United States Department of Agriculture
Soil Conservation Service
P.O. Box 2890
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20013

March 25, 1992

TR-68A

TECHNICAL RELEASE NO. 68, AMENDMENT 1
210-VI

SUBJECT: ENG - APPENDIX D TO TECHNICAL RELEASE (TR) NO. 68, SEISMIC ANALYSIS OF RISERS

Purpose. To distribute TR-68, Appendix D, and the associated microcomputer program.

Effective Date. Effective upon receipt.

TR-68 presents criteria and procedures for guidance in the analysis of drop inlet spillway risers subjected to earthquake motion. Appendix D to TR-68 describes the computer program which performs seismic analysis of a drop inlet spillway riser with standard covered top (TR-30) or standard baffle inlet top (TR-70). Ronald A. Nulton, Design Engineer, South NTC, developed this program. He wrote the program in GW-BASIC and compiled it with QuickBASIC to run with a DOS operating system.

The National Software Testing Laboratory at Fort Worth, Texas, tested this program. Two diskettes containing the program are being distributed under separate cover.

Filing Instructions. File with TR-68.

Distribution. Copies are being distributed as indicated by the TR-68 distribution list. Obtain additional copies by ordering TR-68A from the Consolidated Forms and Distribution Center, 3222 Hubbard Road, Landover, Maryland 20785.

Edgar H. Nelson

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Enclosure

DIST: TR-68

TECHNICAL RELEASE
NUMBER 68

APPENDIX D

SEISMIC ANALYSIS OF RISERS

February 1992

U.S. Department of Agriculture
Soil Conservation Service
Engineering Division

APPENDIX D
SEISMIC ANALYSIS OF RISERS

Computer Program

This program performs a seismic analysis of a drop inlet spillway riser with a standard covered top (ES-150) or standard baffle inlet top (TR-70). The program was written in GW-BASIC and compiled with QuickBASIC to run with a DOS operating system. The complete program in addition to this documentation consists of:

1. TECHNICAL RELEASE 68, Seismic Analysis of Risers
2. "SARISERS.EXE" - Compiled computational program
3. "SAOUTPUT.EXE" - Compiled output to screen program
4. "SAPRINT.EXE" - Compiled output to printer program
5. "BRUN45.EXE" - QuickBASIC runtime file
6. "SARISER1.2D" - Flowchart, Sheet 1 of 4
7. "SARISER2.2D" - Flowchart, Sheet 2 of 4
8. "SARISER3.2D" - Flowchart, Sheet 3 of 4
9. "SARISER4.2D" - Flowchart, Sheet 4 of 4

The flowcharts are an overall representation of the program, but do not show some of the minor flow paths. They are in Versacad, version 5.2, format. They have been archived using PKARC in order to get them on one diskette. To extract them, load the file "flowchrt.exe" onto a hard disk to provide room for extraction and execute it by entering the command "flowchrt." This will create the four Versacad files for plotting. In addition to the above, a record of the hand computations performed in developing and checking the program are on file at the South National Technical Center.

This program was developed and Appendix D prepared by Ron Nulton, Design Engineer, SNTC.

Before using this program the user should become familiar with TR-68. The procedures presented in TR-68 (4/1/82) are followed except that the depth of submergence has been limited to the weir crest. (A section 12S as used in TR-68 has not been provided, and no consideration has been made for water inside the riser.) The depth of submergence was limited to the weir crest because of the low probability of occurrence of a seismic event in conjunction with a storm event.

The program will compute the in-air or in-water conditions for any water level up to the weir crest as well as the free-standing or partially embedded conditions. A solid section above the footing, as detailed in some standard risers, can be added. This feature is also useful when placing a larger footing under the standard footing to improve overturning stability. For the standard covered top riser, the last five segments must be delineated the same as segments 9, 10, 11, 12, and 13 in figure 13, TR-68 (4/82). For the standard baffle inlet riser, the last five segments must be delineated the same as segments 9 through 13 shown in figure D1. In both cases the fifth segment from the top (segment 9 in the figures) is measured from the next lower segment to the weir crest. Figure D1 also shows the horizontal dimensions T1, T2, and T3 used in the analysis of the baffle inlet riser.

A riser that has an inside length/width ratio other than D by 3D can be run by entering the desired length/width ratio at the input prompt. The program will accept length/width ratios between 1 and 5. In addition to the conditions for dimensioning already explained, the side projections for the top of a covered top riser must conform to the geometry of the standard covered top risers. That is, the side projections must be 2D outside the riser and the top support walls must have a triangular section located below the weir crest that has horizontal and vertical lengths of 2D, as is the case for the standard covered top risers. For a baffle inlet riser, the top must be configured as shown in figure D1 with the sloping portion of the support walls approximately on a 2:1 slope. (The program assumes a 2:1 slope for weight computations of the baffle inlet top support walls.) The input for the pipe diameter sets the inside width for the riser. A riser for a rectangular conduit can be run by inputting inside width instead of pipe diameter.

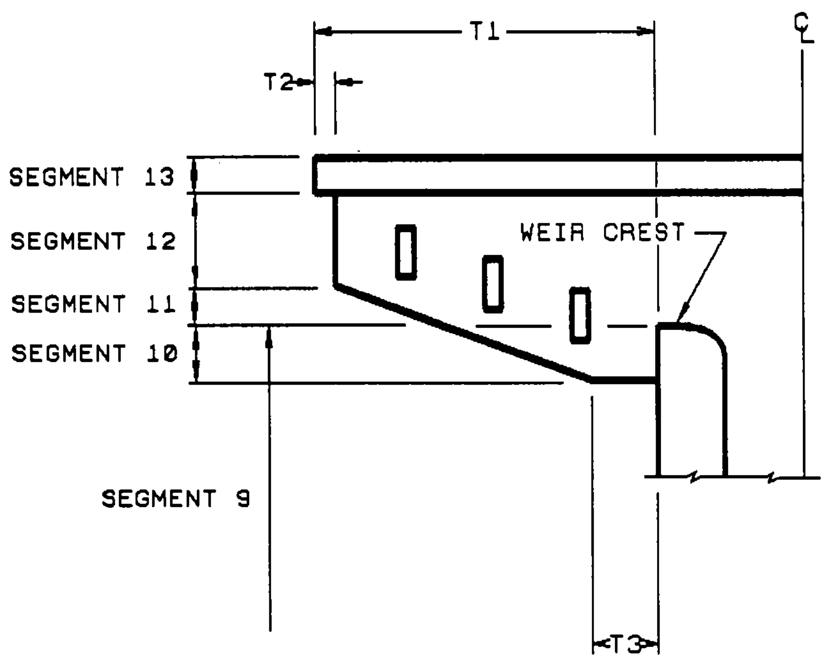

Figure D1. Half section of a standard baffle inlet.

For a water level at the weir crest, the program computes buoyant weights for the portions of the top slab support walls that are below water. For any water level below the weir crest, the in-air weights of the top slab support walls are used even though portions of the walls may be submerged.

When computing the soil-structure interaction factor, an iteration in the program recomputes the factor until it has converged to within 0.01 of the previous computation.

PROGRAM LIMITATIONS:

The program limitations are summarized as follows:

1. For the standard covered top riser, the trashrack supporting walls and top must conform to the proportioning shown on ES-150.

    a. The last five segments must be delineated the same as segments 9 through 13 in figure 13, page 40, TR-68 (4/82).

    b. The side projections of the top must be twice the pipe diameter.

    c. The triangular portion of the support walls must have horizontal and vertical dimensions of twice the pipe diameter.

2. For the standard baffle inlet riser, the trashrack supporting walls and top must conform to the proportioning shown in TR-70, and the sloping edge of the supporting walls should approximate a 2:1 slope.

    a. The last five sections must be delineated the same as shown in figure D1.

    b. The program assumes the sloping edge of the supporting walls is on a 2:1 slope. This assumption is used in computing the weight of the concrete.

c. The horizontal dimensions T1, T2, and T3 must be determined as shown in figure D1 where:

T1 is the side projection of the top outside the riser wall,

T2 is the side projection of the top outside the support walls, and

T3 is the side projection of the bottom straight section of the support walls outside the riser wall.

3. Risers must have an inside width of D. The inside length must be between D and 5D.

4. The maximum number of segments for a free-standing riser is 21. The maximum number for an embedded riser is 20. In the case of an embedded riser, the program splits a segment at the effective base and renumbers the segments. This results in the output having one more segment than the input.

5. The program will not accept water levels above the weir and will not consider water inside the riser. The program also does not consider the effect of submergence of the top slab support walls if the given water level is below the weir crest.

6. The program will not accept a depth of embedment greater than the depth of submergence except for a dry site. It uses buoyant weight for the fill for all submerged conditions.

7. The program will not accept a depth of embedment less than 1.5 times the thickness of the footing. This

limitation was set to simplify programming and is not intended as a recommended minimum depth of embedment.

8. The riser must be symmetrical; therefore, the footing extensions on opposite sides of the riser must be the same length.

9. The base must be close to an adequate size, or the soil-structure interaction factor may not converge.

10. The wall thickness must be the same on all four sides of the riser at any given level.

11. The stress analysis for vertical bending will not compute stresses if the neutral axis falls within the tension wall. In the stress analysis for vertical bending, the location of the neutral axis is determined first. In general, three possible locations exist: in the compression wall, in the tension wall, and between the tension and compression walls. The stress analysis is not performed in the rare case where the neutral axis falls within the tension wall. In this case a manual analysis is necessary. The program will print an error statement to this effect.

INPUT REQUIRED:

The following is an all-inclusive list of the input requested by the program. In an individual run the requested input will vary depending on the specific type of riser and the site conditions.

The input is divided into three groups. At the end of each group, the user can verify the input and reenter that group if necessary. The program checks several of the input values against program limitations and previous input as the entries are being made.

GROUP 1:

1. Project identification. This input is placed at the top of each page of the printed output. Regrettably, the program will not accept commas.

2. The hazard classification of the site.

3. The soil profile type.

4. The seismic zone.

5. The concrete modulus of elasticity in ksf. A default value of 525,000 is provided.

6. The sliding coefficient of friction. A default value of 0.35 is provided.

7. The maximum wall thickness to be used for temperature and shrinkage steel computations. For an existing standard covered top or baffle inlet riser, 16 inches should be used as specified in TR-30. For new designs, 32 inches should be used as specified in NEH 6.

8. The pipe diameter in feet.

9. The length/width ratio of the inside dimensions of the riser. The program will accept values between 2 and 5. A default value of 3 is provided for the standard D by 3D riser.

10. The width and length of the footing.

GROUP 2:

1. Type of riser, standard covered top or standard baffle inlet. A special design riser must have a top that has geometry conforming to one of these two types.

2. The number of support walls supporting the cover slab for a baffle inlet riser.

3. Dimensions T1, T2, and T3 for a baffle inlet riser. (See figure D1 and the discussion in Program Limitations.)

4. The geometry of segment 2. Is it solid or hollow?

5. The width and length of segment 2 if it is solid.

6. The number of segments used to input the riser geometry. It is not necessary to consider the position of the effective base for an embedded riser. The program will adjust for this and increase the number of segments by one as necessary.

7. The number of previously entered riser segments that are submerged. If a dry site is being analyzed, zero would be entered here. The maximum number is 4 less than the number of segments in item 6. Do not include the top slab support walls in this number. They will automatically be considered as submerged if the number includes the segment just below the weir crest.

8. The height of each segment starting with the footing (referred to as "length of segment" in TR-68).

9. The wall thickness of each segment starting with the first hollow one up from the footing. The prompts indicate the input segment numbers.

GROUP 3:

1. Indicate that the riser is either free-standing or embedded.

2. Indicate whether the soil-structure interaction factor should be computed or 1.0 used.

3. The total depth of embedment in feet for an embedded riser.

4. The active, passive, and at-rest lateral earth pressure ratios for an embedded riser. The active and passive ratios are applied to earth loads for the walls perpendicular to the direction of ground motion. The at-rest lateral earth pressure ratio is applied to the walls parallel to the direction of ground motion. An at-rest lateral earth pressure ratio entered as zero will result in no earth loads applied to the wall parallel to the direction of ground motion for the horizontal bending analysis.

5. The moist unit weight of the fill in pounds per cubic foot for an embedded riser.

USER INSTRUCTIONS:

The program was written in GW-BASIC, converted to QuickBASIC, and then compiled to be run in DOS. It is in three separate programs. To run the program on the AT&T PC6300 using a diskette, the default drive must be the drive containing the diskette. Place the program disk in drive A. At the "C>" prompt type "A:" <Enter> to make the "A" drive the default drive. Type "sarisers" <Enter>.

The prompts are self explanatory and relate to the terminology in TR-68. The numerical responses to prompts require that <Return> be pressed after the response. The alphabetical responses do not need to be followed by <Return>. Error checking is used to minimize entry of unrealistic alphabetical responses and some numerical responses; therefore, keystroke error is not expected to be a problem with the alphabetical responses.

PROGRAM OUTPUT:

Output can be sent to the screen, to a slave printer, or to a remote printer through PC Interface. To use a remote 3B2 printer during program execution, one must build the PC Interface bridge and enter the command "printer remote" before running this program. The following items are included in the output:

1. Maximum bearing pressure.

2. Safety factor for sliding.

3. Safety factor for overturning.

4. Compressive concrete stresses in vertical and horizontal bending.

5. Area of steel required for seismic loads evaluated by vertical and horizontal bending.

6. Occurrence of tension on the inside of a corner in horizontal bending (see figure 11(g) in TR-68).

7. Shear associated with horizontal bending.

8. Maximum shear stress on a horizontal plane.

CAUTION - THE SEGMENT NUMBERS MAY CHANGE DURING COMPUTATION. For an embedded riser the output generally lists values for one more segment than was input. The program locates the effective base and, if it does not fall exactly on the division between two segments, then it splits the segment at the effective base. The segment values are repositioned in the array to allow for the extra segment, and the segments are renumbered. The revised segment identification can be easily determined by checking the output segment height table.

DISCUSSION OF VERTICAL AND HORIZONTAL BENDING:

The approach used in vertical and horizontal bending analysis was first detailed in computations. These 22 sheets of computations are available on request. The approach is summarized here. For the vertical bending analysis, area moments about the inside face of the compression wall are computed to determine if the neutral axis is within or outside the compression wall. If the neutral axis is determined to be within the compression wall, the quadratic equation is used to solve for kd (Reinforced Concrete Fundamentals, by Phil M. Ferguson, 1960, pages 73-74). If the neutral axis is determined to be between the walls, it is located by taking the moments of the areas, using transformed tensile area, assuming all compression is within the wall perpendicular to ground motion with no compression in the walls parallel to ground motion. If the neutral axis is within the tension wall, the computations stop and the user is informed that the neutral axis is within the tension wall and that a manual analysis is required. Where the neutral axis is found to be outside the tension wall, the program assumes the vertical steel is T & S steel. It then computes the compressive and tensile stresses and the area of steel required if tensile stresses are exceeded.

The horizontal bending analysis is done using moment distribution in a loop that stops when the moments are balanced to within 0.01 foot kips. The moment distribution coefficient equations for nonprismatic members in TR-42, page 14, are used. (Also see table 2-5, TR-30.) The forces used are the earthquake forces, (Eq. 63, TR-68), the hydrostatic pressure, and the horizontal earth loads. The frictional stress caused by lateral earth pressure on the riser walls parallel to the direction of motion was not considered (see TR-68, page 26, second paragraph). However, the at-rest horizontal earth pressure on these walls was included.

