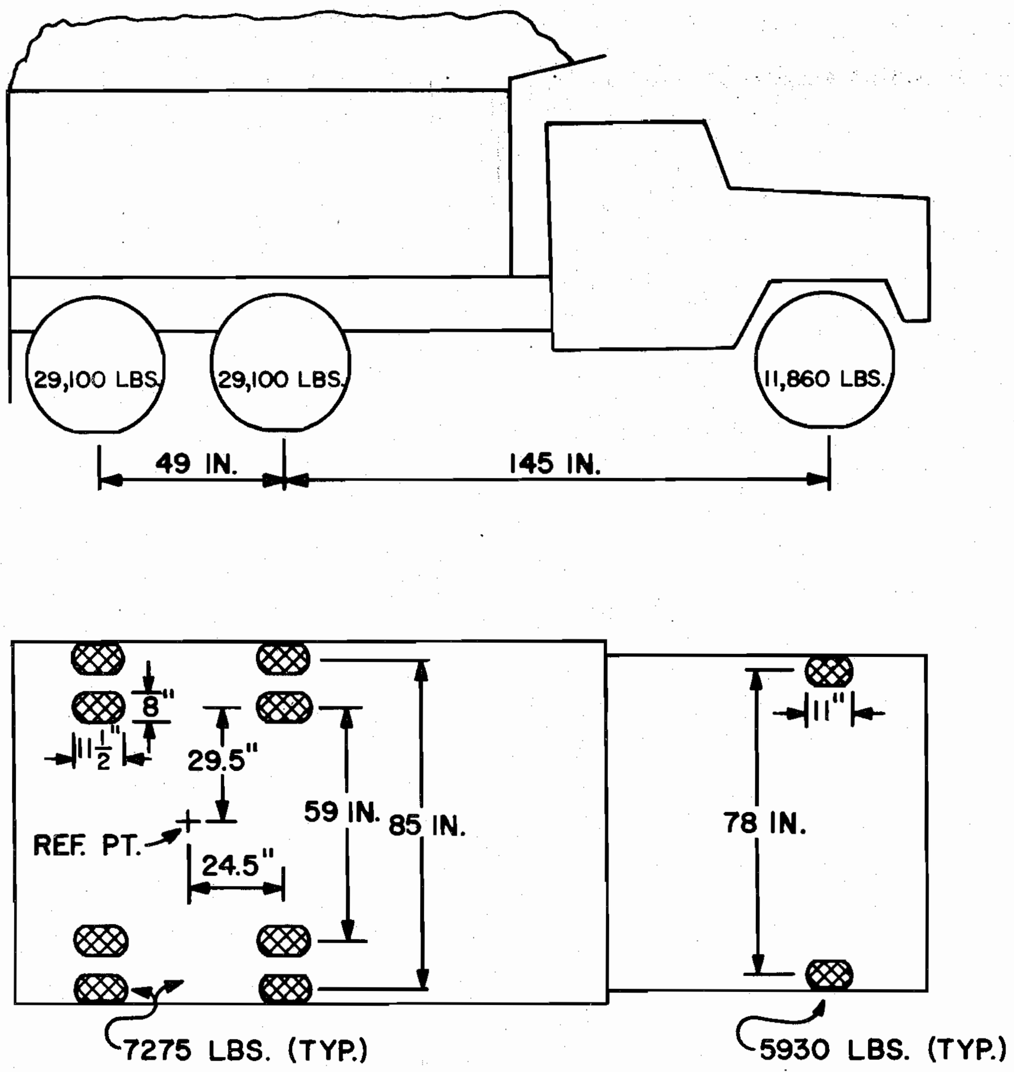
Load Placements

Three load placements were used with a complete set of readings taken for each placement. The load placement positions are shown in Fig 16. Results from placements 1 and 3 were similar but not antisymmetrical since the truck was headed north in both placements. The truck was placed as near the railing as reasonably possible with the centroid of the rear wheels positioned approximately on the diagonal centerline as shown in Fig 16.

The center to center bearing distance of 43.62 feet shown in Fig 16 was estimated to be approximately the distance to the centroid of the support under the ends of the boxes. This distance cannot be precisely defined, but is considered to be within an inch of the correct location.

Instrumentation

Deflections or stresses would have been difficult to quickly and accurately measure for a structure of this type. The maximum deflection for this load was determined to be only about 0.12 inches. Reference points, bars, and deflection gages necessary to directly measure deflections within this range would be almost impossible to establish and ensure that wind and temperature would not overpower the readings.



TOTAL GROSS LOAD = 70,060 LBS.

Fig. 15. The test load

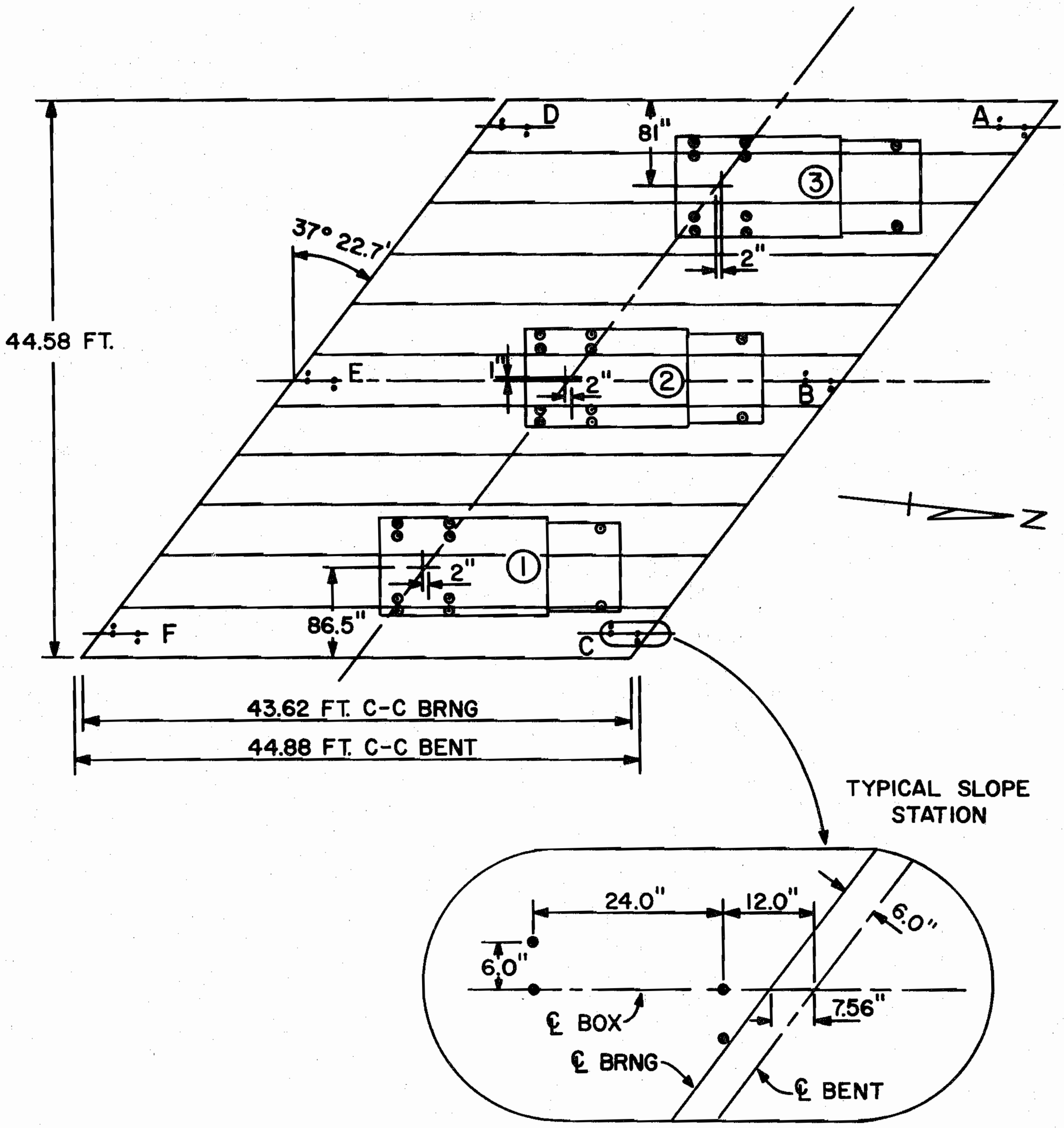
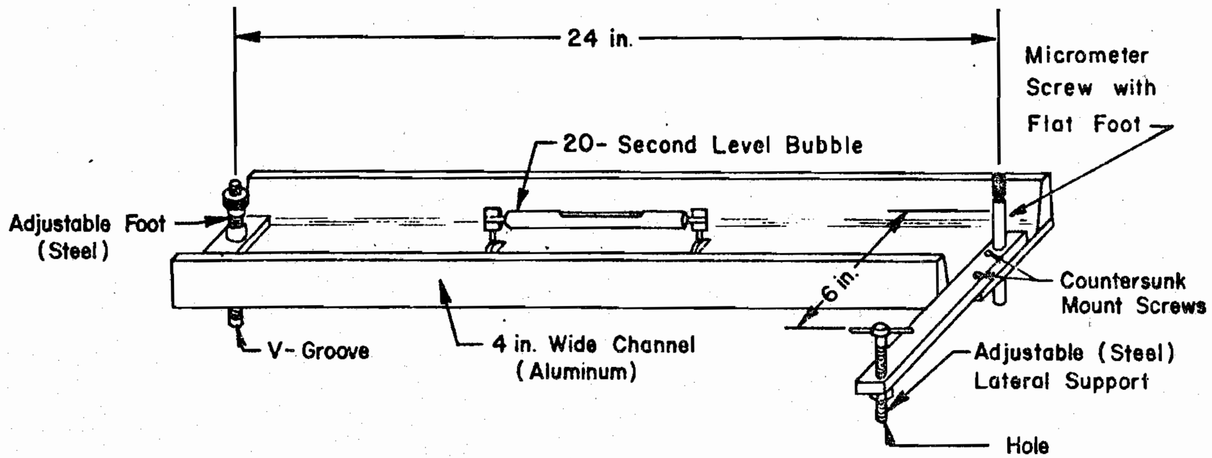


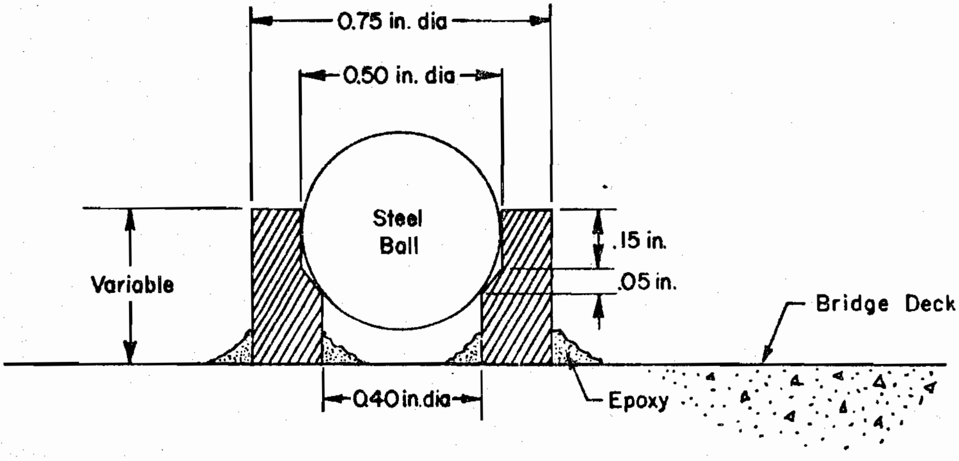
Fig 16. Showing the three load placements and six slope measurement stations.

Slope measurement has been found to be a reliable and accurate means of determining the response of bridges to test or environmental loadings. A mechanical inclinometer was developed in 1970 as part of a special study (Ref 7) to measure slope changes on a bridge tested for static live load effects in Pasadena, Texas. The inclinometer is shown in Fig 17. The inclinometer measures the change in elevation between pairs of ball bearing test points that are cemented to the bridge deck at 24-inch spacings. A typical slope station on the test structure is shown in Fig 18. The slope between the two primary points is computed by dividing the difference in elevation between the two points by the length of the inclinometer, 24 inches. Slope changes are computed by subtracting a reference slope from any other reading. As shown in Fig 17, the inclinometer has two primary steel feet in line with the level bubble, one with a V-grooved bottom and the other the flat end of a micrometer screw. An outrigger foot 6 inches to one side of the longitudinal axis of the device has a circular hole in the bottom to seat on auxiliary ball points for precise repositioning of the inclinometer. The level bubble used has a 20-second sensitivity which has been found to be approximately correct for a 0.0001 micrometer reading and a 24 inch inclinometer gage length. A finer level sensitivity creates excessive leveling times and a coarser bubble reduces accuracy.

An aluminum template, with four 7/16-inch-diameter holes was used to hold the ball points in position as they were cemented on the surface of the slab. The test points were made in various heights and were selected at each location to roughly level the balls in the direction of the inclinometer axis so as not to exceed the travel of the micrometer screw. A five-minute epoxy was used to cement the ball points to the surface of the boxes. It was necessary to remove approximately three inches of asphalt for the slope measurement points in the center of the structure. Auxillary blocks of concrete about two inches



(a) Inclinometer.



(b) Ball point.

Fig 17. Slope measuring instrument and test point (Ref 7).

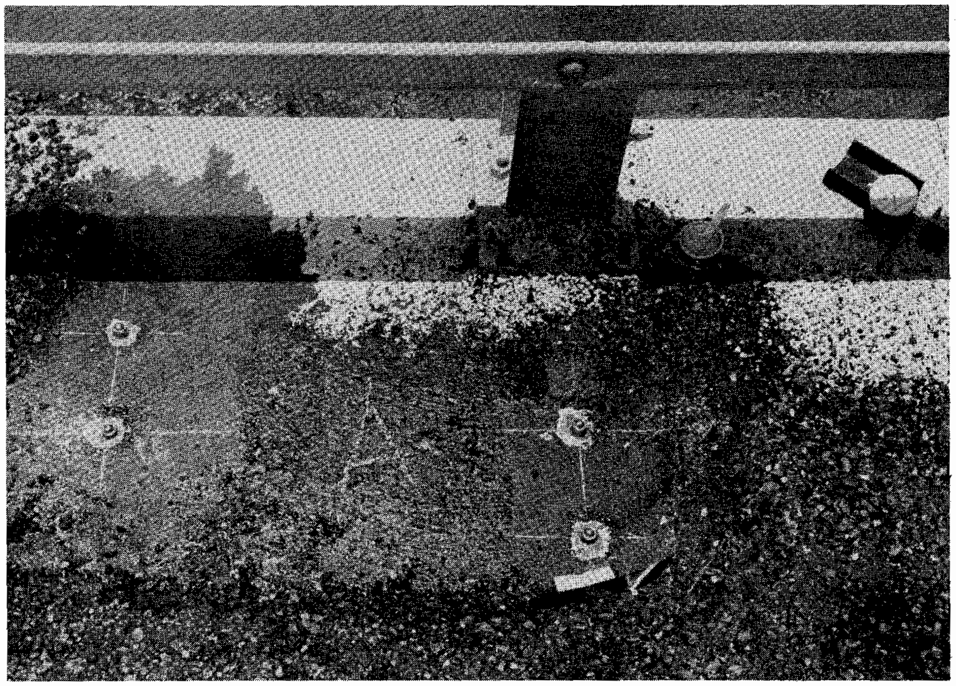


Fig 18. Slope station A.

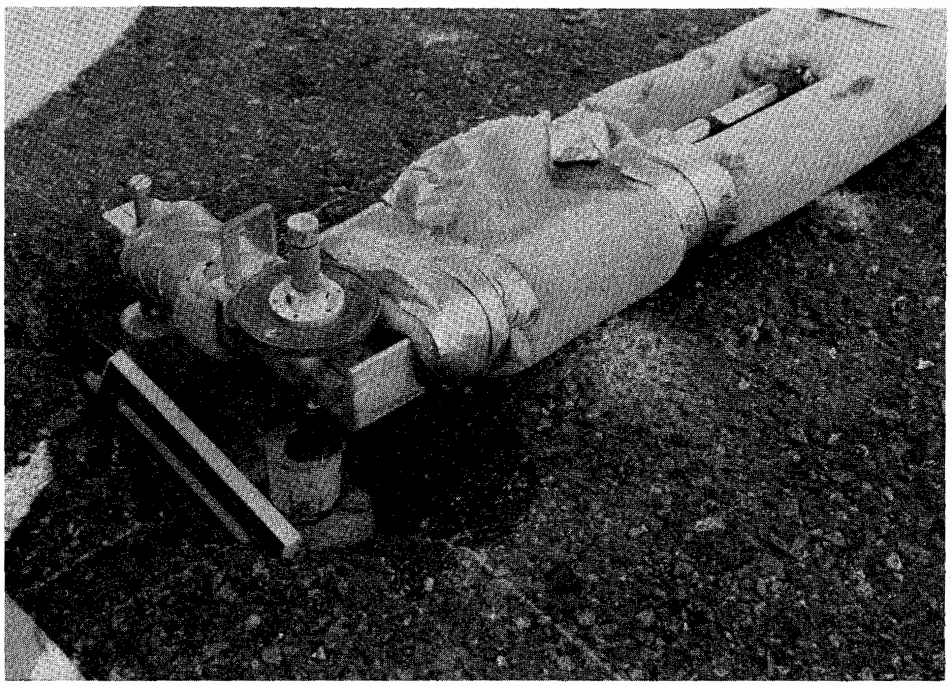


Fig 19. The inclinometer at slope station E.

high were cemented on the boxes prior to placement of the ball points to bring them above the surrounding asphalt level. One of the center stations is shown in Fig 19.

Data Recording

Each slope observation was taken with two readings of the micrometer screw, with the inclinometer reversed end-for-end between the two readings. This procedure serves to cancel instrument errors as well as to provide the possibility of self-checking the readings in the field. Only instrument errors that occur between the two readings are not canceled by this procedure. The inclinometer (insulated to retard sudden temperature changes) is shown in Fig 19 for the direct reading at Station E. Data from the inclinometer readings is summarized in Appendix A for each slope station. The inclinometer was shaded by an umbrella at all times.

A form for recording the inclinometer readings and a typical numerical example are shown in the table below. Regardless of the slope station or relative ball point elevations, the sum of any direct and reverse readings remains almost constant. Any significant variation was used as a basis for an immediate re-check of the slope readings.

Slope Station	A
Time	11:10
Direct (in)	.5750
	.0128
Reverse (in)	.9500
	.0111
Sum	1.5489
-2 x Reverse	-1.9222
=2 x Diff Elev	-0.3733

Direct readings were taken with the micrometer screw seated at the north reference points with the reverse readings at the south reference points. The two entries for each direct and reverse reading are the two readings made of the micrometer screw. The first is the coarse reading of the screw barrel which has 0.025 inch divisions. The second is the vernier reading to 0.0001 inch divisions. This procedure eliminated the need to make a mental addition in the field and thus many errors were avoided. The sum of all four readings was performed in the field, and as can be seen in Appendix A, the sums remained almost constant at 1.55. The slight variation in sums is thought to be due to a gradual heating of the inclinometer through the test day with a shift occurring after noon due to mishandling. The actual elevation differences are still considered accurate to about 0.0002 inch. Any error from temperature or mishandling would have had to occur between the direct and reverse readings; this would have been immediately apparent resulting in a new set of readings.

Summary of Measurements

Six slope stations were located on the second span of the test structure. Each station had four measurement points of which two were the primary points and two the outrigger points for re-positioning purposes. The points were cemented near the ends of the two outside boxes and the centerline box. The primary points were located on the box centerlines at 12 inches and 36 inches from the bent centerline as shown in Fig 16.

Plots of the differences in elevation for the six slope stations are shown in Figs 20 and 21. The solid line between points shows the change in the slope readings as heating of the top surface took place. This line was then the no load reference. The dashed lines connect the slope readings taken with each of the three load positions (Fig 16). As can be seen, the response was almost antisymmetrical; that is, the slopes for Station A were like those for Station F, Station B was like E, and C was similar to D. Much greater slope changes occurred in the exterior boxes with the exterior loadings that for the center box with center loading. This does not imply that the exterior boxes should

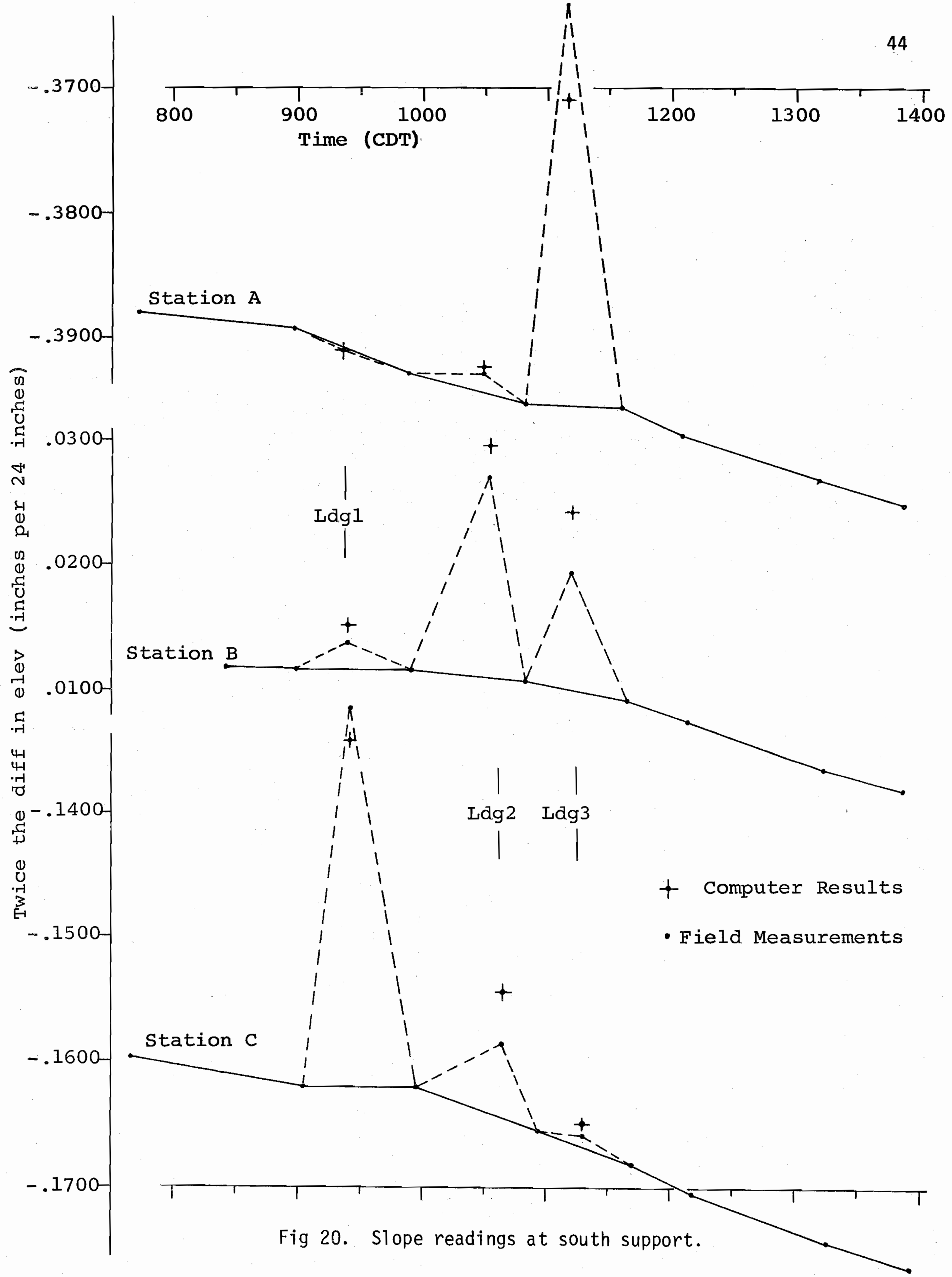


Fig 20. Slope readings at south support.

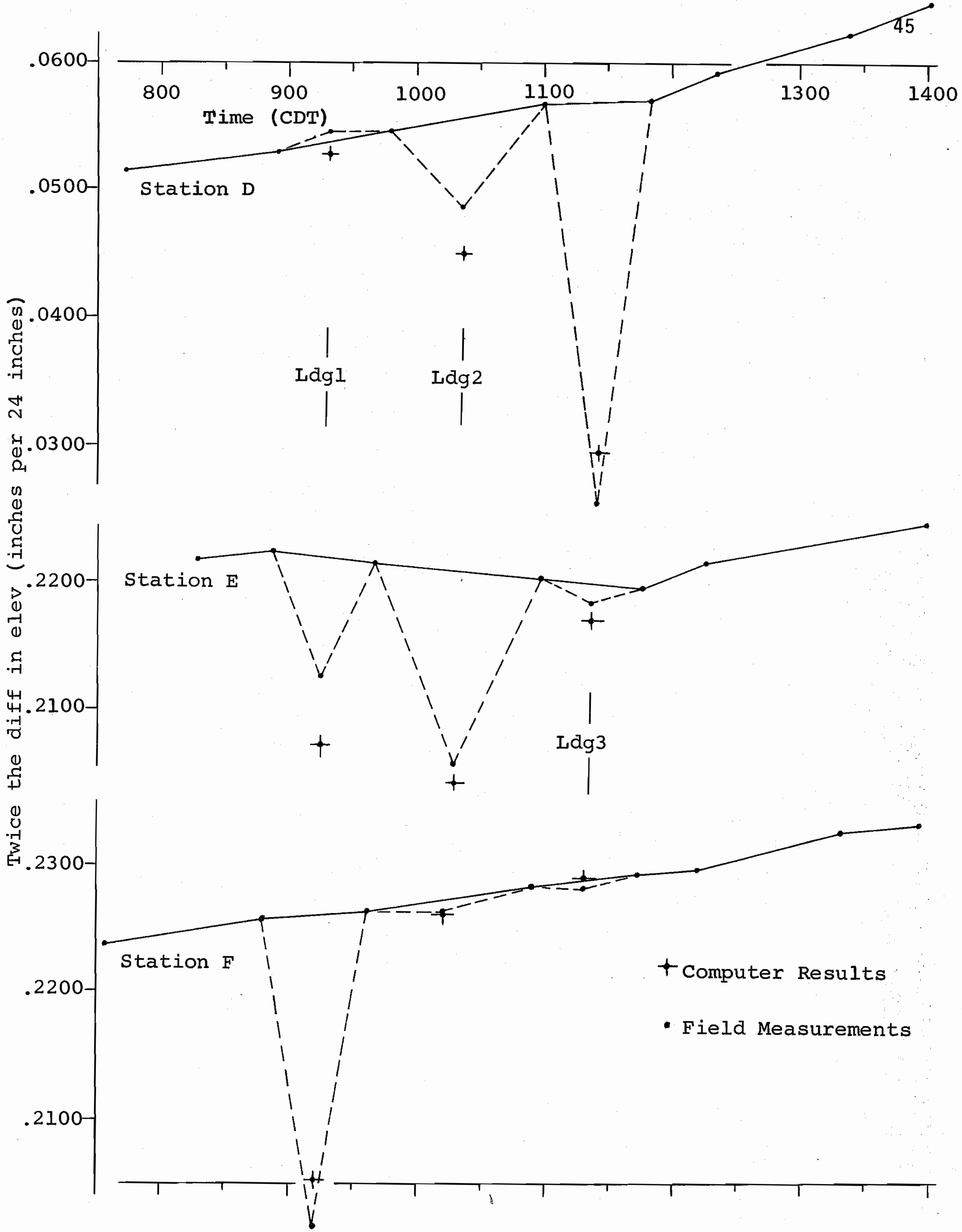


Fig 21. Slope readings at north support.

be designed for more load. Had two or three trucks been placed on the structure, then the maximum response of each box would be more nearly the same.

Computer Analysis Comparisons

Program SLBDG 2 was used to analyze the structure after the test to determine if the measured values could be predicted analytically. As can be seen in Figs 20 and 21, the computer values are in generally good agreement with the measured slopes. The computed slopes are about 15 percent less than the measured for the outside boxes with outside loadings and about 10 percent more for the center box with center loading. A number of computer solutions were made with various assumptions for concrete modulus of elasticity and transverse bending stiffnesses. It was found that a concrete modulus of about 6200 ksi gave the closest average match between measured and calculated. A zero shear key stiffness factor was also found to be the best model. It is hypothesized however, that due to the general heating of the structure, the central boxes may tend to prestress themselves together across the shear keys thus giving more distribution for the center boxes than for the outside boxes. It is impossible at this time to validate this hypothesis, but it seems reasonable in view of the smaller measured center box slopes.

The concrete used for the box beams had been tested at time of release and at 14 days. This data is listed in Appendix A. The average concrete strength at 14 days was approximately 7000 psi. Based on this, a concrete strength in excess of 8000 psi can be estimated to be present at the time of test loading. This strength correlates well with the concrete modulus of 6200 ksi which was used to obtain the computed results.

CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS

The problem of accurate design of skewed multi-beam structures is greatly complicated when the spans are skewed. The primary object of this study was to determine the appropriate design bending moments for multi-beam precast box members of the types currently in use in Texas.

Providing design charts and tabulations for all the variations of box width, skew, structure width, structure span, and individual structural variations such as twisting stiffness and transverse shear key stiffness was not economically justified. Development of such tabulations is possible, but it was found during the course of the project, that use of the developed data generator computer program was quite simple and it could be easily applied to specific design cases.

Verification of Analysis Methods

The analysis technique has been adequately verified by comparisons to other methods and to various field and laboratory tests by a number of investigators. A field test of a full-scale skewed structure was performed on this project and provided exceptionally good correlations between predicted and measured response. This correlation adds significant confidence to the user of the developed analysis technique.

Impact on Construction Costs

It has been demonstrated that a significant reduction in design live load bending moment can be expected by considering the skew angle and span aspect ratio for precast box beam bridges of the type currently in use in Texas. The reduction will vary from about 10 per cent for rectangular structures to about 50 percent for heavily skewed structures. The design live load reduction results in requiring fewer prestressing strands or allowing the maximum span length to be increased for a particular box size. This second effect has a much greater impact on costs since the strand cost differential is usually small. Reducing the box size by one increment will usually reduce the cost in the range of $1.00 to $3.00 per square foot of structure. For instance, a 70 foot span square structure would require 28 inch deep boxes while the same span skewed 45 degrees would only require 20 inch deep boxes for the same concrete strengths.

The final conclusion and result of this project is to recommend that the SLBDG 2 computer program (which is essentially a data generator for the SLAB 49 program) be used for future design of skewed multi-beam box structures in Texas. It should also be used for more accurate analysis of these structures when subjected to planned overloads.

REFERENCES

1. Alani, A. F., and John E. Breen, "Verification of Computer Simulation Methods for Slab and Girder Bridge Systems," Research Report No. 115-1F, Center for Highway Research, The University of Texas at Austin, August 1971.

2. The American Association of State Highway Officials, "Interim Specifications, Bridges," Washington, D.C., 1974.

3. The American Association of State Highway Officials, <u>Standard Specifications for Highway Bridges</u>, Ninth Edition, 1965.

4. The American Association of State Highway Officials, <u>Standard Specifications for Highway Bridges</u>, Eighth Edition, 1961.

5. Chen, T. Y., C. P. Siess, and N. W. Newmark, "Moments in Simply Supported Skew I-Beam Bridges," University of Illinois Engineering Experiment Station, Bulletin 439, January 1957.

6. Kennedy, John B., and D.S.R. Gupta, "Bending of Skew Orthotropic Plate Structures," ASCE Structural Journal, Vol 102, No ST8, August 1976.

7. Matlock, Hudson, J. J. Panak, M. R. Vora, and J. H. C. Chan, "Field Investigation of a Skewed, Post-Stressed Continuous Slab Structure," Unpublished Interim Study Report to Texas Highway Department Bridge Division, Center for Highway Research, The University of Texas at Austin, May 1970.

8. Panak, John J., and Hudson Matlock, "A Discrete-Element Method of Analysis for Orthogonal Slab and Grid Bridge Floor Systems," Research Report No 56-25, Center for Highway Research, The University of Texas at Austin, May 1972.

9. Panak, John J., "Final Report for Project 3-5-63-56," Research Report No. 56-29F, Center for Highway Research, The University of Texas at Austin, August 1973.

10. Sanders, W. W. Jr., and H. A. Elleby, "Distribution of Wheel Loads on Highway Bridges," NCHRP Report 83, Highway Research Board, 1970.

11. Vora, M. R., and Hudson Matlock, "A Discrete-Element Analysis for Anisotropic Skew Plates and Grids," Research Report No. 56-18, Center for Highway Research, The University of Texas at Austin, August 1970.

12. Watanabe, Eiichi, "Study of Load Distribution in Multi-Beam Highway Bridges," Master's Thesis, Iowa State University, Ames, 1968.

13. Will, Kenneth M., C. P. Johnson, and H. Matlock, "Analytical and Experimental Investigation of the Thermal Response of Highway Bridges," Preliminary Research Report No. 23-2, Center for Highway Research, The University of Texas at Austin, February 1977.

APPENDIX A

FIELD TEST LOAD DATA

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

Note: The direct readings are with the micrometer end of the slope indicator toward Beeville (to the north). Times are CDT. Results are twice the actual difference in elevation in inches per 24 inches between the reference points. A positive difference indicates that the northern most point is higher.

Slope Station A

Load No.	-	-	One	-	Two	-	Three
Time	7:41	8:57	9:21	9:51	10:28	10:48	11:10
Direct	.5750 .0016	.5750 .0005	.5500 .0243	.5500 .0232	.5500 .0230	.5500 .0215	.5750 .0128
Reverse	.9500 .0246	.9500 .0248	.9750 .0003	.9750 .0011	.9750 .0010	.9750 .0020	.9500 .0111
Sum	1.5512	1.5503	1.5496	1.5493	1.5490	1.5485	1.5489
-2XRev.	-1.9492	-1.9496	-1.9506	-1.9522	-1.9520	-1.9540	-1.9222
=2X D.E.	-0.3980	-0.3993	-0.4010	-0.4029	-0.4030	-0.4055	-0.3733

Load No	-	-	-	-			
Time	11:35	12:05	1:10	1:51			
Direct	.5500 .0218	.5500 .0192	.5500 .0177	.5500 .0164			
Reverse	.9750 .0026	.9750 .0022	.9750 .0045	.9750 .0051			
Sum	1.5494	1.5464	1.5472	1.5465			
-2XRev.	-1.9552	-1.9544	-1.9590	-1.9602			
=2X D.E.	-0.4058	-0.4080	-0.4118	-0.4137			

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

Note: The direct readings are with the micrometer end of the slope indicator toward Beeville (to the north). Times are CDT. Results are twice the actual difference in elevation in inches per 24 inches between the reference points. A positive difference indicates that the northern most point is higher.

Slope Station B

Load No.	-	-	One	-	Two	-	Three
Time	8:25	8:59	9:23	9:55	10:32	10:50	11:12
Direct	.7750 .0070	.7750 .0062	.7750 .0071	.7750 .0059	.7750 .0133	.7750 .0051	.7750 .0093
Reverse	.7500 .0202	.7500 .0195	.7500 .0183	.7500 .0193	.7500 .0112	.7500 .0194	.7500 .0149
Sum	1.5522	1.5507	1.5504	1.5502	1.5495	1.5495	1.5492
-2XRev.	-1.5404	-1.5390	-1.5366	-1.5386	-1.5224	-1.5388	-1.5298
=2X D.E.	0.0118	0.0117	0.0138	0.0116	0.0271	0.0107	0.0194

Load No	-	-	-	-			
Time	11:39	12:08	1:14	1:52			
Direct	.7750 .0048	.7750 .0026	.7750 .0002	.7500 .0244			
Reverse	.7500 .0206	.7500 .0201	.7500 .0215	.7500 .0224			
Sum	1.5504	1.5477	1.5467	1.5468			
-2XRev.	-1.5412	-1.5402	-1.5430	-1.5448			
=2X D.E.	0.0092	0.0075	0.0037	0.0020			

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

Note: The direct readings are with the micrometer end of the slope indicator toward Beeville (to the north). Times are CDT. Results are twice the actual difference in elevation in inches per 24 inches between the reference points. A positive difference indicates that the northern most point is higher.

Slope Station C

Load No.	-	-	One	-	Two	-	-
Time	7:39	9:03	9:25	9:57	10:38	10:52	10:57
Direct	.6750 .0211	.6750 .0197	.7000 .0105	.6750 .0192	.6750 .0208	.6750 .0171	.6750 .0174
Reverse	.8500 .0059	.8500 .0066	.8250 .0168	.8500 .0062	.8500 .0044	.8500 .0077	.8500 .0078
Sum	1.5520	1.5513	1.5523	1.5504	1.5502	1.5498	1.5502
-2XRev.	-1.7118	-1.7132	-1.6836	-1.7124	-1.7088	-1.7154	-1.7156
=2X D.E.	-0.1598	-0.1619	-0.1313	-0.1620	-0.1586	-0.1656	-0.1654

Load No	Three	-	-	-	-		
Time	11:15	11:41	12:10	1:16	1:55		
Direct	.6750 .0171	.6750 .0160	.6750 .0140	.6750 .0117	.6750 .0106		
Reverse	.8500 .0080	.8500 .0092	.8500 .0094	.8500 .0110	.8500 .0118		
Sum	1.5501	1.5502	1.5484	1.5477	1.5474		
-2XRev.	-1.7160	-1.7184	-1.7188	-1.7220	-1.7236		
=2X D.E.	-0.1659	-0.1682	-0.1704	-0.1743	-0.1762		

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

Note: The direct readings are with the micrometer end of the slope indicator toward Beeville (to the north). Times are CDT. Results are twice the actual difference in elevation in inches per 24 inches between the reference points. A positive difference indicates that the northern most point is higher.

Slope Station D

Load No.	-	-	One	-	-	Two	Two
Time	7:44	8:55	9:19	9:43	9:47	10:21	10:24
Direct	.8000 .0017	.8000 .0020	.8000 .0031	.8000 .0024	.8000 .0023	.7750 .0237	.7750 .0237
Reverse	.7500 .0003	.7250 .0241	.7250 .0237	.7250 .0227	.7250 .0229	.7500 .0000	.7500 .0001
Sum	1.5520	1.5511	1.5518	1.5501	1.5502	1.5487	1.5488
-2XRev.	-1.5006	-1.4982	-1.4974	-1.4954	-1.4958	-1.5000	-1.5002
=2X D.E.	0.0514	0.0529	0.0544	0.0547	0.0544	0.0487	0.0486

Load No	-	Three	-	-	-	-	
Time	11:00	11:24	11:49	12:19	1:23	2:01	
Direct	.8000 .0032	.7750 .0124	.8000 .0032	.8000 .0038	.8000 .0047	.8000 .0061	
Reverse	.7250 .0214	.7500 .0118	.7250 .0212	.7250 .0197	.7250 .0176	.7250 .0165	
Sum	1.5496	1.5492	1.5494	1.5485	1.5473	1.5476	
-2XRev.	-1.4928	-1.5236	-1.4924	-1.4894	-1.4852	-1.4830	
=2X D.E.	0.0568	0.0256	0.0570	0.0591	0.0621	0.0646	

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

Note: The direct readings are with the micrometer end of the slope indicator toward Beeville (to the north). Times are CDT. Results are twice the actual difference in elevation in inches per 24 inches between the reference points. A positive difference indicates that the northern most point is higher.

Slope Station E

Load No.	-	-	One	-	Two	-	Three
Time	8:21	8:52	9:16	9:40	10:17	10:58	11:22
Direct	.8750 .0112	.8750 .0110	.8750 .0062	.8750 .0103	.8750 .0023	.8750 .0095	.8750 .0084
Reverse	.6500 .0144	.6500 .0138	.6500 .0185	.6500 .0140	.6500 .0214	.6500 .0144	.6500 .0150
Sum	1.5506	1.5498	1.5497	1.5493	1.5487	1.5489	1.5484
-2XRev.	-1.3288	-1.3276	-1.3370	-1.3280	-1.3428	-1.3288	-1.3300
=2X D.E.	0.2218	0.2222	0.2127	0.2213	0.2059	0.2201	0.2184

Load No	-	-	-	-			
Time	11:47	12:15	1:21	1:59			
Direct	.8750 .0091	.8750 .0091	.8750 .0096	.8750 .0108			
Reverse	.6500 .0145	.6500 .0127	.6500 .0112	.6500 .0109			
Sum	1.5486	1.5468	1.5458	1.5467			
-2XRev.	-1.3290	-1.3254	-1.3224	-1.3218			
=2X D.E.	0.2196	0.2214	0.2234	0.2249			

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

Note: The direct readings are with the micrometer end of the slope indicator toward Beeville (to the north). Times are CDT. Results are twice the actual difference in elevation in inches per 24 inches between the reference points. A positive difference indicates that the northern most point is higher.

Slope Station F

Load No.	-	-	One	-	Two	-	Three
Time	7:35	8:48	9:13	9:37	10:13	10:55	11:19
Direct	.8750 .0128	.8750 .0135	.8750 .0015	.8750 .0135	.8750 .0132	.8750 .0145	.8750 .0144
Reverse	.6500 .0140	.6500 .0127	.6500 .0249	.6500 .0123	.6500 .0120	.6500 .0112	.6500 .0111
Sum	1.5518	1.5512	1.5514	1.5508	1.5502	1.5507	1.5505
-2XRev.	-1.3280	-1.3254	-1.3498	-1.3246	-1.3240	-1.3224	-1.3222
=2X D.E.	0.2238	0.2258	0.2016	0.2262	0.2262	0.2283	0.2283

Load No	-	-	-	-			
Time	11:44	12:13	1:19	1:57			
Direct	.8750 .0147	.8750 .0141	.8750 .0151	.8750 .0154			
Reverse	.6500 .0105	.6500 .0095	.6500 .0076	.6500 .0074			
Sum	1.5502	1.5486	1.5477	1.5478			
-2XRev.	-1.3210	-1.3190	-1.3152	-1.3148			
=2X D.E.	0.2292	0.2296	0.2325	0.2330			

FIELD TEST LOAD DATA

Chronological sequence of slope indicator sums

Load	Slope Sta	Time CDT	Sum	Avg
NL	F	7:35	1.5518	
	C	7:39	1.5520	
	A	7:41	1.5512	
	D	7:44	1.5520	
	E	8:21	1.5506	
	B	8:25	1.5522	1.5516
NL	F	8:48	1.5512	
	E	8:52	1.5498	
	D	8:55	1.5511	
	A	8:57	1.5503	
	B	8:59	1.5507	
	C	9:03	1.5513	1.5507
ONE	F	9:13	1.5514	
	E	9:16	1.5497	
	D	9:19	1.5518	
	A	9:21	1.5496	
	B	9:23	1.5504	
	C	9:25	1.5523	1.5509
NL	F	9:37	1.5508	
	E	9:40	1.5493	
	D	9:43	1.5501	
	D	9:47	1.5502	
	A	9:51	1.5493	
	B	9:55	1.5502	
	C	9:57	1.5504	1.5500
TWO	F	10:13	1.5502	
	E	10:17	1.5487	
	D	10:21	1.5487	
	D	10:24	1.5488	
	A	10:28	1.5490	
	B	10:32	1.5495	
	C	10:38	1.5502	1.5493
NL	A	10:48	1.5485	
	B	10:50	1.5495	
	C	10:52	1.5498	
	F	10:55	1.5507	
	C	10:57	1.5502	
	E	10:58	1.5489	
	D	11:00	1.5496	1.5498

Load	Slope Sta	Time CDT	Sum	Avg
THREE	A	11:10	1.5489	
	B	11:12	1.5492	
	C	11:15	1.5501	
	F	11:19	1.5505	
	E	11:22	1.5484	
	D	11:24	1.5492	1.5494
NL	A	11:35	1.5494	
	B	11:39	1.5504	
	C	11:41	1.5502	
	F	11:44	1.5502	
	E	11:47	1.5486	
	D	11:49	1.5494	1.5497
			*	
NL	A	12:05	1.5464	
	B	12:08	1.5477	
	C	12:10	1.5484	
	F	12:13	1.5486	
	E	12:15	1.5468	
	D	12:19	1.5485	1.5477
NL	A	1:10	1.5472	
	B	1:14	1.5467	
	C	1:16	1.5477	
	F	1:19	1.5477	
	E	1:21	1.5458	
	D	1:23	1.5473	1.5470
NL	A	1:51	1.5465	
	B	1:52	1.5468	
	C	1:55	1.5474	
	F	1:57	1.5478	
	E	1:59	1.5467	
	D	2:01	1.5476	1.5471

* Probable instrument shift from mishandling

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

At Station E		Bottom of Structure		Wind
Time	Temp (°F)	Time	Temp (°F)	
0847	90	0847	87	None
0915	92			
0939	93	0939	89	Approx 5 mph from SE
1012	94	1012	88	Approx 10 mph from SE
1058	98			Approx 20 mph from S
1122	100			↓
1146	102	1143	91	↓
1214	103	1222	93	↓
1320	108	1324	96	↓
1358	108			Approx 20 mph from S

The structure was in tree shade until about 0800 hours. Small clouds periodically shaded the bridge not more than 5 percent of the time.

Shade Air temperature at 1340 hours was 97°.

The temperature at Station E was within the asphalt excavation for the ball points (See Figure 19) which was shaded continuously by a cardboard covering except when inclinometer readings were made.

The temperature at the bottom was taken with a thermometer taped to the bottom surface near the SE corner of the structure.

FIELD TEST LOAD DATA

Date: 7 July 1977 Bee County, US 181, Control 101-1-41

Dry Creek Bridge, Northbound Structure, 5.5 Miles S. of Beeville

Second span casting records were obtained from the Materials and Test Division of DHT with the following results.

Casting Date	No. Boxes and Type	Release Strength (psi)	14 Day Strength (psi)
Fri Sept 5, 1975	4 interior	4218 @ 18 Hrs	6012
Tues Sept 9, 1975	4 interior	5429 @ 46 Hrs	7459
Wed Sept 10, 1975	1 exterior	4987 @ 30 Hrs	7068
Fri Sept 12, 1975	1 interior & 1 exterior	4916 @ 62 Hrs	7432

Average of 11 Boxes:	4855 psi @ release 6892 psi @ 14 days
Required Design Strengths:	4000 psi @ release 5000 psi @ 28 days

APPENDIX B

GUIDE FOR DATA INPUT

PROGRAM SLBDG 2

SKEWED MULTI-BEAM BRIDGE ANALYSIS - SLBDG 2

This program acts as a data generator for the SLAB49 program and should be used for the analysis of multi-beam bridges composed of prestressed box cross-sections. It is especially useful for skewed structures since the live load design moment is significantly less than for square structures. The spans are assumed simply supported along the skewed support. Square structures may also be analyzed.

IDENTIFICATION OF RUN (two cards per run)

These first two cards identify the run. The Problem Series File No. (PSF No.) is for data filing purposes. The first card indicates the recommended information that should be included to identify the run; however, the complete card may be used for any descriptive data as indicated by the dashed lines. A consistent system of units must be used for all input data. Kips and inches are usually the most convenient.

Problem Series File No.	County	Hwy No.	PD/IPE	Control-Sec-Job	Coded By	Date	Units Force - Length
1 5	8 20	23 28	31 34	37 47	50 52	55 66	69 80

Structure Name or other descriptive run information (do not leave blank)
1 80

Check to ensure that each run has the above two header cards and that each problem in the run (which may encompass a series of problems) has a Prob No. card as follows. Each individual problem in the run may have any convenient descriptive Prob No. such as LDG 5. A final card in the run with CEASE as the Prob No. indicates the end of the data.

IDENTIFICATION OF PROBLEM (one card each problem)

Prob No.	Description of problem
1 5	11 80

Each page in this input guide is for a specific data table. If the blank general coding forms are used, which match the spacing on these forms, then each page can be placed over or adjacent to the blank form to act as the input heading for each data table.

All integer numbers must be right justified if in a 2 space field. All 5 or 10 space fields may be entered at the user's convenience. For example -123.4 or -1.234E+02 define the same number; a decimal point must be used. Blanks are interpreted as zeros.

TABLE 1. CONTROL DATA (two cards for each problem)

Any data may be kept from a prior problem unless if the problems are within a Parent-Offspring series. An Offspring problem must hold Tables 2, 3, and 4 from the previous problem. Tables 5, 7, or 8 may also be kept if desired. A new Table 6 is required for each Offspring problem.

The multiple-load option may be blank or zero in which case the problem is assumed to be independent with only a single load condition. A Parent problem is specified by entering a +1. An Offspring problem is specified by entering a -1. Specification of a Parent problem implies that there are 1 or more following Offspring problems for exactly the same span with different load patterns or placements.

The complete generated SLAB49 data may be printed if desired by entering a 1 for the option.

The skew angle is the angle between a perpendicular to the longitudinal centerline and the support centerline. A left forward skew is positive.

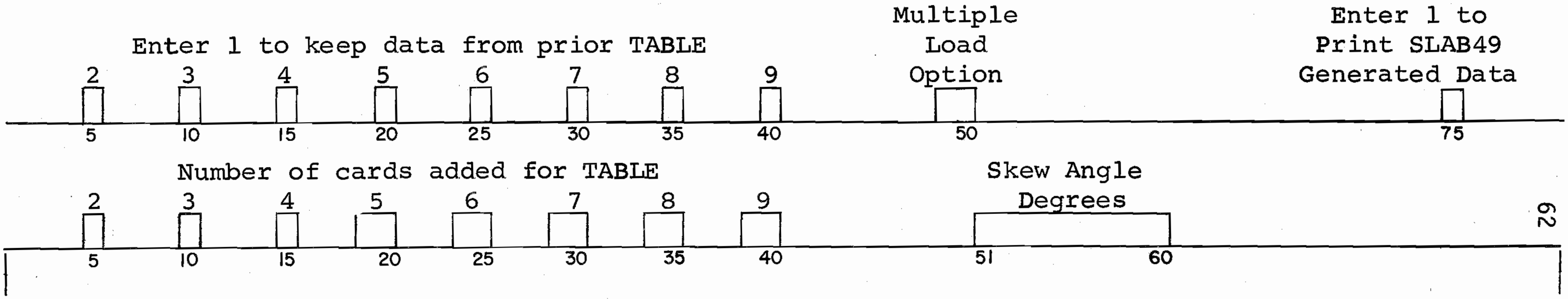


TABLE 2. CONSTANTS (one card - none if kept)

This table must be omitted for Offspring problems.

The number of increments are the totals along the span from c-c of assumed bearing and out to out transversely. A skewed span has the same input number of span X increments as a square span with the same increment length. The generated SLAB49 model will have more X increments for the skewed span however.

The increment lengths may be any fractional length. They should be chosen so there is at least 4 to 5 increments transversely in each box beam and 12 to 14 increments in the span.

Poisson's Ratio is usually specified equal to 0.15 or 0.20 for concrete.

The Modulus of Elasticity may be any conventional value for concrete such as 5000 kips per inch. The modulus only affects the computed deflections.

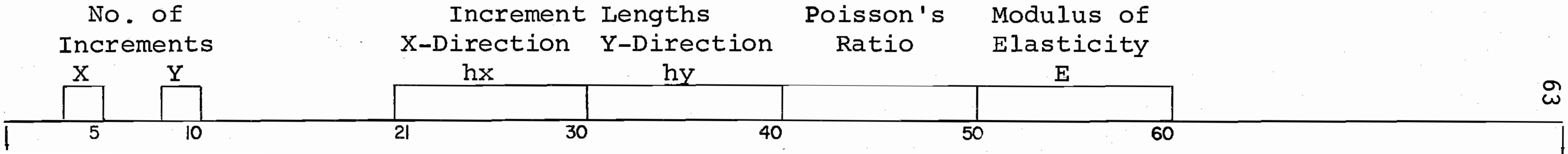


TABLE 3. BOX STIFFNESS DATA (one card each type - none if kept)

This table must be omitted for Offspring problems.

The different box types used to make up the structure are input with this table beginning with type 1. Up to 10 types may be used.

The number of transverse Y increments used for each box defines the total box width. Therefore, this table must be consistent with the transverse increment length used in Table 1 and the box arrangement specified in Table 4.

The box depth, internal void width, and top and bottom slab thicknesses are input in F5.0 format. That is, a 5 inch slab may be entered as a right justified 5 or as 5.0. The decimal form is recommended. Solid cross-sections may be input by specifying a 0.0 void width and 0.0 slab thicknesses. A inverted U cross-section could also be input by specifying the void width as the distance between the webs with only a top slab.

The shear key stiffness factor is used to define the degree of remaining transverse stiffness at the shear key between beams. A value of 0.0 is usually best. A solid slab (not articulated) could be solved with a key stiffness factor of 1.0.

The longitudinal moment of inertia is the conventional total value computed about the horizontal neutral axis of the box. The torsional inertia is the value usually known as the St. Venant torsion constant and may be estimated for a box cross-section by the following formula taken from Ref 4.

$$J = \frac{4\,(l_h\, l_v)^2}{\dfrac{2l_v}{t_w} + \dfrac{l_h}{t_t}\left(\dfrac{t_t + t_b}{t_b}\right)}$$

where l_h is the width between web centers, l_v is the depth between slab centers and t_w, t_t, and t_b are web, top, and bottom slab thicknesses.

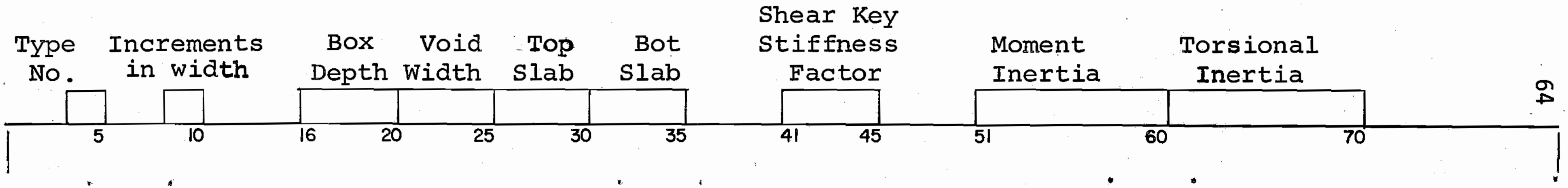
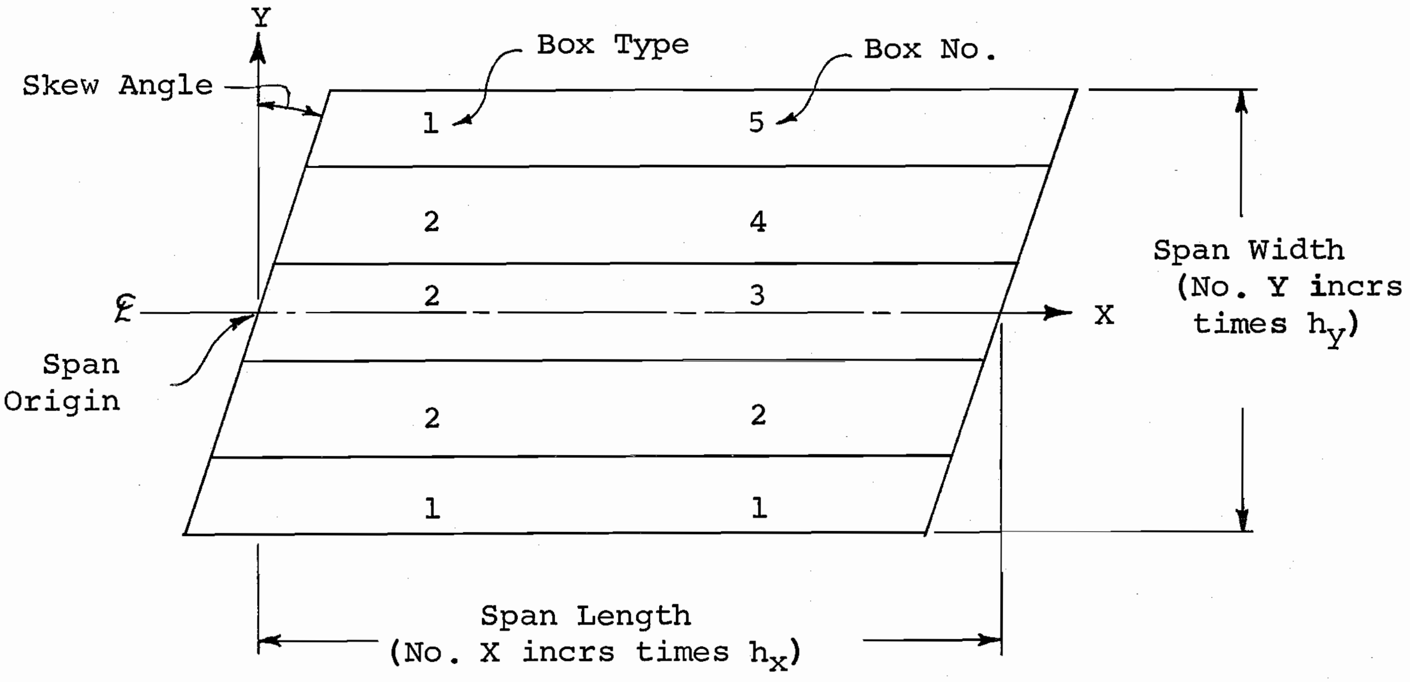


TABLE 4. BOX ARRANGEMENT (one card - none if kept)

This table must be omitted for Offspring problems.

The span is assumed symmetrical about the longitudinal centerline. The arrangement is input by type number beginning at the right most box up to and including the centerline if it straddles the centerline. The following sketch illustrates a typical box arrangement and box numbering scheme. Note for this example that there are 5 boxes. Only the first 3 are specified in this table. Any or all of the 5 boxes may be referenced in Table 7 for sums.



Box Arrangement by Type No. up to and including centerline

Box No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80

TABLE 5. LOAD PATTERNS (two cards per pattern - none if kept)

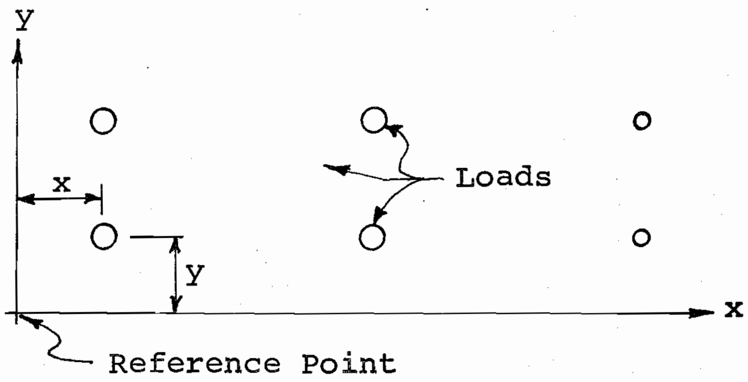
This table may be input or kept for Offspring problems. For a series of Offspring problems with different numbers of patterns, all the anticipated patterns may be input in the Parent problem and kept from problem to problem with only the desired patterns used by the Table 6 placements.

Each pattern is identified by a number (beginning with 1) up to a maximum of 10 different patterns. Each pattern may have from 1 to 6 loads. If the desired pattern has more than 6 loads, then multiple patterns may be specified which can be overlapped by the Table 6 placements.

Each load in the pattern is referenced to a local pattern coordinate system the origin of which may be one of the loads or any other convenient point. This local pattern reference point is the point by which the pattern is placed by Table 6. An example is shown below.

The coordinate distances are input in F5.0 format and may be negative.

Negative loads are downward.



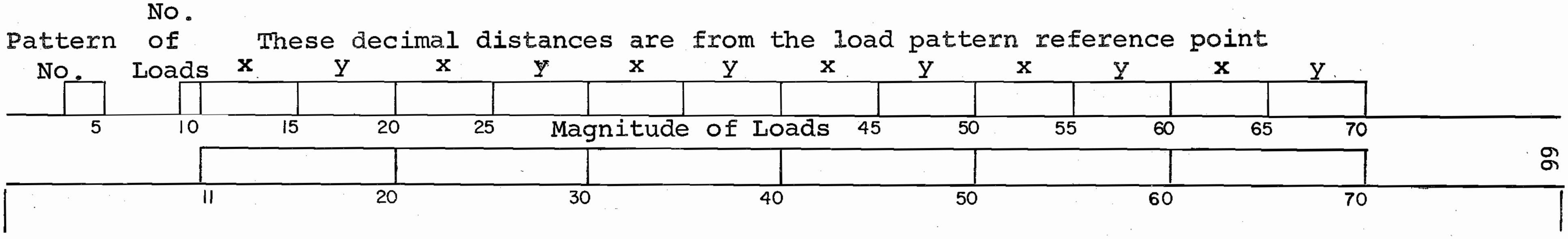


TABLE 6. PLACEMENTS OF LOAD PATTERNS (maximum of 10 cards - none if kept)

This table may not be kept for Offspring problems. Each offspring problem must have a new Table 6.

Each pattern may be placed at as many as 6 different locations on the span. This allows for instance, definition of one truck pattern by Table 5 with up to 6 like trucks placed simultaneously.

The placement is by pattern number and coordinate distances. The distances are in reference to the span geometry wherein the intersection of the longitudinal centerline and the first support line is considered to be the span origin. This is shown in the sketch on page 5.

Pattern No.	No. of Placements	These decimal distances are from the span origin											
		X	Y	X	Y	X	Y	X	Y	X	Y	X	Y

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

TABLE 7. SUMMATION OF BOX BENDING MOMENTS (maximum of 10 cards - none if kept)

This table may be kept for any type of problem or input for each problem.

The locations at which the longitudinal box bending moments will be summed are defined by this table. The summations are the total bending moment in the box and may be used directly for design purposes.

Sums may be for any or all boxes within the span. For instance, if the span has 5 boxes as in the sketch on page 5, the first 3 were specified by Table 4 but any of the 5 boxes may be summed. Any location along the span of the box may be summed.

Distances to the summation locations are in reference to the span coordinate system as shown on page 5.

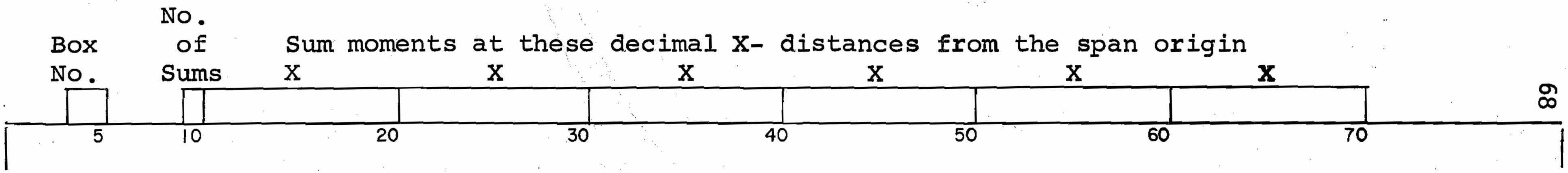


TABLE 8. PROFILE OUTPUT AREAS (maximum of 10 cards - none if kept)

This table may be kept for any type of problem or input for each problem.

Profile output is helpful in displaying the variation of deflections or moments along a beam line or transversely across the span. Deflection, bending moment in the X or Y direction, and maximum principal moment may be displayed. The profiles are presented in the form of crude printer plots for each area specified. The plots have a width of 20 print characters. Each plot has no scale or zero reference. The values are relative to one another, increasing positively to the right.

The profile output area limits are those SLAB49 stations which are nearest these input values of from and thru distance coordinates. The coordinates are with reference to the span origin.

Distances are input in F5.0 format. Thus 12345 is interpreted as 12345.0 and 12.34 is interpreted as input.

From		Thru		Enter 1 for			
X	Y	X	Y	Defl	X-Mom	Y-Mom	Principal Moment
				☐	☐	☐	☐

1 5 10 15 20 25 30 35 40

The from and thru decimal distances refer to the span origin.

TABLE 9. PRINTED OUTPUT LIMITS (maximum of 10 cards - none if kept)

This table may be kept for any type of problem or input for each problem.

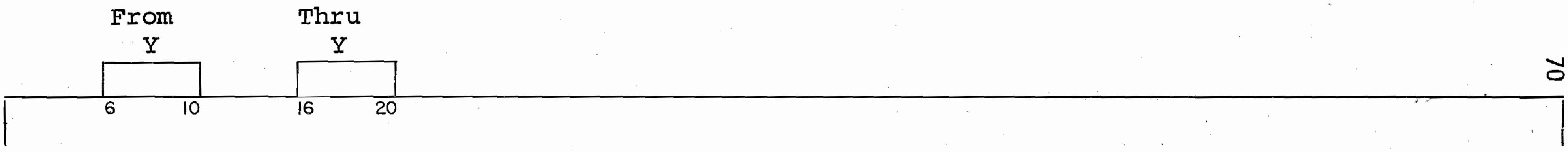
This table may be omitted in which case the complete detailed SLAB49 output is obtained.

Partial SLAB49 detailed output may be obtained by specifying Y-bounded limits designated on each card. The nearest SLAB49 Y-station to the Y-distances specified here is used for the limit of the section.

Y-bounded areas may overlap or be contiguous.

For most multi-beam box solutions, it is best to print the Y-bounded area for the box at or adjacent to the structure centerline unless an edge box is under investigation.

Distances to the Y-bounded areas are in reference to Right (negative) or Left (positive) distances from the span centerline as shown on page 5.