The horizontal earth pressures are based on the effective depth of embedment; therefore, only level earth fill surfaces are considered. In conformance with the approach taken in TR-68, page 24, the lateral earth pressure distribution is considered linear with maximum resultant pressure occurring at mid depth. Equation 52, TR-68, was used as the limiting value for the maximum pressure, which is computed from statics, setting the reduced base moment equal to zero (TR-68, page 24). The horizontal loads are computed at the base of each segment. The load for a segment wall will not necessarily be maximum at the base of the segment, and the point of maximum load will not necessarily be the same on all four walls. Short segment heights could be used if it was necessary to minimize the error resulting from computing loads at the base of the segment. Moments are computed, and shear caused by horizontal bending is checked. The requirements for area of steel and bond are also checked. The minimum steel area given by the program is that required for temperature and shrinkage. It is conditional upon the users choice of 16-inch (TR-30) or 32-inch (NEH-6) maximum wall thickness for computing T & S steel. The flexural bond required is expressed as a maximum spacing of steel (see page 47, TR-42). This maximum spacing is limited to 18 inches.

Six points were chosen for checking steel area and bond in horizontal closed-section bending (figure D2). Moments causing tension on the inside face are considered positive, and moments causing tension on the outside face are considered negative. These points were evaluated as follows:

Point 1. -- Area and bond for negative steel at face of support wall if negative steel is in tension.

Point 2. -- Bond for positive steel at point of inflection if center span moment on right wall is positive.

Point 3. -- Area for positive steel if center span moment on right wall is positive.

Point 4. -- Area and bond for positive steel if inside corner is in tension.

Point 5. -- Bond for negative steel at point of inflection if center span moment on left wall is negative.

Point 6. -- Area for negative steel if center span moment on left wall is negative.

If the moments are opposite that necessary to cause tension at the points indicated in figure D2, the output will be zeros.

In figure D2 the ground motion is parallel to the endwalls. To consider ground motion parallel to the sidewalls, the program interchanges the structural length and width dimensions and repeats the above computations. The six points evaluated would then be located in the endwalls instead of in the sidewalls.

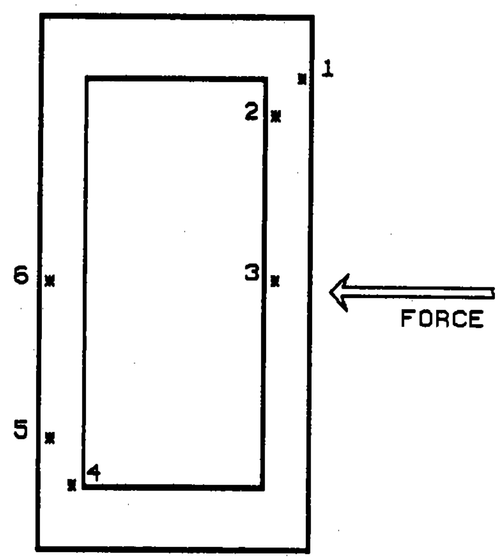

Figure D2. Evaluation points for horizontal closed-section bending with ground motion parallel to the endwalls and the force acting right to left.

The shear stress on a horizontal plane is checked using equation 65, TR-68. The check is made in the first hollow section above the footing for a free standing riser and in the lowest effective section for an embedded riser.

PROGRAM VERIFICATION:

Debugging and verification of the program was done by segments. This was necessary because of the large variety of computational paths in the program. A flow chart was developed, and verification was tracked on the flowchart so that none of the computational segments would be missed. Verification was done by a combination of comparison with the example in TR-68, comparison with other designs, and considerable hand computations. In a few segments where minor computations were being made or duplicate equations were being used, verification was made by inspection.

Verification of the first part of the program, through the computation of shears, moments, and safety factors, was done by comparison with a spread sheet program by Lowell Kenedy, Design Engineer, in Utah. This comparison was done using the TR-68 example for a free standing riser.

In March 1988, a draft copy was sent to all design engineers in the South NTC area for their review. Their comments helped to improve the program and to eliminate several errors in the program.

The following structures were used in the verification process:

1. TR-68 Example
2. Hurricane Creek Site 8, TN
3. Rabon Creek Dam Number 20, SC
4. Stillwater Creek Site 23, OK
5. Sowashee Dam Number 14, MS

The following hand computations were made:

1. Development of procedures for programming horizontal bending, vertical bending, and shear computations.
2. Verification of horizontal and vertical bending computations.

3. Vertical bending check using TR-68 Example, free-standing, in-air condition.
4. Horizontal bending using Sowashee Dam No. 14.
5. Verification of effective weight computations using Rabon Creek Dam No. 20.
6. Verification of segments of the program relative to the effective base being within a solid segment 2, using Stillwater Creek Site 23.
7. Verification of effective earth loadings using TR-68 Example, partially embedded.
8. Verification of computations for tension in an inside corner in horizontal bending using TR-68 Example, in-air condition.
9. Verification of vertical bending computations for the case where the neutral axis is between the walls under analysis. Sowashee Dam No. 14 was used with 8-inch thick walls to force the neutral axis out of the compression wall.

Eighty-three pages of computations were performed in verifying the computer output for a standard covered top riser. The riser was 28.4 feet high, had a 15-foot square base under the standard 4.5- by 9.5-foot base, was embedded 13 feet, and was submerged to the weir crest. Two errors were discovered in this final check. One was a computational error in determining T & S steel area for the second pass through the program, and the other was an output error in the explanation of an output value. The program was then distributed to the South NTC states as an uncompiled GW-BASIC program.

In June 1989, Louis Howell in Georgia reported an error in the program. As a result four errors were corrected that had been missed previously. The errors were program flow control errors that occurred with an embedded riser in which the second segment was solid and the effective depth was located in this second segment. At this time the program was converted to QuickBASIC and compiled for distribution as an appendix to TR-68.

In the fall of 1990, the National IRM Software Testing Lab tested the program for ease of use and output logic. Mark Boysen tested the program and made several recommendations for improvement. Several of these were included in the revision made in November 1991. Others will be included at a later date so that distribution of the software is not delayed.

A record of the hand computations performed in developing and checking the program are on file at the South National Technical Center.

For additional information on this program contact:

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~~~~~~~~~~~~~~~~~~~~~~ NOMENCLATURE ~~~~~~~~~~~~~~~~~~~~~~~~

AMC	-Area moment of compression wall about inside face of wall-used in vertical bending
AMT	-Area moment of T&S steel in tension wall about inside face of compression wall-used in vertical bending
ASV(1,20)	-Total vertical steel area required
AS1(1,20)	-Horizontal steel area required - point 1
AS3(1,20)	-Horizontal steel area required - point 3
AS4(1,20)	-Horizontal steel area required - point 4
AS6(1,20)	-Horizontal steel area required - point 6
AS1$(1,20)	-Information string for AS - point 1
AS3$(1,20)	-Information string for AS - point 3
AS4$(1,20)	-Information string for AS - point 4
AS6$(1,20)	-Information string for AS - point 6
ASTS	-Cross sectional area required for T&S steel
AT$	-Flag for indicating use of PC Interface to send output to a remote printer
B	-Width of riser parallel to the direction of motion, at the section under investigation
B1	-Width of footing parallel to direction of motion
B2	-Width of segment 2 (if solid) parallel to direction of motion
BETA(16)	-Array for ratios used to define ellipses from which added mass values are determined, eq. 44, TR-68
BETAE	-Ratio used in determination of fundamental period of vibration of riser in water, eq. 48, TR-68
C	-Base shear coefficient, eq. 14, TR-68
CDR	-Distance from centerline of concrete section to tensile reinforcement
CF	-Sliding coefficient of friction
COFE	-Carry over factor for moment distribution-Endwall
COFS	-Carry over factor for moment distribution-Sidewall
D	-Pipe conduit diameter
D1 - D8	-Identification of distributions used in moment distribution
DFE	-Distribution factor for endwall
E	-Concrete modulus of elasticity
ECC	-Eccentricity of resultant normal force on a section or bearing area
ED	-Effective depth in stress diagram
EFFWT	-Effective unit weight of constructed fill
F0$	-Flag for standard covered top vs. standard baffle inlet riser
F1$	-Flag for free-standing vs. embedded riser
F2$	-Flag for segment 2 indicating hollow or solid
F3$	-Flag indicating use of soil-structure interaction factor
F4$	-Flag for reentering input

F5$	-Flag for indicating a segment of an embedded riser has been split into two segments. Split occurs at the point of the effective base.
FC(1,20)	-Concrete flexural compressive stress
FC$(1,20)	-Information string for FC
FS(1,20)	-Steel tensile stress
FS$(1,20)	-Information string for FS
FJ(1,21)	-Array for lateral forces acting on segments
FT	-Lateral force assumed concentrated on the top of the riser
HB(21)	-Array for distances from base of riser to bottom of segments
HC$	-Hazard classification of dam
HCK	-Check on input for HE; Alternate equation for HS; Check for HR to set XX%; Check for HE to set XXX%
HE	-Depth of embedment of riser
HH	-Effective height of submerged portion of riser
HI(20)	-Array for distances from effective base of riser to c. g. of segments
HR	-Reduced, or effective depth of embedment of riser
HS	-Total effective height of riser
HSEGI(20)	-Array for height of segments
HT	-Total height of riser
HW	-Effective height of riser to crest of weir
HX(21)	-Array for distances from effective base of riser to bottom of segments
I(1)	-Array for soil-structure interaction factor
I%	-Iteration control; Segment identification numbering from 0 at the base
ICK	-Previous value of soil-structure interaction factor used to control iterative process
J%	-Iteration control; Identification for effects of ground motion parallel to endwalls, (0), or sidewalls, (1)
JD	-Distance between resultants C and T in stress diagram
JO	-Statical base moment reduction factor
JUNK	-Used for temporary storage of values to reverse dimensions
JX	-Statical reduction factor for moment at base of segment
K	-Ratio of distance between extreme fiber and neutral axis to effective depth in stress diagram
KE	-Moment distribution stiffness coefficient for endwall
KS	-Moment distribution stiffness coefficient for sidewall
K%	-Iteration control
K$(1,20)	-Information string for K
KA	-Active lateral earth pressure ratio
KD	-Distance between extreme compression fiber and neutral axis in stress diagram
KO	-At-rest lateral earth pressure
KP	-Passive lateral earth pressure ratio

L	-Width of riser normal to the direction of motion
L%	-Iteration control
L1	-Width of base normal to the direction of motion
L2	-Width of segment 2, (if solid) normal to direction of motion
LE(1)	-Array for weighted widths of horizontal pressure diagrams over effective embedment depth of riser
M%	-Iteration control
MCL	-Moment at centerline of left sidewall *
MCR	-Moment at centerline of right sidewall *
MFD	-Fixed end moment - downstream endwall *
MFL	-Fixed end moment - left sidewall *
MFLU	-Moment in left sidewall at face of endwall *
MFR	-Fixed end moment - right sidewall *
MFRD	-Moment in right sidewall at face of endwall *
MKDLE	-Corner moment - downstream endwall, left side *
MKDRE	-Corner moment - downstream endwall, right side *
MKLDS	-Corner moment - left sidewall, downstream end *
MKLUS	-Corner moment - left sidewall, upstream end *
MKRDS	-Corner moment - right sidewall, downstream end *
MKRUS	-Corner moment - right sidewall, upstream end *
MKULE	-Corner moment - upstream endwall, left side *
MKURE	-Corner moment - upstream endwall, right side *
MOI(20)	-Array for moments of inertia, used twice in one run
MOP	-Maximum overturning moment computed for riser of effective height HS
MOPP	-Overturning moment at base of embedded riser
MSX	-Equivalent moment acting at location of resultant tensile force
MX(1,21)	-Array for moments at bottom of segments
N	-Ratio of modulus of elasticity of steel to that of concrete
NL	-Direct compressive force in the left sidewall
NOSEG%	-Number of riser segments
NOSUB%	-Number of riser segments below water level
NOWALLS%	-Number of walls supporting the top of riser (2 or 3)
NPE	-Ratio to obtain properties of nonprismatic members - end
NPS	-Ratio to obtain properties of nonprismatic members - side
NR	-Direct compressive force in the right sidewall
P(1)	-Array for maximum bearing pressure under riser

* Moments are defined for ground motion parallel to the endwalls and with the force acting from right to left looking downstream. For ground motion parallel to the sidewalls interchange the words "sidewall" and "endwall" in the definitions.

PI$	-Project identification string
PMAX(1)	-Array for the maximum or limiting value of the resultant lateral earth pressure over the effective embedded depth of the riser
PMAXM	-The maximum value of the resultant lateral earth pressure over the effective embedded depth of the riser
PMIN(1)	-Array for the minimum bearing pressure under the riser
QE	-Unit horizontal load - endwall
QL	-Unit horizontal load - left sidewall
QR	-Unit horizontal load - right sidewall
R(16)	-Array for equation 35, TR-68
RE	-Reference for main menu selection
Revised$	-Variable for date of last revision
RS	-Reference for sub menu selection
S1(1,20)	-Horizontal steel spacing required - point 1
S2(1,20)	-Horizontal steel spacing required - point 2
S4(1,20)	-Horizontal steel spacing required - point 4
S5(1,20)	-Horizontal steel spacing required - point 5
SBIHI	-Sum of the products of B and HSEGI for each segment
SC10T1	-Sum of values for column 10 table 1 in TR-68
SFH	-Right portion of equation 27, TR-68
SFJ	-Summation of lateral forces acting on segments, (right portion of equation 23, TR-68
SFO(1)	-Array for safety factors against overturning
SFS(1)	-Array for safety factors against sliding
SLOPE(1)	-Array for slope of bearing pressure diagram
SPT%	-Soil profile type
SWIAIR	-Summation of weights of effective segments in air
SWIHI	-Summation of WIHI's
SZ%	-Seismic zone
T(1)	-Fundamental period of vibration of the riser
T1	-Horizontal distance from outside surface of sidewall to outer edge of cover slab, measured perpendicular to the sidewalls, for standard baffle inlet risers
T2	-Horizontal distance from outside edge of cover slab support wall to outer edge of cover slab, measured perpendicular to the sidewalls, for standard baffle inlet risers
T3	-Length of horizontal section at base of cover slab support wall measured from outer surface of sidewall to the point where the edge of the cover slab support wall slopes upward, for standard baffle inlet risers
TI(20)	-Array for wall thickness of segments
TMAX	-Maximum value for fundamental period of vibration,(eq.18,TR-68)
TS	-Maximum wall thickness for computing T&S