APPENDIX C

NOTATION AND LISTING

PROGRAM SLBDG 2

```
C-----NOTATION FOR PROGRAM SLBDG2                                       10AG77
C      SLBDG2 IS DEPENDENT ON PROGRAM SLAB49 FOR SOLUTION, THE SLAB49   10AG77
C      NOTATION SHOULD ALSO BE USED WHEN REFERRING TO THIS NOTATION.    10AG77
C     ADIST          X DIST BETW SUPPORT LINE AND FIRST SUPPORT SPRING  01MY77
C     AN1( ), AN2( ) ALPHANUMERIC PRINT HEADING IDENTIFIERS             01MY77
C     ATEST( )       TWO BLANKS USED IN TESTING PRINT HEADING TYPE      01MY77
C     BD( )          BOX DEPTH                                          01MY77
C     BOIST          X DIST BETW SUPPORT LINE AND SECOND SUPPORT SPRING 01MY77
C     BME            BENDING MODULUS OF ELASTICITY                      01MY77
C     BMI( )         BOX MOMENT OF INERTIA                              01MY77
C     BTI( )         BOX TORSIONAL INERTIA (2 X EQUIV SLAB TWIST STIFF) 01MY77
C     CH( )          TWISTING STIFFNESS OF EQUIV SLAB                   01MY77
C     CHN( )         GENERATED SLAB49 TWISTING STIFFNESS                01MY77
C     DISTRB         SUBROUTINE NAME - DISTRIBUTES LOAD TO SURROUND JTS 01MY77
C     DX( )          X STIFFNESS IN LONGIT DIRECTION                    01MY77
C     DXN( )         GENERATED SLAB49 SLAB STIFFNESS IN X DIRECTION     01MY77
C     DY1( )         HALF OF WEB Y STIFFNESS TIMES SHEAR KEY STIFF FACT 01MY77
C     DY2( )         WEB Y STIFFNESS                                    01MY77
C     DY3( )         SUM OF TOP AND BOTTOM SLAB Y STIFFNESSES           01MY77
C     DYN( )         GENERATED SLAB49 SLAB STIFFNESS IN Y DIRECTION     01MY77
C     FXN( ), FYN( ) GENERATED SLAB49 BEAM STIFFNESSES (SET TO 0.0)     01MY77
C     HX             INCREMENT LENGTH IN X DIRECTION (SPAN DIRECTION)   01MY77
C     HY             INCREMENT LENGTH IN Y DIRECTION (TRANSVERSE)       01MY77
C     I              TEMPORARY INDEX                                    01MY77
C     IBN( )         BOX NUMBER TO HAVE X MOMENT SUMMED                 01MY77
C     IHDG           PRINT HEADING SWITCH                               01MY77
C     II             TEMPORARY VALUE NUM OF SUMS FOR THE BOX            01MY77
C     IN13( ) THRU   GENERATED -FROM- X STATION USED                    01MY77
C        IN18( )        IN SLAB49 TABLES 3 THRU 8                       01MY77
C     IN23( ) THRU   GENERATED  -TO-  X STATION USED                    01MY77
C        IN28( )        IN SLAB49 TABLES 3 THRU 8                       01MY77
C     INCRW( )       NUM OF Y INCRS IN WIDTH OF BOX                     01MY77
C     INLP( )        NUMBER OF LOADS IN THE PATTERN                     01MY77
C     INP            INPUT UNIT DESIGNATION = 5                         01MY77
C     INPP( )        NUM OF PLACEMENTS OF THE PATTERN                   01MY77
C     INS( )         NUM OF SUMS FOR THE BOX                            01MY77
C     IOP            OUTPUT UNIT DESIGNATION = 6                        01MY77
C     IPGND          OPTION TO PRINT GENERATED SLAB49 DATA IF = 1       01MY77
C     IPN( )         LOAD PATTERN NUMBER                                01MY77
C     IPNP( )        LOAD PATTERN NUM PLACEMENT                         01MY77
C     IR1            X-STA OF FIRST SUPPORT SPRING PRIOR TO SUPPORT LINE 01MY77
C     ISTA( )        ARRAY OF 4 X-STAS OF JOINTS SURROUNDING LOAD       01MY77
C     ITB( )         ARRAY OF BOX ARRANGEMENT BY TYPE NUM UP TO CNTR L  01MY77
C     ITEST( )       RUN TERMINATOR = CEASE OR BLANKS                   01MY77
C     ITYPB( )       TYPE NUMBER OF BOX                                 01MY77
C     IXO            NO. OF X INCRS FROM ORIGIN TO CL AT BENT           10AG77
C     J              TEMPORARY INDEX                                    01MY77
C     JJ             TEMPORARY INDEX                                    01MY77
C     JN13( ) THRU   GENERATED -FROM- Y STATION USED                    01MY77
C        JN19( )        IN SLAB49 TABLES 3 THRU 8                       01MY77
C     JN23( ) THRU   GENERATED  -TO-  Y STATION USED                    01MY77
C        JN29( )        IN SLAB49 TABLES 3 THRU 8                       01MY77
C     JNT            TEMPORARY INDEX FOR JOINT LOAD ALLOCATION          01MY77
C     JSTA( )        ARRAY OF 4 Y-STAS OF JOINTS SURROUNDING LOAD       01MY77
C     JTT            CLOCK PARAMETER                                    01MY77
C     JYS            ACCUMULATED NUMBER OF Y STATIONS                   01MY77
C     K              TEMPORARY INDEX, USUALLY BOX TYPE NUM              01MY77
C     KASEP( )       TABLE 8 PRINCIPAL MOMENT OPTION                    01MY77
C     KASEW( )       TABLE 8 DEFLECTION OPTION                          01MY77
C     KASEX( )       TABLE 8 X BENDING MOMENT OPTION                    01MY77
C     KASEY( )       TABLE 8 Y BENDING MOMENT OPTION                    01MY77
C     KEEP2 -        OPTIONS TO KEEP DATA FROM PRIOR PROBLEM            01MY77
C        KEEP9          IN TABLES 2 THRU 9                              01MY77
C     KEEPT          SUM OF KEEP2 THRU KEEP9                            01MY77
C     KK             TEMPORARY INDEX                                    01MY77
C     KLO            INDEX = 1 IF LOAD IS ON STRUCTURE, = 0 IF OFF      01MY77
C     KPG2 THRU KPG9 GENERATED KEEP OPTIONS FOR SLAB49 TABLES 2 THRU 9  01MY77
C     KPN            TEMPORARY INDEX FOR PATTERN NUMBER                 01MY77
C     KTBA( )        ARRAY OF COMPLETE BOX TYPE ARRANGEMENT             01MY77
C     L              TEMPORARY INDEX, USUALLY FOR REVERSE ORDER         01MY77
C     LOCATE         SUBROUTINE NAME - DETERMINES IF ON OR OFF STRUCTURE 01MY77
C     ML             MULTIPLE LOADING SWITCH                            01MY77
C     MODEV          EQUALS 1 IF ODD NUMBER OF BOXES, 0 IF EVEN         01MY77
C     MX             TOTAL NUM OF X INCRS FOR SLAB49                    01MY77
C     MXS            NUM OF X INCREMENTS IN SPAN OF STRUCTURE           01MY77
C     MY             TOTAL NUM OF Y INCRS ACROSS WIDTH OF STRUCTURE     01MY77
C     MYINCR         SUM OF Y INCREMENTS IN SPECIFIED BOXES             01MY77
C     MYP1           NUMBER OF Y INCREMENTS IN Y DIRECTION PLUS 1       01MY77
C     N              TEMPORARY INDEX                                    01MY77
C     NB             NUMBER OF BOXES SPECIFIED UP TO CENTERLINE         01MY77
C     NBP1           NUM BOXES SPECIFIED UP TO CENTERLINE PLUS 1        10AG77
C     NBSM           NUMBER OF BOXES WHICH HAVE MOMENTS SUMMED          01MY77
C     NBT            TOTAL NUMBER OF BOXES ACROSS STRUCTURE             01MY77
C     NCDT           SUM OF NCO2 THROUGH NCD9                           01MY77
C     NCD2 - NCD9    NUM OF CARDS INPUT IN TABLE 2 THRU 9               01MY77
C     NCG2 THRU NCG9 GENERATED NUM OF SLAB49 CARD IMAGES TABLES 2 THRU 9 01MY77
C     NCG3T          TEMPORARY VALUE OF NCG3                            01MY77
C     NCT3 - NCT9    TOTAL NUMBER OF CARDS IN TABLE 3 THRU 9            01MY77
C     NDES           ACCUMULATED DATA ERRORS                            01MY77
C     NDE1 - NDE9    ACCUMULATED NUM OF DATA ERRORS IN TABLE 1 THRU 9   01MY77
C     NJ             NUMBER OF JOINTS TO WHICH LOAD IS ALLOCATED        01MY77
C     NLP            TEMPORARY VALUE OF NUM LOADS IN THE PATTERN        01MY77
C     NPN            TOTAL NUMBER OF LOAD PATTERNS                      01MY77
C     NPP            TEMPORARY VALUE OF NUM OF PLACEMENTS OF THE PATTERN 01MY77
C     NPROB( )       PROBLEM NUMBER                                     01MY77
C     NXSO           NUMBER OF X STATIONS OFF THE STRUCTURE             01MY77
C     NYM            NUMBER OF Y INCREMENTS ACROSS THE BOX              01MY77
C     NYS            NUMBER OF Y STATIONS ACROSS THE BOX                01MY77
C     OMPR2          1 MINUS POISSONS RATIO SQUARED                     01MY77
C     OPPR           1 PLUS POISSONS RATIO                              01MY77
C     PBXN(), PBYN() GENERATED SLAB49 BEAM THRUSTS (SET TO 0.0)         01MY77
C     PCX( , )       X DISTANCE FROM PATTERN REFERENCE TO LOAD POINT    01MY77
C     PCY( , )       Y DISTANCE FROM PATTERN REFERENCE TO LOAD POINT    01MY77
C     PI             CIRCULAR CONSTANT = 3.1415927                      01MY77
C     PR             POISSONS RATIO                                     01MY77
C     PSS            AXIAL THRUST BETW S1 AND S2 TO FORM SUPPORT SYSTEM 10AG77
C     PXN( )         GENERATED SLAB49 AXIAL THRUST FOR SUPPORT SYSTEM   01MY77
C     PYN( )         GENERATED SLAB49 AXIAL THRUST IN Y-DIR (SET TO 0.0) 01MY77
C     QMN( )         GENERATED SLAB49 LOAD                              01MY77
C     QN( )          GENERATED SLAB49 LOAD IN TABLE 4  (SET TO 0.0)     01MY77
C     QOHXY          LOAD DIVIDED BY HX AND HY                          01MY77
C     QP             CONCENTRATED LOAD IN THE LOAD PATTERN              10AG77
C     QPA( )         ARRAY OF 4 LOADS AT JOINTS SURROUNDING LOAD        01MY77
C     QPOSUM         SUM OF LOADS PLACED OFF THE SLAB                   01MY77
C     QPSUM          SUM OF LOADS PLACED ON THE SLAB                    01MY77
C     RJYO           HALF WIDTH OF STRUCTURE IN DECIMAL Y STATIONS      01MY77
C     RMLL( , )      CONCENTRATED LOAD IN THE PATTERN                   01MY77
C     RXN( ), RYN( ) GENERATED SLAB49 ROTATIONAL STIFFNESS (SET TO 0.0) 01MY77
C     RXO            X DIST FROM STRUCTURE ORIGIN TO MODEL ORIGIN       01MY77
C     RYO            Y DIST FROM STRUCTURE ORIGIN TO MODEL ORIGIN       01MY77
C     SA             COMPUTED SKEW ANGLE IN RADIANS                     01MY77
C     SAI            SKEW ANGLE INPUT                                   01MY77
C     SCX( , )       X DIST FROM STRUCTURE ORIGIN TO PATTERN REF POINT  01MY77
C     SCY( , )       Y DIST FROM STRUCTURE ORIGIN TO PATTERN REF POINT  01MY77
C     SKSF( )        SHEAR KEY TRANSVERSE STIFFNESS FACTOR (1.0 = FULL) 01MY77
C     SLAB49         SUBROUTINE NAME - THIS IS THE MAJOR ROUTINE USED   01MY77
C                       BY SLBDG2.  IT IS DOCUMENTED IN REPORT 56-25    10AG77
C     SMX( , )       X DIST FROM STRUCTURE ORIGIN TO X MOM SUM LOCATION 01MY77
C     SN( )          GENERATED SLAB49 SUPPORT SPRING STIFFNESS          01MY77
C     SS             SUPPORT SPRING (1.0E6 USED TO AVOID ROUNDOFF)      01MY77
C     S1             FIRST SUPPORT SPRING                               01MY77
C     S2             SECOND SUPPORT SPRING                              01MY77
C     TANSA          TANGENT OF THE SKEW ANGLE                          01MY77
C     THKB( )        THICKNESS OF BOTTOM SLAB                           01MY77
C     THKT( )        THICKNESS OF TOP SLAB                              01MY77
C     TICTOC         SUBROUTINE NAME - PRINTS COMPUTATION TIME          01MY77
C     TXN( ), TYN( ) GENERATED SLAB49 APPLIED MOMENTS (SET TO 0.0)      01MY77
C     VW( )          VOID WIDTH OF BOX                                  01MY77
C     WEB            BOX WEB WIDTH FROM EDGE OF VOID TO CL JOINT        01MY77
C     XD             X DISTANCE FROM STRUCTURE ORIGIN                   01MY77
C     XDT            TOTAL X DIST FROM STRUCTURE ORIGIN                 01MY77
C     XLNGTH         X LENGTH OF STRUCTURE ALONG CENTERLINE             01MY77
C     XN18( )        -FROM- X DIST FOR TABLE 8 PROFILE OUTPUT AREAS     01MY77
C     XN28( )         -TO-  X DIST FOR TABLE 8 PROFILE OUTPUT AREAS     01MY77
C     XO             X DISTANCE FROM STA JUST PRIOR TO LOAD TO THE LOAD 01MY77
C     XT             TANGENT OF SKEW ANGLE TIMES YO                     10AG77
C     YO             Y DISTANCE FROM STRUCTURE ORIGIN                   01MY77
C     YN18( )        -FROM- Y DIST FOR TABLE 8 PROFILE OUTPUT AREAS     01MY77
```

```
C     YN19( )          -FROM-  Y DIST FOR TABLE 9 SELECTED OUTPUT          01MY77
C     YN28( )           -TO-   Y DIST FOR TABLE 8 PROFILE OUTPUT AREAS     01MY77
C     YN29( )           -TO-   Y DIST FOR TABLE 9 SELECTED OUTPUT          01MY77
C     YO               Y DISTANCE FROM STA JUST PRIOR TO LOAD TO THE LOAD  01MY77
C     YWIDTH           Y WIDTH OF STRUCTURE                                01MY77
```

The additional variables added to the SLAB49 and SB49S routines (Ref 8) to allow selective summation of individual box beam bending moments are shown below. Some variables defined above for SLBDG2 are also used in that same area of SB49S. All remaining variables in SLAB49 and its associated routines are unchanged. Their definitions may be found in Ref 8.

```
C-----NOTATION ADDED TO SLAB 49                                         10AG77
C      SOME OF THE ABOVE VARIABLES ARE ALSO USED IN SLAB49 FOR THE BOX  10AG77
C      MOMENT SUMMATIONS.                                               10AG77
C     IDUM            DUMMY INTEGER FOR BOUNDRY ALIGNMENT               10AG77
C     SUM( , )        BOX MOMENT SUM                                    10AG77
C     SUMT( , )       BOX MOMENT SUM TEMPORARY                          10AG77
C     ISM( , )        CLOSEST X STATION TO MOMENT SUM LOCATION          10AG77
C     JSM( )          BOX NO. TO HAVE MOMENTS SUMMED                    10AG77
C     JY1             Y STATION AT RT OF BOX TO BE SUMMED               10AG77
C     JY2             Y STATION AT LT OF BOX TO BE SUMMED               10AG77
C     JP2             TEMPORARY INDEX EQUAL TO J + 2                    10AG77
C     II              X STATION INDEX FOR BOX MOMENT SUM                10AG77
C     IIT             X STATION INDEX FOR BOX MOMENT SUM TEMPORARY      10AG77
```

```
C     PROGRAM SLBDG2 -- DATA GENERATOR FOR SKEWED MULTI-BEAM PRECAST    10AG77
C     BOXES.  DATA IS PASSED TO SLAB49 AS A SUBROUTINE FOR ANALYSIS.    10AG77
      IMPLICIT REAL*8 (A-H, O-Z)                                        03MR77
      DIMENSION  ATEST(2), ITEST(4)                                     04MR77
      DIMENSION  ITYPB(10),             BD(10),    VW(10),  THKT(10),   04AP77
     1           THKB(10),  SKSF(10),   BMI(10),   BTI(10),   ITB(16),  04AP77
     2            IPN(10),  INLP(10), PCX(10,6), PCY(10,6),RMLL(10,6),  04AP77
     3           IPNP(10),  INPP(10), SCX(10,6), SCY(10,6),             04AP77
     4           XN18(10),  YN18(10),  XN28(10),  YN28(10),             04AP77
     5                      YN19(10),             YN29(10)              04AP77
      DIMENSION  CH(10)                                                 10SE76
      DIMENSION             DY1(10), DY2(10), DY3(10), DX(10)           04AP77
      COMMON / BLK1 / HX, HY, TANSA, MXS, MY, IXO, ML, MX, IPGND, PR    14MR77
      COMMON / BLK2 / ISTA(4), JSTA(4), QPA(4)                          04FE77
      COMMON / BLK3 / KPG2, KPG3, KPG4, KPG5, KPG6, KPG7, KPG8, KPG9,   04AP77
     1                NCG2, NCG3, NCG4, NCG5, NCG6, NCG7, NCG8, NCG9    04AP77
      COMMON / BLK4 /   IBN(10), INS(10), SMX(10,6),                    04AP77
     1                 KTBA(32), INCRW(10), NBT, NBSM                   04AP77
      COMMON /CARDS/ AN1(46), AN2(18), NPROB(2),                        10AG77
     1         IN13(300), JN13(300), IN23(300), JN23(300), OXN(300),    03MR77
     2          DYN(300),  FXN(300),  FYN(300),   QN(300),  SN(300),    03MR77
     3         IN14( 50), JN14( 50), IN24( 50), JN24( 50),              03MR77
     4          RXN( 50),  RYN( 50),  TXN( 50),  TYN( 50),              03MR77
     5         IN15(100), JN15(100), IN25(100), JN25(100), CHN(100),    03MR77
     6         IN16(150), JN16(150), IN26(150), JN26(150),              12MR77
     7          PXN(150),  PYN(150), PBXN(150), PBYN(150),              12MR77
     8         IN17(100), JN17(100), IN27(100), JN27(100), QMN(100),    03MR77
     9         IN18( 10), JN18( 10), IN28( 10), JN28( 10),              03MR77
     A       KASEW( 10),KASEX( 10),KASEY( 10),KASEP( 10),               03MR77
     B                   JN19( 10),             JN29( 10)               03MR77
      DATA  ITEST(1), ITEST(2), ITEST(3), ITEST(4), ATEST(1), ATEST(2)  26AP76ID
     1   /  1HC     ,  4HEASE ,  1H      ,  4H      ,  2H     ,  4H     / 26AP76ID
    1 FORMAT (    50H     PROGRAM SLBDG2   BRIDGE DIVISION, TEXAS DOHPT  10AG77
     2            35H   PANAK    REVISION DATE 10 AUG 77      /     )   REVISED
    2 FORMAT (    10H       PSF , 15X, 25H HIGHWAY  PD-    CONTROL-,    30AP76ID
     1            10H   CODED                                           04SE75ID
     2   /        50H       NO       COUNTY         NO    IPE  SECTION-JO 25JL75ID
     3            35HB    BY     DATE                           )       25JL75ID
    6 FORMAT (     )                                                    31DC75ID
   11 FORMAT  (  5H1     ,80X   10HI-----TRIM  )                        25JL75ID
   12 FORMAT (     5(A2,A3), A3, 2(A2,A4), 2(3A4,A2), 3A4 / 20A4 )     10AG77ID
   13 FORMAT ( 5X, 5(A2,A3), A3, 2(A2,A4), 2(3A4,A2), 3A4 // 5X, 20A4 ) 10AG77ID
   14 FORMAT ( A1, A4, 5X, 17A4, A2        )                            25JL75ID
   15 FORMAT (  /10H     PROB , /5X, A1, A4, 5X, 17A4, A2 )             25JL75ID
   16 FORMAT (  /17H     PROB (CONTD), /5X, A1, A4, 5X, 17A4, A2, // )  25JL75ID
   18 FORMAT (// 50H     ***** ERROR - BLANK PROB NO. IS NOT ALLOWED,   02JA76ID
     1            25HRUN IS TERMINATED *****                 )          02JA76ID
   20 FORMAT ( 8I5, 5X, I5,          20X, I5, 5X, / , 8I5, 10X, E10.3 ) 14AP77
   21 FORMAT ( 2I5, 10X,     4E10.3 )                                   10SE76
   33 FORMAT ( 2I5, 5X, 4F5.2, 5X, F5.2, 5X, 2E10.3 )                   10SE76
   43 FORMAT ( 16 ( I5 ) )                                              10SE76
   53 FORMAT ( 2I5, 12F5.0 )                                            07FE77
   54 FORMAT ( 10X, 7E10.4 )                                            10SE76
   63 FORMAT ( 2I5, 12F5.0 )                                            07FE77
   73 FORMAT ( 2I5, 7F5.0  )                                            28AP77
   83 FORMAT ( 4F5.0, 4I5 )                                             10MR77
   93 FORMAT ( 2F10.0 )                                                 10MR77
  100 FORMAT ( //30H     TABLE 1.  CONTROL DATA      ,                  09SE76
     1    / 55X, 20H     TABLE NUMBER      ,                            09SE76
     2    / 40X, 45H        2    3    4    5    6    7    8    9        09SE76
     3   //  5X, 40H     KEEP FROM PRECEDING PROBLEM (1=YES)  , 8I5,    09SE76
     4    /  5X, 40H     NUM CARDS INPUT THIS PROBLEM         , 8I5     09SE76
     5   //  5X, 25H     MULTIPLE LOAD OPTION  ,  15X, I5,              09SE76
     6    /  5X, 25H     PRINT GENERATED DATA  ,  15X, I5,              09SE76
     7    /  5X, 25H     SKEW ANGLE            ,  15X, E10.3 )          09SE76
  200 FORMAT ( //24H     TABLE 2.  CONSTANTS )                          09SE76
  201 FORMAT ( / 50H           NUMBER OF SPAN INCREMENTS IN X DIRECTION, 16MR77
     1                30X, I5,                                          16MR77
     2    / 10X, 35HNUMBER OF INCREMENTS IN Y DIRECTION     , 35X, I5,  09SE76
     3    / 10X, 35HINCREMENT LENGTH IN X DIRECTION (AL                 03MR77
     A           20HONG SPAN CENTERLINE)                , 10X, 1PE10.3, 10MR77
     4    / 10X, 35HINCREMENT LENGTH IN Y DIRECTION     , 30X, 1PE10.3, 09SE76
     5    / 10X, 35HPOISSONS RATIO                      , 30X, 1PE10.3, 09SE76
     6    / 10X, 35HMODULUS OF ELASTICITY               , 30X, 1PE10.3 ) 09SE76
```

```
  300 FORMAT (  /34H     TABLE 3.  BOX STIFFNESS DATA  / )              09SE76
  301 FORMAT (    52H        TYPE  NO. INCR  BOX  VOID   SLAB THICK   SHEA09SE76
     2            33HR KEY       LONGIT. BOX INERTIAS                   09SE76
     3   /        52H        NO.   IN WIDTH  DEP  WIDTH    TOP  BOT   STIF09SE76
     4            33HF FACTOR      MOMENT    TORSIONAL )                09SE76
  311 FORMAT ( 8X, I2, 4X, I6, 2( 2X, F5.2, 1X, F5.2 ), 3X, E11.3, 3X,  02JJ77
     1        1P2E11.3 )                                                09SE76
  400 FORMAT (  /43H     TABLE 4.  BOX ARRANGEMENT BY TYPE NO.   / )    09SE76
  411 FORMAT ( 5X, 16( 3X, I2 )  )                                      09SE76
  500 FORMAT (  /29H     TABLE 5.  LOAD PATTERNS )                      09SE76
  501 FORMAT (  /50H     PAT                   X AND Y DISTANCES (OF THE 02JU77
     1            14H LOAD PATTERN)                                     09SE76
     2           /51H     LDS                               LOAD MAGNITUDE)09SE76
  511 FORMAT ( 4X, I2, 2X, 12F5.0  )                                    08FE77
  512 FORMAT ( 5X, I2, 1X, 1P7E11.3)                                    09SE76
  600 FORMAT ( //42H     TABLE 6.  PLACEMENTS OF LOAD PATTERNS  / )     10AG77
  601 FORMAT (    50H    PAT-PLMTS             X AND Y DISTANCES (OF THE 02JU77
     1            11H STRUCTURE))                                       09SE76
  611 FORMAT ( 5X, I2, 3X, I2, 3X, 12F5.0 )                             08FE77
  700 FORMAT ( //50H     TABLE 7.  SUMMATION OF BOX BENDING MOMENTS     10AG77
     1  //        50H         BOX  SUMS          SUM AT X-STATION NEAREST  04AP77
     1            20HTHESE X-DISTANCES        )                         11MR77
  712 FORMAT ( 5X, 2I5, 7F10.0 )                                        10MR77
  800 FORMAT ( //35H     TABLE 8.  PROFILE OUTPUT AREAS    ,            09SE76
     1   //       45H      DISTS FROM - THRU     DEFL      X MOM        02JJ77
     2            20H  Y MOM    PRIN MOM                                10MR77
     3   /        50H      X     Y     X     Y                (1=YES) ) 10MR77
  811 FORMAT ( 5X, 4F5.0, I5, 3I10 )                                    10MR77
  900 FORMAT ( //40H     TABLE 9.  PRINTED OUTPUT LIMITS        ,       09SE76
     1   //       25H      Y-DIST FROM - THRU                           02JU77
     2   /        25H            Y           Y    )                     17MR77
  903 FORMAT ( / 25H                   NONE )                           09SE76
  905 FORMAT (    46H           USING DATA FROM THE PREVIOUS PROBLEM )  09SE76
  910 FORMAT (    43H           ADDITIONAL DATA FOR THIS PROBLEM  )     09SE76
  911 FORMAT ( 5X, 2F10.0 )                                             10MR77
  980 FORMAT (///40H     **** UNDESIGNATED ERROR STOP ****        )     25JL75ID
  991 FORMAT (  /10H     **** , I4,                                     10SE76
     1            33H  DATA ERRORS IN THIS TABLE  ****  )               10SE76
C-----DEFINE READ AND WRITE UNITS                                       27AG75ID
                INP = 5                                                 25JL75ID
                IOP = 6                                                 25JL75ID
C-----INITIALIZE CLOCK AND SET PSW MASK FOR UNDERFLOWS                  25JL75ID
                JTT = 1                                                 21DC75ID
      CALL TICTOC(JTT)                                                  21DC75ID
                JTT = 2                                                 21DC75ID
C-----BEGIN EXECUTION AND INITIALIZE CONSTANTS                          13SE75ID
      READ (INP,12) ( AN1(N),N = 1, 46 )                                10AG77ID
C----  - RETURN HERE TO READ NEW PROBLEM                                25JL75ID
 1010 READ (INP,14) NPROB(1), NPROB(2), ( AN2(II), II = 1, 18 )         25JL75ID
C----  - IF NPROB = CEASE, TERMINATE RUN                                25JL75ID
          IF (NPROB(1) .EQ. ITEST(1) .AND. NPROB(2) .EQ. ITEST(2))      26AP76ID
     2                                                  GO TO 9990      25JL75ID
          IF ( NPROB(1) .EQ. ITEST(3)  .AND.  NPROB(2) .EQ. ITEST(4) )  26AP76ID
     1                                                     GO TO 1015   02JA76ID
          GO TO  1020                                                   02JA76ID
 1015 WRITE (IOP,  18)                                                  02JA76ID
          GO TO 9990                                                    02JA76ID
 1020     IF ( AN1( 3) .NE. ATEST(1) ) GO TO 1024                       26AP76ID
          IF ( AN1( 9) .NE. ATEST(1) ) GO TO 1024                       26AP76ID
          IF ( AN1(12) .NE. ATEST(1) ) GO TO 1024                       26AP76ID
          IF ( AN1(14) .NE. ATEST(1) ) GO TO 1024                       26AP76ID
               IHDG = 0                                                 25JL75ID
          GO TO 1030                                                    25JL75ID
 1024          IHDG = 1                                                 25JL75ID
 1030 WRITE (IOP,11)                                                    25JL75ID
      WRITE (IOP, 1)                                                    25JL75ID
          IF ( IHDG .EQ. 0 ) GO TO 1032                                 25JL75ID
          GO TO 1034                                                    25JL75ID
 1032 WRITE (IOP, 2)                                                    25JL75ID
          IF ( AN1(20) .EQ. ATEST(2) )  CALL GETDAY ( AN1(20) )         26AP76ID
 1034 WRITE (IOP,13) ( AN1(N), N = 1, 46 )                              10AG77ID
      WRITE (IOP,15)  NPROB(1), NPROB(2), ( AN2(N), N = 1, 18 )         25JL75ID
C                                                                       10SE76
C-----INPUT TABLE 1  CONTROL DATA                                       09SE76
```

```
C                                                                       09SE76
      READ   20, KEEP2, KEEP3, KEEP4, KEEP5, KEEP6, KEEP7, KEEP8,       09SE76
     1            KEEP9, ML,     IPGND, NCD2, NCD3, NCD4, NCD5, NCD6,   14AP77
     2            NCD7, NCD8, NCD9, SAI                                 09SE76
      PRINT 100, KEEP2, KEEP3, KEEP4, KEEP5, KEEP6, KEEP7, KEEP8,       09SE76
     1            KEEP9,     NCD2, NCD3, NCD4, NCD5, NCD6, NCD7,        09SE76
     2            NCD8, NCD9, ML, IPGND, SAI                            09SE76
               NDE1 = 0                                                 16MR77
          IF ( ML .EQ. 0 )      GO TO 1040                              16MR77
          IF ( ML .EQ. 1 )      GO TO 1040                              16MR77
          IF (( KEEP2 * KEEP3 * KEEP4 ) .EQ. 0 )      NDE1 = NDE1 + 1   16MR77
          IF (( NCD2 + NCD3 + NCD4 ) .GT. 0 )     NDE1 = NDE1 + 1       16MR77
 1040          KEEPT = KEEP2 + KEEP3 + KEEP4 + KEEP5 + KEEP6 + KEEP7 +  16MR77
     1                KEEP8 + KEEP9                                     14MR77
               NCDT = NCD2+NCD3+NCD4+NCD5+NCD6+NCD7+NCD8+NCD9           14MR77
          IF ( KEEPT .GT. 8 )       NDE1 = NDE1 + 1                     16MR77
          IF ( NCDT .GT. 72 )       NDE1 = NDE1 + 1                     16MR77
          IF ( NDE1 .GT. 0 )      WRITE ( IOP,991 ) NDE1                16MR77
C-----INPUT TABLE 2 -- CONSTANTS                                        09SE76
C                                                                       09SE76
      PRINT 200                                                         09SE76
          IF ( KEEP2 ) 9980, 1202, 1210                                 09SE76
 1202 READ   21, MXS, MY, HX, HY, PR, BME                               10FE77
          GO TO 1212                                                    09SE76
 1210 WRITE ( IOP, 905 )                                                09SE76
 1212 PRINT 201, MXS, MY, HX, HY, PR, BME                               10FE77
               NDE2 = 0                                                 16MR77
          IF ( BME .EQ. 0.0 )      NDE2 = NDE2 + 1                      16MR77
          IF (( HX * HY ) .EQ. 0.0 )      NDE2 = NDE2 + 1               16MR77
          IF (( MXS * MY ) .EQ. 0 )       NDE2 = NDE2 + 1               16MR77
          IF ( NDE2 .GT. 0 )              WRITE ( IOP, 991 ) NDE2       16MR77
C                                                                       09SE76
C-----COMPUTE SKEW PARAMETERS                                           10MR77
               PI = 3.1415927                                           10FE77
               SA = SAI * PI / 180.0                                    10FE77
               TANSA = DTAN(SA)                                         03MR77
               RYO = -MY / 2.0                                          02FE77
               RXO = RYO * HY * TANSA / HX                              14FE77
               IXO = RXO                                                02FE77
          IF ((RXO - IXO) .EQ. 0.0 )    GO TO 1300                      10MR77
               IXO = IXO - 1                                            02FE77
 1300          MX = MXS - 2 * IXO                                       17MR77
C                                                                       10MR77
C-----INPUT TABLE 3 BOX STIFFNESS DATA                                  09SE76
      WRITE  (IOP, 300 )                                                17MR77
          IF ( KEEP3 )  9980, 1302, 1310                                09SE76
 1302          NCT3 = NCD3                                              09SE76
          DO 1305  N = 1, NCD3                                          09SE76
      READ  (INP,   33)  ITYPB(N), INCRW(N), BD(N), VW(N), THKT(N),     09SE76
     1                   THKB(N), SKSF(N), BMI(N), BTI(N)               09SE76
 1305     CONTINUE                                                      09SE76
          GO TO 1312                                                    09SE76
 1310 PRINT 905                                                         09SE76
 1312 WRITE (IOP, 301)                                                  09SE76
               NDE3 = 0                                                 16MR77
          IF ( NCD3 .GT. 10 )      NDE3 = NDE3 + 1                      16MR77
          DO 1315  N = 1,NCT3                                           09SE76
      WRITE (IOP, 311)  ITYPB(N), INCRW(N), BD(N), VW(N), THKT(N),      09SE76
     1                   THKB(N), SKSF(N), BMI(N), BTI(N)               09SE76
          IF ( INCRW(N) .EQ.0 )      NDE3 = NDE3 + 1                    16MR77
 1315     CONTINUE                                                      09SE76
          IF ( NDE3 .GT. 0 )      WRITE ( IOP, 991 ) NDE3               16MR77
C-----INPUT TABLE 4 BOX ARRANGEMENT                                     09SE76
      WRITE  (IOP, 400)                                                 09SE76
          IF ( KEEP4)  9980, 1402, 1410                                 09SE76
 1402          NDE4 = 0                                                 09FE77
      READ  (INP,   43) (ITB  (N), N = 1, 16 )                          09FE77
          GO TO 1411                                                    09SE76
 1410 PRINT 905                                                         09SE76
 1411          K = 0                                                    09SE76
          DO 1412  N = 1 ,  16                                          09SE76
          IF (ITB  (N) .EQ. 0 ) GO TO 1415                              09SE76
               K = K + 1                                                09SE76
 1412 CONTINUE                                                          09SE76
```

```
 1415 WRITE (IOP, 411) (ITB  (N), N = 1, K )                            09SE76
               NB = K                                                   09SE76
          IF ( ITB(1) .EQ. 0  )  NDE4 = NDE4 + 1                        17MR77
          IF ( NDE4 .GT. 0 )      WRITE ( IOP, 991 ) NDE4               16MR77
C-----INPUT TABLE 5  LOAD PATTERNS                                      09SE76
      WRITE (IOP, 500)                                                  09SE76
          IF ( KEEP5)  9980, 1502, 1510                                 09SE76
 1502          NPN= NCD5/2                                              09SE76
               NDE5 = 0                                                 16MR77
          IF ( NPN .GT. 10 )      NDE5 = NDE5 + 1                       16MR77
          DO 1505  N = 1 , NPN                                          09SE76
      READ  (INP,   53)  IPN(N), INLP(N),( PCX(N,J),  PCY(N,J),         09SE76
     1      J = 1, 6 )                                                  09FE77
      READ  (INP,   54) (RMLL( N,J), J = 1, 6 )                         09FE77
          IF (( IPN(N) * INLP(N) ) .EQ. 0 )      NDE5 = NDE5 + 1        16MR77
 1505     CONTINUE                                                      09SE76
          GO TO 1512                                                    09SE76
 1510 PRINT 905                                                         09SE76
 1512 WRITE (IOP, 501)                                                  09SE76
          DO 1515  N = 1, NPN                                           09SE76
               NLP = INLP(N)                                            09SE76
      WRITE (IOP, 511)  IPN(N), ( PCX(N,J),  PCY(N,J), J = 1, NLP )     09SE76
      WRITE (IOP, 512)  INLP(N), (RMLL(N,J), J = 1 , NLP )              09SE76
 1515     CONTINUE                                                      09SE76
          IF ( NDE5 .GT. 0 )      WRITE ( IOP, 991 ) NDE5               16MR77
C-----INPUT TABLE 6  PLACEMENTS OF LOAD PATTERNS                        09SE76
      WRITE (IOP, 600 )                                                 09SE76
          IF ( KEEP6 ) 9980, 1602, 1610                                 09SE76
 1602          NCT6 = NCD6                                              10AG77
          DO  1605 N = 1, NCD6                                          10AG77
      READ  (INP,   63)  IPNP(N), INPP(N),( SCX(N,J),  SCY(N,J), J=1,6) 09FE77
 1605 CONTINUE                                                          09SE76
          GO TO 1612                                                    09SE76
 1610 PRINT 905                                                         09SE76
 1612 WRITE (IOP, 601)                                                  09SE76
               NDE6 = 0                                                 16MR77
          IF ( NCD6 .GT. 10 )      NDE6 = NDE6 + 1                      16MR77
          DO  1615  N = 1, NCT6                                         10AG77
               NPP = INPP(N)                                            09SE76
      WRITE (IOP, 611)  IPNP(N), INPP(N),( SCX(N,J),  SCY(N,J), J=1,NPP)09SE76
          IF (( IPNP(N) * INPP(N) ) .EQ. 0  )      NDE6 = NDE6 + 1      17MR77
 1615     CONTINUE                                                      09SE76
          IF ( NDE6 .GT. 0 )      WRITE ( IOP, 991 ) NDE6               16MR77
C-----INPUT TABLE 7  SUM BOX MOMENTS                                    09SE76
      WRITE (IOP, 700 )                                                 09SE76
          IF ( KEEP7 ) 9980, 1702, 1710                                 09SE76
 1702          NDE7 = 0                                                 09FE77
               NCT7 = NCD7                                              09FE77
               NBSM = NCD7                                              04AP77
          IF ( NCD7 ) 9980, 1703, 1704                                  09FE77
 1703 PRINT 903                                                         09FE77
          GO TO 1772                                                    09FE77
 1704     DO 1705  N = 1, NCD7                                          09SE76
      READ (INP, 73) IBN(N), INS(N), ( SMX(N,I) , I = 1, 6 )            04AP77
          IF (( IBN(N) * INS(N) ) .EQ. 0 )      NDE7 = NDE7 + 1         16MR77
 1705     CONTINUE                                                      09SE76
          GO TO 1712                                                    09SE76
 1710 PRINT 905                                                         09SE76
 1712     DO 1715  N =1 , NCT7                                          09SE76
               II =  INS(N)                                             04AP77
      WRITE (IOP,712) IBN(N), INS(N), ( SMX(N,I) , I = 1, II )          04AP77
 1715     CONTINUE                                                      09SE76
 1772     IF ( NDE7 ) 9980, 1800, 1775                                  09FE77
 1775 PRINT 991, NDE7                                                   09FE77
C-----INPUT TABLE 8 -- PROFILE OUTPUT AREAS                             09SE76
C                                                                       09SE76
 1800 PRINT 800                                                         09SE76
          IF ( KEEP8 ) 9980, 1802, 1810                                 10MR77
 1802          NCT8 = NCD8                                              10MR77
               NDE8 = 0                                                 09SE76
               NCG8 = 0                                                 10AG77
          IF ( NCD8 ) 9980, 1803, 1804                                  10MR77
 1803 WRITE (IOP, 903)                                                  10MR77
          GO TO 1872                                                    10MR77
```

```
 1804     IF ( NCD8 .GT. 10 )      NDE8 = NDE8 + 1                           10AG77
          DO 1805  N = 1, NCD8                                               10MR77
      READ  (INP,  83) XN18(N), YN18(N), XN28(N), YN28(N), KASEW(N),        12MR77
     1                 KASEX(N), KASEY(N), KASEP(N)                          10MR77
                NCG8 = NCG8 + 1                                              10MR77
                IN18(NCG8) = XN18(N) / HX  - IXO                             10MR77
                JN18(NCG8) = YN18(N) / HY  - RYO                             10MR77
                IN28(NCG8) = ( XN28(N) + HX/2.0 ) / HX - IXO                 21MR77
                JN28(NCG8) = ( YN28(N) + HY/2.0 ) / HY - RYO                 21MR77
 1805     CONTINUE                                                           10MR77
          GO TO 1812                                                         10MR77
 1810 PRINT 905                                                              09SE76
 1812     DO 1825  N = 1, NCT8                                               10MR77
      WRITE (IOP,811) XN18(N), YN18(N), XN28(N), YN28(N), KASEW(N),         10MR77
     1                                   KASEX(N), KASEY(N), KASEP(N)        10MR77
 1825     CONTINUE                                                           09SE76
 1872     IF ( NDE8) 9980, 1900, 1875                                        09SE76
 1875 PRINT 991, NDE8                                                        09SE76
C                                                                            09SE76
C-----INPUT TABLE 9 -- PRINTED OUTPUT LIMITS                                 09SE76
C                                                                            09SE76
 1900 PRINT 900                                                              09SE76
          IF ( KEEP9 ) 9980, 1902, 1910                                      10MR77
 1902           NCT9 = NCD9                                                  10MR77
                NDE9 = 0                                                     09SE76
                NCG9 = 0                                                     10AG77
          IF ( NCD9 )  9980, 1903, 1904                                      10MR77
 1903 WRITE (IOP, 903)                                                       10MR77
          GO TO 1972                                                         10MR77
 1904     IF ( NCD9 .GT. 10 )      NDE9 = NDE9 + 1                           10AG77
          DO 1905  N = 1, NCD9                                               10MR77
      READ  (INP,  93) YN19(N), YN29(N)                                      10MR77
                NCG9 = NCG9 + 1                                              10MR77
                JN19(NCG9) = YN19(N) / HY  - RYO                             10MR77
                JN29(NCG9) = ( YN29(N) + HY/2.0 ) / HY - RYO                 21MR77
 1905     CONTINUE                                                           10MR77
          GO TO 1912                                                         10MR77
 1910 PRINT 905                                                              09SE76
 1912     DO 1925  N = 1, NCT9                                               10MR77
      WRITE (IOP, 911)  YN19(N), YN29(N)                                     10MR77
 1925     CONTINUE                                                           09SE76
 1972     IF ( NDE9 ) 9980, 4870, 1975                                       09SE76
 1975 PRINT 991, NDE9                                                        09SE76
 4870     CONTINUE                                                           09SE76
C                                                                            09SE76
C-----GENERATE BOX STIFFNESS AND SUPPORT DATA CARD IMAGES                    10MR77
C                                                                            02FE77
          IF ( ML .EQ. -1 )      GO TO 2370                                  16MR77
C-----DETERMINE TOTAL NO OF BOXES USED                                       02FE77
                MYINCR = 0                                                   02FE77
          DO  2050  K = 1, NB                                                02FE77
                MYINCR = MYINCR + INCRW( ITB(K) )                            02FE77
 2050     CONTINUE                                                           02FE77
C-----TEST IF LAST BOX STRADDLES CL                                          02FE77
          IF ( (2*MYINCR) .EQ. MY ) GO TO 2080                               02FE77
          IF ( (2*(MYINCR - INCRW(ITB(NB))/2 ) ) .EQ. MY ) GO TO 2060        02FE77
          IF ( (2*(MYINCR - INCRW(ITB(NB))/2 ) -1 ) .EQ. MY) GO TO 2060 02FE77
      WRITE (IOP,2055)                                                       02FE77
 2055 FORMAT ( / 50H      ***** ERROR - TOTAL WIDTH SPECIFIED BY TABLE      02FE77
     1           25H4 NOT EQUAL TO MY *****     )                            02FE77
                NDE4 = NDE4 + 1                                              02FE77
 2060           NBT = 2 * NB - 1                                             02FE77
          GO TO 2090                                                         02FE77
 2080           NBT = 2 * NB                                                 02FE77
C-----CHECK FOR ACCUMULATED DATA ERRORS                                      02FE77
 2090           NDES = NDE1+NDE2+NDE3+NDE4+NDE5+NDE6+NDE7+NDE8+NDE9          16MR77
          IF ( NDES .EQ. 0 ) GO TO 2100                                      02FE77
      WRITE (IOP,2095)   NDES                                                02FE77
 2095 FORMAT ( //30H      ***** PROBLEM TERMINATED, I4 ,                     02FE77
     1           20H DATA ERRORS *****    )                                  02FE77
          GO TO 1010                                                         02FE77
C-----DETERMINE COMPLETE SYMMETRICAL BOX ARRANGEMENT                          02FE77
 2100     IF ( ( NBT/2 * 2 ) .EQ. NBT ) GO TO 2105                           08FE77
                MODEV = 1                                                    02FE77
```

```
          GO TO 2110                                                         02FE77
 2105           MODEV = 0                                                    02FE77
 2110     DO  2120  J = 1, NB                                                02FE77
                KTBA(J) = ITB(J)                                             02FE77
 2120     CONTINUE                                                           02FE77
                NBP1 = NB + 1                                                02FE77
          IF ( NBP1  .GT. NBT )  GO TO 2140                                  08FE77
          DO  2130  J = NBP1, NBT                                            02FE77
                L = NBT + 1 - J                                              02FE77
                KTBA(J) = ITB(L)                                             02FE77
 2130     CONTINUE                                                           02FE77
C-----GENERATE STIFFNESS DATA FOR EACH BOX TYPE                              02FE77
 2140           OMPR2 = 1.0 - PR**2                                          02JJ77
                OPPR = 1.0 + PR                                              18MR77
          DO  2150  K = 1, NCD3                                              02JU77
                DY2(K) = BME * BD(K)**3 / 12.0 / OMPR2                       02FE77
                DY1(K) = 0.5 * DY2(K) * SKSF(K)                              17MR77
                DY3(K) = BME * ( THKT(K)**3 + THKB(K)**3 ) / OMPR2 / 12.016FE77
                DX (K) = BME * BMI(K) / INCRW(K) / HY/ OMPR2                 16FE77
                CH (K) = BME * BTI(K) / INCRW(K) / HY / 2.0 / OPPR           10AG77
 2150     CONTINUE                                                           02FE77
C-----GENERATE A STIFFNESS CARD IMAGE FOR EACH Y-LINE WITH 2 IMAGES          02FE77
C     AT LINES BETWEEN BOXES.                                                02FE77
                NCG3 = 1                                                     10MR77
                IN13(1) = 0                                                  02FE77
                JN13(1) = 0                                                  02FE77
                IN23(1) = 0                                                  02FE77
                JN23(1) = 0                                                  10FE77
                XD = 1XO * HX                                                18FE77
                YD = RYO * HY                                                18FE77
          DO 2195 J = 1, NBT                                                 11FE77
                NYS = INCRW(KTBA(J)) + 1                                     07FE77
          DO 2190 K = 1, NYS                                                 02FE77
          IF ( K .EQ. 1  .AND.  J .EQ. 1 )  GO TO 2172                       21FE77
          IF ( K .EQ. 1 )  GO TO 2163                                        22FE77
                YD = JN13(NCG3) * HY      + RYO * HY                         22FE77
 2163           NXSO = 0                                                     18FE77
          DO 2165 JJ = 1, MXS                                                04FE77
                XD = IN13(NCG3) * HX + IXO * HX  + HX                        17FE77
                XDT = XD + HX  * NXSO                                        11FE77
C-----TEST IF JOINT IS ON OR OFF THE SKEWED SLAB                             02FE77
      CALL LOCATE ( KLO, XDT, YD )                                           02FE77
          IF ( KLO .EQ. 1 )  GO TO 2170                                      02FE77
                NXSO = NXSO + 1                                              02FE77
 2165     CONTINUE                                                           02FE77
          GO TO 998D                                                         02FE77
 2170           NCG3 = NCG3 + 1                                              02FE77
                IN13(NCG3) = IN13(NCG3-1) + NXSO                             02FE77
          IF ( K .EQ. 1 )   GO TO 2171                                       18FE77
                JN13(NCG3) = JN13(NCG3 - 1 ) + 1                             15FE77
                JN23(NCG3) = JN13(NCG3)                                      02FE77
          GO TO 2172                                                         18FE77
 2171           JN13(NCG3) = JN13(NCG3 - 1 )                                 18FE77
                JN23(NCG3) = JN13(NCG3)                                      24FE77
C-----SAMPLE LOCATION WITHIN BOX                                             02FE77
 2172     IF (  K .EQ. 1  .OR.  K .EQ. NYS )  GO TO 2185                     16FE77
                WEB = 0.5 * ( (NYS-1) * HY - VW(KTBA(J))  )                  02FE77
C-----TEST IF IN FIRST WEB                                                   02FE77
          IF ( ( (K-1)*HY ) .GT. WEB )  GO TO 2180                           02FE77
C-----FULL WEB STIFFNESSES                                                   02FE77
 2175           DXN(NCG3) = DX(KTBA(J))                                      04FE77
                DYN(NCG3) = DY2(KTBA(J))                                     04FE77
          GO TO  2190                                                        02FE77
C-----TEST IF IN SECOND WEB                                                  02FE77
 2180     IF ( ( (NYS-1)*HY - (K-1)*HY ) .LT. WEB ) GO TO 2175               02FE77
C-----VOID STIFFNESSES                                                       02FE77
                DXN(NCG3) = DX(KTBA(J))                                      02FE77
                DYN(NCG3) = DY3(KTBA(J))                                     02FE77
          GO TO  2190                                                        02FE77
C-----HALF WEB STIFFNESSES                                                   02FE77
 2185           DXN(NCG3) = 0.5 * DX(KTBA(J))                                04FE77
                DYN(NCG3) = DY1(KTBA(J))                                     10FE77
 2190     CONTINUE                                                           02FE77
 2195     CONTINUE                                                           02FE77
```

```
C-----ENSURE THAT A JOINT OCCURS AT CENTER LINE IF THERE IS AN EVEN NO. 02FE77
C     OF Y INCRS                                                        02FE77
      IF ( ( MY - (MY/2)*2 ) .GT. 0 ) GO TO 2230                        02FE77
          JJ = 0                                                        25FE77
C-----FIND CENTERLINE                                                   25FE77
      DO 2217 J = 1, NBT                                                25FE77
          NYS = INCRW(KTBA(J)) + 1                                      25FE77
      DO 2215 K = 1, NYS                                                25FE77
          JJ = JJ + 1                                                   25FE77
      IF ( ( JN13(JJ ) - MY / 2 ).EQ. 0 )  GO TO 2210                   25FE77
      GO TO 2215                                                        25FE77
 2210 IF ( K .EQ. NYS )     GO TO 2215                                  25FE77
      GO TO 2220                                                        25FE77
 2215 CONTINUE                                                          02FE77
 2217 CONTINUE                                                          25FE77
      GO TO 9980                                                        02FE77
 2220 IF ( ( IN13(JJ) + IXO ) .EQ. 0 )   GO TO 2230                     25FE77
          IN13(JJ ) = IN13(JJ ) + 1                                     25FE77
C-----ENSURE THAT 2ND LINE IS CORRECTED IF FIRST WAS                    25FE77
      IF ( ( IN13(JJ + 1 ) - IN13(JJ)) .EQ. 0 )  GO TO 2230             25FE77
          IN13( JJ + 1 ) = IN13( JJ + 1 ) + 1                           25FE77
C-----DETERMINE X STA OF FAR END OF LAST CARD IMAGE                     02FE77
 2230     IN23(NCG3) = IN13(1) + MX                                     10MR77
      DO 2250 J = 2, NCG3                                               02FE77
          L = NCG3 + 1 - J                                              02FE77
          IN23(L) = IN23(L+1) - IN13(J) + IN13(J-1)                     02FE77
 2250 CONTINUE                                                          02FE77
C-----ZERO REMAINDER OF CARD IMAGE DATA                                 14MR77
      DO  2300  J = 1, NCG3                                             14MR77
          FXN(J) = 0.0                                                  14MR77
          FYN(J) = 0.0                                                  14MR77
          QN(J) = 0.0                                                   14MR77
          SN(J) = 0.0                                                   14MR77
 2300 CONTINUE                                                          14MR77
C-----GENERATE TORSIONAL STIFFNESS CARD IMAGES                          02FE77
          NCG5 = 0                                                      02FE77
          JYS = 0                                                       02FE77
          NYS = 1                                                       02FE77
      DO 2270 J = 1, NBT                                                02FE77
          JYS = JYS + NYS                                               02FE77
          NYM = INCRW(KTBA(J))                                          07FE77
          NYS = NYM + 1                                                 02FE77
      DO 2260 K = 1, NYM                                                02FE77
          NCG5 = NCG5 + 1                                               02FE77
          IN15(NCG5) = IN13(JYS + K) + 1                                17FE77
          JN15(NCG5) = JN13(JYS + K)                                    02FE77
          IN25(NCG5) = IN23(JYS + K - 1 )                               22FE77
          JN25(NCG5) = JN15(NCG5)                                       02FE77
          CHN(NCG5) = CH(KTBA(J))                                       16FE77
 2260 CONTINUE                                                          02FE77
 2270 CONTINUE                                                          02FE77
C-----GENERATE SPRING AND AXIAL THRUST SUPPORT SYSTEMS                  02FE77
C     THE SPRING VALUE IS SET AS A MULTIPLE OF BME SO THAT ALL RESULTS  10AG77
C     ARE LINEAR WITH A CHANGE IN BME.                                  10AG77
          SS = 1000.0 * BME                                             10AG77
          NCG6 = 0                                                      02FE77
          MYP1 = MY + 1                                                 02FE77
          NCG3T = NCG3 + 1                                              14MR77
      DO 2340 J = 1, MYP1                                               02FE77
          YD = RYO * HY + (J-1) * HY                                    02FE77
          XD = YD * TANSA                                               02FE77
C-----FIND FIRST X STA PRECEEDING SUPPORT LINE INTERSECT WITH OS EDGE   02JU77
          IR1 = XD / HX - IXO                                           02FE77
      IF ((IXO + IR1) .EQ. ( XD / HX ) )  GO TO 2320                    02FE77
          ADIST = XD - ( IR1 + IXO ) * HX                               16FE77
          BDIST = HX - ADIST                                            02FE77
          S1 = BDIST / HX * SS                                          02FE77
          S2 = ADIST / HX * SS                                          02FE77
          PSS = - ADIST * BDIST * SS / HX                               22MR77
C-----GENERATE SECOND SPRINGS PAST FIRST SUPPORT LINE                   02FE77
          NCG3 = NCG3 + 1                                               02FE77
          IN13(NCG3) = IR1 + 1                                          02FE77
          JN13(NCG3) = J - 1                                            02FE77
          IN23(NCG3) = IN13(NCG3)                                       02FE77
```

```
          JN23(NCG3) = JN13(NCG3)                                       02FE77
          SN(NCG3) = S2                                                 02FE77
C-----GENERATE AXIAL THRUSTS AT FIRST SUPPORT LINE                      02FE77
          NCG6 = NCG6 + 1                                               02FE77
          IN16(NCG6) = IN13(NCG3)                                       02FE77
          JN16(NCG6) = JN13(NCG3)                                       02FE77
          IN26(NCG6) = IN13(NCG3)                                       02FE77
          JN26(NCG6) = JN13(NCG3)                                       10FE77
          PXN(NCG6) = PSS                                               02FE77
C-----GENERATE SECOND SPRINGS PAST SECOND SUPPORT LINE                  02FE77
          NCG3 = NCG3 + 1                                               02FE77
          IN13(NCG3) = IR1 + 1 + MXS                                    02FE77
          JN13(NCG3) = J - 1                                            02FE77
          IN23(NCG3) = IN13(NCG3)                                       02FE77
          JN23(NCG3) = JN13(NCG3)                                       02FE77
          SN(NCG3) = S2                                                 02FE77
C-----GENERATE AXIAL THRUSTS AT SECOND SUPPORT LINE                     02FE77
          NCG6 = NCG6 + 1                                               02FE77
          IN16(NCG6) = IN13(NCG3)                                       02FE77
          JN16(NCG6) = JN13(NCG3)                                       02FE77
          IN26(NCG6) = IN13(NCG3)                                       02FE77
          JN26(NCG6) = JN13(NCG3)                                       02FE77
          PXN(NCG6) = PSS                                               02FE77
      GO TO 2330                                                        02FE77
C-----SET SINGLE SPRING VALUE - USED BELOW AS FIRST SPRINGS             02FE77
 2320     S1 = SS                                                       02FE77
C-----GENERATE FIRST SPRINGS PRIOR TO FIRST SUPPORT LINE                02FE77
 2330     NCG3 = NCG3 + 1                                               02FE77
          IN13(NCG3) = IR1                                              02FE77
          JN13(NCG3) = J - 1                                            02FE77
          IN23(NCG3) = IN13(NCG3)                                       02FE77
          JN23(NCG3) = JN13(NCG3)                                       02FE77
          SN(NCG3) = S1                                                 02FE77
C-----GENERATE FIRST SPRINGS PRIOR TO SECOND SUPPORT LINE               02FE77
          NCG3 = NCG3 + 1                                               02FE77
          IN13(NCG3) = IR1 + MXS                                        02FE77
          JN13(NCG3) = J - 1                                            02FE77
          IN23(NCG3) = IN13(NCG3)                                       02FE77
          JN23(NCG3) = JN13(NCG3)                                       02FE77
          SN(NCG3) = S1                                                 02FE77
 2340 CONTINUE                                                          02FE77
C-----ZERO REMAINDER OF CARD IMAGE DATA                                 14MR77
      DO  2350  J = NCG3T, NCG3                                         14MR77
          DXN(J) = 0.0                                                  14MR77
          DYN(J) = 0.0                                                  14MR77
          FXN(J) = 0.0                                                  14MR77
          FYN(J) = 0.0                                                  14MR77
          QN(J) = 0.0                                                   14MR77
 2350 CONTINUE                                                          14MR77
      DO  2360  J = 1, NCG6                                             14MR77
          PYN(J) = 0.0                                                  14MR77
          PBXN(J) = 0.0                                                 14MR77
          PBYN(J) = 0.0                                                 14MR77
 2360 CONTINUE                                                          14MR77
C-----GENERATE LOAD DATA CARD IMAGES                                    02FE77
 2370     NCG7 = 0                                                      16MR77
          QPOSUM = 0.0                                                  02FE77
          QPSUM = 0.0                                                   02FE77
C-----DO FOR EACH PATTERN SPECIFIED BY TABLE 6                          02FE77
      DO 3060 KK = 1, NCD6                                              02FE77
          NPP = INPP(KK)                                                02FE77
C-----DO FOR NUM PLACEMENTS EACH PATTERN                                02FE77
      DO 3050 J = 1, NPP                                                02FE77
          KPN = IPN(IPNP(KK))                                           02FE77
          NLP = INLP(IPNP(KK))                                          02FE77
C-----DO FOR NUM LOADS IN EACH PATTERN                                  02FE77
      DO 3040 K = 1, NLP                                                02FE77
          XD = SCX(KK,J) + PCX(KPN,K)                                   02FE77
          YD = SCY(KK,J) + PCY(KPN,K)                                   02FE77
C-----DETERMINE IF LOAD IS WITHIN BOUNDRIES OF STRUCTURE                02FE77
     CALL LOCATE   (KLO, XD, YD)                                        02FE77
      IF ( KLO .EQ. 0 )  GO TO 3010                                     02FE77
          QPSUM = QPSUM + RMLL(KK,K)                                    23FE77
C-----ALLOCATE LOAD TO SURROUNDING JOINTS                               02FE77
```

```
      CALL DISTRB    (XD, YD, RMLL(KK,K), NJ )                       23FE77
          GO TO 3012                                                 02FE77
 3010          QPOSUM = QPOSUM + RMLL(KK,K)                          23FE77
          GO TO 3040                                                 17FE77
 3012     DO 3015 JNT = 1, NJ                                        02FE77
               NCG7 = NCG7 + 1                                       02FE77
               IN17(NCG7) = ISTA(JNT)                                02FE77
               JN17(NCG7) = JSTA(JNT)                                02FE77
               IN27(NCG7) = ISTA(JNT)                                02FE77
               JN27(NCG7) = JSTA(JNT)                                02FE77
               QMN(NCG7) = QPA(JNT)                                  02FE77
 3015     CONTINUE                                                   02FE77
 3040     CONTINUE                                                   04FE77
 3050     CONTINUE                                                   04FE77
 3060     CONTINUE                                                   04FE77
C-----PRINT SUMMATION OF APPLIED LOADS                               14AP77
      WRITE (IOP,915)  QPSUM, QPOSUM                                 14AP77
  915 FORMAT (///40H     SUMMATION OF LOADS ON STRUCTURE    , 1PE10.3, 14AP77
     1          / 40H     SUMMATION OF LOADS OFF STRUCTURE   , 1PE10.3 ) 14AP77
C-----GENERATE TABLE 1 FOR SLAB49 AND PASS VIA COMMON BLK3           04AP77
               KPG2 = 0                                              04AP77
               NCG2 = 1                                              04AP77
          IF ( KEEP2 .EQ. 1 ) KPG2 = 1                               04AP77
          IF ( KEEP2 .EQ. 1 ) NCG2 = 0                               04AP77
               KPG3 = 0                                              04AP77
C              NCG3 = ACCUMULATED AT 2160 THRU 2320                  04AP77
          IF (  ML .EQ.  -1 ) KPG3 = 1                               04AP77
          IF (  ML .EQ.  -1 ) NCG3 = 0                               04AP77
               KPG4 = 0                                              04AP77
               NCG4 = 0                                              04AP77
               KPG5 = 0                                              04AP77
C              NCG5 = ACCUMULATED AT 2250 THRU 2270                  04AP77
          IF (  ML .EQ.  -1 ) KPG5 = 1                               04AP77
          IF (  ML .EQ.  -1 ) NCG5 = 0                               04AP77
               KPG6 = 0                                              04AP77
C              NCG6 = ACCUMULATED AT 2270 THRU 2320                  04AP77
          IF (  ML .EQ.  -1 ) KPG6 = 1                               04AP77
          IF (  ML .EQ.  -1 ) NCG6 = D                               04AP77
               KPG7 = 0                                              04AP77
C              NCG7 = ACCUMULATED AT 2370 THRU 3060                  14AP77
          IF (  (KEEP5*KEEP6) .EQ. 1 )  KPG7 = 1                     28AP77
          IF (  (KEEP5*KEEP6) .EQ. 1 )  NCG7 = 0                     28AP77
               KPG8 = 0                                              04AP77
C              NCG8 = ACCUMULATED AT DO 1805                         04AP77
          IF ( KEEP8 .EQ. 1 )  KPG8 = 1                              04AP77
          IF ( KEEP8 .EQ. 1 ) NCG8 = 0                               04AP77
               KPG9 = 0                                              04AP77
C              NCG9 = ACCUMULATED AT DO 1905                         04AP77
          IF ( KEEP9 .EQ. 1 ) KPG9 = 1                               04AP77
          IF ( KEEP9 .EQ. 1 ) NCG9 = 0                               04AP77
 4000 CALL SLAB49                                                    04AP77
      CALL TIC TOC (J7T)                                             15AP76ID
          GO TO 1010                                                 25JL75ID
 9980 WRITE (IOP,980)                                                25JL75ID
 9990     CONTINUE                                                   25JL75ID
      STOP                                                           20JA76ID
      END                                                            25JL75ID
```

```
      SUBROUTINE DISTRB  ( XD, YD, QP, NJ )                           04FE77
      IMPLICIT REAL*8 (A-H, O-Z)                                      07MR77
C-----THIS ROUTINE FINDS THE STATIONS BOUNDING THE LOAD AND           02FE77
C     DISTRIBUTES IT TO THESE STATIONS.                               02FE77
      COMMON / BLK1 / HX, HY, TANSA, MXS, MY, IXO, ML, MX, IPGND, PR  14MR77
      COMMON / BLK2 / ISTA(4), JSTA(4), QPA(4)                        04FE77
               RJYO =  -MY * 0.5                                      18FE77
               ISTA(1) = - IXO + XD / HX                              18FE77
               XO =(XD / HX - IXO - ISTA(1) ) * HX                    22FE77
               JSTA(1) = - RJYO + YD / HY                             18FE77
               YO =(YD / HY - JSTA(1) - RJYO) * HY                    22FE77
          IF ( XO .EQ. 0.0 )      GO TO 30                            02FE77
          IF ( YO .EQ. 0.0 )      GO TO 22                            04FE77
C-----DISTRIBUTE TO ALL FOUR JOINTS                                   02FE77
               NJ = 4                                                 02FE77
               ISTA(2) = ISTA(1) + 1                                  02FE77
               JSTA(2) = JSTA(1)                                      02FE77
               ISTA(3) = ISTA(1)                                      02FE77
               JSTA(3) = JSTA(1) + 1                                  02FE77
               ISTA(4) = ISTA(2)                                      02FE77
               JSTA(4) = JSTA(3)                                      02FE77
               QOHXY = QP/HX/HY                                       23FE77
               QPA(1) = (HX-XO) * (HY-YO) * QOHXY                     23FE77
               QPA(2) =    XO   * (HY-YO) * QOHXY                     23FE77
               QPA(3) = (HX-XO) *    YO   * QOHXY                     23FE77
               QPA(4) =    XO   *    YO   * QOHXY                     23FE77
      RETURN                                                          02FE77
C-----DISTRIBUTE TO TWO X STATIONS - LOAD IS ON AN  X-LINE            04FE77
   22          NJ = 2                                                 04FE77
               ISTA(2) = ISTA(1) + 1                                  02FE77
               JSTA(2) = JSTA(1)                                      02FE77
               QPA(2) = XO / HX * QP                                  02FE77
               QPA(1) = QP - QPA(2)                                   02FE77
      RETURN                                                          02FE77
C-----DISTRIBUTE TO TWO Y STATIONS - LOAD IS ON A Y-LINE              02FE77
   30     IF ( YO .EQ. 0.0 )  GO TO 40                                02FE77
               NJ = 2                                                 02FE77
               ISTA(2) = ISTA(1)                                      02FE77
               JSTA(2) = JSTA(1) + 1                                  02FE77
               QPA(2) = YO / HY * QP                                  02FE77
               QPA(1) = QP - QPA(2)                                   02FE77
      RETURN                                                          02FE77
C-----LOAD OCCURS AT A SINGLE JOINT                                   02FE77
   40          NJ = 1                                                 02FE77
               QPA(1) = QP                                            02FE77
      RETURN                                                          02FE77
      END                                                             02FE77
```

```
      SUBROUTINE LOCATE  ( KLO, XD, YD )                              02FE77
      IMPLICIT REAL*8 (A-H, O-Z)                                      07MR77
C-----THIS ROUTINE DETERMINES IF A LOCATION IS ON OR OFF THE SKEWED   02FE77
C     SLAB.  LOADS JUST PAST SUPPORT ARE ASSUMED OFF EVEN THO THERE   02FE77
C     MAY BE A STIFFNESS.                                             02FE77
      COMMON / 8LK1 / HX, HY, TANSA, MXS, MY, IXO, ML, MX, IPGND, PR  14MR77
               XLNGTH = HX * MXS                                      04FE77
C-----THE 1.D-07 VALUE IS ADDED TO AVOID POSSIBLE ROUNDOFF IN THE TEST 10AG77
               YWIDTH = HY * MY + 1.0D-07                             10AG77
          IF (DABS(YD) .GT. ( YWIDTH / 2.0 ) )   GO TO 20             07MR77
               XT = YD * TANSA                                        02FE77
          IF ( XD .LT. XT )  GO TO 20                                 02FE77
          IF ( XD .GT. ( XLNGTH + XT ) )      GO TO 20                04FE77
               KLO = 1                                                02FE77
      RETURN                                                          02FE77
   20          KLO = 0                                                02FE77
      RETURN                                                          02FE77
      END                                                             02FE77
```

```
      SUBROUTINE SLAB49                                                 04AP77
C     PROGRAM  SLAB49  ( INPUT, OUTPUT, TAPE1, TAPE2, TAPE3, TAPE4 )
C
C-----FOR OTHER PROBLEM SIZES, ONLY THIS DRIVER NEED BE RE-DIMENSIONED.
C     FOR EXAMPLE, AA(S+3,1), CC(S+3,5), DD(S+3,3), RI(S+3,S+3),
C     DX(S+3), PW(S+3,L+3), KSHORT = S, AND KLONG = L   WHERE S AND L
C     ARE THE MAXIMUN X AND Y SIZES OF THE PROBLEM.
C
C-----THIS PROGRAM IS NOW DIMENSIONED TO SOLVE A  36 BY 60  GRID.       RE-DIMEN
C
C-----THIS PROGRAM WILL OPERATE ON CDC 6000 SERIES OR IBM G-LEVEL
C     SYSTEMS.  THE CARDS NEEDED FOR CDC OPERATION HAVE A C IN COLUMN
C     1 AND CDC IN COLUMN 78 THRU 80.  THOSE CARDS NEEDED FOR IBM
C     OPERATION ARE TAGGED WITH IBM.  WHEN CONVERTING FROM ONE SYSTEM
C     TO ANOTHER, THOSE CARDS NOT NEEDED SHOULD BE RETAINED AND NULLED
C     WITH AN ADDED C.  SOME CARDS NOW TAGGED IBM ARE PUNCHED IN THE
C     NECESSARY EBCDIC CODE.  THE CDC CARDS AND THE REMAINDER OF THE
C     CARDS WHICH ARE NOT SPECIALLY TAGGED ARE PUNCHED IN BCD WHICH
C     IS COMPATIBLE WITH BOTH SYSTEMS.  ASA FORTRAN IS USED THRUOUT.
C
      IMPLICIT REAL*8  (A-H,O-Z)                                        17AG76
      DIMENSION AA( 39 , 1  ),      BB( 39 , 1  ),      CC( 39 , 5  ),  RE-DIMEN
     1          DD( 39 , 3  ),      EE( 39 , 1  ),      FF( 39 , 1  ),  RE-DIMEN
     2          AT( 39 , 1  ),                                          RE-DIMEN
     3           A( 39 , 1  ),     AM1( 39 , 1  ),     AM2( 39 , 1  ),  RE-DIMEN
     4          R1( 39 , 39 ),      R2( 39 , 39 ),      R3( 39 , 39 )   RE-DIMEN
      DIMENSION DX( 39 ),         DXM1( 39 ),         DXP1( 39 ),       RE-DIMEN
     1          DY( 39 ),         DYM1( 39 ),         DYP1( 39 ),       RE-DIMEN
     2          FX( 39 ),                                               RE-DIMEN
     3          FY( 39 ),         FYM1( 39 ),         FYP1( 39 ),       RE-DIMEN
     4           Q( 39 ),            S( 39 ),                           RE-DIMEN
     5          RX( 39 ),         RYM1( 39 ),         RYP1( 39 ),       RE-DIMEN
     6          TX( 39 ),         TYM1( 39 ),         TYP1( 39 ),       RE-DIMEN
     7          CH( 39 ),         CHP1( 39 ),                           RE-DIMEN
     8          PX( 39 ),           PY( 39 ),         PYP1( 39 ),       RE-DIMEN
     9         PBX( 39 ),          PBY( 39 ),        PBYP1( 39 ),       RE-DIMEN
     A          QM( 39 )                                                RE-DIMEN
      DIMENSION  W( 39 ),          WM1( 39 ),          WM2( 39 ),       RE-DIMEN
     1                             WP1( 39 ),          WP2( 39 ),       RE-DIMEN
     2         BMX( 39 ),         BMBX( 39 ),                           RE-DIMEN
     3       BMYM1( 39 ),          BMY( 39 ),        BMYP1( 39 ),       RE-DIMEN
     4      BMBYM1( 39 ),         BMBY( 39 ),       BMBYP1( 39 ),       RE-DIMEN
     5          PW( 39 , 63 ),    PBMX( 39 , 63 ),    PBMY( 39 , 63 ),  RE-DIMEN
     6       PSIGO( 39 , 63 )                                           RE-DIMEN
C-----DIMENSION ARRAY USED FOR BOX MOMENT SUMMATIONS                    04AP77
      DIMENSION  JSM(63)                                                RE-DIMEN
C-----THE FOLLOWING 5 CARDS PERTAIN TO DIRECT ACCESS FILES AND MUST BE  14JA2IBM
C     CHANGED WHEN PROGRAM IS REDIMENSIONED. FOR EXAMPLE, THE DEFINE    14JA2IBM
C     FILE CARD PARAMETERS ARE  2*(L+3), 2((S+3)**2), U, ID1 THRU ID4.  14JA2IBM
      COMMON /DA/ ID1, ID2, ID3, ID4                                    14JA2IBM
      DEFINE FILE 1 ( 126, 3042, U, ID1 )                               RE-DIMEN
      DEFINE FILE 2 ( 126, 3042, U, ID2 )                               RE-DIMEN
      DEFINE FILE 3 ( 126, 3042, U, ID3 )                               RE-DIMEN
      DEFINE FILE 4 ( 126, 3042, U, ID4 )                               RE-DIMEN
                KSHORT = 36                                             RE-DIMEN
                KLONG = 60                                              RE-DIMEN
                L1 = KSHORT + 3                                         05JAB
                L2 = KLONG + 3                                          12MY0
C
      CALL SB49S          (   AA,   BB,   CC,   DD,   EE,   FF,   AT,   22AG9
     1                         A,  AM1,  AM2,   R1,   R2,   R3,         22AG9
     2                        DX, DXM1, DXP1,   DY, DYM1, DYP1,         100C9
     3                        FX,   FY, FYM1, FYP1,    Q,    S,         100C9
     4                        RX, RYM1, RYP1,   TX, TYM1, TYP1,   CH,   100C9
     5                      CHP1,   PX,   PY, PYP1,  PBX,  PBY,PBYP1,   100C9
     6                        QM,    W,  WM1,  WM2,  WP1,  WP2,         100C9
     7                       BMX, BMBX,BMYM1,  BMY,BMYP1,               100C9
     A                       JSM, IDUM,                                 04AP77
     8                    BMBYM1, BMBY,     BMBYP1,                     21JA1
     9                        PW, PBMX, PBMY,PSIGO,   L1,   L2  )       17FE1
      RETURN                                                            14AP77
      END                                                               05JA8
```