	steel(ASTS) as controlled by TR-30 or NEH 6
TS$	-Flag for 16" vs. 32" max. wall thickness for computing T&S steel
TWF	-Fundamental period of vibration of riser when fully submerged
TWP	-Fundamental period of vibration for partial submergence
UNITWT	-Unit weight of constructed fill
VH(1,20)	-Array for critical shear in horizontal bending
VH$(1,20)	-Information string for shear in horizontal bending
VOPP	-Shear at base of embedded riser
VP	-Shear in horizontal plane near effective base
VP$(1,20)	-Information string for horizontal plane shear
VX(1,21)	-Array for shears at bottom of segments
VO(1)	-Array for total base shears
WAI(20)	-Array for weight per foot added to a segment to duplicate the effect of water surrounding the riser
WE	-Effective weight of concrete
WF	-Effective weight of fill
WFF	-Factor used in computing WF
WI(20)	-Array for assigned weight of segments (WAI+WIAIR)
WIAIR(20)	-Array for weight of segment in air
WIHI(20)	-Array for product of WI and HI
WOPP	-Contact bearing reaction at base of embedded riser
WT	-Total assigned weight of riser,(summation of WI's)
WX(20)	-Effective weight of the upper portion of the riser above any level x
X	-Factor used in computing HI for standard baffle inlet
XX%	-Array address for first effective segment
XXX%	-Array address for last embedded segment
Y	-Factor for D by 3D riser, see section on comp. of riser weights
Z(16)	-Array for equation 41, TR-68
ZETA(16)	-Array for equation 43, TR-68

```
10 'sarisers
20 '
30 '
40 '
50 '
60 '
70 '
80 '
90 '                    SEISMIC ANALYSIS OF STANDARD RISERS
100 '                                PART 1
110 '
120 '
130 '   For Information Contact:
140 '
150 '                          SOIL CONSERVATION SERVICE
160 '                       SOUTH NATIONAL TECHNICAL CENTER
170 '                                P.O. BOX 6567
180 '                             FORT WORTH,TX 76115
190 '                             PHONE: 817/334-5242
200 '
210 '
250 '****************** COMMON STATEMENTS ******************
251 COMMON SHARED PI$, Y, F0$, F1$, F2$, F3$, F5$, SPT%,
SZ%, HC$, D, NOSEG%, NOSUB%, L%, HSEGI()
252 COMMON SHARED L1, B1, L2, B2, NOWALLS%, T1, T2, T3, E,
CF, TS$, HE, KA, KP, KO
253 COMMON SHARED HT, HS, HR, HW, HH, WE, WF, HI(), HX(),
T(), V0(), I(), LE(), PMAX()
254 COMMON SHARED P(), PMIN(), SLOPE(), SFO(), SFS(), VX(),
MX(), FC(), FC$()
255 COMMON SHARED FS(), FS$(), K$(), ASV(), I%, K%, XX%, M%,
AS1$(), SA(), AS1()
256 COMMON SHARED AS3$(), S2(), AS3(), AS4$(), S4(), AS4(),
AS6$(), S5(), AS6()
257 COMMON SHARED VH$(), VH(), VP$(), VP(), S1(), TI(),
UNITWT, RE, Revised$
260
'**********************************************************
261 '
262 '
263 '   Programmed by Ron Nulton 11/22/88
264 '                 Modified by Pam Bayliff
265                   Revised$ = "11/91"    'Variable - LAST
REVISION DATE
266 '
267 '
270 '***************** DIMENSION STATEMENTS ****************
280 '
282 IF RE = 2 OR RE = 3 THEN GOTO 700
290 DIM HSEGI(20), TI(20)
300 DIM HI(20), HX(21), WIAIR(20), WI(20), WIHI(20), HB(21)
310 DIM MOI(20), BETA(16), ZETA(16), R(16), Z(16), WAI(20),
WX(20)
320 DIM T(1), V0(1), I(1), LE(1), PMAX(1), P(1), PMIN(1),
SLOPE(1), SFO(1), SFS(1)
```

```
330 DIM FJ(1, 21), VX(1, 21), MX(1, 21), K$(1, 20), FC$(1,
20), FS$(1, 20)
340 DIM FC(1, 20), FS(1, 20), ASV(1, 20), AS1(1, 20), AS3(1,
20), AS4(1, 20), AS6(1, 20)
350 DIM S1(1, 20), S2(1, 20), S4(1, 20), S5(1, 20), AS1$(1,
20), AS3$(1, 20), AS4$(1, 20)
360 DIM AS6$(1, 20), VH(1, 20), VH$(1, 20), VP(1), VP$(1)
370 '
371 ON ERROR GOTO Handlerr    'Error code handler subroutine
372 '                     Original adaptation by Mark Boysen 1/91
373 '
380 COLOR 7, 0: LOCATE , , 0: CLS
390 PRINT "     SOIL CONSERVATION SERVICE"; TAB(67); "S N T
C": PRINT
400 COLOR 15: PRINT "     SEISMIC ANALYSIS OF STANDARD
RISERS"
410 PRINT : PRINT ""; : COLOR 7: PRINT TAB(33); "LAST
REVISED "; Revised$
420 PRINT TAB(6); CHR$(201); STRING$(68, 205); CHR$(187)
430 FOR I = 7 TO 20: LOCATE I, 6: PRINT CHR$(186); : LOCATE
I, 75: PRINT CHR$(186): NEXT I
440 PRINT TAB(6); CHR$(200); STRING$(68, 205); CHR$(188)
450 '
460 '**************** PROGRAM MAINLINE ********************
470 '
480 GOSUB 960          'INPUT DATA
490 GOSUB 3710         'COMPUTATION OF RISER WEIGHTS
500 GOSUB 4130         'COMPUTATION OF VERTICAL DIMENSIONS
510 GOSUB 5570         'COMPUTATION OF SHEARS AND MOMENTS
520 GOSUB 8330         'BEARING & SAFETY FACTOR COMPUTATIONS
530 GOSUB 9130         'STRESS ANALYSIS FOR VERTICAL BENDING
540 GOSUB 9920         'STRESS ANALYSIS FOR HORIZONTAL BENDING
550 GOSUB 11620        'SHEAR STRESS ON HORIZONTAL PLANE
560 GOSUB 11750        'REVERSE DIMENSIONS FOR FORCES PARALLEL
TO SIDEWALLS
570 GOSUB 5570         'COMPUTATION OF SHEARS AND MOMENTS
580 GOSUB 8330         'BEARING & SAFETY FACTOR COMPUTATIONS
590 GOSUB 9130         'STRESS ANALYSIS FOR VERTICAL BENDING
600 GOSUB 9920         'STRESS ANALYSIS FOR HORIZONTAL BENDING
610 GOSUB 11620        'SHEAR STRESS ON HORIZONTAL PLANE
620 GOSUB 11950        'PRELIMINARY OUTPUT
630 GOTO 700           'MENU
640 CHAIN "saoutput" 'PRINT TO SCREEN COMMANDS
650 GOTO 700           'MENU
660 CHAIN "saprint"  'OUTPUT TO PRINTER
670 GOTO 700           'MENU
680 END
690 '
700 '*********************** MENU *************************
710 '
720 COLOR 7, 0: LOCATE , , 0: CLS
730 PRINT "     SOIL CONSERVATION SERVICE"; TAB(67); "S N T
C": PRINT
740 COLOR 15: PRINT "     SEISMIC ANALYSIS OF STANDARD
RISERS"
750 PRINT : PRINT "SELECT OPTION:"; : COLOR 7: PRINT
TAB(54); "LAST REVISED "; Revised$
```

```
760 PRINT TAB(6); CHR$(201); STRING$(68, 205); CHR$(187)
770 FOR I = 7 TO 20: LOCATE I, 6: PRINT CHR$(186); : LOCATE
I, 75: PRINT CHR$(186): NEXT I
780 PRINT TAB(6); CHR$(200); STRING$(68, 205); CHR$(188)
790 COLOR 15: LOCATE 22, 25: PRINT "SELECT AN OPTION FROM
ABOVE.": COLOR 7
800 '
810 LOCATE 9, 26: PRINT "*************************"
820 LOCATE 10, 26: PRINT "          MENU          "
830 LOCATE 11, 26: PRINT "*************************"
840 LOCATE 13, 25: PRINT "1. CHANGE FOOTING SIZE"
850 LOCATE 14, 25: PRINT "2. REVIEW RESULTS"
860 LOCATE 15, 25: PRINT "3. PRINT RESULTS"
870 LOCATE 16, 25: PRINT "4. END"
880 LOCATE 20, 25: INPUT ; RE
890 IF RE < 1 OR RE > 4 THEN BEEP: GOTO 880
900 CLS
910 IF RE = 1 THEN 11750
920 IF RE = 2 THEN 640
930 IF RE = 3 THEN 660
940 GOTO 680
950 '
960 '********************** INPUT DATA *********************
970 '
980 LOCATE 12, 20: PRINT "ENTER PROJECT INDENTIFICATION (NO
COMMAS)"
990 LOCATE 14, 20: INPUT " "; PI$
1000 '
1010 CLS : LOCATE 10, 20: PRINT "SELECT HAZARD CLASS OF DAM
(A, B, OR C)?"
1020 HC$ = INPUT$(1)
1030 IF HC$ = "A" OR HC$ = "B" OR HC$ = "C" THEN GOTO 1070
1040 IF HC$ = "a" OR HC$ = "b" OR HC$ = "c" THEN GOTO 1070
1050 BEEP: GOTO 1010
1060 '
1070 CLS : LOCATE 10, 20: INPUT "SELECT SOIL PROFILE TYPE
(1, 2, OR 3) "; SPT%
1080 IF SPT% = 1 OR SPT% = 2 OR SPT% = 3 THEN 1110
1090 BEEP: GOTO 1070
1100 '
1110 LOCATE 12, 20: INPUT "SELECT SEISMIC ZONE (1, 2, 3, OR
4) "; SZ%
1120 IF SZ% = 1 OR SZ% = 2 OR SZ% = 3 OR SZ% = 4 THEN 1150
1130 BEEP: GOTO 1110
1140 '
1150 CLS
1160 LOCATE 8, 20: PRINT "CONCRETE MODULUS OF ELASTICITY
(KSF) "
1170 LOCATE 10, 20: INPUT "(DEFAULT - 525,000 KSF )"; E
1180 IF E = 0 THEN E = 525000!
1190 '
1200 LOCATE 12, 20: PRINT "SLIDING COEFFICIENT OF FRICTION "
1210 LOCATE 14, 20: INPUT "(DEFAULT - 0.35) "; CF
1220 IF CF = 0 THEN CF = .35
1230 '
1240 CLS
```

```
1250 LOCATE 8, 20: PRINT "CHOOSE MAX. WALL THICKNESS FOR T &
S STEEL"
1260 LOCATE 12, 20: PRINT "A - 16 INCHES (TR-30)"
1270 LOCATE 14, 20: PRINT "B - 32 INCHES (NEH-6)"
1280 TS$ = INKEY$
1290 IF TS$ = "" THEN 1280
1300 IF TS$ = "A" OR TS$ = "B" OR TS$ = "a" OR TS$ = "b"
THEN 1320
1310 BEEP: GOTO 1280
1320 IF TS$ = "A" OR TS$ = "a" THEN TS = 1.33333
1330 IF TS$ = "B" OR TS$ = "b" THEN TS = 2.66667
1340 '
1350 CLS : LOCATE 10, 20: INPUT "ENTER THE PIPE DIAMETER IN
FEET "; D
1380 '
1390 CLS
1400 LOCATE 8, 20: PRINT "RISER INSIDE LENGTH/WIDTH RATIO "
1410 LOCATE 10, 20: INPUT "(DEFAULT - 3 FOR Dx3D RISER )"; Y
1420 IF Y = 0 THEN Y = 3
1430 IF Y >= 1 OR Y <= 5 THEN 1460
1440 BEEP: GOTO 1410
1450 '
1460 CLS
1470 LOCATE 12, 20: INPUT "BASE WIDTH (PARALLEL TO ENDWALLS)
(FT.) "; B1
1480 LOCATE 14, 20: INPUT "BASE LENGTH (PARALLEL TO
SIDEWALLS) (FT.) "; L1
1490 IF RE = 1 THEN RE = 8: GOTO 490    'IF CHANGING FOOTING
SIZE
1500 '
1510 '
1520 '
1530 CLS
1540 LOCATE 5, 15: PRINT PI$
1550 PRINT
1560 PRINT TAB(15); "HAZARD CLASS -------------- ";
1570 PRINT ; HC$
1580 PRINT TAB(15); "SOIL PROFILE TYPE --------- ";
1590 PRINT USING "#"; SPT%
1600 PRINT TAB(15); "SEISMIC ZONE -------------- ";
1610 PRINT USING "#"; SZ%
1620 PRINT
1630 PRINT TAB(15); USING "CONCRETE MODULUS OF ELASTICITY
(KSF) --- ######"; E
1640 PRINT TAB(15); USING "SLIDING COEFF. OF FRICTION ------
--------  #.##"; CF
1650 IF TS$ = "B" OR TS$ = "b" THEN 1680
1660 PRINT TAB(15); "MAX WALL THICKNESS FOR T&S STEEL (IN) -
-- 16"
1670 GOTO 1690
1680 PRINT TAB(15); "MAX WALL THICKNESS FOR T&S STEEL (IN) -
-- 32"
1690 PRINT
1700 PRINT TAB(15); "CONDUIT DIAMETER (FT) ----- ";
1710 PRINT USING "#.##"; D
1720 PRINT TAB(15); "LENGTH/WIDTH RATIO -------- ";
1730 PRINT USING "#.##"; Y
```

```
1740 PRINT USING "                BASE WIDTH (FT) ----------
##.###"; B1
1750 PRINT USING "                BASE LENGTH (FT) ---------
##.###"; L1
1760 '
1770 LOCATE 23, 52: PRINT " IS INPUT CORRECT? (Y OR N)"
1780 F4$ = INKEY$
1790 IF F4$ = "" THEN 1780
1800 IF F4$ = "Y" OR F4$ = "y" OR F4$ = "N" OR F4$ = "n"
THEN 1820
1810 BEEP: GOTO 1780
1820 CLS
1830 IF F4$ = "N" OR F4$ = "n" THEN 970
1840 '
1850 '
1860 LOCATE 12, 20: PRINT "A - STANDARD COVERED TOP RISER"
1870 LOCATE 14, 20: PRINT "B - STANDARD BAFFLE INLET RISER"
1880 F0$ = INKEY$
1890 IF F0$ = "" THEN 1880
1900 IF F0$ = "A" OR F0$ = "a" OR F0$ = "B" OR F0$ = "b"
THEN 1930
1910 BEEP: GOTO 1880
1920 '
1930 IF F0$ = "A" OR F0$ = "a" THEN 2000  'IF STD COVERED
TOP RISER
1940 CLS
1950 LOCATE 12, 20: INPUT "NO. WALLS SUPPORTING COVER SLAB
"; NOWALLS%
1960 IF NOWALLS% = 2 OR NOWALLS% = 3 THEN 1970 ELSE BEEP:
GOTO 1950
1970 LOCATE 14, 20: INPUT "BAFFLE INLET DIMENSION T1 (FT.)
"; T1
1980 LOCATE 16, 20: INPUT "BAFFLE INLET DIMENSION T2 (FT.)
"; T2
1990 LOCATE 18, 20: INPUT "BAFFLE INLET DIMENSION T3 (FT.)
"; T3
2000 '
2010 '
2020 '
2030 '
2040 '
2050 CLS
2060 LOCATE 12, 20: PRINT "A - SEGMENT 2 IS HOLLOW"
2070 LOCATE 14, 20: PRINT "B - SEGMENT 2 IS SOLID"
2080 F2$ = INKEY$
2090 IF F2$ = "" THEN 2080
2100 IF F2$ = "A" OR F2$ = "B" OR F2$ = "a" OR F2$ = "b"
THEN 2120
2110 BEEP: GOTO 2080
2120 '
2130 CLS
2140 IF F2$ = "A" OR F2$ = "a" THEN 2190  'IF SEGMENT 2 IS
HOLLOW
2150 '
2160 LOCATE 12, 20: INPUT "SEGMENT 2 WIDTH (PARALLEL TO
ENDWALLS) (FT.) "; B2
```

```
2170 LOCATE 14, 20: INPUT "SEGMENT 2 LENGTH (PARALLEL TO
SIDEWALLS) (FT.) "; L2
2180 '
2190 CLS
2200 LOCATE 12, 20: INPUT "ENTER THE NO. OF RISER SEGMENTS
"; NOSEG%
2210 IF NOSEG% < 1 OR NOSEG% > 21 THEN 2230
2220 GOTO 2240
2230 BEEP: GOTO 2200
2240 '
2250 LOCATE 14, 20: INPUT "ENTER THE NO. OF SEGMENTS BELOW
WATER "; NOSUB%
2260 IF NOSUB% < 0 OR NOSUB% > NOSEG% - 4 THEN 2280
2270 GOTO 2290
2280 BEEP: GOTO 2250
2290 '
2300 CLS : I% = 0
2310 LOCATE I% + 2, 18: PRINT I% + 1
2320 LOCATE I% + 2, 22: INPUT "SEGMENT HEIGHT (FT.) ";
HSEGI(I%)
2330 I% = I% + 1
2340 IF I% > NOSEG% - 1 THEN 2360
2350 GOTO 2310
2360 '
2370 CLS : I% = 1
2380 IF F2$ = "B" OR F2$ = "b" THEN I% = I% + 1'IF SEGMENT 2
IS SOLID
2390 LOCATE I% + 2, 18: PRINT I% + 1
2400 LOCATE I% + 2, 22: INPUT "WALL THICKNESS (FT.) ";
TI(I%)
2410 I% = I% + 1
2420 IF I% > NOSEG% - 2 THEN 2440
2430 GOTO 2390
2440 '
2450 '
2460 '
2470 CLS
2480 IF F0$ = "B" OR F0$ = "b" THEN 2510
2490 LOCATE 5, 15: PRINT "STANDARD COVERED TOP RISER"
2500 GOTO 2520
2510 LOCATE 5, 15: PRINT "STANDARD BAFFLE INLET RISER"
2520 IF F0$ = "A" OR F0$ = "a" THEN GOTO 2590
2530 PRINT
2540 PRINT " ", "NO. WALLS", "T1", "T2", "T3"
2550 PRINT " ", "          ", "(FT)", "(FT)", "(FT)"
2560 PRINT
2570 PRINT USING "              ####         ##.###";
NOWALLS%; T1;
2580 PRINT USING "        ##.###         ##.###"; T2; T3
2590 '
2600 PRINT
2610 PRINT
2620 IF F2$ = "B" OR F2$ = "b" THEN 2650
2630 PRINT TAB(15); "SEGMENT 2 IS HOLLOW"
2640 GOTO 2660
2650 PRINT TAB(15); "SEGMENT 2 IS SOLID"
2660 PRINT
```

```
2670 IF F2$ = "A" OR F2$ = "a" THEN GOTO 2710
2680 PRINT USING "                    SEGMENT 2 WIDTH (FT) -------
-- ##.###"; B2
2690 PRINT USING "                    SEGMENT 2 LENGTH (FT) ------
-- ##.###"; L2
2700 PRINT
2710 PRINT TAB(15); "NO. OF RISER SEGMENTS -------- ";
2720 PRINT USING "##.##"; NOSEG%
2730 PRINT TAB(15); "NO. OF SEGMENTS SUBMERGED ---- ";
2740 PRINT USING "##.##"; NOSUB%
2750 '
2760 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2770 INK$ = INKEY$: IF INK$ = "" THEN 2770 ELSE 2780
2780 '
2790 CLS
2800 PRINT "", "SEGMENT", "SEGMENT", "  WALL"
2810 PRINT "", "", "HEIGHT", "THICKNESS"
2820 PRINT "", "", " (FT)", "  (FT)  "
2830 PRINT
2840 FOR L% = 0 TO 10000
2850 NEXT
2860 FOR L% = 0 TO NOSEG% - 1
2870 PRINT USING "              ####          ##.###"; L% +
1; HSEGI(L%);
2880 PRINT USING "        ##.###"; TI(L%)
2890 NEXT
2900 '
2910 LOCATE 23, 52: PRINT " IS INPUT CORRECT? (Y OR N)"
2920 F4$ = INKEY$
2930 IF F4$ = "" THEN 2920
2940 IF F4$ = "Y" OR F4$ = "y" OR F4$ = "N" OR F4$ = "n"
THEN 2960
2950 BEEP: GOTO 2920
2960 CLS
2970 IF F4$ = "N" OR F4$ = "n" THEN 1850
2980 '
2990 '
3000 LOCATE 12, 20: PRINT "A - FREE-STANDING RISER"
3010 LOCATE 14, 20: PRINT "B - EMBEDDED RISER"
3020 F1$ = INKEY$
3030 IF F1$ = "" THEN 3020
3040 IF F1$ = "A" OR F1$ = "a" OR F1$ = "B" OR F1$ = "b"
THEN 3060
3050 BEEP: GOTO 3020
3060 '
3070 CLS
3080 F3$ = "N"
3090 IF F1$ = "B" OR F1$ = "b" THEN 3150
3100 LOCATE 12, 18: PRINT "COMPUTE SOIL-STRUCTURE
INTERACTION FACTOR? (Y OR N)"
3110 F3$ = INKEY$
3120 IF F3$ = "" THEN 3110
3130 IF F3$ = "Y" OR F3$ = "N" OR F3$ = "y" OR F3$ = "n"
THEN 3150
3140 BEEP: GOTO 3110
3150 '
```

```
3160 HE = 0
3170 IF F1$ = "A" OR F1$ = "a" THEN 3390        'IF FREE
STANDING
3180 CLS
3190 LOCATE 8, 20: INPUT "TOTAL DEPTH OF EMBEDMENT (FT.) ";
HE
3200 IF NOSUB% = 0 THEN 3270
3210 HCK = 0
3220 FOR I% = 0 TO NOSUB% - 1
3230 HCK = HCK + HSEGI(I%)
3240 NEXT
3250 IF HE <= HCK THEN 3270   'CHECKS FOR HE>"DEPTH OF WATER
3260 BEEP: GOTO 3190
3270 HCK = 0
3280 FOR I% = 0 TO NOSEG% - 5
3290 HCK = HCK + HSEGI(I%)
3300 NEXT
3310 IF HE < HCK THEN 3330   'CHECKS FOR HE<"HEIGHT OF WEIR"
3320 BEEP: GOTO 3190
3330 IF HE < 1.5 * (HSEGI(0)) THEN 3320        'CHECKS FOR
HR>FOOTING THICKNESS
3340 '
3350 LOCATE 10, 20: INPUT "ACTIVE LATERAL EARTH PRESSURE
RATIO "; KA
3360 LOCATE 12, 20: INPUT "PASSIVE LATERAL EARTH PRESSURE
RATIO "; KP
3370 LOCATE 14, 20: INPUT "AT REST LATERAL EARTH PRESSURE
RATIO "; KO
3380 LOCATE 16, 20: INPUT "MOIST UNIT WEIGHT OF FILL (LBS/CU
FT) "; UNITWT
3390 '
3400 '
3410 '
3420 CLS
3430 IF F1$ = "B" OR F1$ = "b" THEN 3460
3440 LOCATE 5, 15: PRINT "FREE-STANDING"
3450 GOTO 3470
3460 LOCATE 5, 15: PRINT "EMBEDDED"
3470 IF F3$ = "N" OR F3$ = "n" THEN 3500
3480 PRINT TAB(15); "COMPUTING SOIL-STRUCTURE INTERACTION
FACTOR"
3490 GOTO 3510
3500 PRINT TAB(15); "USING 1 FOR SOIL-STRUCTURE INTERACTION
FACTOR"
3510 PRINT
3520 IF F1$ = "A" OR F1$ = "a" THEN 3590
3530 PRINT TAB(15); USING "DEPTH OF EMBEDMENT (FT) ---------
-------- ##.###"; HE
3540 PRINT TAB(15); USING "ACTIVE LATERAL EARTH PRESSURE
RATIO -----  #.##"; KA
3550 PRINT TAB(15); USING "PASSIVE LATERAL EARTH PRESSURE
RATIO ----  #.##"; KP
3560 PRINT TAB(15); USING "AT REST LATERAL EARTH PRESSURE
RATIO ----  #.##"; KO
3570 PRINT TAB(15); "MOIST UNIT WEIGHT OF FILL (LBS/CU FT)";
3580 PRINT USING " -- ###.##"; UNITWT
3590 '
```

```
3600 LOCATE 23, 52: PRINT " IS INPUT CORRECT? (Y OR N)"
3610 F4$ = INKEY$
3620 IF F4$ = "" THEN 3610
3630 IF F4$ = "Y" OR F4$ = "y" OR F4$ = "N" OR F4$ = "n"
THEN 3650
3640 BEEP: GOTO 3610
3650 CLS
3660 IF F4$ = "N" OR F4$ = "n" THEN 2990
3670 '
3680 RETURN
3690 '
3700 '
3710 '************ COMPUTATION OF RISER WEIGHTS ************
3720 '
3730 '
3740 J% = 0          'ARRAY ADDRESS FOR FORCES PARALLEL TO
THE ENDWALLS
3750 CLS
3760 LOCATE 10, 33: PRINT "LET ME THINK !"
3770 '
3780 '
3790 WIAIR(0) = .15 * B1 * L1 * HSEGI(0) 'FOOTING WT. (KIPS)
3800 I% = 1
3810 IF F2$ = "A" OR F2$ = "a" THEN 3840
3820 WIAIR(I%) = .15 * B2 * L2 * HSEGI(I%)    'SOLID SEG. 2
WT. (KIPS)
3830 I% = I% + 1
3831 HCK = HSEGI(0) + HSEGI(1)
3832 IF RE <> 8 OR F2$ <> "B" OR HR > HCK THEN GOTO 3840
3833 IF HR = HCK AND F5$ = "0" THEN GOTO 3840
3834 WIAIR(I%) = .15 * B2 * L2 * HSEGI(I%)
3835 I% = I% + 1
3840 WIAIR(I%) = .3 * TI(I%) * (2 * TI(I%) + D + D * Y) *
HSEGI(I%)'SEG. WT. (KIPS)
3850 I% = I% + 1
3860 IF I% < NOSEG% - 4 THEN 3840
3870 IF F0$ = "B" OR F0$ = "b" THEN 4000    'IF STD BAFFLE
INLET
3880 '
3890 '    ~~~~~~~~ STANDARD COVERED TOP RISER ~~~~~~~~
3900 '
3910 WIAIR(I%) = .6 * TI(I%) * D * HSEGI(I%)    'WT. 4TH SEG
FROM TOP
3920 I% = I% + 1
3930 WIAIR(I%) = 1.2 * TI(I%) * D * HSEGI(I%)   'WT. 3RD SEG
FROM TOP
3940 I% = I% + 1
3950 WIAIR(I%) = ((5 * D) + (2 * TI(I% - 3))) * TI(I%) * .3
* HSEGI(I%)'WT. 2ND SEG FROM TOP
3960 I% = I% + 1
3970 WIAIR(I%) = .15 * (5 * D + 2 * TI(I% - 4)) * (Y * D + 2
* TI(I% - 4)) * HSEGI(I%)'WT. TOP SEG
3980 RETURN
3990 '
4000 '   ~~~~~~~~ STANDARD BAFFLE INLET RISER ~~~~~~~~
4010 '
```

```
4020 WIAIR(I%) = .3 * TI(I%) * (T3 + HSEGI(I%)) * NOWALLS% *
HSEGI(I%)'WT. 4TH SEG FROM TOP
4030 I% = I% + 1
4040 WIAIR(I%) = .15 * TI(I%) * NOWALLS% * HSEGI(I%)
4050 WIAIR(I%) = WIAIR(I%) * ((D + 2 * TI(I% - 2)) + 2 * (T1
- T2 - HSEGI(I%)))'WT. 3RD SEG DOWN
4060 I% = I% + 1
4070 WIAIR(I%) = ((D + 2 * TI(I% - 3)) + 2 * (T1 - T2))
4080 WIAIR(I%) = WIAIR(I%) * NOWALLS% * TI(I%) * .15 *
HSEGI(I%)'WT. 2ND SEG FROM TOP
4090 I% = I% + 1
4100 WIAIR(I%) = .15 * ((D + 2 * TI(I% - 4)) + 2 * T1) * (Y
* D + 2 * TI(I% - 4)) * HSEGI(I%)'WT. TOP SEG
4110 RETURN
4120 '
4130 '********* COMPUTATION OF VERTICAL DIMENSIONS *********
4140 '
4150 '
4160 '       ~~~~~~~~ COMPUTE HT, HS, & HR ~~~~~~~~
4170 '
4180 HT = 0
4190 '
4200 FOR I% = 0 TO NOSEG% - 5
4210 HT = HT + HSEGI(I%)
4220 NEXT
4230 '
4240 HT = HT + HSEGI(NOSEG% - 2) + HSEGI(NOSEG% - 1)
4250 IF F0$ = "B" OR F0$ = "b" THEN HT = HT + HSEGI(NOSEG% -
3)'STD BAFFLE INLET RISER
4260 HS = HT - .6667 * HE                                  'EQ
50, TR-68
4270 HCK = 2 * (HT - HE)                                   'EQ
51, TR-68
4280 IF HCK < HS THEN HS = HCK
4290 '!!!!!IF "<" IS CHANGED TO ">" IN TR WILL NEED TO HAVE
A <0 CHECK!!!!!!!!
4300 HR = HT - HS
4310 '
4320 '  ~~~~~~~~ ADJUST SEGMENTS FOR EFFECTIVE BASE ~~~~~~~~
4330 '
4340 XX% = 0       'ARRAY ADDRESS FOR FIRST EFFECTIVE SEGMENT
4341 IF F5$ = "1" GOTO 4360
4350 F5$ = "0"                         '"SEG TO BE SPLIT" FLAG
4360 IF F1$ = "a" OR F1$ = "A" THEN 4630'FREE-STANDING RISER
4370 HCK = 0
4380 '
4390 FOR I% = 0 TO NOSEG% - 5
4400 HCK = HCK + HSEGI(I%)
4410 IF HCK >= HR GOTO 4440
4420 NEXT
4430 '
4440 XX% = I% + 1 'ARRAY ADDRESS FOR FIRST EFFECTIVE SEGMENT
4450 IF HCK = HR GOTO 4630
4460 F5$ = "1"                                 'SEG TO BE SPLIT
4470 NOSEG% = NOSEG% + 1
4480 IF NOSUB% = 0 THEN 4500
4490 NOSUB% = NOSUB% + 1
```

```
4500 '
4510 FOR I% = NOSEG% - 1 TO XX% + 1 STEP -1
4520 HSEGI(I%) = HSEGI(I% - 1)
4530 TI(I%) = TI(I% - 1)
4540 WIAIR(I%) = WIAIR(I% - 1)
4550 NEXT
4560 '
4570 HSEGI(XX%) = HCK - HR
4580 TI(XX%) = TI(XX% - 1)
4590 WIAIR(XX%) = WIAIR(XX% - 1) * HSEGI(XX%) / HSEGI(XX% -
1)
4600 HSEGI(XX% - 1) = HSEGI(XX% - 1) - HSEGI(XX%)
4610 WIAIR(XX% - 1) = WIAIR(XX% - 1) - WIAIR(XX%)
4620 '
4630 '         ~~~~~~~~ COMPUTE HW ~~~~~~~~
4640 '
4650 HW = 0
4660 '
4670 FOR I% = 0 TO NOSEG% - 5
4680 HW = HW + HSEGI(I%)
4690 NEXT
4700 '
4710 IF F1$ = "a" OR F1$ = "A" THEN 4740'FREE-STANDING RISER
4720 HW = HW - HR
4730 '
4740 '         ~~~~~~~~ COMPUTE HH ~~~~~~~~
4750 '
4760 HH = HW
4770 IF NOSUB% = NOSEG% - 4 THEN 4830
4780 FOR I% = NOSUB% TO NOSEG% - 5
4790 HH = HH - HSEGI(I%)
4800 NEXT
4810 IF NOSUB% = 0 THEN HH = 0
4820 '
4830 '      ~~~~~~~~ COMPUTE UNADJUSTED HI ~~~~~~~~
4840 '
4850 HI(0) = HSEGI(0) / 2
4860 '
4870 FOR I% = 1 TO NOSEG% - 5
4880 HI(I%) = HI(I% - 1) + (HSEGI(I% - 1) + HSEGI(I%)) / 2
4890 NEXT
4900 '
4910 IF F0$ = "B" OR F0$ = "b" THEN 5040  'STD BAFFLE INLET
RISER
4920 '
4930 '     ~~~~ STANDARD COVERED TOP RISER ~~~~