Cards changed in the SLAB49 and SB49S subroutines (Ref 8) to integrate them into the SLBDG2 data generator program are indicated below by 77 year dates in columns 77 and 78. Note that the data created in SLBDG2 is passed by way of the common blocks. Also note the shift in variable names in /BLK 3/.

```
      SUBROUTINE SB49S    (   AA,   BB,   CC,   DD,   EE,   FF,   AT,   21JA1
     1                         A,  AM1,  AM2,   R1,   R2,   R3,         22AG9
     2                        DX, DXM1, DXP1,   DY, DYM1, DYP1,         100C9
     3                        FX,   FY, FYM1, FYP1,    Q,    S,         100C9
     4                        RX, RYM1, RYP1,   TX, TYM1, TYP1,   CH,   100C9
     5                      CHP1,   PX,   PY, PYP1,  PBX,  PBY,PBYP1,   100C9
     6                        QM,    W,  WM1,  WM2,  WP1,  WP2,         100C9
     A                       JSM, IDUM,                                 04AP77
     7                       BMX, BMBX,BMYM1,  BMY,BMYP1,               100C9
     8                    BMBYM1, BMBY,     BMBYP1,                     21JA1
     9                        PW, PBMX, PBMY,PSIGO,   L1,   L2  )       17FE1
C
      IMPLICIT REAL*8  (A-H,O-Z)                                        11MR76
    1 FORMAT  (   50H     RESULTS FROM SLAB49 PROGRAM USING DATA GENERA 02JU77
     1            15HTED BY SLBDG2     ,                                10AG77
     B//  )                                                             21JA1
C
      DIMENSION AA( L1 , 1  ),      BB( L1 , 1  ),      CC( L1 , 5  ),  26SE8
     1          DD( L1 , 3  ),      EE( L1 , 1  ),      FF( L1 , 1  ),  26SE8
     2          AT( L1 , 1  ),                                          26SE8
     3           A( L1 , 1  ),     AM1( L1 , 1  ),     AM2( L1 , 1  ),  26SE8
     4          R1( L1 , L1 ),      R2( L1 , L1 ),      R3( L1 , L1 )   22AG9
      DIMENSION DX( L1 ),         DXM1( L1 ),         DXP1( L1 ),       100C9
     1          DY( L1 ),         DYM1( L1 ),         DYP1( L1 ),       100C9
     2          FX( L1 ),                                               100C9
     3          FY( L1 ),         FYM1( L1 ),         FYP1( L1 ),       100C9
     4           Q( L1 ),            S( L1 ),                           100C9
     5          RX( L1 ),         RYM1( L1 ),         RYP1( L1 ),       100C9
     6          TX( L1 ),         TYM1( L1 ),         TYP1( L1 ),       100C9
     7          CH( L1 ),         CHP1( L1 ),                           100C9
     8          PX( L1 ),           PY( L1 ),         PYP1( L1 ),       100C9
     9         PBX( L1 ),          PBY( L1 ),        PBYP1( L1 ),       100C9
     A          QM( L1 )                                                100C9
      DIMENSION  W( L1 ),          WM1( L1 ),          WM2( L1 ),       100C9
     1                             WP1( L1 ),          WP2( L1 ),       100C9
     2         BMX( L1 ),         BMBX( L1 ),                           100C9
     3       BMYMI( L1 ),          BMY( L1 ),        BMYP1( L1 ),       100C9
     4      BMBYM1( L1 ),         BMBY( L1 ),       BMBYP1( L1 ),       17FE1
     5          PW( L1 , L2 ),    PBMX( L1 , L2 ),    PBMY( L1 , L2 ),  17FE1
     6       PSIGO( L1 , L2 )                                           17FE1
C-----DIMENSION ARRAYS USED FOR BOX MOMENT SUMMATIONS                   04AP77
      DIMENSION  SUM(10,6), SUMT(6), ISM(10,6), JSM(L2)                 04AP77
      DIMENSION  TEMX (300), TEMY (300), XX(300)                        11FE1
C     DIMENSION IBUF(500)                                               06DE1IBM
      DIMENSION KPROB(2)                                                03MR77
      DIMENSION  ITEST(4), ATEST(2)                                     12MR77
C
      COMMON / ZOT / LOP, MC, IROLL, MOP                                15JE0
C     COMMON /PLOT/ I1, I2, J1, J2                                      25NO9CDC
      COMMON /PLT / I1, I2, J1, J2                                      01DE1IBM
      COMMON /CARDS/ AN1(46), AN2(18), NPROB(2),                        10AG77
     1          IN13(300), JN13(300), IN23(300), JN23(300), DXN(300),   23SE0
     2           DYN(300),  FXN(300),  FYN(300),   QN(300),  SN(300),   23SE0
     3          IN14( 50), JN14( 50), IN24( 50), JN24( 50),             23SE0
     4           RXN( 50),  RYN( 50),  TXN( 50),  TYN( 50),             23SE0
     5          IN15(100), JN15(100), IN25(100), JN25(100), CHN(100),   23SE0
     6          IN16(150), JN16(150), IN26(150), JN26(150),             12MR77
     7           PXN(150),  PYN(150), PBXN(150), PBYN(150),             12MR77
     8          IN17(100), JN17(100), IN27(100), JN27(100), QMN(100),   17FE1
     9          IN18( 10), JN18( 10), IN28( 10), JN28( 10),             17FE1
     A         KASEW( 10),KASEX( 10),KASEY( 10),KASEP( 10),             17FE1
     B                    JN19( 10),            JN29( 10)               17FE1
```

```
      COMMON /TABLE/NC13, NCT3, NC14, NCT4, NC15, NCT5, NC16, NCT6,     10OC9
     1             NC17, NCT7, NC18, NCT8, NC19, NCT9                   17FE1
      COMMON /STIFF/PDHXHY, HYDHX3, ODHX3, ODHX2, ODHX,                 10OC9
     1             ODHXHY, HXDHY3, ODHY3, ODHY2, ODHY, CRD(5)           24MY1
      COMMON / R1 / MXP3, MYP3, NF, ITMPP                               23DE0
      COMMON / BLK1 / HX, HY, TANSA, MXS, MY, IXO, ML, MX, IPGNO, PR    14MR77
      COMMON / BLK3 / KEEP2,KEEP3,KEEP4,KEEP5,KEEP6,KEEP7,KEEP8,KEEP9,  04AP77
     1              NCD2, NCD3, NCD4, NCD5, NCD6, NCD7, NCD8, NCD9      04AP77
      COMMON / BLK4 /   IBN(10), INS(10), SMX(10,6),                    04AP77
     1                KT8A(32), INCRW(10), NBT, NBSM                    04AP77
C
      DATA  SUP / 7HSUPPORT /, STAT / 7HSTATICS /, STRS / 6HSTRESS  /,  08FE1
     1      RCT / 8HREACTION/,  CHK / 8H CHECK  /, BMOM / 6HMOMENT  /,  08FE1
     2     SLBX / 6HSLAB X  /, SLBY /  6HSLAB Y  /,BLNK / 6H        /,  08FE1
     3     BEMX / 6HBEAM X  /, BEMY / 6HBEAM Y  /                       11MR77
      DATA  ITEST(1), ITEST(2), ITEST(3), ITEST(4), ATEST(1), ATEST(2)  26AP76ID
     1   /  1HC     ,  4HEASE ,  1H     ,  4H     ,  2H     ,  4H     / 26AP76ID
C     DATA ID1, ID2, ID3, ID4  /8HDEFLECTN, 8HBN MOM X,                 15JE0CDC
C    1                           8HBN MOM Y,  8H   SIGO     /           15JE0CDC
C
    6 FORMAT ( )                                                        04MY3
   11 FORMAT (     5H1     , 80X, 10HI-----TRIM )                       17FE1
   12 FORMAT (      5(A2,A3), A3, 2(A2,A4), 2(3A4,A2), 3A4 / 20A4 )     10AG77ID
   13 FORMAT ( 5X, 5(A2,A3), A3, 2(A2,A4), 2(3A4,A2), 3A4 // 5X, 20A4 ) 10AG77ID
   14 FORMAT ( A1, A4, 5X, 17A4, A2      )                              03MR77ID
   15 FORMAT (  /10H      PROB , /5X, A1, A4, 5X, 17A4, A2 )            03MR77ID
C  16 FORMAT (///17H      PROB (CONTD), /5X, A5, 5X, 17A4, A2 )         07DE0CDC
   16 FORMAT (  /17H      PROB (CONTD), /5X, A1, A4, 5X, 17A4, A2, // ) 03MR77ID
   19 FORMAT (///50H      KEEP RUN TIME RECORDS FOR FUTURE ESTIMATES OF 21JA1
     1             31H PARENT AND OFFSPRING RUN TIMES      )            21JA1
   20 FORMAT ( 8I5, 5X,I5,25X, I5,/, 8I5,5X,3I5,I2,I3,3F5.0 )           06DE1
   21 FORMAT ( 2I5, 10X,    4E10.3 )                                    21JA1
   33 FORMAT (  4( 2X, I3 ),   6E10.3 )                                 19AG8
   43 FORMAT ( 4( 2X, I3 ), 20X,    4E10.3 )                            21JA1
   53 FORMAT ( 4( 2X, I3 ),    E10.3 )                                  21JA1
   63 FORMAT ( 4( 2X, I3 ), 20X,   4E10.3 )                             21JA1
   73 FORMAT ( 4( 2X, I3 ), 40X,    E10.3 )                             21JA1
   83 FORMAT ( 4( 2X, I3 ), 4( 4X, I1 ) )                               03FE1
   93 FORMAT ( 2I10 )                                                   060C0
C 100 FORMAT ( //30H      TABLE 1.  CONTROL DATA      ,                  21JA1CDC
  100 FORMAT ( //30H      TABLE 1.  CONTROL DATA      ,                  06DE1IBM
     1   / 55X, 20H      TABLE NUMBER       ,                           21JA1
     2   / 40X, 45H          2     3     4     5     6     7     8    9 , 21JA1
C    3  //  5X, 40H      KEEP FROM PRECEDING PROBLEM (1=YES)  , 8I5,    21JA1CDC
     3  //  5X, 40H      KEEP FROM PRECEDING PROBLEM (1=YES)  , 8I5,    06DE1IBM
     4   /  5X, 40H      NUM CARDS INPUT THIS PROBLEM         , 8I5,    21JA1
     5  //  5X, 25H      MULTIPLE LOAD OPTION  , 15X, I5,               21JA1
     6   /  5X, 25H      STATICS CHECK OPTION  , 15X, I5,               21JA1
     7   /  5X, 25H      PRIN STRESS OPTION    , 15X, I5,               21JA1
     8   /  5X, 25H      PROFILE PLOT OPTION   , 15X, I5,               21JA1
C    9   /  5X, 25H      3-D PLOT OPTION       , 15X, I5      )         21JA1CDC
     9   /  5X, 25H      3-D PLOT OPTION       , 15X, I5      )         06DE1IBM
  200 FORMAT ( //24H      TABLE 2.  CONSTANTS )                         16AG8
  201 FORMAT ( / 45H           NUMBER OF INCREMENTS IN X DIRECTION    , 21JA1
     1                35X, I5,                                          21JA1
     2    / 10X, 35HNUMBER OF INCREMENTS IN Y DIRECTION     , 35X, I5,  21JA1
     3    / 10X, 35HINCREMENT LENGTH IN X DIRECTION    , 30X, 1PE10.3,  21JA1IBM
C    3    / 10X, 35HINCREMENT LENGTH IN X DIRECTION    , 30X,   E10.3,  21JA1CDC
     4    / 10X, 35HINCREMENT LENGTH IN Y DIRECTION    , 30X, 1PE10.3,  21JA1IBM
C    4    / 10X, 35HINCREMENT LENGTH IN Y DIRECTION    , 30X,   E10.3,  21JA1CDC
     5    / 10X, 35HPOISSONS RATIO                     , 30X, 1PE10.3,  21JA1IBM
C    5    / 10X, 35HPOISSONS RATIO                     , 30X,   E10.3,  21JA1CDC
     6    / 10X, 35HSLAB THICKNESS                     , 30X, 1PE10.3 ) 21JA1IBM
C    6    / 10X, 35HSLAB THICKNESS                     , 30X,   E10.3 ) 21JA1CDC
  300 FORMAT ( //49H      TABLE 3.  JOINT BENDING STIFFNESSES, LOADS,   10DE1
     +             15HAND SUPPORTS                                      10DE1
     1  //         50H        FROM    THRU      DX          DY         FX , 30AG8
     2             35H        FY           Q           S    ,           30AG8
     3   /         20H        JOINT   JOINT , / )                       30AG8
  311 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 1P6E11.3 )                      21JA1IBM
C 311 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ),   6E11.3 )                      21JA1CDC
  400 FORMAT ( //51H      TABLE 4.  JOINT RESTRAINTS AND APPLIED MOMENTS 10DE1
     1  //         50H        FROM    THRU                            RX , 30AGB
     2             35H        RY          TX           TY    ,          30AGB
```

```
     3   /         20H        JOINT   JOINT , / )                       30AGB
  411 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 22X, 1P4E11.3 )                 21JA1IBM
C 411 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 22X,   4E11.3 )                 21JA1CDC
  500 FORMAT ( //50H      TABLE 5.  MESH TWISTING STIFFNESSES           10DE1
     1  //         30H        FROM    THRU       C     ,                30AGB
     2   /         20H        MESH    MESH   , / )                      30AG8
  511 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 1PE11.3 )                       21JA1IBM
C 511 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ),   E11.3 )                       21JA1CDC
  600 FORMAT ( //40H      TABLE 6.  BAR AXIAL THRUSTS                   10DE1
     1  //         50H        FROM    THRU                          PX  , 30AG8
     2             35H        PY          PBX          PBY     ,        30AGB
     3   /         20H        BAR     BAR    , / )                      30AG8
  611 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 22X, 1P4E11.3 )                 21JA1IBM
C 611 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 22X,   4E11.3 )                 21JA1CDC
  700 FORMAT ( //35H      TABLE 7.  MULTIPLE LOADS                      10DE1
     1  //         50H        FROM    THRU                              , 30AG8
     2             20H                     QM,                          30AG8
     3   /         20H        JOINT   JOINT , / )                       30AG8
  711 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 44X, 1PE11.3 )                  21JA1IBM
C 711 FORMAT ( 5X, 2( 1X, I2, 1X, I3 ), 44X,   E11.3 )                  21JA1CDC
C 800 FORMAT ( //35H      TABLE 8.  PROFILE OUTPUT AREAS   ,            21JA1CDC
  800 FORMAT ( //35H      TABLE 8.  PROFILE OUTPUT AREAS   ,            06DE1IBM
     1  //         40H        FROM    THRU     DEFL    X MOMENT         21JA1
     2             35H     Y MOMENT   PRIN MOM OR STRESS     ,          21JA1
C    3   /         42H        JOINT   JOINT  (1=YES)       (1=SLAB,     24FE1CDC
C    4             35H2=BEAM)              (1=YES)          )           24FE1CDC
     3   /         42H        JOINT   JOINT  (1=YES)       (1=SLAB,     06DE1IBM
     4             35H2=BEAM)              (1=YES)          )           06DE1IBM
  811 FORMAT ( 5X, 2(1X,I2,1X,I3), 4X, I2, 9X, I2, 10X, I2, 14X, I2 )   16AP1
  812 FORMAT ( / 45H              BEAM MOMENTS ARE TOTAL PER BEAM      ) 22JA1
  813 FORMAT ( / 25X, A6, 5X, A6, 13X,          20H  LARGEST    BETA    22JA1
     1   /         25X, A6, 5X, A6, 5X, A6, 2X,  20H PRINCIPAL   X TO   10DE1
     2   /         25X, A6, 5X, A6, 33H    TWISTING   SLAB     LARGEST , 10DE1
     1              A7,                                                 22JA1
     2   /         25H      X , Y    DEFL       , A6, 5X, A6, 5X, A6, 4X, 22JA1
     3              A6, 4X, A6, 2X, AB  )                               22JA1
  814 FORMAT ( 25X A6, 5X A6, 33X A7,                                   10DE1
     +   /     25H      X , Y    DEFL       , A6, 5X A6, 33X A8 )       20DE1
C 815 FORMAT ( / 50H              SLAB X MOMENT AND X TWISTING MOMENT ACT 12FE1CDC
C    1             35HIN THE X DIRECTION (ABOUT Y AXIS)     ,           22JA1CDC
C    2    / 10X, 50HY TWISTING MOMENT = -X TWISTING MOMENT, COUNTERCLD  22JA1CDC
  815 FORMAT ( / 50H              SLAB X MOMENT AND X TWISTING MOMENT ACT 06DE1IBM
     1             35HIN THE X DIRECTION (ABOUT Y AXIS)     ,           06DE1IBM
     2    / 10X, 50HY TWISTING MOMENT = -X TWISTING MOMENT, COUNTERCLD  06DE1IBM
     3             25HCKWISE BETA ANGLES ARE                            22JA1
     4    / 10X, 50HPOSITIVE FROM THE X AXIS TO THE DIRECTION OF THE L  22JA1
     5             17HARGEST PRINCIPAL , A6 ,                           22JA1
C    6   /  10X, 35HSLAB MOMENTS ARE PER UNIT WIDTH      )              22JA1CDC
     6   /  10X, 35HSLAB MOMENTS ARE PER UNIT WIDTH      )              06DE1IBM
  851 FORMAT ( 5X, I2, 1X, I3, 1P3E11.3, 28X, 1PE11.3 )                 21JA1IBM
C 851 FORMAT ( 5X, I2, 1X, I3,   3E11.3, 28X,   E11.3 )                 21JA1CDC
  852 FORMAT ( 5X, I2, 1X, I3, 1P5E11.3, 0PF6.1, 1PE11.3 )              21JA1IBM
C 852 FORMAT ( 5X, I2, 1X, I3,   5E11.3,   F6.1,   E11.3 )              21JA1CDC
  853 FORMAT ( 22X, 1P2E11.3 )                                          21JA1IBM
C 853 FORMAT ( 22X,   2E11.3 )                                          21JA1CDC
C 860 FORMAT (///50H     STATICS CHECK.           SUMMATION OF REACTION, 13SE8CDC
C    1              6HS =    ,  E10.3  )                                21JA1CDC
  860 FORMAT (///50H     STATICS CHECK.           SUMMATION OF REACTION, 06DE1IBM
     1              6HS =    , 1PE10.3  )                               06DE1IBM
C 861 FORMAT ( / 29X 35HMAXIMUM STATICS CHECK ERROR AT STA     ,2I3,    09FE1CDC
C    1              2H =,   E11.3 )                                     16AP1CDC
  861 FORMAT ( / 29X 35HMAXIMUM STATICS CHECK ERROR AT STA     ,2I3,    06DE1IBM
     1              2H =, 1PE11.3 )                                     06DE1IBM
  864 FORMAT (// 25H     PROFILE OUTPUT AREAS  )                        15FE1
C 865 FORMAT (   50H             X MOMENTS ACT IN X DIRECTION (ABOUT Y AX 15FE1CDC
C    1              3HIS),/,10X,  35HTHE PLOTTED RESULTS INDICATE THE RE 15MR1CDC
C    2             40HLATIVE VALUE EACH HAS WITHIN THAT LIST     )      15FE1CDC
  865 FORMAT (   50H             X MOMENTS ACT IN X DIRECTION (ABOUT Y AX 06DE1IBM
     1              3HIS),/,10X,  35HTHE PLOTTED RESULTS INDICATE THE RE 06DE1IBM
     2             40HLATIVE VALUE EACH HAS WITHIN THAT LIST     )      06DE1IBM
C 866 FORMAT (// 42H                                      BETWEEN       15FE1CDC
C    1              2H (, I3, 2H ,, I3, 8H ) AND (, I3, 2H ,, I3, 2H ) ) 06DE1CDC
  866 FORMAT (// 42H                                      BETWEEN       29FE2IBM
     1              2H (, I3, 2H ,, 13, 8H ) AND (, I3, 2H ,, I3, 2H ) ) 29FE2IBM
```

```
  867 FORMAT (     1HL  , 17X,     11HDEFLECTIONS                            10DE1IBM
      1   //      25H       X , Y DEFLECTION    ,                       / )  10DE1IBM
C 867 FORMAT (     1H+  , 17X,     11HDEFLECTIONS                            10DE1CDC
C     1   //      25H       X , Y DEFLECTION    ,                       / )  10DE1CDC
  868 FORMAT (     1HL  ,  9X, A6, 5H AND ,A6, 1X, A6,                       10DE1IBM
      1   //      12H       X , Y , A6, 5H MOM , 27X A6,    5H MOM , / )    10DE1IBM
C 868 FORMAT (     1H+  ,  9X, A6, 5H AND ,A6, 1X, A6,                       10DE1CDC
C     1   //      12H       X , Y , A6, 5H MOM , 27X A6,    5H MOM , / )    10DE1CDC
  869 FORMAT (     1HL  , 20X, A6, 1X, A6,                                   10DE1IBM
      1   //      12H       X , Y , A6,5H MOM ,                         / )  10DE1IBM
C 869 FORMAT (     1H+  , 20X, A6, 1X, A6,                                   10DE1CDC
C     1   //      12H       X , Y , A6,5H MOM ,                         / )  10DE1CDC
  870 FORMAT (     1HL  , 17X,     10HPRINCIPAL , A6,                        10DE1IBM
      1   //      17H       X , Y PRIN , A6,                            / )  10DE1IBM
C 870 66RMAT (     1H+ 8 17X,     10HPRINCIPAL , A6,                        10DE1CDC
C     1   //      17H       X , Y PRIN , A6,                            / )  10DE1CDC
  900 FORMAT ( //40H       TABLE 9.  PRINTED OUTPUT LIMITS        ,          24FE1
      1   //      20H         FROM    THRU     ,                             21JA1
      2   /       20H        Y STA    Y STA    )                             21JA1
  903 FORMAT ( / 25H                       NONE )                            17FE1
  905 FORMAT (    46H              USING DATA FROM THE PREVIOUS PROBLEM )    17FE1
  910 FORMAT (    43H              ADDITIONAL DATA FOR THIS PROBLEM  )       31DE4
  911 FORMAT (2(5X,I5))                                                      03FE1
  920 FORMAT ( //15H       RESULTS                 )                         12FE1
  921 FORMAT ( //35H       RESULTS--USING STIFFNESS DATA ,                   12FE1
C     1               22HFROM PREVIOUS PROBLEM ,      A5 )                   21JA1
      1               22HFROM PREVIOUS PROBLEM ,      A1, A4 )               14AP77
  980 FORMAT (///40H       **** UNDESIGNATED ERROR STOP ****  )              19JE8
  981 FORMAT ( //51H       **** CAUTION.  MULTIPLE LOADING OPTION MISUSED 02FE1
      1               35H FOR THIS OR PRIOR PROBLEM ****      )              02FE1
  982 FORMAT ( //50H       **** MISUSE OF MULTIPLE LOADING OPTION ****   ) 02FE1
  983 FORMAT (//50H      **** IMPROPER NO OF CARDS INPUT OR KEPT **** )      02FE1
  984 FORMAT (   /50H      **** X INCREMENTS EXCEED Y INCREMENTS ****    ) 02FE1
  985 FORMAT (    35H      **** ERRONEOUS DATA INPUT ****        )           02FE1
  986 FORMAT (   /50H      **** THE DIMENSIONED STORAGE IS TOO SMALL FOR    02FE1
      1               30H THIS SIZE OF PROBLEM ****        )                 02FE1
  990 FORMAT (    35H      **** TOTAL NUMBER OF SPECIFIED                    12FE1
      1               10H POINTS IS   , I5,                                  03FE1
      2               25H      , 300 IS MAX ****         )                   12FE1
  991 FORMAT (   /10H      **** , I4,                                        24FE1
      1               33H  DATA ERRORS IN THIS TABLE  ****  )                19AG8
  992 FORMAT (///30H       **** PROBLEM TERMINATED  , I4   ,                 23AG8
      1               20H  DATA ERRORS ****  )                               23AG8
C
C-----DEFINE READ AND WRITE UNITS                                            04AP77
                    INP = 5                                                  04AP77
                    IOP = 6                                                  04AP77
                    ID1 = 0                                                  30NO1
                    ID2 = 0                                                  30NO1
                    ID3 = 0                                                  30NO1
                    ID4 = 0                                                  30NOI
                    I4D = 0                                                  06DE1IBM
C-----PROGRAM AND PROBLEM IDENTIFICATION
C
C-----INITIALIZE DATA NORMALLY READ IN TABLE 1                               16MR77
               IF ( ML .EQ. -1 )      GO TO 1005                             16MR77
                    KML = 0                                                  05FE1
          IPLFLG = 0                                                         22JA RLM
 1005               THK = 0.0                                                28AP77
                    ITMPP = 0                                                03MR77
                    KROPT = 0                                                03MR77
                    IOPPS = 0                                                03MR77
                    IPOP  = 0                                                03MR77
                    IGSW = 0                                                 03MR77
                    I3D = 0                                                  03MR77
                    VEF = 0                                                  03MR77
                    RDF = 0                                                  03MR77
                    SLOPE = 0                                                03MR77
C-----THESE VALUES ARE ADDED TO ALLOW ECHO PRINT OF THE DATA GENERATED  28AP77
C              BY SLAB49M TO BE PRINTED JUST AS IF IT HAD BEEN CODED.        28AP77
                    KML = ML                                                 14AP77
                    SWS = 1.0                                                03MR77
                    SWB = 0.0                                                03MR77
                    IBOS = 1                                                 03MR77
```

```
                 IBOST = 1                                                   03MR77
                 NDE1 = 0                                                    03MR77
                 NDE2 = 0                                                    03MR77
                 NDE3 = 0                                                    03MR77
                 NDE4 = 0                                                    03MR77
                 NDE5 = 0                                                    03MR77
                 NDE6 = 0                                                    03MR77
                 NDE7 = 0                                                    03MR77
                 NDE8 = 0                                                    03MR77
                 NDE9 = 0                                                    03MR77
            IF ( KEEP3 .EQ. 0 )  NCT3 = NCD3                                 28AP77
            IF ( KEEP4 .EQ. 0 )  NCT4 = NCD4                                 28AP77
            IF ( KEEP5 .EQ. 0 )  NCT5 = NCD5                                 28AP77
            IF ( KEEP6 .EQ. 0 )  NCT6 = NCD6                                 28AP77
            IF ( KEEP7 .EQ. 0 )  NCT7 = NCD7                                 28AP77
            IF ( KEEP8 .EQ. 0 )  NCT8 = NCD8                                 28AP77
            IF ( KEEP9 .EQ. 0 )  NCT9 = NCD9                                 28AP77
C-----OMIT PRINT OF GENERATED DATA                                           14AP77
            IF ( IPGND .EQ. 0 )  GO TO 4870                                  28AP77
C     READ 12, (AN1(N), N = 1, 40)                                           03MR77
C1010 READ 14, NPROB, (AN2(N), N = 1, 18)                                    03MR77
 1020       IF ( NPROB(2) - ITEST(2) )  1021,  9990,  1021                   11MR77
 1021 PRINT 11                                                               11MR77
      PRINT  1                                                               11MR77
          PRINT 13,  AN1                                                     03MR77
      PRINT 15,  NPROB, AN2                                                  03MR77
C
C-----INPUT TABLE 1  CONTROL DATA                                            02FE1
C
C     READ    20, KEEP2, KEEP3, KEEP4, KEEP5, KEEP6, KEEP7, KEEP8,          03MR77
C    1            KEEP9, ML, ITMPP, NCD2, NCD3, NCD4, NCD5, NCD6, NCD7,     03MR77
C    2            NCD8, NCD9, KROPT, IOPPS,IPOP,IGSW, I3D,VEF,RDF,SLOPE     03MR77
                 I4D = I4D + I3D                                             06DE1
      PRINT 100, KEEP2, KEEP3, KEEP4, KEEP5, KEEP6, KEEP7, KEEP8,           18MYO
     1            KEEP9,      NCD2, NCD3, NCD4, NCD5, NCD6, NCD7,           06JCO
     2            NCD8, NCD9, ML, KROPT, IOPPS,       IPOP, I3D              02FE1
                 NDE1 = 0                                                    02FE1
            IF (KML) 1174, 1170, 1172                                        02FE1
 117D       IF ( ML ) 1171, 1175, 1175                                       02FE1
 1171            NOE1 = NDE1 + 1                                             02FE1
      PRINT 982                                                              05FE1
            GO TO 1176                                                       02FE1
 1172       IF ( ML ) 1176, 1173, 1173                                       02FE1
 1173 PRINT 981                                                              02FE1
            GO TO 1175                                                       02FE1
 1174       IF ( ML ) 1176, 1175, 1175                                       02FE1
 1175       IF ( KEEP2 ) 1179, 1177, 1178                                    02FE1
 1176       IF ( KEEP2 ) 1179, 1179, 1178                                    02FE1
 1177       IF (NCD2 ) 1179, 1179, 1180                                      02FE1
 1178       IF ( NCD2 ) 1179, 1180, 1179                                     02FE1
 1179            NDE1 = NDE1 + 1                                             02FE1
      PRINT 983                                                              05FE1
 1180            KML = ML                                                    02FE1
            IF (NDE1)  9980, 1200, 1182                                      23FE1
 1182 PRINT 991, NDE1                                                        05FE1
C
C-----INPUT TABLE 2 -- CONSTANTS                                             02FE1
C
 1200 PRINT 200                                                              02FE1
            IF ( KEEP2 ) 9980, 1201, 1240                                    24FE1
 1201            NDE2 = 0                                                    26AG8
            IF ( NCD2 - 1 ) 1203, 1205, 1203                                 28AG8
 1203            NDE2 = NDE2 + 1                                             26AG8
      PRINT 985                                                              23FE1
C1205 READ   21, MX, MY, HX, HY, PR, THK                                     03MR77
 1205 PRINT 201, MX, MY, HX, HY, PR, THK                                     03MR77
            IF ( MX - MY ) 1211, 1211, 1210                                  19AG8
 1210            NDE2 = NDE2 + 1                                             16AG8
```

The statements which originally read the data cards in Tables 2 through 9 have been nulled with a C in column 1. The remainder of the data input and print logic is the same as in the original SB49S routine (Ref 8).

The preceding 438 cards are exactly the same as in SB49S (Ref 8) and are thus omitted from this listing.

```
C-----PRINT HEADINGS FOR COMBINED SLAB AND BEAM OUTPUT
 6140 PRINT 6                                                           08FE1
      PRINT 815, SOM                                                    16AP1
      PRINT 812                                                         08FE1
      PRINT 6                                                           08FE1
      PRINT 813, SLBX, SLBY, BMOM, BMOM, SLBX,                          10DE1
     +           BEMX, BEMY, ROSC1, BMOM, BMOM, BMOM, SOM, SOM, ROSC2   10DE1
 6145     IF (IOPPS) 9980, 6180, 6175                                   060C0
 6175     IF ( THK ) 9980, 6180, 6176                                   09FE1
 6176         SDT2 = 6.0 / ( THK * THK )                                060C0
          GO TO 6200                                                    09FE1
 6180         SDT2 = 1.0                                                060C0
C
C-----COMPUTE BENDING MOMENTS, REACTIONS AND TWISTING MOMENTS
C
C-----DETERMINE IF BOX MOMENT SUMS WILL BE MADE, INITIATE STORAGE       04AP77
          IF ( NBSM .EQ. 0 )  GO TO  6199                               04AP77
          DO  6181  J = 1, MYP3                                         04AP77
              JSM(J) = 0                                                04AP77
 6181     CONTINUE                                                      04AP77
          DO  6183  JJ = 1, NBSM                                        04AP77
          DO  6182  II = 1, 6                                           04AP77
              SUM(JJ,II) = 0.0                                          04AP77
 6182     CONTINUE                                                      04AP77
 6183     CONTINUE                                                      04AP77
C-----DETERMINE Y-STA LIMITS TO HAVE BOX SUMS.  IF A SUM IS TO BE       04AP77
C     MADE, SET JSM = TO BOX NUMBER.                                    04AP77
          DO  6188  JJ = 1, NBSM                                        04AP77
              JY2 = 0                                                   04AP77
              NB = IBN(JJ)                                              04AP77
          DO  6184  K = 1, NB                                           04AP77
              JY2 = JY2 + INCRW( KTBA(K) )                              04AP77
 6184     CONTINUE                                                      04AP77
              JY1 = JY2 - INCRW( KTBA(NB) )                             04AP77
          DO  6187  J = 1, MYP3                                         04AP77
          IF ( J .LT. ( JY1 + 2 ) ) GO TO 6187                          04AP77
          IF ( J .GT. ( JY2 + 2 ) ) GO TO 6188                          04AP77
              JSM(J) = NB                                               04AP77
C-----DETERMINE CLOSEST X-STA TO LOCATION WHERE SUM IS NEEDED           04AP77
              K = INS(JJ)                                               08AP77
          DO  6186  I = 1, K                                            04AP77
              ISM(JJ,I) = ( SMX(JJ,I) + HX/2.0 ) / HX - IXO             04AP77
 6186     CONTINUE                                                      04AP77
 6187     CONTINUE                                                      04AP77
 6188     CONTINUE                                                      04AP77
 6199     CONTINUE                                                      04AP77
 6200     DO 8650  LL = 1, MYP3                                         15MR1
              J = MYP4 - LL                                             24JL8
          DO 6250  I = 1, MXP3                                          08JL8
              WP2(I) = WP1(I)                                           08JL8
              WP1(I) = W(I)                                             05JL8
              W(I)   = WM1(I)                                           05JL8
              WM1(I) = WM2(I)                                           05JL8
 6250     CONTINUE                                                      08JL8
          DO 6300  I = 1, MXP3                                          12MY0
              WM2(I) = PW(I,J)                                          12MY0
 6300     CONTINUE                                                      12MY0
          IF ( MYP1 - J ) 8650, 6400, 6500                              02MA1
 6400     DO 6450  I = 2, MXP2                                          24JL8
              CRD(2) = DMIN1 ( DX(I), DY(I) )                           11MR76
              WSUMM1      = ODHX2 * ( WM1(I-1) - 2.0 * WM1(I)           05JL8
     1                          + WM1(I+1) )                            05JL8
              WSUMM2      = ODHY2 * ( WM2(I) - 2.0 * WM1(I) + W(I) )    05JL8
              BMYM1(I)    =    DY(I) * WSUMM2 + CRD(2) * PR * WSUMM1    05AG9
              BMBYM1(I)   =    FYI(I) * WSUMM2                          26JL8
```

```
 6450     CONTINUE                                                      24JL8
          GO TO 8650                                                    09FE1
 6500     DO 7200  I = 2, MXP2                                          08JL8
              CRD(2) = DMIN1 ( DX(I), DY(I) )                           11MR76
              CRD(4) = DMIN1 ( DXM1(I), DYM1(I) )                       11MR76
```

The following 107 cards are exactly the same as in SB49S (Ref 8) and are thus omitted from this listing.

```
C-----COMPUTE PRINCIPAL MOMENTS OR STRESSES                             14NO7
C
 8060           BMA    = 0.5 * ( BMX(I) + BMY(I) )                      08JL8
                TMY    = - TMX                                          07DE0
                BMP    = BMX(I) - BMA                                   08JL8
                BMR    =DSQRT ( BMP * BMP + TMY * TMY )                 07DE0IBM
C               BMR    = SQRT ( BMP * BMP + TMY * TMY )                 07DE0CDC
                BMO    = BMA + BMR                                      08JL8
                BMT    = BMA - BMR                                      08JL8
C-----TEST TO PRINT ONLY THE MAXIMUM VALUE                              15DE7
          IF ( BMA ) 8160, 8180, 8180                                   08JL8
 8160           PMMAX  = BMT                                            08JL8
          IF ( BMP ) 8400, 8300, 8200                                   08JL8
 8180           PMMAX  = BMO                                            08JL8
          IF ( BMP ) 8200, 8300, 8400                                   08JL8
 8200           ALF    = TMY / BMP                                      07DE0
                ALF    =DATAN ( ALF ) * 57.29578                        07DE0IBM
C               ALF    = ATAN ( ALF ) * 57.29578                        07DE0CDC
          IF ( ALF ) 8220, 8240, 8240                                   07DE0
 8220           THETA  =  - ALF - 180.0                                 07DE0
          GO TO 8450                                                    08JL8
 8240           THETA  =  + 180.0 - ALF                                 07DE0
          GO TO 8450                                                    08JL8
 8300     IF ( TMY ) 8320, 8340, 8360                                   07DE0
 8320           THETA  =  + 90.0                                        07DE0
          GO TO 8450                                                    08JL8
 8340           THETA  = 0.0                                            08JL8
          GO TO 8450                                                    08JL8
 8360           THETA  =  - 90.0                                        07DE0
          GO TO 8450                                                    08JL8
 8400           ALF    = TMY / BMP                                      07DE0
                ALF    =DATAN ( ALF )    * 57.29578                     07DE0IBM
C               ALF    = ATAN ( ALF )    * 57.29578                     07DE0CDC
                THETA  = - ALF                                          07DE0
C-----CLOCKWISE ANGLES ARE NEGATIVE                                     15DE7
 8450           BETA   = 0.5 * THETA                                    09FE1
                SIGO   = PMMAX * SDT2                                   08JL8
                PSIGO(I,J+2) = SIGO                                     15JL0
C-----PRINT SLAB ONLY OUTPUT
          IF ( IPRINT ) 9980, 8458, 8454                                15MR1
 8454 PRINT 852, ISTA, JSTA, W(I), BMX(I), BMY(I), TMX, SIGO,           15MR1
     1       BETA, ROCK                                                 09FE1
C-----PRINT BEAM OUTPUT IF COMBINED
 8458     IF ( SWB ) 9980, 8470, 8460                                   04AP77
 8460     IF ( IPRINT ) 9980, 8470, 8465                                04AP77
 8465 PRINT 853, BMBX(I), BMBY(I)                                       15MR1
 8470           JP2 = J + 2                                             11AP77
          IF ( JSM(JP2) .EQ. 0 )  GO TO 8550                            11AP77
C-----FIND BOX WITH SUM, JJ WILL BE BOX INDEX                           04AP77
          DO  8475  JJ = 1, NBSM                                        04AP77
          IF ( JSM(JP2) .EQ. IBN(JJ) )  GO TO 8480                      11AP77
 8475     CONTINUE                                                      04AP77
      WRITE (IOP,821)                                                   08AP77
  821 FORMAT ( / 45H     ***** INVALID MOMENT SUM SPECIFIED ****      ) 08AP77
          GO TO 8550                                                    08AP77
C-----FIND X-STA TO BE SUMMED, II WILL BE X-STA INDEX                   04AP77
```

```
8480          K = INS(JJ)                                                      04AP77
        DO  8485  II = 1, K                                                     04AP77
        IF ( ISM(JJ,II)  .EQ.  ISTA )  GO TO 8490                               04AP77
8485    CONTINUE                                                                04AP77
        IF ( JSM(JP2)  .EQ.  JSM(JP2-1) )  GO TO  8550                          11AP77
        GO TO 8495                                                              04AP77
8490    IF ( JSM(JP2+1)  .EQ.  0 )  GO TO  8500                                 11AP77
        IF ( JSM(JP2)  .EQ.  JSM(JP2-1) )  GO TO  8505                          11AP77
8495    IF ( JSM(JP2-1)  .EQ.  0 )  GO TO 8525                                  11AP77
        GO TO  8510                                                             04AP77
8500    IF ( JP2 .EQ. 2  .OR.  JP2 .EQ. MYP2 )  GO TO 8502                      11AP77
            SUM(JJ,II) = BMX(I) * HY * 0.5                                      11AP77
        GO TO  8550                                                             04AP77
8502        SUM(JJ,II) = BMX(I) * HY                                            11AP77
        GO TO 8550                                                              11AP77
8505        SUM(JJ,II) = SUM(JJ,II) + BMX(I) * HY                               04AP77
        IF ( JSM(JP2)  .EQ.  JSM(JP2+1) )  GO TO  8550                          11AP77
            SUM(JJ,II) = SUM(JJ,II) + SUMT(II)                                  04AP77
        GO TO  8550                                                             04AP77
8510        K = INS(JJ-1)                                                       04AP77
        DO  8515  IIT = 1, K                                                    04AP77
        IF ( ISM(JJ-1,IIT)  .EQ.  ISTA )  GO TO  8520                           04AP77
8515    CONTINUE                                                                04AP77
        GO TO 8525                                                              04AP77
8520    IF ( JSM(JP2)  .EQ.  JSM(JP2-1) )  GO TO  8525                          11AP77
            SUMT(IIT) = BMX(I) * HY * 0.5                                       04AP77
8525    IF ( ISM(JJ,II)  .EQ.  ISTA )  GO TO  8530                              04AP77
        GO TO  8550                                                             04AP77
8530    IF ( JP2 .EQ. 2  .OR.  JP2 .EQ. MYP2 )  GO TO 8532                      11AP77
            SUM(JJ,II) = SUM(JJ,II) + BMX(I) * HY * 0.5                         11AP77
        GO TO 8550                                                              11AP77
8532        SUM(JJ,II) = SUM(JJ,II) + BMX(I) * HY                               11AP77
8550    CONTINUE                                                                08JL8
        IF ( ISW ) 9980, 8600, 8650                                             09FE1
8600        JN = J - 1                                                          24JL8
     CALL DATA        (   L1,    JN,    1,    MXP3,                             D9FE1
    1                     DX, DYM1,   DY, DYP1,   FX, FYM1,                     24JE8
    2                     FY, FYP1,    Q,    S,                                 24JE8
    3                     RX, RYM1, RYP1,   TX, TYM1, TYP1,                     24JE8
    4                     CH, CHP1,                      DXP1, DXM1,            05AG9
    5                     PX,   PY, PYP1,  PBX,  PBY, PBYP1,                    24JE8
    6                     QM, IPRINT                                  )         15MR1
        IF ( J - 1 ) 9980, 8610, 8650                                           07DE0
8610        ISW = 1                                                             07DE0
        DO 8620  I = 1, MXP3                                                    09FE1
            WP2(I) = WP1(I)                                                     24JL8
            WP1(I) = W(I)                                                       05JL8
            W(I)   = WM1(I)                                                     05JL8
            WM1(I) = WM2(I)                                                     05JL8
            WM2(I) = 0.D                                                        24JL8
8620    CONTINUE                                                                07DE0
        DO 8630  I = 2, MXP2                                                    07DE0
            CRD(2) = DMIN1 ( DX(I), DY(I) )                                     11MR76
            BMYP1(I)    = BMY(I)                                                08JL8
            BMY(I)      = BMYM1(I)                                              08JL8
            BMYM1(I)    = 0.0                                                   24JL8
            BMBYP1(I)   = BMBY(I)                                               08JL8
            BMBY(I)     = BMBYM1(I)                                             08JL8
            BMBYM1(I)   = 0.0                                                   24JL8
            WSUM1       = OOHX2 * ( W(I-1) - 2.0 * W(I) + W(I+1) )              08JL8
            WSUM2       = ODHY2 * ( WM1(I) - 2.0 * W(I) + WP1(I) )              08JL8
            BMX(I)      = DX(I) * WSUM1 + CRD(2) * PR * WSUM2                   05AG9
            BMBX(I)     = FX(I) * WSUM1                                         08JL8
C-----BMX AND BMY ARE AT STATION 0, PBMX AND PBMY ARE STORED AT J = 2
        IF ( IBOS .EQ. 2 ) GO TO 8625                                           11FE1
            PBMX(I, 2 ) = BMX(I)                                                21AP1
            PBMY(I, 2 ) = BMY(I)                                                21AP1
        GO TO 8630                                                              11FE1
8625        PBMX(I, 2 ) = BMBX(I)                                               21AP1
            PBMY(I, 2 ) = BMBY(I)                                               21AP1
8630    CONTINUE                                                                07DE0
            JSTA = 0                                                            26JL8
            J = 0                                                               15JL0
        GO TO  7300                                                             24JL8
```

```
 8650      CONTINUE                                                         07DE0
      PRINT 860, SUMR                                                       13SE8
      PRINT 861, ITEMP, JTEMP, STEMP                                        09FE1
C-----PRINT BOX MOMENT SUMS                                                 04AP77
           IF ( NBSM .EQ. 0 ) GO TO 8658                                    04AP77
      WRITE (IOP,820)                                                       04AP77
  820 FORMAT (///45H     BOX MOMENT SUMMATIONS (TOTAL ACROSS BOX)           04AP77
     1 //         51H           BOX NO.    X-STA      X-DIST      TOTAL BMX)02JU77
           DO  8656  JJ = 1, NBSM                                           04AP77
                K = INS(JJ)                                                 04AP77
           DO  8654  II = 1, K                                              04AP77
                XD = ( ISM(JJ,II) + IXO ) * HX                              02JU77
      WRITE (IOP,825) IBN(JJ), ISM(JJ,II), XD, SUM(JJ,II)                   02JJ77
  825 FORMAT ( 10X, 2( I4, 5X ), 1PE10.3, 1PE13.3 )                         02JU77
 8654      CONTINUE                                                         04AP77
      WRITE (IOP,6)                                                         11AP77
 8656      CONTINUE                                                         04AP77
           GO TO 8659                                                       04AP77
 8658 WRITE (IOP,828)                                                       04AP77
  828 FORMAT (///30H      NO BOX SUMS SPECIFIED        )                    D4AP77
 8659      CONTINUE                                                         04AP77
C ******* NO ZOT, SPLOT ONLY, FOR IBM ***********                           30NO1
                IPOP = 0                                                    30NO1IBM
C          IF(IPOP .GT. 0 .OR. I3D .EQ. 1)  CALL PLOTS( IBUF,5)0,10)        30NO1IBM
C-----  3D PLOT CAPABILITY OMITTED FOR THIS VERSION   *************         11MR76
```