4940 '
4950 HI(I%) = HI(I% - 1) + HSEGI(I% - 1) / 2 - .5 -
HSEGI(I%) / 3'4TH SEG FROM TOP
4960 I% = I% + 1
4970 HI(I%) = HI(I% - 1) + HSEGI(I% - 1) / 3 + HSEGI(I%) /
2'3RD SEG FROM TOP
4980 I% = I% + 1
4990 HI(I%) = HI(I% - 1) + (HSEGI(I% - 1) + HSEGI(I%)) /
2'2ND SEG FROM TOP
5000 I% = I% + 1
```

```
5010 HI(I%) = HI(I% - 1) + (HSEGI(I% - 1) + HSEGI(I%)) /
2'TOP SEGMENT
5020 GOTO 5170
5030 '
5040 '       ~~~~ STANDARD BAFFLE INLET RISER ~~~~
5050 '
5060 HI(I%) = ((HSEGI(I%) ^ 2 * T3) / 2 + HSEGI(I%) ^ 3 / 3)
/ (T3 * HSEGI(I%) + HSEGI(I%) ^ 2)
5070 HI(I%) = HI(I% - 1) + HSEGI(I% - 1) / 2 - HI(I%)  '4TH
SEG FROM TOP
5080 I% = I% + 1
5090 X = D / 2 + TI(I% - 2) + T1 - T2
5100 HI(I%) = (X / 2 * HSEGI(I%) ^ 2 - HSEGI(I%) ^ 3 / 3) /
(X * HSEGI(I%) - HSEGI(I%) ^ 2)
5110 HI(I%) = HI(I% - 2) + HSEGI(I% - 2) / 2 + HI(I%)  '3RD
SEG FROM TOP
5120 I% = I% + 1
5130 HI(I%) = HI(I% - 3) + HSEGI(I% - 3) / 2 + HSEGI(I% - 1)
+ HSEGI(I%) / 2'2ND SEG DOWN
5140 I% = I% + 1
5150 HI(I%) = HI(I% - 1) + (HSEGI(I% - 1) + HSEGI(I%)) /
2'TOP SEGMENT
5160 '
5170 '           ~~~~~~~~ COMPUTE HB ~~~~~~~~
5180 '
5190 FOR I% = 0 TO NOSEG% - 5
5200 HB(I%) = HI(I%) - HSEGI(I%) / 2
5210 NEXT
5220 '
5230 IF F0$ = "B" OR F0$ = "b" THEN 5360   'STD BAFFLE INLET
RISER
5240 '
5250 '        ~~~~ STANDARD COVERED TOP RISER ~~~~
5260 '
5270 HB(I%) = HB(I% - 1) + HSEGI(I% - 1) - HSEGI(I%) -
HSEGI(I% + 1)'4TH SEG FROM TOP
5280 '
5290 FOR I% = I% + 1 TO NOSEG% - 1
5300 HB(I%) = HI(I%) - HSEGI(I%) / 2       'TOP 3 SEGMENTS
5310 NEXT
5320 '
5330 HB(I% + 1) = HI(I%) + HSEGI(I%)  'FOR TOP LATERAL FORCE
5340 GOTO 5460
5350 '
5360 '        ~~~~ STANDARD BAFFLE INLET RISER ~~~~
5370 '
5380 HB(I%) = HW - HSEGI(I%)                     '4TH SEG FROM TOP
5390 I% = I% + 1
5400 HB(I%) = HW                                 '3RD SEG FROM TOP
5410 '
5420 FOR I% = I% + 1 TO NOSEG%
5430 HB(I%) = HB(I% - 1) + HSEGI(I% - 1)  'TOP 2 SEGS & TOP
LATERAL FORCE
5440 NEXT
5450 '
5460 '         ~~~~~~~~ ADJUST HI FOR HR ~~~~~~~~
5470 '
```

```
5480 IF F1$ = "a" OR F1$ = "A" THEN 5550'FREE-STANDING RISER
5490 '
5500 FOR I% = 0 TO NOSEG% - 1
5510 HI(I%) = HI(I%) - HR
5520 IF HI(I%) < 0 THEN HI(I%) = 0
5530 NEXT
5540 '
5550 RETURN
5560 '
5570 '******** COMPUTATION OF SHEARS AND MOMENTS **********
5580 '
5590 '
5600 '  ~~~~~~~~ COMPUTE MOMENT OF INERTIA ~~~~~~~~
5610 '
5620 MOI(0) = (L1 * B1 ^ 3) / 12
5630 X = 1
5640 IF F2$ = "a" OR F2$ = "A" THEN 5710    'SEG 2 IS HOLLOW
5650 MOI(1) = (L2 * B2 ^ 3) / 12
5660 X = 2
5670 IF XX% <> 2 OR F5$ <> "1" THEN 5710
5680 MOI(2) = MOI(1)
5690 X = 3
5700 '
5710 FOR I% = X TO NOSEG% - 5
5720 MOI(I%) = ((Y * D + 2 * TI(I%)) * (D + 2 * TI(I%)) ^ 3
- (Y * D) * (D ^ 3)) / 12
5730 NEXT
5740 '
5750 '~~~~ COMPUTE SUMS COL 10 & COL 11, TABLE 1, TR-68 ~~~~
5760 '
5770 SC10T1 = 0
5780 SBIHI = 0
5790 I% = XX%
5800 IF F1$ = "b" OR F1$ = "B" THEN 5840  'RISER IS EMBEDDED
5810 SBIHI = B1 * HSEGI(0)
5820 SC10T1 = SC10T1 + (HW - HI(0)) ^ 2 * HSEGI(0) / MOI(0)
5830 I% = I% + 1
5840 IF F2$ = "a" OR F2$ = "A" THEN 5950    'SEG 2 IS HOLLOW
5850 IF XX% > 1 THEN 5900                   'SEG 2 IS EMBEDDED
5860 SBIHI = SBIHI + B2 * HSEGI(1)
5870 SC10T1 = SC10T1 + (HW - HI(1)) ^ 2 * HSEGI(1) / MOI(1)
5880 I% = I% + 1
5890 GOTO 5950
5900 IF XX% <> 2 OR F5$ <> "1" THEN 5950
5910 SBIHI = SBIHI + B2 * HSEGI(2)
5920 SC10T1 = SC10T1 + (HW - HI(2)) ^ 2 * HSEGI(2) / MOI(2)
5930 I% = I% + 1
5940 '
5950 FOR I% = I% TO NOSEG% - 5
5960 SC10T1 = SC10T1 + (HW - HI(I%)) ^ 2 * HSEGI(I%) /
MOI(I%)
5970 SBIHI = SBIHI + (D + 2 * TI(I%)) * HSEGI(I%)
5980 NEXT
5990 '
6000 '
6010 '    ~~~~~~~~ COMPUTE COL 3 TABLE 2, TR-68 ~~~~~~~~
```

```
6020 '
6030 I% = XX%
6040 IF F1$ = "b" OR F1$ = "B" THEN 6070  'RISER IS EMBEDDED
6050 BETA(0) = B1 / HS                    'EQ. 39, TR-68
6060 I% = I% + 1
6070 IF F2$ = "a" OR F2$ = "A" THEN 6160  'SEG 2 IS HOLLOW
6080 IF XX% > 1 THEN 6120                 'SEG 2 IS EMBEDDED
6090 BETA(1) = B2 / HS                    'EQ. 44, TR-68
6100 I% = I% + 1
6110 GOTO 6160
6120 IF XX% <> 2 OR F5$ <> "1" THEN 6160
6130 BETA(2) = B2 / HS                    'EQ. 44, TR-68
6140 I% = I% + 1
6150 '
6160 FOR I% = I% TO NOSEG% - 5
6170 BETA(I%) = (D + 2 * TI(I%)) / HS     'EQ. 44, TR-68
6180 NEXT
6190 '
6200 '~~~~~ COMPUTE COLS 4, 6, & 7, TABLE 2, TR-68 ~~~~~
6210 '
6220 FOR I% = XX% TO NOSUB% - 1
6230 IF BETA(I%) > 2 THEN 6260
6240 ZETA(I%) = .8 * (BETA(I%)) - .2 * (BETA(I%)) ^ 2  'EQ.
42, TR-68
6250 GOTO 6270
6260 ZETA(I%) = 14 * BETA(I%) / (3 + 16 * BETA(I%))    'EQ.
43, TR-68
6270 R(I%) = HI(I%) / HH                          'EQ. 35, TR-68
6280 Z(I%) = ZETA(I%) * (1 - R(I%) ^ 2) ^ .5      'EQ. 41, TR-68
6290 NEXT
6300 '
6310 '~ COMPUTE COL 11, TABLE 2 OR COL 17, TABLE 3, TR-68 ~~
6320 '
6330 FOR I% = XX% TO NOSUB% - 1
6340 WAI(I%) = .0624 * Z(I%) * HH * (Y * D + 2 * TI(I%)) *
HSEGI(I%)'EQS. 40 & 45, TR-68
6350 NEXT
6360 '
6370 IF XX% = 0 THEN WAI(0) = .0624 * Z(0) * HH * L1 *
HSEGI(0)
6380 IF XX% > 1 THEN GOTO 6420                  'SEG 2 IS EMBEDDED
6390 IF F2$ = "A" OR F2$ = "a" THEN GOTO 6450       'SEG 2 IS
HOLLOW
6400 WAI(1) = .0624 * Z(1) * HH * L2 * HSEGI(1)
6410 GOTO 6450
6420 IF XX% <> 2 OR F5$ <> "1" THEN 6450
6430 WAI(2) = .0624 * Z(2) * HH * L2 * HSEGI(2)
6440 '
6450 '~~~~~ COMPUTE COL 12 TABLE 1, COL 16 TABLE 2, ~~~~~~~
6460 '    ~~~~~~~~ OR COL 21, TABLE 3, TR-68 ~~~~~~~~
6470 '      ~~~~~~~~ AND SUM WEIGHT COLUMNS ~~~~~~~~
6480 '
6490 SWIAIR = 0
6500 WT = 0
6510 SWIHI = 0
6520 '
6530 FOR I% = XX% TO NOSEG% - 1
```

```
6540 SWIAIR = SWIAIR + WIAIR(I%)
6550 WI(I%) = WIAIR(I%) + WAI(I%)
6560 WT = WT + WI(I%)
6570 WIHI(I%) = WI(I%) * HI(I%)
6580 SWIHI = SWIHI + WIHI(I%)
6590 NEXT
6600 '
6610 '          ~~~~~~~~~ COMPUTE HX ~~~~~~~~~
6620 '
6630 FOR I% = XX% TO NOSEG% - 5
6640 HX(I%) = HI(I%) - HSEGI(I%) / 2
6650 NEXT
6660 '
6670 IF F0$ = "B" OR F0$ = "b" THEN 6800   'STD BAFFLE INLET
RISER
6680 '
6690 '          ~~~~ STANDARD COVERED TOP RISER ~~~~
6700 '
6710 HX(I%) = HX(I% - 1) + HSEGI(I% - 1) - HSEGI(I%) -
HSEGI(I% + 1)'4TH SEG FROM TOP
6720 '
6730 FOR I% = I% + 1 TO NOSEG% - 1
6740 HX(I%) = HI(I%) - HSEGI(I%) / 2         'TOP 3 SEGMENTS
6750 NEXT
6760 '
6770 HX(I% + 1) = HI(I%) + HSEGI(I%)  'FOR TOP LATERAL FORCE
6780 GOTO 6900
6790 '
6800 '          ~~~~ STANDARD BAFFLE INLET RISER ~~~~
6810 '
6820 HX(I%) = HW - HSEGI(I%)                   '4TH SEG FROM TOP
6830 I% = I% + 1
6840 HX(I%) = HW                               '3RD SEG FROM TOP
6850 '
6860 FOR I% = I% + 1 TO NOSEG%
6870 HX(I%) = HX(I% - 1) + HSEGI(I% - 1)   'TOP 2 SEGS & TOP
LATERAL FORCE
6880 NEXT
6890 '
6900 '            ~~~~~~~~~ COMPUTE T & TWP ~~~~~~~~~
6910 '
6920 T(J%) = 1.7615 * (.0932 * SWIAIR * SC10T1 / E) ^ .5'EQ
17, TR-68
6930 TMAX = .05 * HS / (SBIHI / HW) ^ .5       'EQ 18, TR-68
6940 IF T(J%) > TMAX THEN T(J%) = TMAX
6950 '
6960 IF NOSUB% = 0 THEN 7100
6970 BETAE = (SBIHI / HW) / HS                 'EQ 48, TR-68
6980 IF BETAE > .5 THEN 7030
6990 '
7000 TWF = (1.46 - .77 * BETAE + .7 * BETAE ^ 2) * T(J%)'EQ
46, TR-68
7010 GOTO 7040
7020 '
7030 TWF = (1.285 - .07 * BETAE) * T(J%)       'EQ 47, TR-68
```

```
7040 TWP = T(J%) + 2.25 * (HH / HS - 1 / 3) ^ 2 * (TWF -
T(J%))'EQ 49, TR-68
7050 IF TWP < T(J%) THEN TWP = T(J%)
7060 '
7070 'FOR SINPLIFICATION IN LATER USE SET T(J%) EQUAL TO TWP
7080 T(J%) = TWP
7090 '
7100 '             ~~~~~~~~ COMPUTE VO ~~~~~~~~
7110 '
7120 C = .05 / T(J%) ^ .33333                         'EQ 14, TR-68
7130 IF C > .1 THEN C = .1
7140 I(J%) = 1
7150 '
7160 IF SZ% = 1 THEN SZF = .25
7170 IF SZ% = 2 THEN SZF = .5
7180 IF SZ% = 3 THEN SZF = 1
7190 IF SZ% = 4 THEN SZF = 1.33
7200 '
7210 IF HC$ = "A" OR HC$ = "a" THEN HCF = 1
7220 IF HC$ = "B" OR HC$ = "b" THEN HCF = 1.5
7230 IF HC$ = "C" OR HC$ = "c" THEN HCF = 2
7240 '
7250 IF SPT% = 1 THEN SPF = 1
7260 IF SPT% = 2 THEN SPF = 1.2
7270 IF SPT% = 3 THEN SPF = 1.5
7280 '
7290 VO(J%) = SZF * HCF * 2 * C * WT * SPF * I(J%)   'EQ 53,
TR-68
7300 IF F1$ = "a" OR F1$ = "A" THEN VOPP = VO(J%)    'FREE-
STANDING RISER
7310 '
7320 '         ~~~~~~~~ CONPUTE FORCES & SHEARS ~~~~~~~
7330 '
7340 I% = NOSEG%
7350 FJ(J%, I%) = .004 * (HS / (SBIHI / HW)) ^ 2 * VO(J%)'EQ
21, TR-68
7360 IF FJ(J%, I%) > .15 * VO(J%) THEN FJ(J%, I%) = .15 *
VO(J%)
7370 FT = FJ(J%, I%)
7380 VX(J%, I%) = FT
7390 SFJ = 0
7400 '
7410 FOR I% = I% - 1 TO XX% STEP -1
7420 FJ(J%, I%) = (VO(J%) - FT) * WIHI(I%) / SWIHI   'EQ 22,
TR-68
7430 SFJ = SFJ + FJ(J%, I%)
7440 VX(J%, I%) = FT + SFJ                          'EQ 23, TR-68
7450 NEXT
7460 '
7470 I% = I% + 1
7480 IF F1$ = "B" OR F1$ = "b" THEN 7540  'RISER IS EMBEDDED
7490 IF ABS(VX(J%, I%) - VO(J%)) < .01 THEN 7540
7500 '
7510 LOCATE 14, 20: PRINT "VO(J%) DOES NOT CHECK WITH EQ 24,
PG 12, TR-68"
7520 STOP
7530 '
```

```
7540 '~~~ COMPUTE MOMENTS FOR EFFECTIVE HEIGHT OF RISER ~~~~
7550 '
7560 J0 = .6 / T(J%) ^ .3333                        'EQ 26, TR-68
7570 IF J0 < .8 THEN J0 = .8
7580 IF J0 > 1 THEN J0 = 1
7590 '
7600 FOR I% = NOSEG% - 1 TO XX% STEP -1
7610 SFH = 0
7620 FOR K% = NOSEG% - 1 TO I% STEP -1         'NESTED LOOP
7630 SFH = SFH + FJ(J%, K%) * (HI(K%) - HX(I%)) 'RT. PORTION
EQ 27, TR-68
7640 NEXT
7650 JX = J0 + (1 - J0) * (HX(I%) / HS) ^ 3     'EQ 28, TR-68
7660 MX(J%, I%) = JX * (FT * (HS - HX(I%)) + SFH)    'EQ 27,
TR-68
7670 NEXT
7680 '
7690 MOP = MX(J%, I% + 1)
7700 IF F1$ = "a" OR F1$ = "A" THEN MOPP = MOP         'FREE-
STANDING RISER
7710 '
7720 '~~~~~~~~~ ADJUST CONCRETE WEIGHTS FOR BUOYANCY ~~~~~~~~~
7730 '
7740 WE = 0                    'WE = EFFECTIVE WEIGHT OF CONCRETE
7750 IF NOSUB% = 0 THEN 8140      'DRY SITE
7760 '
7770 K% = NOSUB%   'UNADJUSTED ADDRESS OF LOWEST DRY SEGMENT
7780 IF HH < HW THEN GOTO 7820
7790 IF HW = HH THEN K% = K% + 1'ADJUST FOR BAFFLE INLET TOP
7800 IF F0$ = "A" OR F0$ = "a" THEN K% = K% + 1'ADJUST FOR
STD TOP SUPPORT
7810 '
7820 FOR I% = NOSEG% - 1 TO K% STEP -1
7830 WE = WE + WIAIR(I%)                          'IN AIR PORTION
7840 WX(I%) = WE
7850 NEXT
7860 '
7870 IF HH < HW THEN GOTO 7970
7880 WE = WE + .584 * WIAIR(I%)                 'ADJUSTMENT TOP
SUPPORT FOR BUOYANCY
7890 WX(I%) = WE
7900 I% = I% - 1
7910 '
7920 IF F0$ = "B" OR F0$ = "b" THEN GOTO 7970
7930 WE = WE + .584 * WIAIR(I%)                 'ADJUSTMENT TOP
SUPPORT FOR BUOYANCY
7940 WX(I%) = WE
7950 I% = I% - 1
7960 '
7970 FOR I% = I% TO 3 STEP -1
7980 WE = WE + .584 * WIAIR(I%) - .0624 * HSEGI(I%) * Y * D
^ 2'ADJUSTMENT FOR BUOYANCY
7990 WX(I%) = WE
8000 NEXT
8010 '
```

```
8020 WE = WE + .584 * WIAIR(2)    'ADJUSTMENT FOR BUOYANCY,
SEG 3
8030 IF F2$ = "A" OR F2$ = "a" GOTO 8050      'SEG 2 HOLLOW
8040 IF XX% = 2 AND F5$ = "1" GOTO 8060       'SEG 2 EMBEDDED
AND SPLIT
8050 WE = WE - .0624 * HSEGI(2) * Y * D ^ 2
8060 WX(2) = WE
8070 WE = WE + .584 * WIAIR(1)     'ADJUSTMENT FOR BUOYANCY,
SEG 2
8080 IF F2$ = "A" OR F2$ = "a" THEN WE = WE - .0624 *
HSEGI(1) * Y * D ^ 2
8090 WX(1) = WE
8100 WE = WE + .584 * WIAIR(0)     'ADJUSTMENT FOR BUOYANCY,
FOOTING
8110 WX(0) = WE
8120 GOTO 8190
8130 '
8140 FOR I% = NOSEG% - 1 TO 0 STEP -1
8150 WE = WE + WIAIR(I%)                         'DRY SITE
8160 WX(I%) = WE
8170 NEXT
8180 '
8190 IF F1$ = "a" OR F1$ = "A" THEN WOPP = WE 'FREE-STANDING
RISER
8200 '
8210 ' ~~~ COMPUTE I (SOIL-STRUCTURE INTERACTION FACTOR) ~~~
8220 '
8230 IF F1$ = "B" OR F1$ = "b" THEN 8310'EMBEDDED RISER, I=1
8240 IF F3$ = "N" OR F3$ = "n" THEN 8310      'I=1
8250 ECC = MX(J%, 0) / WE                      'ECCENTRICITY
8260 IF ECC <= B1 / 6 THEN 8310
8270 ICK = I(J%)
8280 I(J%) = 1 - .9 * (ECC - B1 / 6) / B1      'EQ 54, TR-68
8290 IF ABS(I(J%) - ICK) < .01 THEN 8310
8300 GOTO 7290                               'RECOMPUTE WITH NEW I
8310 RETURN
8320 '
8330 '****** BEARING AND SAFETY FACTOR COMPUTATIONS *******
8340 '
8350 '
8360 '      ~~~~~~~~ COMPUTE WF, LE, & WOPP ~~~~~~~~
8370 '
8380 WF = 0
8390 IF F1$ = "A" OR F1$ = "a" THEN 8900'FREE-STANDING RISER
8400 LE(J%) = L1 * HSEGI(0)
8410 WFF = 0
8420 XXX% = 0        'ARRAY ADDRESS FOR LAST EMBEDDED SEGMENT
8430 HCK = 0
8440 '
8450 FOR I% = 0 TO NOSEG% - 5
8460 HCK = HCK + HSEGI(I%)
8470 IF HCK >= HE GOTO 8500
8480 NEXT
8490 '
8500 XXX% = I%       'ARRAY ADDRESS FOR LAST EMBEDDED SEGMENT
8510 I% = 1
8520 K% = 1
```

```
8530 WFF = HCK - HE
8540 IF F2$ = "A" OR F2$ = "a" THEN 8630      'SEG 2 HOLLOW
8550 WF = ((B2 * (L1 - L2) + L2 * (B1 - B2) + (L1 - L2) *
(B1 - B2)) * HSEGI(1)) * UNITWT / 1000
8560 LE(J%) = LE(J%) + L2 * HSEGI(1)
8570 I% = 2
8580 K% = 2
8581 L = 0
8582 B = 0
8590 '
8600 IF XX% <> 2 OR F5$ <> "1" THEN 8630
8610 WF = WF + ((B2 * (L1 - L2) + L2 * (B1 - B2) + (L1 - L2)
* (B1 - B2)) * HSEGI(2)) * UNITWT / 1000
8611 IF XXX% > 3 OR XXX% = 3 THEN GOTO 8620
8612 '
8613 WF = WF - ((B2 * (L1 - L2) + L2 * (B1 - B2) + (L1 - L2)
* (B1 - B2)) * WFF) * UNITWT / 1000
8614 IF XXX% < 3 THEN GOTO 8700
8620 I% = 3
8630 FOR I% = I% TO XXX%
8640 B = D + 2 * TI(I%)
8650 L = Y * D + 2 * TI(I%)
8660 WF = WF + ((B * (L1 - L) + L * (B1 - B) + (L1 - L) *
(B1 - B)) * HSEGI(I%)) * UNITWT / 1000
8670 NEXT
8680 '
8690 WF = WF - ((B * (L1 - L) + L * (B1 - B) + (L1 - L) *
(B1 - B)) * WFF) * UNITWT / 1000
8700 '
8710 FOR I% = K% TO XX% - 1
8720 L = Y * D + 2 * TI(I%)
8730 LE(J%) = LE(J%) + L * HSEGI(I%)
8740 NEXT
8750 '
8760 LE(J%) = LE(J%) / HR
8770 WOPP = WF + SWIAIR
8780 IF NOSUB% = 0 THEN 8820                              'DRY
SITE
8790 WF = WF * (UNITWT - 62.4) / UNITWT     'ADJUSTMENT FOR
BUOYANCY
8800 WOPP = WF + WE
8810 '
8820 '  ~~~~~~~~ COMPLETE BEARING COMPUTATIONS ~~~~~~~~
8830 '
8840 PMAX(J%) = (KP - KA) * UNITWT * HR / 2000 'EQ 52, TR-68
8850 IF NOSUB% > 0 THEN PMAX(J%) = PMAX(J%) * (UNITWT -
62.4) / UNITWT
8860 PMAXM = (MOP + HR * VO(J%)) * 4 / (LE(J%) * HR ^ 2)'4TH
EQ, PG 61, TR-68
8870 IF PMAXM < PMAX(J%) THEN PMAX(J%) = PMAXM
8880 MOPP = MOP + VO(J%) * HR - (PMAX(J%) * LE(J%) * HR ^ 2)
/ 4'5TH EQ, PG 61, TR-68
8890 VOPP = PMAX(J%) * HR * LE(J%) / 2 - VO(J%)          '6TH
EQ, PG 61, TR-68
8900 ECC = MOPP / WOPP                                   '7TH
EQ, PG 61, TR-68
```

```
8901 PMIN(J%) = 0
8910 IF ECC < B1 / 6 THEN GOTO 8990     'BEARING PRESSURE
DIAGRAM IS TRAPEZOIDAL
8920 '
8930 ' ~~~~~ BEARING PRESSURE DIAGRAM IS TRIANGULAR ~~~~~~
8940 '
8950 P(J%) = 2 * WOPP / (3 * L1 * (B1 / 2 - ECC))'EQ 68, TR-
68 - MAXIMUM BEARING PRESSURE
8960 SLOPE(J%) = P(J%) / (3 * (B1 / 2 - ECC))    'BEARING
PRESSURE DIAGRAM SLOPE
8970 GOTO 9050
8980 '
8990 ' ~~~~~ BEARING PRESSURE DIAGRAM IS TRAPEZOIDAL ~~~~~
9000 '
9010 P(J%) = (WOPP / (L1 * B1)) * (1 + 6 * ECC / B1)'EQ 70,
TR-68 - MAXIMUM BEARING PRESSURE
9020 PMIN(J%) = P(J%) - 2 * (P(J%) - WOPP / (B1 *
L1))'MINIMUM BEARING PRESSURE
9030 SLOPE(J%) = (P(J%) - PMIN(J%)) / B1        'BEARING
PRESSURE DIAGRAM SLOPE
9040 '
9050 '      ~~~~~~~~ COMPUTE SAFETY FACTORS ~~~~~~~~
9060 '
9070 SFO(J%) = ((WOPP * B1) / 2 + (PMAX(J%) * (HR ^ 2) *
LE(J%)) / 4)
9080 SFO(J%) = SFO(J%) / (MOP + V0(J%) * HR) 'EMBEDDED RISER
9090 IF F1$ = "a" OR F1$ = "A" THEN SFO(J%) = WE * B1 / (2 *
MOP)'FREE-STANDING RISER
9100 SFS(J%) = ABS(WOPP * CF / VOPP)
9110 RETURN
9120 '
9130 '******** STRESS ANALYSIS FOR VERTICAL BENDING *******
9140 '
9150 N = 8
9160 I% = 1
9170 IF F1$ = "B" OR F1$ = "b" THEN I% = XX% 'EMBEDDED RISER
9180 IF F2$ = "A" OR F2$ = "a" GOTO 9440      'SEG 2 HOLLOW
9190 IF F1$ = "A" OR F1$ = "a" GOTO 9230      'FREE-STANDING
9200 IF XX% > 2 GOTO 9440
9210 IF XX% > 1 AND F5$ <> "1" GOTO 9440
9220 '
9230 FC$(J%, I%) = "COMPRESSIVE STRESS OK"
9240 FS$(J%, I%) = "TENSILE STRESS OK FOR T&S STEEL"
9250 ASTS = .004 * TS * (L2 - TI(I% + 1))
9260 ASV(J%, I%) = ASTS
9270 ED = B2 - TI(I% + 1) / 2
9280 CDR = B2 / 2 - TI(I% + 1) / 2
9290 KD = (((N * ASV(J%, I%)) ^ 2 + 2 * L2 * N * ASV(J%, I%)
* ED) ^ .5 - N * ASV(J%, I%)) / L2
9300 K = KD / ED
9310 ECC = MX(J%, I%) / WX(I%) + CDR
9320 JD = ED - KD / 3
9330 FS(J%, I%) = WX(I%) * (ECC - JD) / (ASV(J%, I%) *
JD)'KIPS / SQ. FT.
9340 IF FS(J%, I%) <= 26.7 * 144 THEN 9380
9350 FS$(J%, I%) = "*** TENSILE STRESS EXCEEDED ALLOWABLE
FOR T&S STEEL"
```

```
9360 ASV(J%, I%) = WX(I%) * (ECC - JD) / (25 * 144 * JD)
9370 GOTO 9290
9380 FC(J%, I%) = (FS(J%, I%) / N) * (K / (1 - K))
'KIPS / SQ. FT.
9390 IF FS(J%, I%) < 0 THEN FC(J%, I%) = 2 * WX(I%) / ED
9400 IF FC(J%, I%) <= 2133 * .144 THEN 9420
9410 FC$(J%, I%) = "*** COMPRESSIVE STRESS EXCEEDED
ALLOWABLE"
9420 I% = I% + 1
9430 '
9440 FOR I% = I% TO NOSEG% - 5
9450 FC$(J%, I%) = "COMPRESSIVE STRESS OK"
9460 FS$(J%, I%) = "TENSILE STRESS OK FOR T&S STEEL"
9470 B = D + 2 * TI(I%)
9480 L = Y * D + 2 * TI(I%)
9490 IF TI(I%) < TS THEN TS = TI(I%)      'PG 1-2, TR-30 OR
9500                                      'PG 6.4-3a, NEH 6
9510 ASTS = .004 * TS * (L - TI(I%))
9520 ASV(J%, I%) = ASTS
9530 ED = B - TI(I%) / 2
9540 CDR = B / 2 - TI(I%) / 2
9550 AMC = L * TI(I%) ^ 2 / 2
9560 AMT = ASV(J%, I%) * N * (B - 3 * TI(I%) / 2)
9570 KD = (((N * ASV(J%, I%)) ^ 2 + 2 * L * N * ASV(J%, I%)
* ED) ^ .5 - N * ASV(J%, I%)) / L
9580 '
9590 IF AMT < AMC THEN 9620            'NEUTRAL AXIS WITHIN
COMPRESSION WALL
9600 '
9610 KD = (N * ASV(J%, I%) * ED + L * TI(I%) ^ 2 / 2) / (N *
ASV(J%, I%) + L * TI(I%))
9620 K = KD / ED
9630 IF KD < B - TI(I%) THEN 9670
9640 '
9650 K$(J%, I%) = "*** *** NEUTRAL AXIS IN TENSION WALL-
MANUAL ANALYSIS REQUIRED"
9660 GOTO 9880
9670 ECC = MX(J%, I%) / WX(I%) + CDR
9680 JD = ED - KD / 3
9690 IF AMT < AMC THEN 9740             'NEUTRAL AXIS WITHIN
COMPRESSION WALL
9700 '
9710 JD = TI(I%) * (KD - TI(I%)) / (2 * KD) + TI(I%) / 6 -
TI(I%) * (KD - TI(I%)) / (6 * KD)
9720 JD = JD / (.5 + (KD - TI(I%)) / (2 * KD))
9730 JD = ED - JD
9740 FS(J%, I%) = WX(I%) * (ECC - JD) / (ASV(J%, I%) *
JD)'KIPS / SQ. FT.
9750 IF FS(J%, I%) <= 26.7 * 144 THEN 9830
9760 '
9770 FS$(J%, I%) = "*** TENSILE STRESS EXCEEDED ALLOWABLE
FOR T&S STEEL"
9780 '
9790 ASV(J%, I%) = WX(I%) * (ECC - JD) / (25 * 144 * JD)
9800                     'AS IS COMPUTED FOR FS(J%,I%)=25 ksi
9810 '
```

```
10760 MKRDS = MKRDS + D2 + D4 * COFS
10770 MKRUS = MKRUS + D4 + D2 * COFS
10780 MKURE = MKURE + D3 + D5 * COFE
10790 MKULE = MKULE + D5 + D3 * COFE
10800 MKLUS = MKLUS + D6 + D8 * COFS
10810 MKLDS = MKLDS + D8 + D6 * COFS
10820 MKDLE = MKDLE + D7 + D1 * COFE
10830 WEND
10840 '
10850 '
10860 MKDRE = -MKDRE
10870 MKRUS = -MKRUS
10880 MKULE = -MKULE
10890 MKLDS = -MKLDS
10900 '
10910 '      ~~~~~~~~ EVALUATE CRITICAL POINTS ~~~~~~~~
10920 '
10930 MCR = (QR * (Y * D + TI(I%)) ^ 2 / 8) + MKRDS
10940 MCL = (QL * (Y * D + TI(I%)) ^ 2 / 8) + MKLUS
10950 '
10960 MFRD = MCR - QR * (Y * D) ^ 2 / 8
10970 MFLU = MCL - QL * (Y * D) ^ 2 / 8
10980 '
10990 NR = (QE * (D + TI(I%)) / 2) - (MKDRE - MKDLE) / (D +
TI(I%))
11000 NL = (QE * (D + TI(I%)) / 2) + (MKDRE - MKDLE) / (D +
TI(I%))
11010 '
11020 IF TI(I%) < TS THEN TS = TI(I%)      'PG 1-2, TR-30 OR
11030                                      'PG 6.4-3a, NEH 6
11040 ASTS = .002 * TS * 144
11050 AS1(J%, I%) = 0
11060 S1(J%, I%) = 0
11070 AS1$(J%, I%) = "    MOMENT AT POINT 1 IS POSITIVE"
11080 IF MFRD > 0 THEN 11160
11090 AS1$(J%, I%) = "    MOMENT AT POINT 1 IS NEGATIVE"
11100 AS1(J%, I%) = ((12 * ABS(MFRD) + NR * (6 * TI(I%) -
2.5)) / (23.229 * (12 * TI(I%) - 2.5)))
11110 AS1(J%, I%) = AS1(J%, I%) - NR / 26.7
11120 IF AS1(J%, I%) < ASTS THEN AS1(J%, I%) = ASTS'T&S
STEEL MIN.
11130 S1(J%, I%) = 7.093 * (12 * TI(I%) - 2.5) / (.5 * Y * D
* QR)
11140 IF S1(J%, I%) > 18 THEN S1(J%, I%) = 18      '18 INCH
MAX. SPACING
11150 '
11160 AS3(J%, I%) = 0
11170 S2(J%, I%) = 0
11180 '
11190 AS3$(J%, I%) = "    MOMENT AT POINT 3 IS NEGATIVE"
11200 IF MCR < 0 THEN 11280
11210 AS3$(J%, I%) = "    MOMENT AT POINT 3 IS POSITIVE"
11220 AS3(J%, I%) = ((12 * (MCR) + NR * (6 * TI(I%) - 2.5))
/ (23.229 * (12 * TI(I%) - 2.5))) - NR / 26.7
11230 IF AS3(J%, I%) < ASTS THEN AS3(J%, I%) = ASTS'T&S
STEEL MIN.
11240 '
```

```
11250 S2(J%, I%) = 7.093 * (12 * TI(I%) - 2.5) / (QR * (((Y
* D + TI(I%)) ^ 2 / 4) + 2 * MKRDS / QR) ^ .5)
11260 IF S2(J%, I%) > 18 THEN S2(J%, I%) = 18      '18 INCH
MAX. SPACING
11270 '
11280 AS4(J%, I%) = 0
11290 S4(J%, I%) = 0
11300 AS4$(J%, I%) = "    MOMENT AT POINT 4 IS NEGATIVE"
11310 IF MFLU < 0 THEN 11390
11320 AS4$(J%, I%) = "*** MOMENT AT POINT 4 IS POSITIVE -
TENSION EXISTS AT INSIDE CORNER"
11330 '
11340 AS4(J%, I%) = ((12 * MFLU + NL * (6 * TI(I%) - 2.5)) /
(23.229 * (12 * TI(I%) - 2.5))) - NL / 26.7
11350 IF AS4(J%, I%) < ASTS THEN AS4(J%, I%) = ASTS'T&S