The following 154 cards are exactly the same as in SB49S (Ref 8) and are thus omitted from this listing.

```
C-----LINE PLOTS NOT AVAILABLE THIS VERSION                                 11MR76
                NP2 = NEND + 2                                              19JE0
           DO  8872  I = 1, NP2                                             11DE0
 8872           XX(I) = I - 1                                               11DE0
           IF ( IPOP.EQ.1 )    GO TO  8865                                  11DE0
 8884      CONTINUE                                                         11DE0
 8885      CONTINUE                                                         11DE0
 8950      CONTINUE                                                         12MY0
           IF ( I3D.EQ.1 )                                                  26OC0
     1PRINT  9099                                                           11MR76
 9099 FORMAT ( //50H      **** 3D PLOT NOT AVAILABLE THIS VERSION **** )    11MR76
C     CALL TIC TOC (4)                                                      14AP77
C          GO TO 1010                                                       03MR77
C-----RETURN TO DATA GENERATOR                                              03MR77
      RETURN                                                                03MR77
 9980 PRINT 980                                                             19JE8
 9990      CONTINUE                                                         19MR5
 9999      CONTINUE                                                         04MY3
C-----  3D PLOTS NOT AVAILABLE THIS VERSION                                 11MR76
C          IF ( IPOP.GT.0 .OR.I3D.EQ.1 ) CALL ENOPLT                        14MY1CDC
      PRINT 11                                                              08MY3
      PRINT 1                                                               21JL7
      PRINT 13, AN1                                                         06OC0
      CALL TIC TOC (2)                                                      26SE6
      PRINT 19                                                              26AG3
      RETURN                                                                23NO1
      END
```

The remainder of the subroutines are exactly the same as those used for SLAB 49 (Ref 8). The only changes are total double precisioning and the increase in the axial thrust array sizes in common block /CARDS/ of subroutine STIFF. 1198 cards are thus omitted from this listing.