STEEL MIN.
11360 S4(J%, I%) = 7.093 * (12 * TI(I%) - 2.5) / (.5 * Y * D
* ABS(QL))
11370 IF S4(J%, I%) > 18 THEN S4(J%, I%) = 18      '18 INCH
MAX. SPACING
11380 '
11390 AS6(J%, I%) = 0
11400 S5(J%, I%) = 0
11410 '
11420 AS6$(J%, I%) = "    MOMENT AT POINT 6 IS POSITIVE"
11430 IF MCL > 0 THEN 11530
11440 AS6$(J%, I%) = "    MOMENT AT POINT 6 IS NEGATIVE"
11450 AS6(J%, I%) = ((12 * ABS(MCL) + NL * (6 * TI(I%) -
2.5)) / (23.229 * (12 * TI(I%) - 2.5)))
11460 AS6(J%, I%) = AS6(J%, I%) - NL / 26.7
11470 IF AS6(J%, I%) < ASTS THEN AS6(J%, I%) = ASTS'T&S
STEEL MIN.
11480 '
11490 S5(J%, I%) = 7.093 * (12 * TI(I%) - 2.5)
11500 S5(J%, I%) = S5(J%, I%) / (ABS(QL) * (((Y * D +
TI(I%)) ^ 2 / 4) - 2 * MKLUS / ABS(QL)) ^ .5)
11510 IF S5(J%, I%) > 18 THEN S5(J%, I%) = 18      '18 INCH
MAX. SPACING
11520 '
11530 VH$(J%, I%) = "    HORIZONTAL BENDING SHEAR IS OK"
11540 VH(J%, I%) = ABS(QR * (.5 * Y * D - TI(I%) + .20833) /
(TI(I%) - .20833)) / 144'SHEAR
11550 IF VH(J%, I%) <= .093 THEN 11570
11560 VH$(J%, I%) = "*** HORIZONTAL BENDING SHEAR IS
EXCESSIVE"
11570 NEXT
11580 '
11590 '
11600 RETURN
11610 '
11620 '********* SHEAR STRESS ON HORIZONTAL PLANE *********
11630 '
11640 I% = 1
11650 IF F2$ = "b" OR F2$ = "B" THEN I% = 2     'SEG 2 SOLID
11660 IF F1$ = "b" OR F1$ = "B" THEN I% = XX%'EMBEDDED RISER
11670 IF XX% = 2 AND F5$ = "1" THEN I% = 3
```

```
11680 VP$(J%) = "    SHEAR ON HORIZONTAL PLANE IS OK"
11690 VP(J%) = VX(J%, I%) / (2 * D * TI(I%) + 3 * TI(I%) ^
2)
11700 VP(J%) = VP(J%) / 144                          'KSF TO KSI
11710 IF VP(J%) <= .093 THEN 11730
11720 VP$(J%) = "*** SHEAR ON HORIZONTAL PLANE IS EXCESSIVE"
11730 RETURN
11740 '
11750 '*** REVERSE DIMENSIONS FOR GROUND MOTION PARALLEL***
                 ****** TO SIDEWALLS ******
11760 '
11770 D = Y * D
11780 Y = 1 / Y
11790 JUNK = B1
11800 B1 = L1
11810 L1 = JUNK
11820 JUNK = B2
11830 B2 = L2
11840 L2 = JUNK
11850 DFE = 1 - DFE
11860 JUNK = COFS
11870 COFS = COFE
11880 COFE = JUNK
11890 IF TS$ = "A" OR TS$ = "a" THEN TS = 1.33333
11900 IF TS$ = "B" OR TS$ = "b" THEN TS = 2.66667
11910 J% = 1
11920 IF RE = 1 THEN 1460
11930 RETURN
11940 '
11950 '************** PRELIMINARY OUTPUT *****************
11960 '
11970 CLS
11980 PRINT
11990 PRINT
12000 PRINT
12010 PRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
12020 PRINT
12030 PRINT TAB(10); "MAXIMUM BEARING PRESSURE (KSF)";
12040 PRINT USING " -------------- ###.##"; P(0)
12050 PRINT TAB(10); "SAFETY FACTOR - OVERTURNING";
12060 PRINT USING " -----------------   ##.###"; SFO(0)
12070 PRINT TAB(10); "SAFETY FACTOR - SLIDING";
12080 PRINT USING " ---------------------   ##.###"; SFS(0)
12090 PRINT
12100 PRINT
12110 PRINT
12120 PRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
12130 PRINT
12140 PRINT TAB(10); "MAXIMUM BEARING PRESSURE (KSF)";
12150 PRINT USING " -------------- ###.##"; P(1)
12160 PRINT TAB(10); "SAFETY FACTOR - OVERTURNING";
12170 PRINT USING " -----------------   ##.###"; SFO(1)
12180 PRINT TAB(10); "SAFETY FACTOR - SLIDING";
12190 PRINT USING " ---------------------   ##.###"; SFS(1)
12200 PRINT
12210 PRINT
12220 PRINT
```

```
12230 PRINT "", "", "(PRESS ANY KEY TO CONTINUE)"
12240 INK$ = INKEY$: IF INK$ = "" THEN 12240 ELSE 12250
12250 RETURN
12260 '
12270 '********** ERROR CODE HANDLER SUBROUTINE ***********
12280 '                orig. adaptation by Mark Boysen 1/91
12295 '
12300 Handlerr:
12310 '
12320 SELECT CASE ERR
        CASE 24, 25     'Device Timeout (24) and Device
fault (25)'
          PRINT "Device timeout or device fault, such as
printer not on line!"
          PRINT "Turn Printer on and/or press ONLINE button,
then;"
          PRINT "        press any key to continue;"
          Pause$ = INPUT$(1)
          RESUME
        CASE 27                      'Printer out of paper'
          PRINT "Printer is out of paper. Insert paper, then
"
          PRINT "        press any key to continue."
          Pause$ = INPUT$(1)
          RESUME
        CASE ELSE
          PRINT "Unanticipated error in error handling
routine!!! Stop"
          PRINT "ERR ="; ERR
          ON ERROR GOTO 0
      END SELECT
```

```
10 'saoutput
20 '
30 '
40 '
50 '
60 '
70 '
80 '
90 '                    SEISMIC ANALYSIS OF STANDARD RISERS
100 '                                PART 2
110 '
120 '
130 '   For Information Contact:
140 '
150 '                          SOIL CONSERVATION SERVICE
160 '                       SOUTH NATIONAL TECHNICAL CENTER
170 '                                P.O. BOX 6567
180 '                             FORT WORTH,TX 76115
190 '                             PHONE: 817/334-5242
200 '
210 '
220 '   Programmed by Ron Nulton 11/22/88
230 '               Modified by Pam Bayliff
240 '
250 '***************** COMMON STATEMENTS ******************
251 COMMON SHARED PI$, Y, F0$, F1$, F2$, F3$, F5$, SPT%,
SZ%, HC$, D, NOSEG%, NOSUB%, L%, HSEGI()
252 COMMON SHARED L1, B1, L2, B2, NOWALLS%, T1, T2, T3, E,
CF, TS$, HE, KA, KP, KO
253 COMMON SHARED HT, HS, HR, HW, HH, WE, WF, HI(), HX(),
T(), V0(), I(), LE(), PMAX()
254 COMMON SHARED P(), PMIN(), SLOPE(), SFO(), SFS(), VX(),
MX(), FC(), FC$()
255 COMMON SHARED FS(), FS$(), K$(), ASV(), I%, K%, XX%, M%,
AS1$(), SA(), AS1()
256 COMMON SHARED AS3$(), S2(), AS3(), AS4$(), S4(), AS4(),
AS6$(), S5(), AS6()
257 COMMON SHARED VH$(), VH(), VP$(), VP(), S1(), TI(),
UNITWT, RE, Revised$
260 '
270 '
280 '************** PRINT TO SCREEN COMMANDS *************
290 '
300 CLS
310 LOCATE 3, 23: COLOR 15: PRINT "***** O U T  P U T
*****": COLOR 7
320 PRINT TAB(10); USING "TOTAL HEIGHT OF RISER (FT) -------
------ ##.###"; HT
330 PRINT TAB(10); USING "TOTAL EFFECTIVE HEIGHT OF RISER
(FT) --- ##.###"; HS
335 PRINT TAB(10); USING "LENGTH/WIDTH RATIO ---------------
------- #.##"; 1 / Y
340 PRINT
350 PRINT TAB(10); USING "EFFECTIVE DEPTH OF EMBEDMENT (FT)
------ ##.###"; HR
```

```
360 PRINT TAB(10); USING "EFFECTIVE HEIGHT OF WEIR (FT) ----
------ ##.###"; HW
370 PRINT TAB(10); USING "EFFECTIVE SUBMERGED HEIGHT (FT) --
------ ##.###"; HH
380 PRINT TAB(10); USING "EFFECTIVE WEIGHT OF TOTAL RISER
(KIPS)  ###.##"; WE
390 PRINT TAB(10); USING "EFFECTIVE WEIGHT OF FILL (KIPS) --
----- ###.##"; WF
400 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
410 INK$ = INKEY$: IF INK$ = "" THEN 410 ELSE 430
420 '
430 CLS
440 PRINT " ", "SEGMENT", "   Hi", "   Hx"
450 PRINT " ", "        ", "  (FT)", "  (FT)"
460 PRINT
470 FOR L% = 0 TO 10000
480 NEXT
490 FOR L% = 0 TO NOSEG% - 1
500 PRINT USING "              ####          ###.##"; L% +
1; HI(L%);
510 PRINT USING "        ###.##"; HX(L%)
520 NEXT
530 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
540 INK$ = INKEY$: IF INK$ = "" THEN 540 ELSE 560
550 '
560 CLS
570 PRINT
580 PRINT
590 PRINT
600 PRINT
610 PRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
620 PRINT
630 PRINT TAB(10); "FUNDAMENTAL PERIOD OF VIBRATION (SECS)";
640 PRINT USING " ------ ###.##"; T(0)
650 PRINT TAB(10); "BASE SHEAR (KIPS)";
660 PRINT USING " --------------------------- ###.##"; V0(0)
670 PRINT TAB(10); "SOIL-STRUCTURE INTERACTION FACTOR";
680 PRINT USING " -----------   #.##"; I(0)
690 PRINT TAB(10); "HORIZ. PRESSURE DIAGRAM WEIGHTED WIDTH
(FT)";
700 PRINT USING " -  ##.##"; LE(0)
710 PRINT TAB(10); "MAXIMUM LATERAL EARTH PRESSURE (KSF)";
720 PRINT USING " --------  ##.##"; PMAX(0)
730 PRINT
740 PRINT TAB(10); "MAXIMUM BEARING PRESSURE (KSF)";
750 PRINT USING " --------------- ###.##"; P(0)
760 PRINT TAB(10); "MINIMUM POSITIVE BEARING PRESSURE
(KSF)";
770 PRINT USING " ----- ###.##"; PMIN(0)
780 PRINT TAB(10); "BEARING PRESSURE DIAGRAM SLOPE (FT/FT)";
790 PRINT USING " ------ ###.##"; SLOPE(0)
800 PRINT TAB(10); "SAFETY FACTOR - OVERTURNING";
810 PRINT USING " -----------------  ##.###"; SFO(0)
820 PRINT TAB(10); "SAFETY FACTOR - SLIDING";
830 PRINT USING " ---------------------  ##.###"; SFS(0)
840 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
850 INK$ = INKEY$: IF INK$ = "" THEN 850 ELSE 870
```

```
860 '
870 CLS
880 PRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
890 PRINT
900 PRINT "", "SEGMENT", "  Vx", "  Mx"
910 PRINT "", "       ", " KIPS", "FT-KIPS"
920 PRINT
930 FOR L% = 0 TO 10000
940 NEXT
950 FOR L% = 0 TO NOSEG%
960 PRINT USING "              ##            ###.##"; L% +
1; VX(0, L%);
970 PRINT USING "       ####.#"; MX(0, L%)
980 NEXT
990 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
1000 INK$ = INKEY$: IF INK$ = "" THEN 1000 ELSE 1020
1010 '
1020 CLS
1030 PRINT
1040 PRINT
1050 PRINT
1060 PRINT
1070 PRINT
1080 PRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
1090 PRINT
1100 PRINT TAB(10); "FUNDAMENTAL PERIOD OF VIBRATION
(SECS)";
1110 PRINT USING " ------ ###.##"; T(1)
1120 PRINT TAB(10); "BASE SHEAR (KIPS)";
1130 PRINT USING " -------------------------- ###.##";
V0(1)
1140 PRINT TAB(10); "SOIL-STRUCTURE INTERACTION FACTOR";
1150 PRINT USING " -----------    #.##"; I(1)
1160 PRINT TAB(10); "HORIZ. PRESSURE DIAGRAM WEIGHTED WIDTH
(FT)";
1170 PRINT USING " -  ##.##"; LE(1)
1180 PRINT TAB(10); "MAXIMUM LATERAL EARTH PRESSURE (KSF)";
1190 PRINT USING " --------  ##.##"; PMAX(1)
1200 PRINT
1210 PRINT TAB(10); "MAXIMUM BEARING PRESSURE (KSF)";
1220 PRINT USING " -------------- ###.##"; P(1)
1230 PRINT TAB(10); "MINIMUM POSITIVE BEARING PRESSURE
(KSF)";
1240 PRINT USING " ----- ###.##"; PMIN(1)
1250 PRINT TAB(10); "BEARING PRESSURE DIAGRAM SLOPE
(FT/FT)";
1260 PRINT USING " ------ ###.##"; SLOPE(1)
1270 PRINT TAB(10); "SAFETY FACTOR - OVERTURNING";
1280 PRINT USING " -----------------  ##.###"; SFO(1)
1290 PRINT TAB(10); "SAFETY FACTOR - SLIDING";
1300 PRINT USING " --------------------  ##.###"; SFS(1)
1310 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
1320 INK$ = INKEY$: IF INK$ = "" THEN 1320 ELSE 1340
1330 '
1340 CLS
1350 PRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
```

```
1360 PRINT
1370 PRINT "", "SEGMENT", "  Vx", "  Mx"
1380 PRINT "", "         ", " KIPS", "FT-KIPS"
1390 PRINT
1400 FOR L% = 0 TO 10000
1410 NEXT
1420 FOR L% = 0 TO NOSEG%
1430 PRINT USING "              ##            ###.##"; L% +
1; VX(1, L%);
1440 PRINT USING "        ####.#"; MX(1, L%)