APPENDIX D

TYPICAL OUTPUT

PROGRAM SLBDG 2

```
                                                                                I-----TRIM
PROGRAM SLBDG2   BRIDGE DIVISION, TEXAS DOHPT   PANAK    REVISION DATE 10 AUG 77

POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS      RUN AS CHECK FOR 10 AUG 77 VERSION

PROB
 170A      LOADING NO. ONE    EAST EDGE


TABLE 1.  CONTROL DATA
                                                      TABLE NUMBER
                                              2    3    4    5    6    7    8    9

    KEEP FROM PRECEDING PROBLEM (1=YES)       0    0    0    0    0    0    0    0
    NUM CARDS INPUT THIS PROBLEM              1    1    1    2    1    2    3    3

    MULTIPLE LOAD OPTION                      1
    PRINT GENERATED DATA                      0
    SKEW ANGLE                             0.374D 02


TABLE 2.  CONSTANTS

    NUMBER OF SPAN INCREMENTS IN X DIRECTION                                  14
    NUMBER OF INCREMENTS IN Y DIRECTION                                       44
    INCREMENT LENGTH IN X DIRECTION (ALONG SPAN CENTERLINE)             3.739D 01
    INCREMENT LENGTH IN Y DIRECTION                                     1.216D 01
    POISSONS RATIO                                                      1.500D-01
    MODULUS OF ELASTICITY                                               6.200D 03

TABLE 3.  BOX STIFFNESS DATA

  TYPE  NO. INCR  BOX   VOID   SLAB THICK   SHEAR KEY       LONGIT. BOX INERTIAS
  NO.   IN WIDTH  DEP   WIDTH   TOP  BOT   STIFF FACTOR      MOMENT    TORSIONAL
   1          4  20.00 23.75   5.50  5.00    0.100D-05      3.099D 04  7.198D 04

TABLE 4.  BOX ARRANGEMENT BY TYPE NO.

   1    1    1    1    1    1

TABLE 5.  LOAD PATTERNS

PAT                   X AND Y DISTANCES (OF THE LOAD PATTERN)
 LDS                              LOAD MAGNITUDE
1  -170. -39.-170.  39. -25. -36. -25.  36.  25. -36.  25.  36.
 6  -5.930D 00 -5.930D 00 -1.455D 01 -1.455D 01 -1.455D 01 -1.455D 01


TABLE 6.  PLACEMENTS OF LOAD PATTERNS

PAT-PLMTS             X AND Y DISTANCES (OF THE STRUCTURE)
 1    1    402. 181.


TABLE 7.  SUMMATION OF BOX BENDING MOMENTS

   BOX  SUMS          SUM AT X-STATION NEAREST THESE X-DISTANCES
   10    5       370.       406.       442.       478.       514.
   11    5       370.       406.       442.       478.       514.


TABLE 8.  PROFILE OUTPUT AREAS

 DISTS FROM - THRU     DEFL      X MOM     Y MOM     PRIN MOM
  X    Y    X    Y                     (1=YES)
 160. 242. 727. 242.    1         0         0         0
 -38.   0. 562.   0.    1         0         0         0
-204.-242. 360.-242.    1         0         0         0


TABLE 9.  PRINTED OUTPUT LIMITS
```

```
Y-DIST FROM - THRU
      Y          Y
   -268.      -243.
    -12.        12.
    243.       268.


SUMMATION OF LOADS ON STRUCTURE      -7.006D 01
SUMMATION OF LOADS OFF STRUCTURE      0.0




RESULTS FROM SLAB49 PROGRAM USING DATA GENERATED BY SLBDG2


POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS      RUN AS CHECK FOR 10 AUG 77 VERSION

PROB (CONTD)
 170A      LOADING NO. ONE    EAST EDGE



RESULTS

     SLAB X MOMENT AND X TWISTING MOMENT ACT IN THE X DIRECTION (ABOUT Y AXIS)
     Y TWISTING MOMENT = -X TWISTING MOMENT, COUNTERCLOCKWISE BETA ANGLES ARE
     POSITIVE FROM THE X AXIS TO THE DIRECTION OF THE LARGEST PRINCIPAL MOMENT
     SLAB MOMENTS ARE PER UNIT WIDTH


                                                       LARGEST     BETA
                                            SLAB X    PRINCIPAL    X TO
                         SLAB X      SLAB Y     TWISTING    SLAB      LARGEST  SUPPORT
 X , Y     DEFL          MOMENT      MOMENT      MOMENT     MOMENT     MOMENT  REACTION

 0   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 1   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 2   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 3   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 4   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 5   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 6   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 7   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 8   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
 9   44   0.0          0.0         0.0         0.0         0.0          0.0   0.0
10   44   2.993D-02    0.0         0.0         0.0         0.0          0.0   0.0
11   44   1.020D-02 -3.126D 00   7.102D-16   1.922D 01  -2.085D 01  -42.7 -3.377D 04
12   44  -1.170D-02 -1.836D 00  -2.892D-16  -1.846D 00  -2.980D 00   31.8  3.379D 04
13   44  -3.487D-02  2.214D 00  -1.368D-15  -2.810D 00   4.127D 00  -34.2  0.0
14   44  -5.650D-02  4.690D 00  -2.376D-15  -2.761D 00   5.967D 00  -24.8  0.0
15   44  -7.489D-02  7.078D 00  -3.234D-15  -2.739D 00   8.015D 00  -18.9  0.0
16   44  -8.839D-02  9.364D 00  -3.872D-15  -2.864D 00   1.017D 01  -15.7  0.0
```

```
17  44 -9.541D-02  9.733D 00 -4.220D-15 -3.095D 00  1.063D 01 -16.2  0.0
18  44 -9.569D-02  8.493D 00 -4.266D-15 -3.264D 00  9.602D 00 -18.8  0.0
19  44 -9.010D-02  6.421D 00 -4.047D-15 -3.313D 00  7.823D 00 -22.9  0.0
20  44 -8.006D-02  4.450D 00 -3.628D-15 -3.274D 00  6.184D 00 -27.9  0.0
21  44 -6.695D-02  2.652D 00 -3.067D-15 -3.200D 00  4.790D 00 -33.7  0.0
22  44 -5.200D-02  1.005D 00 -2.425D-15 -3.082D 00  3.626D 00 -40.4  0.0
23  44 -3.636D-02 -4.143D-01 -1.748D-15 -2.885D 00 -3.099D 00  42.9  0.0
24  44 -2.100D-02 -1.249D 00 -1.082D-15 -2.510D 00 -3.210D 00  38.0  0.0
25  44 -6.511D-03 -7.449D-01 -4.500D-16 -1.418D 00 -1.839D 00  37.6  2.156D 04
26  44  7.466D-03  1.256D-14  1.759D-16 -2.320D-01  2.320D-01 -45.0 -2.156D 04

 0  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  43  4.417D-02  0.0        0.0        0.0        0.0         0.0  0.0
10  43  2.446D-02 -7.917D-11  3.306D-01  2.709D 01  2.725D 01  45.2  0.0
11  43  4.722D-03 -5.140D 00  3.111D 00 -6.987D-01 -5.199D 00   4.8 -2.291D 04
12  43 -1.699D-02 -2.178D 00  1.286D 00 -3.222D 00 -4.105D 00  30.9  2.289D 04
13  43 -3.953D-02  4.353D 00  1.788D-01 -5.234D 00  7.901D 00 -34.1  0.0
14  43 -6.054D-02  9.157D 00  7.146D-02 -5.279D 00  1.158D 01 -24.6  0.0
15  43 -7.832D-02  1.386D 01  2.313D-06 -5.237D 00  1.561D 01 -18.5  0.0
16  43 -9.121D-02  1.849D 01 -1.734D-01 -5.587D 00  2.003D 01 -15.5  0.0
17  43 -9.754D-02  1.919D 01 -1.670D-01 -6.239D 00  2.133D 01 -16.4  0.0
18  43 -9.709D-02  1.670D 01 -8.893D-02 -6.699D 00  1.904D 01 -19.3  0.0
19  43 -9.073D-02  1.255D 01  1.577D-02 -6.829D 00  1.556D 01 -23.7  0.0
20  43 -7.993D-02  8.678D 00  6.317D-02 -6.734D 00  1.236D 01 -28.7  0.0
21  43 -6.607D-02  5.145D 00  1.068D-01 -6.571D 00  9.663D 00 -34.5  0.0
22  43 -5.039D-02  1.895D 00  1.708D-01 -6.324D 00  7.415D 00 -41.1  0.0
23  43 -3.406D-02 -9.412D-01  2.830D-01 -5.907D 00 -5.268D 00  42.0  0.0
24  43 -1.807D-02 -2.707D 00  5.496D-01 -5.201D 00 -6.529D 00  36.3  0.0
25  43 -3.063D-03 -2.215D 00  2.316D 00 -2.804D 00  3.656D 00 -64.5  1.486D 04
26  43  1.104D-02 -1.089D-11  9.311D-01 -3.987D-01  1.078D 00 -69.7 -1.488D 04

 0  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  42  3.858D-02  0.0        0.0        0.0        0.0         0.0  0.0
10  42  1.899D-02 -1.044D-11  4.764D-01 -7.404D-01  1.016D 00 -53.9 -3.661D 03
11  42 -6.120D-04 -5.685D 00  5.115D-01 -1.047D 00 -5.857D 00   9.3  3.676D 03
12  42 -2.221D-02 -1.066D 00  4.774D-01 -2.277D 00 -2.698D 00  35.6  0.0
13  42 -4.421D-02  4.585D 00  2.836D-01 -4.176D 00  7.132D 00 -31.4  0.0
14  42 -6.463D-02  9.335D 00  1.434D-01 -4.496D 00  1.117D 01 -22.2  0.0
15  42 -8.183D-02  1.415D 01  2.624D-02 -4.501D 00  1.546D 01 -16.3  0.0
16  42 -9.413D-02  1.916D 01 -8.859D-02 -5.160D 00  2.045D 01 -14.1  0.0
17  42 -9.979D-02  1.983D 01 -1.081D-01 -6.352D 00  2.168D 01 -16.3  0.0
18  42 -9.858D-02  1.717D 01 -5.956D-02 -7.153D 00  1.975D 01 -19.9  0.0
19  42 -9.143D-02  1.280D 01  2.334D-02 -7.375D 00  1.617D 01 -24.6  0.0
20  42 -7.984D-02  8.820D 00  1.013D-01 -7.267D 00  1.293D 01 -29.5  0.0
21  42 -6.521D-02  5.201D 00  1.880D-01 -7.163D 00  1.028D 01 -35.4  0.0
22  42 -4.879D-02  1.855D 00  3.008D-01 -7.046D 00  8.166D 00 -41.9  0.0
23  42 -3.174D-02 -1.109D 00  4.540D-01 -6.730D 00 -7.103D 00  41.7  0.0
24  42 -1.510D-02 -2.981D 00  6.235D-01 -5.405D 00 -6.876D 00  35.8  2.910D 03
25  42  4.799D-04 -3.997D 00  4.512D-01 -1.789D 00 -4.627D 00  19.4 -2.883D 03
26  42  1.465D-02 -8.845D-13  4.423D-01  1.790D 01  1.812D 01  45.4  0.0

 0  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  41  3.335D-02  0.0        0.0        0.0        0.0         0.0  0.0
10  41  1.399D-02 -1.399D-10  1.011D 00 -4.819D 00  5.351D 00 -48.0 -2.425D 04
11  41 -5.424D-03 -5.693D 00  2.479D 00 -1.022D 00 -5.819D 00   7.0  2.423D 04
12  41 -2.698D-02 -2.481D-01  4.676D-01 -1.368D 00  1.524D 00 -52.3  0.0
13  41 -4.864D-02  4.753D 00  1.617D-01 -3.206D 00  5.400D 00 -27.2  0.0
14  41 -6.863D-02  9.169D 00  8.390D-02 -3.721D 00  1.050D 01 -19.7  0.0
15  41 -8.538D-02  1.386D 01  2.550D-02 -3.751D 00  1.481D 01 -14.2  0.0
16  41 -9.724D-02  1.934D 01 -2.037D-01 -4.722D 00  2.042D 01 -12.9  0.0
17  41 -1.023D-01  1.987D 01 -1.748D-01 -6.473D 00  2.178D 01 -16.4  0.0
18  41 -1.002D-01  1.705D 01 -9.104D-02 -7.618D 00  1.994D 01 -20.8  0.0
19  41 -9.218D-02  1.249D 01  2.840D-02 -7.926D 00  1.634D 01 -25.9  0.0
20  41 -7.971D-02  8.605D 00  6.498D-02 -7.798D 00  1.323D 01 -30.6  0.0
21  41 -6.420D-02  5.085D 00  1.063D-01 -7.757D 00  1.074D 01 -36.1  0.0
22  41 -4.691D-02  1.804D 00  1.801D-01 -7.784D 00  8.819D 00 -42.0  0.0
23  41 -2.898D-02 -1.232D 00  4.547D-01 -7.738D 00 -8.172D 00  41.9  0.0
24  41 -1.151D-02 -3.780D 00  2.781D 00 -5.906D 00 -7.255D 00  30.5  1.995D 04
25  41  4.478D-03 -4.182D 00  6.042D 00 -3.615D 00  7.191D 00 -72.4 -2.000D 04
26  41  1.868D-02  0.0        0.0        0.0        0.0         0.0  0.0

 0  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  23  3.819D-03  0.0        0.0        0.0        0.0         0.0  0.0
 6  23  7.968D-04 -1.137D-11  3.301D 00 -2.295D 00  4.477D 00 -62.9 -3.713D 03
 7  23 -2.392D-03 -2.146D 00  1.462D 00 -2.831D 00 -3.699D 00  28.7  3.685D 03
 8  23 -6.414D-03 -2.157D 00  2.656D-01 -3.807D 00 -4.941D 00  36.2  0.0
 9  23 -1.121D-02 -1.704D 00  1.240D-01 -4.365D 00 -5.249D 00  39.1  0.0
10  23 -1.662D-02 -7.439D-01  7.686D-02 -4.907D 00 -5.257D 00  42.6  0.0
11  23 -2.229D-02  6.298D-01  4.011D-02 -5.259D 00  5.602D 00 -43.4  0.0
12  23 -2.774D-02  2.246D 00  5.735D-03 -5.315D 00  6.557D 00 -39.0  0.0
13  23 -3.240D-02  3.905D 00 -2.566D-02 -5.043D 00  7.352D 00 -34.4  0.0
14  23 -3.568D-02  5.507D 00 -6.111D-02 -4.442D 00  7.965D 00 -29.0  0.0
15  23 -3.701D-02  6.930D 00 -1.075D-01 -3.492D 00  8.368D 00 -22.4  0.0
16  23 -3.588D-02  7.932D 00 -1.671D-01 -2.211D 00  8.497D 00 -14.3  0.0
17  23 -3.194D-02  8.186D 00 -2.336D-01 -7.819D-01  8.258D 00  -5.3  0.0
18  23 -2.509D-02  7.646D 00 -3.181D-01  5.216D-01  7.680D 00   3.7  0.0
19  23 -1.553D-02  6.513D 00 -4.523D-01  1.795D 00  6.948D 00  13.6  0.0
20  23 -3.639D-03  7.513D 00 -1.825D 00  1.590D 00  7.777D 00   9.4  1.696D 04
21  23  1.100D-02  6.046D-13 -8.707D-01  1.632D 01 -1.676D 01 -45.8 -1.694D 04
22  23  2.568D-02  0.0        0.0        0.0        0.0         0.0  0.0
23  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
24  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
25  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
26  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0

 0  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  22  1.844D-03  0.0        0.0        0.0        0.0         0.0  0.0
 6  22 -1.949D-06 -3.209D 00  3.547D-01 -1.855D 00 -3.999D 00  23.1  1.208D 01
 7  22 -2.977D-03 -1.857D 00  3.893D-01 -2.449D 00 -3.428D 00  32.7  0.0
 8  22 -6.616D-03 -1.979D 00  2.811D-01 -3.275D 00 -4.313D 00  35.5  0.0
 9  22 -1.095D-02 -1.530D 00  1.908D-01 -3.978D 00 -4.740D 00  38.9  0.0
10  22 -1.583D-02 -5.967D-01  1.205D-01 -4.573D 00 -4.825D 00  42.8  0.0
11  22 -2.092D-02  7.180D-01  6.152D-02 -4.946D 00  5.347D 00 -43.1  0.0
12  22 -2.577D-02  2.257D 00  7.623D-03 -5.006D 00  5.263D 00 -38.7  0.0
13  22 -2.983D-02  3.842D 00 -4.618D-02 -4.721D 00  7.004D 00 -33.8  0.0
14  22 -3.257D-02  5.364D 00 -1.065D-01 -4.082D 00  7.542D 00 -28.1  0.0
15  22 -3.344D-02  6.695D 00 -1.808D-01 -3.059D 00  7.866D 00 -20.9  0.0
16  22 -3.198D-02  7.618D 00 -2.765D-01 -1.702D 00  7.970D 00 -11.7  0.0
17  22 -2.787D-02  7.867D 00 -4.038D-01 -1.334D-01  7.869D 00  -0.9  0.0
18  22 -2.102D-02  7.381D 00 -5.815D-01  1.358D 00  7.606D 00   9.4  0.0
19  22 -1.158D-02  6.064D 00 -6.123D-01  2.495D 00  6.874D 00  18.0  0.0
20  22  3.119D-06  8.233D 00 -8.536D-01  4.189D 00  9.870D 00  21.3 -1.934D 01
21  22  1.448D-02  0.0        0.0        0.0        0.0         0.0  0.0
22  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
23  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
24  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
```

```
25 22  0.0         0.0         0.0         0.0         0.0          0.0  0.0
26 22  0.0         0.0         0.0         0.0         0.0          0.0  0.0

 0 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 1 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 2 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 3 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 4 21  3.108D-03   0.0         0.0         0.0         0.0          0.0  0.0
 5 21  1.341D-03 -6.190D-12  3.394D-01  1.857D 00  2.035D 00  47.6 -2.066D 03
 6 21 -4.423D-04 -2.593D 00  7.088D-01 -1.001D 00 -2.872D 00  15.6  2.061D 03
 7 21 -3.178D-03 -1.731D 00  2.090D-01 -2.225D 00 -3.188D 00  33.2  0.0
 8 21 -6.537D-03 -1.702D 00  1.565D-01 -2.839D 00 -3.760D 00  35.9  0.0
 9 21 -1.051D-02 -1.269D 00  1.119D-01 -3.601D 00 -4.245D 00  39.6  0.0
10 21 -1.493D-02 -4.137D-01  7.333D-02 -4.243D 00 -4.421D 00  43.4  0.0
11 21 -1.950D-02  7.799D-01  3.846D-02 -4.638D 00  5.062D 00 -42.7  0.0
12 21 -2.380D-02  2.173D 00  5.552D-03 -4.703D 00  5.916D 00 -38.5  0.0
13 21 -2.733D-02  3.610D 00 -2.605D-02 -4.405D 00  6.557D 00 -33.8  0.0
14 21 -2.958D-02  4.978D 00 -6.144D-02 -3.728D 00  6.958D 00 -28.0  0.0
15 21 -3.007D-02  6.153D 00 -1.060D-01 -2.653D 00  7.126D 00 -20.1  0.0
16 21 -2.838D-02  6.947D 00 -1.629D-01 -1.196D 00  7.143D 00  -9.3  0.0
17 21 -2.423D-02  7.147D 00 -2.423D-01  5.300D-01  7.185D 00   4.1  0.0
18 21 -1.754D-02  6.735D 00 -4.924D-01  2.355D 00  7.434D 00  16.5  0.0
19 21 -8.439D-03  5.645D 00 -2.471D 00  3.381D 00  6.869D 00  19.9  1.300D 04
20 21  2.780D-03  3.137D-11 -5.365D 00  4.921D 00 -8.287D 00 -59.3 -1.295D 04
21 21  1.427D-02  0.0         0.0         0.0         0.0          0.0  0.0
22 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
23 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
24 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
25 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0
26 21  0.0         0.0         0.0         0.0         0.0          0.0  0.0

 0 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 1 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 2 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 3 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
 4 20  2.545D-03   0.0         0.0         0.0         0.0          0.0  0.0
 5 20  8.508D-04 -2.385D-14  1.212D-06 -1.090D 00  1.090D 00 -45.0 -2.621D 03
 6 20 -8.434D-04 -2.385D 00  1.704D-06 -1.465D 00 -3.081D 00  25.4  2.631D 03
 7 20 -3.363D-03 -1.624D 00  2.520D-06 -2.186D 00 -3.144D 00  34.8  0.0
 8 20 -6.443D-03 -1.507D 00  2.040D-06 -2.656D 00 -3.514D 00  37.1  0.0
 9 20 -1.005D-02 -1.073D 00  3.797D-07 -3.240D 00 -3.821D 00  40.3  0.0
10 20 -1.402D-02 -2.567D-01 -2.188D-06 -3.750D 00 -3.880D 00  44.0  0.0
11 20 -1.808D-02  8.706D-01 -5.363D-06 -4.063D 00  4.522D 00 -41.9  0.0
12 20 -2.184D-02  2.183D 00 -8.834D-06 -4.103D 00  5.337D 00 -37.6  0.0
13 20 -2.485D-02  3.534D 00 -1.228D-05 -3.834D 00  5.988D 00 -32.6  0.0
14 20 -2.663D-02  4.810D 00 -1.537D-05 -3.243D 00  6.443D 00 -26.7  0.0
15 20 -2.675D-02  5.885D 00 -1.775D-05 -2.327D 00  6.694D 00 -19.2  0.0
16 20 -2.483D-02  6.589D 00 -1.894D-05 -1.119D 00  6.774D 00  -9.4  0.0
17 20 -2.064D-02  6.737D 00 -1.833D-05  2.546D-01  6.747D 00   2.2  0.0
18 20 -1.411D-02  6.267D 00 -1.510D-05  1.633D 00  6.657D 00  13.8  0.0
19 20 -5.419D-03  6.046D 00 -6.978D-06  2.740D 00  7.103D 00  21.1  1.670D 04
20 20  5.366D-03 -1.533D-14 -3.765D-06  1.817D 00 -1.817D 00 -45.0 -1.674D 04
21 20  1.615D-02  0.0         0.0         0.0         0.0          0.0  0.0
22 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
23 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
24 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
25 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0
26 20  0.0         0.0         0.0         0.0         0.0          0.0  0.0

 0  2 -2.496D-04  1.255D-14  1.805D-02 -2.972D-01  3.064D-01 -45.9  0.0
 1  2 -5.941D-06 -1.635D-01  1.799D-02 -6.816D-02 -1.863D-01  18.5  3.569D 01
 2  2  1.802D-04 -2.425D-01  2.348D-02 -1.899D-01 -3.413D-01  27.5 -3.473D 01
 3  2  2.812D-04 -3.693D-01  1.848D-02 -2.249D-01 -4.723D-01  24.6  0.0
 4  2  2.533D-04 -4.643D-01  1.464D-02 -2.399D-01 -5.638D-01  22.5  0.0
 5  2  6.400D-05 -5.144D-01  1.212D-02 -2.590D-01 -6.205D-01  22.3  0.0
 6  2 -3.041D-04 -4.922D-01  9.849D-03 -2.862D-01 -6.219D-01  24.4  0.0
 7  2 -8.430D-04 -3.727D-01  6.771D-03 -3.191D-01 -5.542D-01  29.6  0.0
 8  2 -1.511D-03 -1.450D-01  2.055D-03 -3.529D-01 -4.320D-01  39.1  0.0
 9  2 -2.230D-03  1.871D-01 -5.041D-03 -3.829D-01  4.858D-01 -38.0  0.0
10  2 -2.884D-03  6.034D-01 -1.525D-02 -4.032D-01  8.022D-01 -26.3  0.0
11  2 -3.328D-03  1.064D 00 -2.934D-02 -4.072D-01  1.199D 00 -18.3  0.0
12  2 -3.402D-03  1.509D 00 -4.821D-02 -3.878D-01  1.600D 00 -13.2  0.0
13  2 -2.951D-03  1.853D 00 -7.292D-02 -3.358D-01  1.909D 00  -9.6  0.0
14  2 -1.855D-03  1.968D 00 -1.036D-01 -2.281D-01  1.993D 00  -6.2  0.0

15  2 -7.210D-05  1.550D 00 -1.269D-01  8.867D-02  1.555D 00   3.0  4.331D 02
16  2  2.254D-03 -4.118D-14 -1.202D-01  1.770D-01 -2.470D-01 -54.4 -4.344D 02
17  2  4.586D-03  0.0         0.0         0.0         0.0          0.0  0.0
18  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
19  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
20  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
21  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
22  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
23  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
24  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
25  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0
26  2  0.0         0.0         0.0         0.0         0.0          0.0  0.0

 0  1 -1.927D-04  7.279D-14  3.834D-02 -1.595D-02  4.411D-02 -70.1  2.596D 02
 1  1  5.366D-05 -9.651D-02  9.293D-02 -1.065D-01 -1.443D-01  24.2 -2.604D 02
 2  1  2.612D-04 -2.343D-01  1.904D-02 -1.900D-01 -3.360D-01  28.2  0.0
 3  1  3.849D-04 -3.567D-01  1.099D-02 -2.107D-01 -4.524D-01  24.4  0.0
 4  1  3.819D-04 -4.493D-01  9.151D-03 -2.297D-01 -5.446D-01  22.5  0.0
 5  1  2.197D-04 -4.970D-01  8.724D-03 -2.495D-01 -5.994D-01  22.3  0.0
 6  1 -1.187D-04 -4.741D-01  8.382D-03 -2.715D-01 -5.961D-01  24.2  0.0
 7  1 -6.251D-04 -3.569D-01  7.183D-03 -2.942D-01 -5.208D-01  29.1  0.0
 8  1 -1.258D-03 -1.350D-01  4.630D-03 -3.144D-01 -3.872D-01  38.7  0.0
 9  1 -1.939D-03  1.877D-01  2.805D-04 -3.280D-01  4.352D-01 -37.0  0.0
10  1 -2.553D-03  5.911D-01 -6.340D-03 -3.302D-01  7.376D-01 -23.9  0.0
11  1 -2.959D-03  1.036D 00 -1.571D-02 -3.148D-01  1.123D 00 -15.5  0.0
12  1 -2.997D-03  1.463D 00 -2.851D-02 -2.751D-01  1.512D 00 -10.1  0.0
13  1 -2.516D-03  1.789D 00 -4.752D-02 -2.032D-01  1.811D 00  -6.2  0.0
14  1 -1.401D-03  1.897D 00 -9.452D-02 -1.172D-01  1.903D 00  -3.4  1.888D 03
15  1  3.891D-04  1.412D 00 -1.145D-01  5.689D-02  1.414D 00   2.1 -1.888D 03
16  1  2.685D-03 -1.105D-14 -7.246D-02  3.015D 00 -3.051D 00 -45.3  0.0
17  1  4.984D-03  0.0         0.0         0.0         0.0          0.0  0.0
18  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
19  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
20  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
21  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
22  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
23  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
24  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
25  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0
26  1  0.0         0.0         0.0         0.0         0.0          0.0  0.0

 0  0 -1.343D-04  3.330D-16  7.306D-22 -9.278D-03  9.278D-03 -45.0  3.879D 02
 1  0  1.171D-04 -3.539D-02 -4.095D-22 -5.526D-02 -7.572D-02  36.1 -3.879D 02
 2  0  3.440D-04 -1.159D-01 -1.146D-21 -9.507D-02 -1.693D-01  29.3  0.0
 3  0  4.908D-04 -1.798D-01 -1.755D-21 -1.076D-01 -2.301D-01  25.1  0.0
 4  0  5.132D-04 -2.273D-01 -2.539D-21 -1.164D-01 -2.764D-01  22.8  0.0
 5  0  3.784D-04 -2.514D-01 -2.249D-21 -1.250D-01 -3.030D-01  22.4  0.0
 6  0  6.954D-05 -2.395D-01 -8.743D-22 -1.340D-01 -2.994D-01  24.1  0.0
 7  0 -4.049D-04 -1.797D-01  2.412D-21 -1.429D-01 -2.586D-01  28.9  0.0
 8  0 -1.004D-03 -6.676D-02  3.787D-21 -1.504D-01 -1.874D-01  38.7  0.0
 9  0 -1.649D-03  9.707D-02  6.481D-21 -1.549D-01  2.108D-01 -36.3  0.0
10  0 -2.226D-03  3.015D-01  1.180D-20 -1.543D-01  3.664D-01 -22.8  0.0
11  0 -2.596D-03  5.263D-01  5.969D-21 -1.461D-01  5.642D-01 -14.5  0.0
12  0 -2.601D-03  7.409D-01  1.502D-20 -1.273D-01  7.622D-01  -9.5  0.0
13  0 -2.093D-03  9.029D-01  2.501D-20 -9.375D-02  9.125D-01  -5.9  0.0
14  0 -9.615D-04  9.656D-01  3.931D-21 -6.080D-02  9.594D-01  -3.6  2.777D 03
15  0  8.386D-04  6.852D-01 -3.534D-21  1.949D 00  2.322D 00  40.0 -2.777D 03
16  0  3.113D-03  0.0         0.0         0.0         0.0          0.0  0.0
17  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
18  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
19  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
20  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
21  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
22  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
23  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
24  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
25  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0
26  0  0.0         0.0         0.0         0.0         0.0          0.0  0.0


STATICS CHECK.          SUMMATION OF REACTIONS =     7.006D 01

                        MAXIMUM STATICS CHECK ERROR AT STA  17 42 = -2.679D-08
```

```
BOX MOMENT SUMMATIONS (TOTAL ACRDSS BOX)

      BOX NO.   X-STA      X-DIST     TOTAL BMX
        10       16      3.739D 02    9.226D 02
        10       17      4.113D 02    9.475D 02
        10       18      4.487D 02    8.112D 02
        10       19      4.861D 02    5.937D 02
        10       20      5.234D 02    4.097D 02

        11       16      3.739D 02    9.313D 02
        11       17      4.113D 02    9.612D 02
        11       18      4.487D 02    8.299D 02
        11       19      4.861D 02    6.154D 02
        11       20      5.234D 02    4.247D 02
```

```
RESULTS FROM SLAB49 PROGRAM USING DATA GENERATED BY SLBDG2


POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS       RUN AS CHECK FOR 10 AUG 77 VERSION

PROB (CONTD)
 170A     LOADING NO. ONE   EAST EDGE



PROFILE OUTPUT AREAS
     X MOMENTS ACT IN X DIRECTION (ABOUT Y AXIS)
     THE PLOTTED RESULTS INDICATE THE RELATIVE VALUE EACH HAS WITHIN THAT LIST


                              BETWEEN ( 10 , 41 ) AND ( 25 , 42 )
             DEFLECTIONS

 X , Y DEFLECTION

10  41  1.399D-02                       *
11  41 -5.424D-03                    *
12  41 -2.698D-02                 *
13  41 -4.864D-02             *
14  41 -6.863D-02          *
15  41 -8.538D-02        *
16  41 -9.724D-02      *
17  41 -1.023D-01     *
18  41 -1.002D-01     *
19  41 -9.218D-02       *
20  41 -7.971D-02         *
21  41 -6.420D-02           *
22  41 -4.691D-02              *
23  41 -2.898D-02                *
24  41 -1.151D-02                   *
25  41  4.478D-03                      *
10  42  1.899D-02                        *
11  42 -6.120D-04                     *
12  42 -2.221D-02                  *
13  42 -4.421D-02              *
14  42 -6.463D-02           *
15  42 -8.183D-02        *
16  42 -9.413D-02      *
17  42 -9.979D-02     *
18  42 -9.858D-02      *
19  42 -9.143D-02       *
20  42 -7.984D-02         *
21  42 -6.521D-02           *
22  42 -4.879D-02             *
23  42 -3.174D-02                *
24  42 -1.510D-02                   *
25  42  4.799D-04                     *


                              BETWEEN (  4 , 22 ) AND ( 21 , 22 )
             DEFLECTIONS

 X , Y DEFLECTION

 4  22  0.0                        *
 5  22  1.844D-03                   *
 6  22 -1.949D-06                  *
 7  22 -2.977D-03                 *
 8  22 -6.616D-03                *
 9  22 -1.095D-02              *
10  22 -1.583D-02            *
11  22 -2.092D-02          *
12  22 -2.577D-02        *
13  22 -2.983D-02      *
14  22 -3.257D-02     *
15  22 -3.344D-02     *
16  22 -3.198D-02      *
17  22 -2.787D-02       *
18  22 -2.102D-02          *
19  22 -1.158D-02              *
20  22  3.119D-06                  *
21  22  1.448D-02                        *


                              BETWEEN (  0 ,  2 ) AND ( 16 ,  2 )
             DEFLECTIONS

 X , Y DEFLECTION

 0    2 -2.496D-04                *
 1    2 -5.941D-06                *
 2    2  1.802D-04                 *
 3    2  2.812D-04                 *
 4    2  2.533D-04                 *
 5    2  6.400D-05                 *
 6    2 -3.041D-04               *
 7    2 -8.430D-04              *
 8    2 -1.511D-03           *
 9    2 -2.230D-03         *
10    2 -2.884D-03       *
11    2 -3.328D-03     *
12    2 -3.402D-03     *
13    2 -2.951D-03       *
14    2 -1.855D-03          *
15    2 -7.210D-05                *
16    2  2.254D-03                        *

CPU TIME SINCE LAST CALL = 183.363 SECONDS, TOTAL ELAPSED TIME = 183.363 SECONDS
```

```
                                                                               I-----TRIM
PROGRAM SLBDG2   BRIDGE DIVISION, TEXAS DOHPT    PANAK     REVISION DATE 10 AUG 77

POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS       RUN AS CHECK FOR 10 AUG 77 VERSIDN

PROB
 171A      LOADING NO. TWD    CENTERLINE


TABLE 1.  CONTROL DATA
                                                         TABLE NUMBER
                                           2     3     4     5     6     7     8     9

     KEEP FROM PRECEDING PROBLEM (1=YES)   1     1     1     1     0     0     0     1
     NUM CARDS INPUT THIS PROBLEM          0     0     0     0     1     2     3     0

     MULTIPLE LOAD OPTION                 -1
     PRINT GENERATED DATA                  0
     SKEW ANGLE                         0.374D 02


TABLE 2.  CONSTANTS
     USING DATA FROM THE PREVIOUS PROBLEM

     NUMBER OF SPAN INCREMENTS IN X DIRECTION                                 14
     NUMBER OF INCREMENTS IN Y DIRECTION                                      44
     INCREMENT LENGTH IN X DIRECTION (ALONG SPAN CENTERLINE)           3.739D 01
     INCREMENT LENGTH IN Y DIRECTION                                   1.216D 01
     POISSONS RATIO                                                    1.500D-01
     MODULUS OF ELASTICITY                                             6.200D 03

TABLE 3.  BOX STIFFNESS DATA

     USING DATA FROM THE PREVIOUS PROBLEM
  TYPE  NO. INCR  BOX   VOID    SLAB THICK   SHEAR KEY         LONGIT. BOX INERTIAS
  NO.    IN WIDTH  DEP   WIDTH    TOP  BOT   STIFF FACTOR        MOMENT     TORSIONAL
    1          4  20.00 23.75   5.50  5.00     0.100D-05       3.099D 04  7.198D 04

TABLE 4.  BOX ARRANGEMENT BY TYPE NO.

     USING DATA FROM THE PREVIOUS PROBLEM
    1    1    1    1    1    1

TABLE 5.  LOAD PATTERNS
     USING DATA FROM THE PREVIOUS PROBLEM

PAT                  X AND Y DISTANCES (OF THE LOAD PATTERN)
 LDS                                LOAD MAGNITUDE
1  -170. -39.-170.  39. -25. -36. -25.  36.  25. -35.  25.  36.
 6  -5.930D 00 -5.930D 00 -1.455D 01 -1.455D 01 -1.455D 01 -1.455D 01


TABLE 6.  PLACEMENTS OF LOAD PATTERNS

PAT-PLMTS            X AND Y OISTANCES (OF THE STRUCTJRE)
 1    1     262.  -1.


TABLE 7.  SUMMATION OF BOX BENDING MOMENTS

   BOX  SUMS         SUM AT X-STATION NEAREST THESE X-DISTANCES
    5    5        190.       226.       262.       298.       334.
    6    5        190.       226.       262.       298.       334.


TABLE 8.  PROFILE OUTPUT AREAS

 DISTS FROM - THRU       DEFL      X MOM      Y MOM      PRIN MOM
  X     Y    X     Y                  (1=YES)
 160. 242. 727. 242.      1          0          0          0
 -38.   0. 562.   0.      1          0          0          0
-204.-242. 360.-242.      1          0          0          0
```

```
TABLE 9.  PRINTED OUTPUT LIMITS

 Y-DIST FROM - THRU
     Y          Y
     USING DATA FROM THE PREVIOUS PROBLEM
     -268.     -243.
      -12.       12.
      243.      268.


SUMMATION OF LOADS ON STRUCTURE     -7.006D 01
SUMMATION OF LOADS OFF STRUCTURE     0.0











RESULTS FROM SLAB49 PROGRAM USING DATA GENERATED BY SLBDG2


POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS       RUN AS CHECK FOR 10 AUG 77 VERSIDN

PROB (CONTD)
 171A      LOADING NO. TWD    CENTERLINE



RESULTS--USING STIFFNESS DATA FROM PREVIOUS PROBLEM  170A


     SLAB X MOMENT AND X TWISTING MOMENT ACT IN THE X DIRECTION (ABOUT Y AXIS)
     Y TWISTING MOMENT = -X TWISTING MOMENT, COUNTERCLOCKWISE BETA ANGLES ARE
     POSITIVE FROM THE X AXIS TO THE DIRECTION OF THE LARGEST PRINCIPAL MOMENT
     SLAB MOMENTS ARE PER UNIT WIDTH


                                                             LARGEST      BETA
                                                  SLAB X    PRINCIPAL     X TO
                          SLAB X      SLAB Y     TWISTING     SLAB      LARGEST   SUPPORT
 X , Y      DEFL          MOMENT      MOMENT      MOMENT      MOMENT     MOMENT   REACTION

 0  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 1  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 2  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 3  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 4  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 5  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 6  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 7  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 8  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
 9  44   0.0           0.0         0.0         0.0         0.0           0.0   0.0
10  44   1.261D-02     0.0         0.0         0.0         0.0           0.0   0.0
11  44   3.713D-03     1.344D 00   2.572D-16   7.974D 00   8.674D 00    42.6 -1.230D 04
12  44  -4.258D-03     2.314D 00 -1.058D-16  -3.779D-01   2.374D 00    -9.0  1.230D 04
13  44  -1.063D-02     2.895D 00 -3.994D-16  -5.827D-01   3.008D 00   -11.0   0.0
14  44  -1.500D-02     2.948D 00 -6.038D-16  -6.822D-01   3.098D 00   -12.4   0.0
15  44  -1.732D-02     2.662D 00 -7.165D-16  -7.537D-01   2.860D 00   -14.8   0.0
16  44  -1.781D-02     2.154D 00 -7.465D-16  -8.000D-01   2.419D 00   -18.3   0.0
```

```
17  44 -1.681D-02  1.529D 00 -7.093D-16 -8.238D-01  1.888D 00 -23.6  0.0
18  44 -1.475D-02  8.741D-01 -6.243D-16 -8.281D-01  1.373D 00 -31.1  0.0
19  44 -1.208D-02  2.654D-01 -5.121D-16 -8.153D-01  9.587D-01 -40.4  0.0
20  44 -9.233D-03 -2.338D-01 -3.914D-16 -7.880D-01 -9.135D-01  40.8  0.0
21  44 -6.546D-03 -5.764D-01 -2.776D-16 -7.491D-01 -1.091D 00  34.5  0.0
22  44 -4.258D-03 -7.430D-01 -1.816D-16 -7.013D-01 -1.165D 00  31.0  0.0
23  44 -2.483D-03 -7.382D-01 -1.084D-16 -6.435D-01 -1.111D 00  30.1  0.0
24  44 -1.219D-03 -5.621D-01 -5.763D-17 -5.608D-01 -9.083D-01  31.7  0.0
25  44 -3.445D-04 -1.958D-01 -2.348D-17 -3.220D-01 -4.345D-01  36.5  1.141D 03
26  44  3.950D-04 -3.368D-15  8.451D-18 -5.364D-02 -5.364D-02  45.0 -1.141D 03

 0  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  43  1.964D-02  0.0        0.0        0.0        0.0         0.0  0.0
10  43  1.068D-02 -3.951D-11 -1.422D-01  1.193D 01 -1.201D 01 -45.2  0.0
11  43  1.723D-03  2.930D 00  9.012D-02  5.999D-02  2.931D 00   1.2 -8.358D 03
12  43 -6.201D-03  4.714D 00 -7.637D-02 -6.700D-01  4.806D 00  -7.8  8.357D 03
13  43 -1.245D-02  5.731D 00 -1.093D-01 -1.136D 00  5.945D 00 -10.6  0.0
14  43 -1.668D-02  5.816D 00 -8.508D-02 -1.380D 00  6.123D 00 -12.5  0.0
15  43 -1.884D-02  5.242D 00 -5.929D-02 -1.549D 00  5.661D 00 -15.2  0.0
16  43 -1.914D-02  4.234D 00 -3.581D-02 -1.657D 00  4.802D 00 -18.9  0.0
17  43 -1.795D-02  2.998D 00 -1.518D-02 -1.711D 00  3.771D 00 -24.3  0.0
18  43 -1.570D-02  1.707D 00  2.878D-03 -1.718D 00  2.773D 00 -31.8  0.0
19  43 -1.284D-02  5.071D-01  1.879D-02 -1.685D 00  1.966D 00 -40.9  0.0
20  43 -9.806D-03 -4.772D-01  3.250D-02 -1.618D 00 -1.860D 00  40.5  0.0
21  43 -6.941D-03 -1.153D 00  4.388D-02 -1.524D 00 -2.192D 00  34.3  0.0
22  43 -4.486D-03 -1.482D 00  5.460D-02 -1.412D 00 -2.322D 00  30.7  0.0
23  43 -2.558D-03 -1.478D 00  7.025D-02 -1.284D 00 -2.203D 00  29.5  0.0
24  43 -1.156D-03 -1.152D 00  1.180D-01 -1.134D 00 -1.816D 00  30.4  0.0
25  43 -1.664D-04 -5.459D-01  5.372D-01 -6.250D-01 -8.313D-01  24.5  8.075D 02
26  43  6.025D-04 -4.889D-13  2.200D-01 -9.218D-02  2.535D-01 -70.0 -8.119D 02

 0  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  42  1.777D-02  0.0        0.0        0.0        0.0         0.0  0.0
10  42  8.736D-03 -4.799D-12 -2.441D-01  3.570D-01 -4.993D-01 -54.4 -1.684D 03
11  42 -2.801D-04  3.209D 00 -2.574D-01  1.080D-01  3.212D 00   1.8  1.683D 03
12  42 -8.172D-03  5.020D 00 -2.049D-01 -7.932D-01  5.138D 00  -8.4  0.0
13  42 -1.432D-02  5.948D 00 -1.602D-01 -1.288D 00  6.209D 00 -11.4  0.0
14  42 -1.839D-02  6.005D 00 -1.209D-01 -1.553D 00  6.376D 00 -13.4  0.0
15  42 -2.038D-02  5.396D 00 -8.557D-02 -1.733D 00  5.898D 00 -16.1  0.0
16  42 -2.050D-02  4.348D 00 -5.388D-02 -1.841D 00  5.017D 00 -20.0  0.0
17  42 -1.911D-02  3.070D 00 -2.569D-02 -1.888D 00  3.963D 00 -25.3  0.0
18  42 -1.666D-02  1.737D 00 -6.438D-04 -1.881D 00  2.941D 00 -32.6  0.0
19  42 -1.360D-02  4.994D-01  2.180D-02 -1.831D 00  2.107D 00 -41.3  0.0
20  42 -1.037D-02 -5.155D-01  4.227D-02 -1.744D 00 -2.003D 00  40.5  0.0
21  42 -7.328D-03 -1.211D 00  6.189D-02 -1.636D 00 -2.330D 00  34.4  0.0
22  42 -4.705D-03 -1.551D 00  8.314D-02 -1.523D 00 -2.462D 00  30.9  0.0
23  42 -2.622D-03 -1.550D 00  1.097D-01 -1.399D 00 -2.347D 00  29.7  0.0
24  42 -1.081D-03 -1.208D 00  1.393D-01 -1.140D 00 -1.858D 00  29.7  2.084D 02
25  42  3.375D-05 -9.403D-01  1.036D-01 -3.975D-01 -1.074D 00  18.6 -2.027D 02
26  42  8.179D-04 -3.038D-14  1.037D-01  1.023D 00  1.076D 00  46.5  0.0

 0  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  41  1.570D-02  0.0        0.0        0.0        0.0         0.0  0.0
10  41  6.560D-03 -6.848D-11 -5.234D-01  2.131D 00 -2.409D 00 -48.5 -1.137D 04
11  41 -2.548D-03  3.470D 00 -1.214D 00  1.227D-01  3.473D 00   1.5  1.138D 04
12  41 -1.037D-02  5.128D 00 -2.245D-01 -1.022D 00  5.317D 00 -10.4  0.0
13  41 -1.636D-02  5.933D 00 -1.172D-01 -1.454D 00  6.264D 00 -12.8  0.0
14  41 -2.026D-02  5.956D 00 -8.530D-02 -1.729D 00  6.416D 00 -14.9  0.0
15  41 -2.204D-02  5.333D 00 -5.916D-02 -1.918D 00  5.946D 00 -17.7  0.0
16  41 -2.193D-02  4.282D 00 -3.557D-02 -2.026D 00  5.084D 00 -21.6  0.0
17  41 -2.031D-02  3.010D 00 -1.497D-02 -2.065D 00  4.057D 00 -26.9  0.0
18  41 -1.763D-02  1.688D 00  3.056D-03 -2.045D 00  3.057D 00 -33.8  0.0
19  41 -1.434D-02  4.612D-01  1.905D-02 -1.977D 00  2.229D 00 -41.8  0.0
20  41 -1.090D-02 -5.428D-01  3.294D-02 -1.871D 00 -2.148D 00  40.6  0.0
21  41 -7.650D-03 -1.226D 00  4.447D-02 -1.749D 00 -2.451D 00  35.0  0.0
22  41 -4.835D-03 -1.554D 00  5.737D-02 -1.637D 00 -2.573D 00  31.9  0.0
23  41 -2.572D-03 -1.561D 00  1.070D-01 -1.552D 00 -2.489D 00  30.9  0.0
24  41 -8.667D-04 -1.332D 00  5.811D-01 -1.204D 00 -1.913D 00  25.8  1.502D 03
25  41  3.386D-04 -9.806D-01  1.270D 00 -8.088D-01  1.531D 00 -72.1 -1.513D 03
26  41  1.133D-03  0.0        0.0        0.0        0.0         0.0  0.0

 0  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  23  1.819D-02  0.0        0.0        0.0        0.0         0.0  0.0
 6  23  3.674D-03 -5.004D-11  4.821D 00 -4.170D 00  7.226D 00 -60.0 -1.712D 04
 7  23 -1.109D-02 -1.742D 00  2.212D 00 -4.092D 00  4.780D 00 -57.9  1.708D 04
 8  23 -2.658D-02  2.199D 00  3.445D-01 -5.027D 00  6.384D 00 -39.8  0.0
 9  23 -4.131D-02  5.004D 00  1.249D-01 -4.830D 00  7.975D 00 -31.6  0.0
10  23 -5.428D-02  6.954D 00  1.080D-01 -4.766D 00  9.399D 00 -27.2  0.0
11  23 -6.479D-02  9.534D 00  7.227D-02 -4.900D 00  1.161D 01 -23.0  0.0
12  23 -7.194D-02  1.320D 01 -8.352D-02 -4.802D 00  1.475D 01 -17.9  0.0
13  23 -7.442D-02  1.434D 01 -1.094D-01 -4.395D 00  1.557D 01 -15.7  0.0
14  23 -7.182D-02  1.290D 01 -8.606D-02 -3.934D 00  1.399D 01 -15.6  0.0
15  23 -6.466D-02  8.794D 00  7.410D-02 -3.695D 00  1.015D 01 -20.1  0.0
16  23 -5.440D-02  5.671D 00  1.164D-01 -3.624D 00  7.460D 00 -26.3  0.0
17  23 -4.213D-02  3.020D 00  1.658D-01 -3.371D 00  5.253D 00 -33.5  0.0
18  23 -2.881D-02  4.938D-01  2.492D-01 -2.888D 00  3.262D 00 -43.8  0.0
19  23 -1.533D-02 -2.033D 00  3.927D-01 -2.331D 00 -3.448D 00  31.3  0.0
20  23 -2.579D-03 -6.442D 00  1.593D 00 -1.375D 00 -6.671D 00   9.4  1.202D 04
21  23  7.809D-03  7.189D-13  7.460D-01  1.116D 01  1.154D 01  46.0 -1.203D 04
22  23  1.816D-02  0.0        0.0        0.0        0.0         0.0  0.0
23  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
24  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
25  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
26  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0

 0  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  22  1.205D-02  0.0        0.0        0.0        0.0         0.0  0.0
 6  22 -2.914D-06 -6.842D 00  7.146D-01 -3.468D 00 -8.192D 00  21.3  1.807D 01
 7  22 -1.446D-02 -1.328D 00  6.768D-01 -3.023D 00 -3.510D 00  35.8  0.0
 8  22 -2.941D-02  2.292D 00  4.381D-01 -3.855D 00  5.329D 00 -38.2  0.0
 9  22 -4.359D-02  5.082D 00  2.725D-01 -4.137D 00  7.462D 00 -29.9  0.0
10  22 -5.602D-02  7.130D 00  1.724D-01 -4.262D 00  9.153D 00 -25.4  0.0
11  22 -6.600D-02  9.786D 00  8.754D-02 -4.363D 00  1.146D 01 -21.0  0.0
12  22 -7.259D-02  1.339D 01 -4.308D-03 -4.417D 00  1.471D 01 -16.7  0.0
13  22 -7.455D-02  1.454D 01 -3.413D-02 -4.410D 00  1.577D 01 -15.6  0.0
14  22 -7.147D-02  1.304D 01 -6.618D-04 -4.361D 00  1.437D 01 -16.9  0.0
15  22 -6.387D-02  8.976D 00  9.871D-02 -4.298D 00  1.072D 01 -22.0  0.0
16  22 -5.318D-02  5.748D 00  1.958D-01 -4.228D 00  8.030D 00 -28.4  0.0
17  22 -4.050D-02  2.992D 00  3.153D-01 -4.119D 00  5.985D 00 -36.0  0.0
18  22 -2.681D-02  3.411D-01  4.860D-01 -3.861D 00  4.276D 00 -45.5  0.0
19  22 -1.302D-02 -2.121D 00  7.113D-01 -3.139D 00 -4.149D 00  32.9  0.0
20  22 -3.033D-06 -7.054D 00  7.383D-01 -3.610D 00 -8.469D 00  21.4  1.881D 01
21  22  1.053D-02  0.0        0.0        0.0        0.0         0.0  0.0
22  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
23  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
24  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
```

```
25  22  0.0         0.0         0.0         0.0         0.0         0.0   0.0
26  22  0.0         0.0         0.0         0.0         0.0         0.0   0.0

 0  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 1  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 2  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 3  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 4  21  2.082D-02   0.0         0.0         0.0         0.0         0.0   0.0
 5  21  8.948D-03 -4.309D-11  7.236D-01  1.283D 01  1.319D 01  45.8 -1.378D 04
 6  21 -2.956D-03 -6.314D 00  1.558D 00 -1.261D 00 -6.511D 00   8.9  1.377D 04
 7  21 -1.717D-02 -1.203D 00  3.839D-01 -2.120D 00 -2.673D 00  34.7  0.0
 8  21 -3.183D-02  2.449D 00  1.929D-01 -2.830D 00  4.368D 00 -34.1  0.0
 9  21 -4.563D-02  5.094D 00  1.163D-01 -3.458D 00  6.866D 00 -27.1  0.0
10  21 -5.764D-02  7.024D 00  1.075D-01 -3.759D 00  8.674D 00 -23.7  0.0
11  21 -6.717D-02  9.594D 00  7.104D-02 -3.828D 00  1.094D 01 -19.4  0.0
12  21 -7.332D-02  1.321D 01 -8.291D-02 -4.034D 00  1.434D 01 -15.6  0.0
13  21 -7.479D-02  1.432D 01 -1.092D-01 -4.426D 00  1.557D 01 -15.8  0.0
14  21 -7.119D-02  1.285D 01 -8.496D-02 -4.787D 00  1.443D 01 -18.3  0.0
15  21 -6.304D-02  8.759D 00  7.336D-02 -4.900D 00  1.096D 01 -24.2  0.0
16  21 -5.180D-02  5.617D 00  1.168D-01 -4.833D 00  8.428D 00 -30.2  0.0
17  21 -3.859D-02  2.934D 00  1.762D-01 -4.882D 00  5.628D 00 -37.1  0.0
18  21 -2.434D-02  2.713D-01  4.100D-01 -4.987D 00  5.328D 00 -45.4  0.0
19  21 -1.002D-02 -2.445D 00  2.301D 00 -4.125D 00 -4.831D 00  30.0  1.543D 04
20  21  3.321D-03  3.730D-11  5.035D 00 -4.326D 00  7.523D 00 -60.1 -1.547D 04
21  21  1.641D-02   0.0         0.0         0.0         0.0         0.0   0.0
22  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
23  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
24  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
25  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0
26  21  0.0         0.0         0.0         0.0         0.0         0.0   0.0

 0  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 1  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 2  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 3  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
 4  20  1.757D-02   0.0         0.0         0.0         0.0         0.0   0.0
 5  20  5.876D-03 -2.891D-14  1.180D-06 -4.644D 00  4.644D 00 -45.0 -1.810D 04
 6  20 -5.819D-03 -6.792D 00  9.961D-06 -4.176D 00 -8.778D 00  25.4  1.815D 04
 7  20 -1.986D-02 -1.016D 00  3.371D-05 -5.137D 00 -5.670D 00  42.2  0.0
 8  20 -3.426D-02  2.749D 00  5.354D-05 -5.421D 00  6.967D 00 -37.9  0.0
 9  20 -4.770D-02  5.351D 00  6.971D-05 -5.588D 00  8.871D 00 -32.2  0.0
10  20 -5.930D-02  7.202D 00  8.280D-05 -5.466D 00  1.015D 01 -28.3  0.0
11  20 -6.840D-02  9.779D 00  9.340D-05 -5.049D 00  1.192D 01 -23.0  0.0
12  20 -7.412D-02  1.367D 01  1.009D-04 -4.543D 00  1.504D 01 -16.8  0.0
13  20 -7.511D-02  1.480D 01  1.017D-04 -3.996D 00  1.581D 01 -14.2  0.0
14  20 -7.098D-02  1.329D 01  9.515D-05 -3.428D 00  1.412D 01 -13.6  0.0
15  20 -6.225D-02  8.886D 00  8.205D-05 -2.670D 00  9.732D 00 -16.4  0.0
16  20 -5.046D-02  5.718D 00  6.618D-05 -2.416D 00  5.602D 00 -20.1  0.0
17  20 -3.668D-02  3.016D 00  4.861D-05 -2.221D 00  4.193D 00 -27.9  0.0
18  20 -2.186D-02  3.379D-01  2.953D-05 -2.178D 00  2.353D 00 -42.8  0.0
19  20 -6.924D-03 -3.435D 00  7.974D-06 -2.247D 00 -4.546D 00  26.3  2.133D 04
20  20  6.825D-03 -1.083D-14  2.226D-07 -1.415D 00  1.415D 00 -45.0 -2.129D 04
21  20  2.057D-02   0.0         0.0         0.0         0.0         0.0   0.0
22  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
23  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
24  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
25  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0
26  20  0.0         0.0         0.0         0.0         0.0         0.0   0.0

 0   2  1.259D-03 -7.758D-15  1.173D-01  1.562D 00  1.622D 00  46.1  0.0
 1   2  4.822D-05 -1.063D 00  1.172D-01 -4.501D-01 -1.215D 00  18.7 -2.897D 02
 2   2 -1.537D-03 -1.340D 00  1.581D-01 -1.295D 00 -2.087D 00  30.0  2.961D 02
 3   2 -3.593D-03 -1.671D 00  1.246D-01 -1.598D 00 -2.606D 00  30.3  0.0
 4   2 -6.236D-03 -1.589D 00  9.387D-02 -1.745D 00 -2.685D 00  32.1  0.0
 5   2 -9.433D-03 -1.102D 00  6.859D-02 -1.876D 00 -2.482D 00  36.3  0.0
 6   2 -1.301D-02 -2.135D-01  4.496D-02 -1.992D 00 -2.080D 00  43.1  0.0
 7   2 -1.667D-02  9.974D-01  2.088D-02 -2.071D 00  2.637D 00 -38.4  0.0
 8   2 -1.999D-02  2.381D 00 -4.030D-03 -2.099D 00  3.603D 00 -30.2  0.0
 9   2 -2.248D-02  3.765D 00 -2.966D-02 -2.073D 00  4.678D 00 -23.8  0.0
10   2 -2.366D-02  4.989D 00 -5.637D-02 -1.996D 00  5.684D 00 -19.2  0.0
11   2 -2.312D-02  5.898D 00 -8.479D-02 -1.865D 00  6.432D 00 -16.0  0.0
12   2 -2.052D-02  6.310D 00 -1.152D-01 -1.671D 00  6.719D 00 -13.7  0.0
13   2 -1.574D-02  6.024D 00 -1.478D-01 -1.393D 00  6.324D 00 -12.1  0.0
14   2 -8.866D-03  4.858D 00 -1.839D-01 -8.552D-01  5.000D 00  -9.4  0.0
15   2 -2.985D-04  2.960D 00 -2.355D-01  6.566D-02  2.961D 00   1.2  1.793D 03
16   2  9.306D-03 -1.572D-13 -2.233D-01  3.260D-01 -4.563D-01 -54.5 -1.793D 03
17   2  1.892D-02   0.0         0.0         0.0         0.0         0.0   0.0
18   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
19   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
20   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
21   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
22   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
23   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
24   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
25   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0
26   2  0.0         0.0         0.0         0.0         0.0         0.0   0.0

 0   1  9.348D-04 -3.385D-13  2.486D-01 -1.043D-01  2.866D-01 -70.0 -1.260D 03
 1   1 -2.586D-04 -6.160D-01  6.073D-01 -7.085D-01 -9.402D-01  24.6  1.255D 03
 2   1 -1.700D-03 -1.275D 00  1.347D-01 -1.288D 00 -2.039D 00  30.7  0.0
 3   1 -3.600D-03 -1.590D 00  8.065D-02 -1.462D 00 -2.439D 00  30.1  0.0
 4   1 -6.066D-03 -1.514D 00  6.231D-02 -1.612D 00 -2.520D 00  32.0  0.0
 5   1 -9.070D-03 -1.042D 00  4.877D-02 -1.739D 00 -2.319D 00  36.3  0.0
 6   1 -1.244D-02 -1.808D-01  3.392D-02 -1.840D 00 -1.916D 00  43.3  0.0
 7   1 -1.589D-02  9.915D-01  1.661D-02 -1.904D 00  2.470D 00 -37.8  0.0
 8   1 -1.898D-02  2.331D 00 -2.007D-03 -1.924D 00  3.415D 00 -29.4  0.0
 9   1 -2.124D-02  3.672D 00 -2.077D-02 -1.899D 00  4.474D 00 -22.9  0.0
10   1 -2.221D-02  4.856D 00 -4.003D-02 -1.827D 00  5.463D 00 -18.4  0.0
11   1 -2.146D-02  5.729D 00 -6.091D-02 -1.707D 00  5.195D 00 -15.3  0.0
12   1 -1.868D-02  6.114D 00 -8.326D-02 -1.533D 00  5.472D 00 -13.2  0.0
13   1 -1.373D-02  5.803D 00 -1.008D-01 -1.289D 00  5.072D 00 -11.8  0.0
14   1 -6.732D-03  4.525D 00 -2.623D-02 -7.673D-01  4.651D 00  -9.3  9.073D 03
15   1  1.870D-03  2.704D 00  1.992D-01  3.381D-02  2.704D 00   0.8 -9.075D 03
16   1  1.142D-02  3.604D-15 -1.283D-01  1.275D 01 -1.282D 01 -45.1  0.0
17   1  2.097D-02   0.0         0.0         0.0         0.0         0.0   0.0
18   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
19   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
20   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
21   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
22   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
23   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
24   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
25   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0
26   1  0.0         0.0         0.0         0.0         0.0         0.0   0.0

 0   0  6.196D-04 -1.019D-15 -2.486D-21 -6.069D-02 -6.069D-02  45.0 -1.789D 03
 1   0 -5.404D-04 -2.203D-01  1.645D-21 -3.647D-01 -4.912D-01  36.6  1.790D 03
 2   0 -1.853D-03 -6.211D-01  7.187D-21 -6.361D-01 -1.018D 00  32.0  0.0
 3   0 -3.595D-03 -7.926D-01  3.797D-20 -7.314D-01 -1.228D 00  30.8  0.0
 4   0 -5.885D-03 -7.570D-01  1.318D-20 -7.981D-01 -1.262D 00  32.3  0.0
 5   0 -8.699D-03 -5.183D-01  3.219D-20 -8.522D-01 -1.150D 00  36.5  0.0
 6   0 -1.187D-02 -8.203D-02  4.166D-20 -8.942D-01 -9.361D-01  43.7  0.0
 7   0 -1.510D-02  5.119D-01  5.351D-20 -9.205D-01  1.221D 00 -37.2  0.0
 8   0 -1.798D-02  1.191D 00  6.823D-20 -9.286D-01  1.699D 00 -28.7  0.0
 9   0 -2.003D-02  1.870D 00  8.296D-20 -9.176D-01  2.245D 00 -22.2  0.0
10   0 -2.079D-02  2.470D 00  8.589D-20 -8.873D-01  2.756D 00 -17.8  0.0
11   0 -1.983D-02  2.910D 00  7.959D-20 -8.368D-01  3.133D 00 -15.0  0.0
12   0 -1.687D-02  3.100D 00  6.530D-20 -7.640D-01  3.278D 00 -13.1  0.0
13   0 -1.176D-02  2.932D 00  4.169D-20 -6.657D-01  3.077D 00 -12.2  0.0
14   0 -4.624D-03  2.195D 00  1.867D-20 -4.343D-01  2.278D 00 -10.8  1.336D 04
15   0  4.032D-03  1.213D 00 -4.035D-20  8.562D 00  9.190D 00  43.0 -1.335D 04
16   0  1.353D-02   0.0         0.0         0.0         0.0         0.0   0.0
17   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
18   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
19   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
20   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
21   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
22   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
23   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
24   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
25   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0
26   0  0.0         0.0         0.0         0.0         0.0         0.0   0.0


STATICS CHECK.        SUMMATION OF REACTIONS =    7.006D 01

                      MAXIMUM STATICS CHECK ERROR AT STA  13 24 = -1.135D-08
```

```
BOX MOMENT SUMMATIONS (TOTAL ACROSS BOX)

     BOX NO.   X-STA       X-DIST      TOTAL BMX
        5        11      1.869D 02    4.470D 02
        5        12      2.243D 02    6.106D 02
        5        13      2.617D 02    6.562D 02
        5        14      2.991D 02    5.900D 02
        5        15      3.365D 02    4.018D 02

        6        11      1.869D 02    4.697D 02
        6        12      2.243D 02    6.500D 02
        6        13      2.617D 02    7.055D 02
        6        14      2.991D 02    6.338D 02
        6        15      3.365D 02    4.310D 02




RESULTS FROM SLAB49 PROGRAM USING DATA GENERATED BY SLBDGZ


POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS      RUN AS CHECK FOR 10 AUG 77 VERSION

PROB (CONTD)
 171A     LOADING NO. TWO   CENTERLINE


PROFILE OUTPUT AREAS
     X MOMENTS ACT IN X DIRECTION (ABOUT Y AXIS)
     THE PLOTTED RESULTS INDICATE THE RELATIVE VALUE EACH HAS WITHIN THAT LIST


                              BETWEEN ( 10 , 41 ) AND ( 25 , 42 )
             DEFLECTIONS

 X , Y DEFLECTION

10  41  6.560D-03                      *
11  41 -2.548D-03                *
12  41 -1.037D-02           *
13  41 -1.636D-02        *
14  41 -2.026D-02     *
15  41 -2.204D-02    *
16  41 -2.193D-02    *
17  41 -2.031D-02     *
18  41 -1.763D-02       *
```

```
19  41 -1.434D-02         *
20  41 -1.090D-02           *
21  41 -7.650D-03             *
22  41 -4.835D-03               *
23  41 -2.572D-03                *
24  41 -8.667D-04                 *
25  41  3.386D-04                  *
10  42  8.736D-03                       *
11  42 -2.801D-04                 *
12  42 -8.172D-03             *
13  42 -1.432D-02         *
14  42 -1.839D-02      *
15  42 -2.038D-02     *
16  42 -2.050D-02     *
17  42 -1.911D-02      *
18  42 -1.666D-02       *
19  42 -1.360D-02         *
20  42 -1.037D-02           *
21  42 -7.328D-03             *
22  42 -4.705D-03               *
23  42 -2.622D-03                *
24  42 -1.081D-03                 *
25  42  3.375D-05                  *


                             BETWEEN (  4 , 22 ) AND ( 21 , 22 )
             DEFLECTIONS

 X , Y DEFLECTION

 4  22  0.0                          *
 5  22  1.205D-02                       *
 6  22 -2.914D-06                    *
 7  22 -1.446D-02                 *
 8  22 -2.941D-02              *
 9  22 -4.359D-02           *
10  22 -5.602D-02        *
11  22 -6.600D-02      *
12  22 -7.259D-02    *
13  22 -7.455D-02    *
14  22 -7.147D-02     *
15  22 -6.387D-02      *
16  22 -5.318D-02         *
17  22 -4.050D-02           *
18  22 -2.681D-02              *
19  22 -1.302D-02                 *
20  22 -3.033D-06                    *
21  22  1.053D-02                       *


                             BETWEEN (  0 ,  2 ) AND ( 16 ,  2 )
             DEFLECTIONS

 X , Y DEFLECTION

 0   2  1.259D-03                  *
 1   2  4.822D-05                  *
 2   2 -1.537D-03                 *
 3   2 -3.593D-03                *
 4   2 -6.236D-03              *
 5   2 -9.433D-03            *
 6   2 -1.301D-02          *
 7   2 -1.667D-02        *
 8   2 -1.999D-02      *
 9   2 -2.248D-02     *
10   2 -2.366D-02    *
11   2 -2.312D-02    *
12   2 -2.052D-02      *
13   2 -1.574D-02         *
14   2 -8.866D-03             *
15   2 -2.985D-04                 *
16   2  9.306D-03                       *
CPU TIME SINCE LAST CALL =  27.739 SECONDS, TOTAL ELAPSED TIME = 211.132 SECONDS
```

```
                                                                    I-----TRIM
PROGRAM SLBDG2   BRIDGE DIVISION, TEXAS DDHPT   PANAK    REVISION DATE 10 AUG 77

POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS      RUN AS CHECK FOR 10 AUG 77 VERSION

PROB
 172A     LOADING NO. THREE    WEST EDGE


TABLE 1.  CONTROL DATA
                                                  TABLE NUMBER
                                         2    3    4    5    6    7    8    9

    KEEP FROM PRECEDING PROBLEM (1=YES)  1    1    1    1    0    0    0    1
    NUM CARDS INPUT THIS PROBLEM         0    0    0    0    1    2    3    0

    MULTIPLE LOAD OPTION                -1
    PRINT GENERATED DATA                 0
    SKEW ANGLE                        0.374D 02


TABLE 2.  CONSTANTS
    USING DATA FROM THE PREVIOUS PROBLEM

    NUMBER OF SPAN INCREMENTS IN X DIRECTION                            14
    NUMBER OF INCREMENTS IN Y DIRECTION                                 44
    INCREMENT LENGTH IN X DIRECTION (ALONG SPAN CENTERLINE)      3.739D 01
    INCREMENT LENGTH IN Y DIRECTION                              1.216D 01
    POISSONS RATIO                                               1.500D-01
    MODULUS OF ELASTICITY                                        6.200D 03

TABLE 3.  BOX STIFFNESS DATA

    USING DATA FROM THE PREVIOUS PROBLEM
 TYPE  NO. INCR   BOX   VOID    SLAB THICK    SHEAR KEY        LONGIT. BOX INERTIAS
 NO.   IN WIDTH   DEP   WIDTH    TOP   BOT    STIFF FACTOR      MOMENT     TORSIONAL
  1          4  20.00 23.75   5.50  5.00      0.1000-05       3.099D 04  7.198D 04

TABLE 4.  BOX ARRANGEMENT BY TYPE NO.

    USING DATA FROM THE PREVIOUS PROBLEM
  1    1    1    1    1    1

TABLE 5.  LOAD PATTERNS
    USING DATA FROM THE PREVIOUS PROBLEM

PAT                  X AND Y DISTANCES (OF THE LOAD PATTERN)
 LDS                               LOAD MAGNITUDE
1  -170. -39.-170.  39. -25. -36. -25.  36.  25. -36.  25.  36.
 6  -5.930D 00 -5.930D 00 -1.455D 01 -1.455D 01 -1.455D 01 -1.455D 01


TABLE 6.  PLACEMENTS OF LOAD PATTERNS

PAT-PLMTS            X AND Y DISTANCES (OF THE STRUCTURE)
 1    1    117.-187.


TABLE 7.  SUMMATION OF BOX BENDING MOMENTS

   BOX  SUMS          SUM AT X-STATION NEAREST THESE X-DISTANCES
    1    5        24.        60.        96.       132.       168.
    2    5        24.        60.        96.       132.       168.


TABLE 8.  PROFILE OUTPUT AREAS

 DISTS FROM - THRU      DEFL     X MOM      Y MOM      PRIN MOM
  X    Y    X    Y                    (1=YES)
 160. 242. 727. 242.     1        0          0          0
 -38.   0. 562.   0.     1        0          0          0
-204.-242. 360.-242.     1        0          0          0
```

```
TABLE 9.  PRINTED OUTPUT LIMITS

 Y-DIST FROM - THRU
       Y          Y
     USING DATA FROM THE PREVIOUS PROBLEM
     -268.     -243.
      -12.       12.
      243.      268.


SUMMATION OF LOADS ON STRUCTURE     -7.006D 01
SUMMATION OF LOADS OFF STRUCTURE     0.0
```

```
RESULTS FROM SLAB49 PROGRAM USING DATA GENERATED BY SLBDG2


POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS      RUN AS CHECK FOR 10 AUG 77 VERSION

PROB (CONTD)
 172A     LOADING NO. THREE    WEST EDGE


RESULTS--USING STIFFNESS DATA FROM PREVIOUS PROBLEM  170A


     SLAB X MOMENT AND X TWISTING MOMENT ACT IN THE X DIRECTION (ABOUT Y AXIS)
     Y TWISTING MOMENT = -X TWISTING MOMENT, COUNTERCLOCKWISE BETA ANGLES ARE
     POSITIVE FROM THE X AXIS TO THE DIRECTION OF THE LARGEST PRINCIPAL MOMENT
     SLAB MOMENTS ARE PER UNIT WIDTH


                                                          LARGEST     BETA
                                               SLAB X    PRINCIPAL    X TO
                        SLAB X      SLAB Y    TWISTING    SLAB      LARGEST  SUPPORT
 X , Y     DEFL         MOMENT      MOMENT     MOMENT     MOMENT     MOMENT  REACTION

 0  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 1  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 2  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 3  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 4  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 5  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 6  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 7  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 8  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
 9  44   0.0          0.0         0.0         0.0         0.0          0.0  0.0
10  44   2.508D-03    0.0         0.0         0.0         0.0          0.0  0.0
11  44   6.611D-04    6.188D-01   4.563D-17   1.567D 00   1.907D 00   39.4 -2.189D 03
12  44  -7.579D-04    8.504D-01  -1.901D-17  -4.357D-02   3.527D-01   -2.9  2.189D 03
13  44  -1.588D-03    7.598D-01  -5.709D-17  -6.702D-02   7.657D-01   -5.0  0.0
14  44  -1.893D-03    5.955D-01  -7.174D-17  -9.557D-02   6.104D-01   -8.9  0.0
15  44  -1.786D-03    3.961D-01  -6.794D-17  -1.107D-01   4.249D-01  -14.6  0.0
16  44  -1.405D-03    1.986D-01  -5.184D-17  -1.165D-01   2.524D-01  -24.8  0.0
```

```
17  44 -8.870D-04  2.789D-02 -2.953D-17 -1.159D-01  1.307D-01 -41.6  0.0
18  44 -3.493D-04 -1.017D-01 -6.344D-18 -1.114D-01 -1.733D-01  32.7  0.0
19  44  1.180D-04 -1.844D-01  1.371D-17 -1.048D-01 -2.318D-01  24.3  0.0
20  44  4.578D-04 -2.215D-01  2.805D-17 -9.744D-02 -2.582D-01  20.7  0.0
21  44  6.443D-04 -2.194D-01  3.553D-17 -9.043D-02 -2.518D-01  19.8  0.0
22  44  6.791D-04 -1.897D-01  3.620D-17 -8.409D-02 -2.216D-01  20.8  0.0
23  44  5.827D-04 -1.441D-01  3.098D-17 -7.783D-02 -1.781D-01  23.6  0.0
24  44  3.865D-04 -8.930D-02  2.132D-17 -6.911D-02 -1.269D-01  28.6  0.0
25  44  1.286D-04 -2.626D-02  8.975D-18 -4.033D-02 -5.555D-02  36.0 -4.259D 02
26  44 -1.475D-04 -2.356D-16 -3.709D-18 -6.789D-03 -6.789D-03  45.0  4.259D 02

 0  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  43  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  43  4.042D-03  0.0        0.0        0.0        0.0         0.0  0.0
10  43  2.173D-03 -8.598D-12 -6.544D-02  2.443D 00 -2.476D 00 -45.4  0.0
11  43  3.067D-04  1.269D 00 -1.169D-01  5.353D-02  1.271D 00   2.2 -1.488D 03
12  43 -1.105D-03  1.663D 00 -8.993D-02 -8.683D-02  1.667D 00  -2.8  1.489D 03
13  43 -1.924D-03  1.506D 00 -4.200D-02 -1.511D-01  1.520D 00  -5.5  0.0
14  43 -2.208D-03  1.176D 00 -2.419D-02 -2.107D-01  1.212D 00  -9.7  0.0
15  43 -2.076D-03  7.795D-01 -1.265D-02 -2.417D-01  8.474D-01 -15.7  0.0
16  43 -1.668D-03  3.889D-01 -4.532D-03 -2.514D-01  5.114D-01 -26.0  0.0
17  43 -1.122D-03  5.210D-02  9.288D-04 -2.467D-01  2.745D-01 -42.0  0.0
18  43 -5.572D-04 -2.030D-01  4.284D-03 -2.332D-01 -3.545D-01  33.0  0.0
19  43 -6.466D-05 -3.655D-01  6.050D-03 -2.154D-01 -4.641D-01  24.6  0.0
20  43  2.983D-04 -4.378D-01  6.677D-03 -1.966D-01 -5.123D-01  20.7  0.0
21  43  5.062D-04 -4.331D-01  6.613D-03 -1.793D-01 -4.970D-01  19.6  0.0
22  43  5.607D-04 -3.744D-01  6.637D-03 -1.647D-01 -4.357D-01  20.4  0.0
23  43  4.825D-04 -2.853D-01  7.786D-03 -1.515D-01 -3.495D-01  23.0  0.0
24  43  3.031D-04 -1.800D-01  1.361D-02 -1.376D-01 -2.514D-01  27.4  0.0
25  43  5.929D-05 -7.113D-02  6.800D-02 -7.754D-02 -1.057D-01  24.1 -2.877D 02
26  43 -2.131D-04  2.368D-13  2.813D-02 -1.167D-02  3.234D-02 -70.2  2.871D 02

 0  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 7  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  42  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  42  3.734D-03  0.0        0.0        0.0        0.0         0.0  0.0
10  42  1.835D-03 -1.025D-12 -1.082D-01  1.595D-01 -2.225D-01 -54.4 -3.536D 02
11  42 -5.866D-05  1.393D 00 -1.142D-01  8.242D-02  1.398D 00   3.1  3.524D 02
12  42 -1.464D-03  1.720D 00 -9.340D-02 -1.919D-01  1.740D 00  -6.0  0.0
13  42 -2.269D-03  1.559D 00 -6.490D-02 -2.762D-01  1.604D 00  -9.4  0.0
14  42 -2.530D-03  1.212D 00 -4.212D-02 -3.148D-01  1.287D 00 -13.3  0.0
15  42 -2.371D-03  7.999D-01 -2.502D-02 -3.246D-01  9.123D-01 -19.1  0.0
16  42 -1.932D-03  3.956D-01 -1.257D-02 -3.147D-01  5.666D-01 -28.5  0.0
17  42 -1.357D-03  4.833D-02 -3.855D-03 -2.923D-01  3.157D-01 -42.4  0.0
18  42 -7.638D-04 -2.138D-01  1.936D-03 -2.635D-01 -3.907D-01  33.9  0.0
19  42 -2.452D-04 -3.803D-01  5.552D-03 -2.334D-01 -4.901D-01  25.2  0.0
20  42  1.415D-04 -4.536D-01  7.708D-03 -2.058D-01 -5.321D-01  20.9  0.0
21  42  3.707D-04 -4.475D-01  9.147D-03 -1.842D-01 -5.125D-01  19.4  0.0
22  42  4.446D-04 -3.862D-01  1.076D-02 -1.702D-01 -4.492D-01  20.3  0.0
23  42  3.841D-04 -2.946D-01  1.341D-02 -1.606D-01 -3.631D-01  23.1  0.0
24  42  2.210D-04 -1.856D-01  1.704D-02 -1.372D-01 -2.548D-01  26.8 -4.260D 01
25  42 -7.207D-06 -1.199D-01  1.318D-02 -4.973D-02 -1.364D-01  18.4  4.329D 01
26  42 -2.776D-04  2.071D-14  1.323D-02 -3.327D-01  3.393D-01 -45.6  0.0

 0  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 6  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
```

```
 7  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 8  41  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 9  41  3.339D-03  0.0        0.0        0.0        0.0         0.0  0.0
10  41  1.393D-03 -1.490D-11 -2.332D-01  1.059D 00 -1.182D 00 -48.1 -2.414D 03
11  41 -5.414D-04  1.488D 00 -5.489D-01  8.214D-02  1.491D 00   2.3  2.418D 03
12  41 -1.922D-03  1.734D 00 -1.026D-01 -3.330D-01  1.793D 00 -10.0  0.0
13  41 -2.684D-03  1.541D 00 -4.264D-02 -4.029D-01  1.638D 00 -13.5  0.0
14  41 -2.900D-03  1.190D 00 -2.403D-02 -4.193D-01  1.320D 00 -17.3  0.0
15  41 -2.693D-03  7.782D-01 -1.247D-02 -4.079D-01  9.509D-01 -22.9  0.0
16  41 -2.211D-03  3.774D-01 -4.370D-03 -3.782D-01  6.101D-01 -31.6  0.0
17  41 -1.595D-03  3.471D-02  1.064D-03 -3.379D-01  3.562D-01 -43.6  0.0
18  41 -9.673D-04 -2.226D-01  4.389D-03 -2.938D-01 -4.241D-01  34.4  0.0
19  41 -4.183D-04 -3.847D-01  6.138D-03 -2.513D-01 -5.076D-01  26.1  0.0
20  41 -5.458D-06 -4.542D-01  6.753D-03 -2.149D-01 -5.388D-01  21.5  0.0
21  41  2.465D-04 -4.446D-01  6.643D-03 -1.890D-01 -5.133D-01  20.0  0.0
22  41  3.409D-04 -3.809D-01  6.916D-03 -1.760D-01 -4.489D-01  21.1  0.0
23  41  3.003D-04 -2.904D-01  1.236D-02 -1.743D-01 -3.699D-01  24.5  0.0
24  41  1.564D-04 -1.959D-01  7.176D-02 -1.442D-01 -2.588D-01  23.6 -2.711D 02
25  41 -6.038D-05 -1.251D-01  1.595D-01 -1.026D-01  1.926D-01 -72.1  2.697D 02
26  41 -3.295D-04  0.0        0.0        0.0        0.0         0.0  0.0

 0  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  23  1.354D-02  0.0        0.0        0.0        0.0         0.0  0.0
 6  23  2.632D-03 -3.373D-11 -5.601D 00  5.365D 00 -8.953D 00 -58.8 -1.227D 04
 7  23 -7.993D-03  6.043D 00 -2.601D 00  3.413D 00  7.228D 00  19.1  1.231D 04
 8  23 -1.635D-02  6.932D 00 -5.273D-01  2.178D 00  7.521D 00  15.1  0.0
 9  23 -2.223D-02  7.057D 00 -2.578D-01  2.535D-01  7.066D 00   2.0  0.0
10  23 -2.560D-02  6.577D 00 -1.694D-01 -1.464D 00  6.881D 00 -11.7  0.0
11  23 -2.664D-02  5.557D 00 -1.076D-01 -2.830D 00  6.729D 00 -22.5  0.0
12  23 -2.571D-02  4.219D 00 -5.954D-02 -3.758D 00  6.404D 00 -30.2  0.0
13  23 -2.328D-02  2.777D 00 -2.175D-02 -4.247D 00  5.849D 00 -35.9  0.0
14  23 -1.987D-02  1.393D 00  9.279D-03 -4.346D 00  5.102D 00 -40.5  0.0
15  23 -1.597D-02  1.904D-01  3.679D-02 -4.125D 00  4.239D 00 -44.5  0.0
16  23 -1.201D-02 -7.423D-01  6.401D-02 -3.664D 00 -4.025D 00  41.9  0.0
17  23 -8.308D-03 -1.344D 00  9.415D-02 -3.048D 00 -3.757D 00  38.4  0.0
18  23 -5.087D-03 -1.589D 00  1.302D-01 -2.380D 00 -3.260D 00  35.1  0.0
19  23 -2.435D-03 -1.513D 00  1.735D-01 -1.666D 00 -2.718D 00  32.8  0.0
20  23 -3.264D-04 -2.155D 00  5.897D-01 -8.397D-01 -2.392D 00  15.7  1.521D 03
21  23  9.903D-04  1.164D-13  2.828D-01  1.362D 00  1.511D 00  48.0 -1.525D 03
22  23  2.293D-03  0.0        0.0        0.0        0.0         0.0  0.0
23  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
24  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
25  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0
26  23  0.0        0.0        0.0        0.0        0.0         0.0  0.0

 0  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 1  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 2  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 3  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 4  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
 5  22  1.423D-02  0.0        0.0        0.0        0.0         0.0  0.0
 6  22  3.268D-06  9.180D 00 -9.445D-01  4.595D 00  1.095D 01  21.1 -2.026D 01
 7  22 -1.100D-02  6.568D 00 -8.837D-01  2.413D 00  7.282D 00  16.5  0.0
 8  22 -1.968D-02  7.630D 00 -6.293D-01  1.071D 00  7.766D 00   7.3  0.0
 9  22 -2.569D-02  7.786D 00 -4.330D-01 -4.931D-01  7.815D 00  -3.4  0.0
10  22 -2.899D-02  7.219D 00 -2.927D-01 -2.029D 00  7.732D 00 -14.2  0.0
11  22 -2.977D-02  6.044D 00 -1.886D-01 -3.286D 00  7.456D 00 -23.3  0.0
12  22 -2.844D-02  4.531D 00 -1.091D-01 -4.135D 00  5.952D 00 -30.4  0.0
13  22 -2.554D-02  2.922D 00 -4.651D-02 -4.555D 00  5.239D 00 -36.0  0.0
14  22 -2.163D-02  1.394D 00  5.679D-03 -4.626D 00  5.377D 00 -40.7  0.0
15  22 -1.723D-02  7.596D-02  5.336D-02 -4.387D 00  4.451D 00 -44.9  0.0
16  22 -1.282D-02 -9.390D-01  1.026D-01 -3.932D 00 -4.384D 00  41.2  0.0
17  22 -8.728D-03 -1.585D 00  1.603D-01 -3.353D 00 -4.177D 00  37.7  0.0
18  22 -5.197D-03 -1.828D 00  2.349D-01 -2.735D 00 -3.720D 00  34.7  0.0
19  22 -2.311D-03 -1.616D 00  3.248D-01 -2.047D 00 -2.911D 00  32.3  0.0
20  22 -1.629D-06 -2.674D 00  2.959D-01 -1.549D 00 -3.335D 00  23.1  1.010D 01
21  22  1.367D-03  0.0        0.0        0.0        0.0         0.0  0.0
22  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
23  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
24  22  0.0        0.0        0.0        0.0        0.0         0.0  0.0
```

```
 25  22  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 26  22  0.0        0.0        0.0        0.0        0.0          0.0  0.0

  0  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  1  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  2  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  3  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  4  21  2.529D-02  0.0        0.0        0.0        0.0          0.0  0.0
  5  21  1.083D-02 -5.626D-11 -9.708D-01  1.611D 01 -1.660D 01  -45.9 -1.668D 04
  6  21 -3.584D-03  8.488D 00 -2.045D 00  1.643D 00  8.738D 00    8.7  1.670D 04
  7  21 -1.489D-02  7.105D 00 -5.006D-01  1.590D 00  7.425D 00   11.3  0.0
  8  21 -2.367D-02  7.928D 00 -3.448D-01  1.279D-01  7.930D 00    0.9  0.0
  9  21 -2.962D-02  8.106D 00 -2.479D-01 -1.226D 00  8.282D 00   -8.2  0.0
 10  21 -3.269D-02  7.510D 00 -1.727D-01 -2.598D 00  8.306D 00  -17.0  0.0
 11  21 -3.310D-02  6.244D 00 -1.089D-01 -3.748D 00  7.981D 00  -24.9  0.0
 12  21 -3.130D-02  4.627D 00 -5.889D-02 -4.518D 00  7.373D 00  -31.3  0.0
 13  21 -2.786D-02  2.925D 00 -2.025D-02 -4.889D 00  6.559D 00  -36.6  0.0
 14  21 -2.339D-02  1.323D 00  1.118D-02 -4.910D 00  5.621D 00  -41.2  0.0
 15  21 -1.844D-02 -4.703D-02  3.897D-02 -4.652D 00 -4.656D 00   44.7  0.0
 16  21 -1.352D-02 -1.091D 00  6.702D-02 -4.202D 00 -4.754D 00   41.1  0.0
 17  21 -8.986D-03 -1.740D 00  1.039D-01 -3.665D 00 -4.597D 00   37.9  0.0
 18  21 -5.072D-03 -1.975D 00  2.212D-01 -3.171D 00 -4.233D 00   35.4  0.0
 19  21 -1.867D-03 -1.850D 00  1.223D 00 -2.363D 00 -3.132D 00   28.5  2.876D 03
 20  21  6.221D-04  6.936D-12  2.766D 00 -1.918D 00  3.748D 00  -62.9 -2.899D 03
 21  21  2.971D-03  0.0        0.0        0.0        0.0          0.0  0.0
 22  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 23  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 24  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 25  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 26  21  0.0        0.0        0.0        0.0        0.0          0.0  0.0

  0  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  1  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  2  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  3  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
  4  20  2.207D-02  0.0        0.0        0.0        0.0          0.0  0.0
  5  20  7.391D-03 -6.073D-14 -3.066D-06  4.676D 00 -4.676D 00  -45.0 -2.277D 04
  6  20 -7.289D-03  9.042D 00 -6.620D-06  3.211D 00  1.007D 01   17.7  2.274D 04
  7  20 -1.884D-02  7.786D 00 -1.453D-05  2.383D 00  8.457D 00   15.7  0.0
  8  20 -2.770D-02  8.578D 00 -1.885D-05  5.613D-01  8.615D 00    3.7  0.0
  9  20 -3.359D-02  8.793D 00 -2.013D-05 -1.238D 00  8.964D 00   -7.9  0.0
 10  20 -3.645D-02  8.142D 00 -1.900D-05 -2.966D 00  9.107D 00  -18.0  0.0
 11  20 -3.648D-02  6.720D 00 -1.609D-05 -4.354D 00  8.860D 00  -26.2  0.0
 12  20 -3.419D-02  4.923D 00 -1.216D-05 -5.245D 00  8.255D 00  -32.4  0.0
 13  20 -3.020D-02  3.051D 00 -7.789D-06 -5.647D 00  7.374D 00  -37.4  0.0
 14  20 -2.515D-02  1.303D 00 -3.437D-06 -5.625D 00  5.314D 00  -41.7  0.0
 15  20 -1.965D-02 -1.806D-01  5.079D-07 -5.262D 00 -5.353D 00   44.5  0.0
 16  20 -1.422D-02 -1.299D 00  3.687D-06 -4.648D 00 -5.343D 00   41.0  0.0
 17  20 -9.231D-03 -1.974D 00  5.711D-06 -3.880D 00 -4.990D 00   37.9  0.0
 18  20 -4.928D-03 -2.151D 00  6.060D-06 -3.098D 00 -4.356D 00   35.4  0.0
 19  20 -1.369D-03 -2.445D 00  3.524D-06 -2.246D 00 -3.780D 00   30.7  4.216D 03
 20  20  1.345D-03 -1.050D-14  2.575D-06 -9.904D-01  9.904D-01  -45.0 -4.194D 03
 21  20  4.058D-03  0.0        0.0        0.0        0.0          0.0  0.0
 22  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 23  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 24  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 25  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 26  20  0.0        0.0        0.0        0.0        0.0          0.0  0.0

  0   2  1.854D-02 -7.712D-13  4.353D-01  2.261D 01  2.283D 01   45.3  0.0
  1   2  5.965D-04 -3.948D 00  4.429D-01 -1.773D 00 -4.574D 00   19.5 -3.583D 03
  2   2 -1.873D-02 -2.196D 00  6.388D-01 -5.401D 00 -6.362D 00   37.6  3.610D 03
  3   2 -3.885D-02  8.487D-01  4.991D-01 -6.801D 00  7.478D 00  -44.3  0.0
  4   2 -5.871D-02  5.231D 00  3.759D-01 -7.098D 00  1.031D 01  -35.6  0.0
  5   2 -7.677D-02  9.082D 00  2.907D-01 -7.063D 00  1.301D 01  -29.1  0.0
  6   2 -9.170D-02  1.181D 01  2.314D-01 -7.110D 00  1.519D 01  -25.4  0.0
  7   2 -1.026D-01  1.515D 01  1.943D-01 -7.316D 00  1.813D 01  -22.2  0.0
  8   2 -1.082D-01  1.920D 01  1.693D-01 -7.201D 00  2.162D 01  -18.6  0.0
  9   2 -1.072D-01  2.083D 01  1.659D-01 -6.626D 00  2.277D 01  -16.3  0.0
 10   2 -9.895D-02  1.894D 01  1.870D-01 -5.855D 00  2.062D 01  -16.0  0.0
 11   2 -8.418D-02  1.285D 01  2.448D-01 -5.492D 00  1.491D 01  -20.5  0.0
 12   2 -6.498D-02  7.194D 00  3.299D-01 -5.535D 00  1.027D 01  -29.1  0.0
 13   2 -4.331D-02  1.545D 00  4.717D-01 -5.220D 00  6.256D 00  -42.1  0.0
 14   2 -2.112D-02 -4.599D 00  6.873D-01 -3.221D 00 -5.122D 00   25.3  0.0
 15   2 -5.635D-04 -7.237D 00  6.573D-01 -1.647D 00 -7.567D 00   11.3  3.385D 03
 16   2  1.745D-02 -2.687D-13  6.192D-01 -9.375D-01  1.297D 00  -54.1 -3.364D 03
 17   2  3.544D-02  0.0        0.0        0.0        0.0          0.0  0.0
 18   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 19   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 20   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 21   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 22   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 23   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 24   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 25   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 26   2  0.0        0.0        0.0        0.0        0.0          0.0  0.0

  0   1  1.399D-02 -5.078D-12  9.163D-01 -3.944D-01  1.063D 00  -69.6 -1.886D 04
  1   1 -3.882D-03 -2.153D 00  2.296D 00 -2.814D 00  3.658D 00  -64.2  1.884D 04
  2   1 -2.263D-02 -1.908D 00  5.690D-01 -5.269D 00 -5.082D 00   38.4  0.0
  3   1 -4.209D-02  9.968D-01  3.098D-01 -6.044D 00  6.707D 00  -43.4  0.0
  4   1 -6.121D-02  5.158D 00  1.786D-01 -6.452D 00  9.584D 00  -34.5  0.0
  5   1 -7.851D-02  8.881D 00  1.169D-01 -6.599D 00  1.242D 01  -28.2  0.0
  6   1 -9.268D-02  1.164D 01  1.307D-01 -6.762D 00  1.477D 01  -24.8  0.0
  7   1 -1.027D-01  1.490D 01  1.084D-01 -7.004D 00  1.769D 01  -21.7  0.0
  8   1 -1.075D-01  1.868D 01  5.620D-03 -6.999D 00  2.101D 01  -18.4  0.0
  9   1 -1.057D-01  2.020D 01 -3.944D-02 -6.667D 00  2.220D 01  -16.7  0.0
 10   1 -9.679D-02  1.833D 01 -3.505D-02 -6.218D 00  2.024D 01  -17.1  0.0
 11   1 -8.136D-02  1.264D 01  1.176D-01 -6.083D 00  1.510D 01  -22.1  0.0
 12   1 -6.147D-02  7.089D 00  1.693D-01 -6.297D 00  1.081D 01  -30.6  0.0
 13   1 -3.908D-02  1.400D 00  3.163D-01 -6.395D 00  7.277D 00  -42.6  0.0
 14   1 -1.621D-02 -5.802D 00  1.810D 00 -4.110D 00 -7.597D 00   23.6  2.185D 04
 15   1  4.510D-03 -6.601D 00  4.119D 00 -9.534D-01 -5.685D 00    5.0 -2.188D 04
 16   1  2.269D-02  1.708D-14  4.278D-01  2.510D 01  2.532D 01   45.2  0.0
 17   1  4.085D-02  0.0        0.0        0.0        0.0          0.0  0.0
 18   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 19   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 20   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 21   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 22   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 23   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 24   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 25   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 26   1  0.0        0.0        0.0        0.0        0.0          0.0  0.0

  0   0  9.481D-03 -1.254D-14 -3.918D-20 -2.296D-01 -2.296D-01   45.0 -2.738D 04
  1   0 -8.267D-03 -7.072D-01  5.605D-20 -1.415D 00 -1.812D 00   38.0  2.738D 04
  2   0 -2.650D-02 -8.313D-01  1.121D-19 -2.522D 00 -2.972D 00   40.3  0.0
  3   0 -4.532D-02  5.829D-01  2.835D-19 -2.923D 00  3.229D 00  -42.2  0.0
  4   0 -6.373D-02  2.662D 00  5.205D-19 -3.124D 00  4.727D 00  -33.5  0.0
  5   0 -8.029D-02  4.547D 00  4.080D-19 -3.219D 00  5.215D 00  -27.4  0.0
  6   0 -9.371D-02  5.979D 00  5.180D-19 -3.308D 00  7.448D 00  -23.9  0.0
  7   0 -1.030D-01  7.640D 00  3.498D-19 -3.413D 00  8.943D 00  -20.9  0.0
  8   0 -1.070D-01  9.517D 00  4.422D-19 -3.431D 00  1.062D 01  -17.9  0.0
  9   0 -1.044D-01  1.027D 01  3.329D-19 -3.337D 00  1.126D 01  -16.5  0.0
 10   0 -9.473D-02  9.310D 00  3.799D-19 -3.205D 00  1.031D 01  -17.3  0.0
 11   0 -7.860D-02  6.478D 00  4.453D-19 -3.184D 00  7.781D 00  -22.3  0.0
 12   0 -5.799D-02  3.650D 00  4.140D-19 -3.291D 00  5.589D 00  -30.5  0.0
 13   0 -3.485D-02  7.282D-01  3.267D-19 -3.428D 00  3.811D 00  -42.0  0.0
 14   0 -1.121D-02 -3.849D 00  6.148D-20 -2.308D 00 -4.930D 00   25.1  3.238D 04
 15   0  9.766D-03 -4.046D 00 -4.514D-20  1.796D 01 -2.009D 01  -41.8 -3.234D 04
 16   0  2.794D-02  0.0        0.0        0.0        0.0          0.0  0.0
 17   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 18   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 19   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 20   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 21   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 22   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 23   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 24   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 25   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0
 26   0  0.0        0.0        0.0        0.0        0.0          0.0  0.0


STATICS CHECK.          SUMMATION OF REACTIONS =     7.006D 01

                        MAXIMUM STATICS CHECK ERROR AT STA   9 12 = -6.126D-09
```

```
BOX MOMENT SUMMATIONS (TOTAL ACROSS BOX)

     BOX NO.   X-STA       X-DIST       TOTAL BMX
        1        7       3.739D 01     7.292D 02
        1        8       7.478D 01     9.268D 02
        1        9       1.122D 02     1.006D 03
        1       10       1.496D 02     9.165D 02
        1       10       1.496D 02     0.0

        2        7       3.739D 01     6.992D 02
        2        8       7.478D 01     8.925D 02
        2        9       1.122D 02     9.710D 02
        2       10       1.496D 02     8.8640 02
        2       10       1.496D 02     0.0
```

```
RESULTS FROM SLAB49 PROGRAM USING DATA GENERATED BY SLBDG2


POST TEST ANALYSIS OF BEEVILLE STRUCTURE

14 SPAN INCRS, 44 TRANSVERSE INCREMENTS      RUN AS CHECK FOR 10 AUG 77 VERSION

PROB (CONTD)
 172A     LOADING NO. THREE   WEST EDGE


PROFILE OUTPUT AREAS
     X MOMENTS ACT IN X DIRECTION (ABOUT Y AXIS)
     THE PLOTTED RESULTS INDICATE THE RELATIVE VALUE EACH HAS WITHIN THAT LIST


                              BETWEEN ( 10 , 41 ) AND ( 25 , 42 )
             DEFLECTIONS

 X , Y DEFLECTION

10  41  1.393D-03                      *
11  41 -5.414D-04              *
12  41 -1.922D-03         *
13  41 -2.684D-03      *
14  41 -2.900D-03    *
15  41 -2.693D-03      *
16  41 -2.211D-03        *
17  41 -1.595D-03          *
18  41 -9.673D-04             *
19  41 -4.183D-04               *
20  41 -5.458D-06                 *
21  41  2.465D-04                  *
22  41  3.409D-04                  *
23  41  3.003D-04                  *
24  41  1.564D-04                 *
25  41 -6.038D-05                *
10  42  1.835D-03                        *
11  42 -5.866D-05                *
12  42 -1.464D-03           *
13  42 -2.269D-03        *
14  42 -2.530D-03      *
15  42 -2.371D-03       *
16  42 -1.932D-03         *
17  42 -1.357D-03           *
18  42 -7.638D-04              *
19  42 -2.452D-04                *
20  42  1.415D-04                 *
21  42  3.707D-04                  *
22  42  4.446D-04                  *
23  42  3.841D-04                  *
24  42  2.210D-04                  *
25  42 -7.207D-06                 *

                              BETWEEN (  4 , 22 ) AND ( 21 , 22 )
             DEFLECTIONS

 X , Y DEFLECTION

 4  22  0.0                        *
 5  22  1.423D-02                        *
 6  22  3.268D-06                  *
 7  22 -1.100D-02             *
 8  22 -1.968D-02         *
 9  22 -2.569D-02       *
10  22 -2.899D-02     *
11  22 -2.977D-02     *
12  22 -2.844D-02      *
13  22 -2.554D-02       *
14  22 -2.163D-02         *
15  22 -1.723D-02          *
16  22 -1.282D-02            *
17  22 -8.728D-03              *
18  22 -5.197D-03                *
19  22 -2.311D-03                 *
20  22 -1.629D-06                  *
21  22  1.367D-03                  *

                              BETWEEN (  0 ,  2 ) AND ( 16 ,  2 )
             DEFLECTIONS

 X , Y DEFLECTION

 0   2  1.854D-02                        *
 1   2  5.965D-04                     *
 2   2 -1.873D-02                  *
 3   2 -3.885D-02               *
 4   2 -5.871D-02            *
 5   2 -7.677D-02          *
 6   2 -9.170D-02       *
 7   2 -1.026D-01      *
 8   2 -1.082D-01     *
 9   2 -1.072D-01     *
10   2 -9.895D-02      *
11   2 -8.418D-02         *
12   2 -6.498D-02           *
13   2 -4.331D-02               *
14   2 -2.112D-02                  *
15   2 -5.635D-04                     *
16   2  1.745D-02                        *

CPU TIME SINCE LAST CALL =  27.513 SECONDS, TOTAL ELAPSED TIME = 238.614 SEC3NDS
```