1450 NEXT
1460 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
1470 INK$ = INKEY$: IF INK$ = "" THEN 1470 ELSE 1490
1480 '
1490 CLS
1500 PRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
1510 PRINT
1520 PRINT "", "        VERTICAL BENDING"
1530 PRINT
1540 FOR L% = 0 TO 10000
1550 NEXT
1560 I% = 1
1570 IF F2$ = "B" OR F2$ = "b" THEN I% = 2      'SEG 2 SOLID
1580 IF F1$ = "B" OR F1$ = "b" THEN I% = XX%    'EMBEDDED
RISER, I=1
1590 FOR L% = I% TO NOSEG% - 5
1620 PRINT TAB(10); "CONCRETE COMPRESSIVE STRESS (PSI),";
1630 PRINT USING " SEG. ## -----####"; L% + 1; FC(0, L%) /
.144
1640                                     'CONVERT KSF to PSI
1650 PRINT TAB(10); FC$(0, L%)
1660 PRINT
1670 IF L% = 6 OR L% = 12 OR L% = 18 THEN 1680 ELSE 1696
1680 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
1690 INK$ = INKEY$: IF INK$ = "" THEN 1690 ELSE 1695
1695 CLS
1696 NEXT
1697 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
1698 INK$ = INKEY$: IF INK$ = "" THEN 1698 ELSE 1700
1700 '
1710 CLS
1720 FOR L% = I% TO NOSEG% - 5
1750 PRINT TAB(10); "STEEL TENSILE STRESS (KSI),";
1760 PRINT USING "  SEG. ## ----------####"; L% + 1; FS(0,
L%) / 144
1770                                     'CONVERT ksf to ksi
1780 PRINT TAB(10); FS$(0, L%)
1790 PRINT TAB(10); K$(0, L%)
1800 PRINT TAB(10); "AREA STEEL REQUIRED (SQ IN),";
1810 PRINT USING " SEG. ## ----------- ##.##"; L% + 1;
ASV(0, L%) * 144
1820                             'CONVERT sq. ft. to sq. in.
1830 PRINT
1840 IF L% = 4 OR L% = 8 OR L% = 12 OR L% = 16 THEN 1850
ELSE 1866
1850 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
1860 INK$ = INKEY$: IF INK$ = "" THEN 1860 ELSE 1865
```

```
1865 CLS
1866 NEXT
1867 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
1868 INK$ = INKEY$: IF INK$ = "" THEN 1868 ELSE 1870
1870  '
1880 CLS
1890 PRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
1900 PRINT
1910 PRINT "", "        VERTICAL BENDING"
1920 PRINT
1930 FOR L% = 0 TO 10000
1940 NEXT
1950 FOR L% = I% TO NOSEG% - 5
1980 PRINT TAB(10); "CONCRETE COMPRESSIVE STRESS (PSI),";
1990 PRINT USING " SEG. ## -----####"; L% + 1; FC(1, L%) /
.144
2000 '                                       'CONVERT KSF to PSI
2010 PRINT TAB(10); FC$(1, L%)
2020 PRINT
2030 IF L% = 6 OR L% = 12 OR L% = 18 THEN 2040 ELSE 2056
2040 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2050 INK$ = INKEY$: IF INK$ = "" THEN 2050 ELSE 2055
2055 CLS
2056 NEXT
2057 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2058 INK$ = INKEY$: IF INK$ = "" THEN 2058 ELSE 2060
2060 '
2070 CLS
2080 FOR L% = I% TO NOSEG% - 5
2110 IF L% = 12 THEN FOR K% = 0 TO 10000: NEXT
2120 PRINT TAB(10); "STEEL TENSILE STRESS (KSI),";
2130 PRINT USING "  SEG. ## ----------####"; L% + 1; FS(1,
L%) / 144
2140                                      'CONVERT ksf to ksi
2150 PRINT TAB(10); FS$(1, L%)
2160 PRINT TAB(10); K$(1, L%)
2170 PRINT TAB(10); "AREA STEEL REQUIRED (SQ IN),";
2180 PRINT USING " SEG. ## ----------- ##.##"; L% + 1;
ASV(1, L%) * 144
2190                               'CONVERT sq. ft. to sq. in.
2200 PRINT
2210 IF L% = 4 OR L% = 8 OR L% = 12 OR L% = 16 THEN 2220
ELSE 2236
2220 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2230 INK$ = INKEY$: IF INK$ = "" THEN 2230 ELSE 2235
2235 CLS
2236 NEXT
2237 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2238 INK$ = INKEY$: IF INK$ = "" THEN 2238 ELSE 2240
2240 '
2250 CLS
2255 PRINT : PRINT : PRINT : PRINT : PRINT :
2256 PRINT : PRINT : PRINT : PRINT : PRINT :
2257 '
2260 PRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
2270 PRINT
```

```
2280 PRINT "", "        HORIZONTAL BENDING"
2290 PRINT
2300 FOR L% = 0 TO 10000
2310 NEXT
2312 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2314 INK$ = INKEY$: IF INK$ = "" THEN 2314 ELSE 2316
2316 I% = 1
2318 IF F2$ = "A" OR F2$ = "a" GOTO 2325       'SEG 2 HOLLOW
2320 I% = 2
2322 IF XX% = 2 AND F5$ = "1" THEN I% = 3
2325 CLS
2340 '
2350 FOR L% = I% TO NOSEG% - 5
2360 PRINT
2370 PRINT TAB(10); USING "SEGMENT  ##"; L% + 1
2380 PRINT
2390 PRINT TAB(7); AS1$(0, L%)
2400 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
2410 PRINT USING " ---- POINT 1 ----##.#"; S1(0, L%)
2420 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
2430 PRINT USING " POINT 1 ----##.##"; AS1(0, L%)
2440 PRINT
2450 PRINT TAB(7); AS3$(0, L%)
2460 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
2470 PRINT USING " ---- POINT 2 ----##.#"; S2(0, L%)
2480 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
2490 PRINT USING " POINT 3 ----##.##"; AS3(0, L%)
2500 PRINT
2510 PRINT TAB(7); AS4$(0, L%)
2520 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
2530 PRINT USING " ---- POINT 4 ----##.#"; S4(0, L%)
2540 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
2550 PRINT USING " POINT 4 ----##.##"; AS4(0, L%)
2560 PRINT
2570 PRINT TAB(7); AS6$(0, L%)
2580 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
2590 PRINT USING " ---- POINT 5 ----##.#"; S5(0, L%)
2600 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
2610 PRINT USING " POINT 6 ----##.##"; AS6(0, L%)
2620 PRINT
2630 PRINT TAB(7); VH$(0, L%)
2640 PRINT TAB(10); "HORIZONTAL BENDING SHEAR (KSI)";
2650 PRINT USING " ----------------- .###"; VH(0, L%)
2660 PRINT
2670 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2680 INK$ = INKEY$: IF INK$ = "" THEN 2680 ELSE 2690
2690 '
2700 CLS
2710 NEXT
2720 PRINT
2730 PRINT
2740 PRINT
2750 PRINT
2760 PRINT
2770 PRINT
2780 PRINT TAB(7); VP$(0)
2790 PRINT
```

```
2800 PRINT TAB(10); "FOR THE LOWEST EFFECTIVE WALL SECTION,
"
2810 PRINT TAB(10); "THE SHEAR IN THE HORIZONTAL PLANE IS
(KSI)";
2820 PRINT USING " ----- .###"; VP(0)
2830 PRINT
2840 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2850 INK$ = INKEY$: IF INK$ = "" THEN 2850 ELSE 2860
2860 '
2870 CLS
2874 PRINT : PRINT : PRINT : PRINT : PRINT :
2875 PRINT : PRINT : PRINT : PRINT : PRINT
2876 '
2880 PRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
2890 PRINT
2900 PRINT "", "       HORIZONTAL BENDING"
2910 PRINT
2920 FOR L% = 0 TO 10000
2930 NEXT
2932 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
2934 INK$ = INKEY$: IF INK$ = "" THEN 2934 ELSE 2936
2936 CLS
2940 FOR L% = I% TO NOSEG% - 5
2950 PRINT
2960 PRINT TAB(10); USING "SEGMENT  ##"; L% + 1
2970 PRINT
2980 PRINT TAB(7); AS1$(1, L%)
2990 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
3000 PRINT USING " ---- POINT 1 ----##.#"; S1(1, L%)
3010 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
3020 PRINT USING " POINT 1 ----##.##"; AS1(1, L%)
3030 PRINT
3040 PRINT TAB(7); AS3$(1, L%)
3050 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
3060 PRINT USING " ---- POINT 2 ----##.#"; S2(1, L%)
3070 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
3080 PRINT USING " POINT 3 ----##.##"; AS3(1, L%)
3090 PRINT
3100 PRINT TAB(7); AS4$(1, L%)
3110 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
3120 PRINT USING " ---- POINT 4 ----##.#"; S4(1, L%)
3130 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
3140 PRINT USING " POINT 4 ----##.##"; AS4(1, L%)
3150 PRINT
3160 PRINT TAB(7); AS6$(1, L%)
3170 PRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
3180 PRINT USING " ---- POINT 5 ----##.#"; S5(1, L%)
3190 PRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
3200 PRINT USING " POINT 6 ----##.##"; AS6(1, L%)
3210 PRINT
3220 PRINT TAB(7); VH$(1, L%)
3230 PRINT TAB(10); "HORIZONTAL BENDING SHEAR (KSI)";
3240 PRINT USING " ----------------- .###"; VH(1, L%)
3250 PRINT
3260 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
3270 INK$ = INKEY$: IF INK$ = "" THEN 3270 ELSE 3280
```

```
3280 '
3290 CLS
3300 NEXT
3310 PRINT
3320 PRINT
3330 PRINT
3340 PRINT
3350 PRINT
3360 PRINT
3370 PRINT TAB(7); VP$(1)
3380 PRINT
3390 PRINT TAB(10); "FOR THE LOWEST EFFECTIVE WALL SECTION,
"
3400 PRINT TAB(10); "THE SHEAR IN THE HORIZONTAL PLANE IS
(KSI)";
3410 PRINT USING " ----- .###"; VP(1)
3420 PRINT
3430 LOCATE 23, 52: PRINT "PRESS ANY KEY TO CONTINUE"
3440 INK$ = INKEY$: IF INK$ = "" THEN 3440 ELSE 3450
3450 CLS
3460 CHAIN "sarisers"
```

```
10 'saprint
20 '
30 '
40 '
50 '
60 '
70 '
80 '
90 '                    SEISMIC ANALYSIS OF STANDARD RISERS
100 '                                PART 3
110 '
120 '
130 '   For Information Contact:
140 '
150 '                          SOIL CONSERVATION SERVICE
160 '                       SOUTH NATIONAL TECHNICAL CENTER
170 '                                P.O. BOX 6567
180 '                            FORT WORTH,TX 76115
190  '                           PHONE: 817/334-5242
200 '
210 '
220 '   Programmed by Ron Nulton 11/22/88
230 '               Modified by Pam Bayliff
240 '
250 '************** COMMON STATEMENTS *****************
251 COMMON SHARED PI$, Y, F0$, F1$, F2$, F3$, F5$, SPT%,
SZ%, HC$, D, NOSEG%, NOSUB%, L%, HSEGI()
252 COMMON SHARED L1, B1, L2, B2, NOWALLS%, T1, T2, T3, E,
CF, TS$, HE, KA, KP, KO
253 COMMON SHARED HT, HS, HR, HW, HH, WE, WF, HI(), HX(),
T(), V0(), I(), LE(), PMAX()
254 COMMON SHARED P(), PMIN(), SLOPE(), SFO(), SFS(), VX(),
MX(), FC(), FC$()
255 COMMON SHARED FS(), FS$(), K$(), ASV(), I%, K%, XX%, M%,
AS1$(), SA(), AS1()
256 COMMON SHARED AS3$(), S2(), AS3(), AS4$(), S4(), AS4(),
AS6$(), S5(), AS6()
257 COMMON SHARED VH$(), VH(), VP$(), VP(), S1(), TI(),
UNITWT, RE, Revised$
260 '
270 '
370 '
371 ON ERROR GOTO Handlerr   'Error code handler subroutine
372 '                   Original adaptation by Mark Boysen 1/91
373 '
3480 '************ OUTPUT TO PRINTER COMMANDS *************
3490 '
3500 CLS
3510 LPRINT
3520 LPRINT
3530 LOCATE 10, 25: PRINT "       PRINTING OUTPUT !"
3540 LPRINT
3550 LPRINT TAB(25); DATE$, TIME$
3560 LPRINT
3570 LPRINT
3580 LPRINT
```

```
3590 LPRINT TAB(20); "SEISMIC ANALYSIS OF STANDARD RISERS"
3600 LPRINT TAB(18); "-------------------------------------
-"
3610 LPRINT
3620 LPRINT
3630 LPRINT
3640 LPRINT
3650 LPRINT TAB(11); "SCS - - SNTC                      REVISED
"; Revised$
3660 LPRINT
3670 LPRINT TAB(9); PI$
3680 LPRINT
3690 LPRINT TAB(9); "BY___________DATE________CHECKED BY
___________DATE_______"
3700 LPRINT
3710 LPRINT
3720 IF F0$ = "B" OR F0$ = "b" THEN 3750
3730 LPRINT TAB(25); "STANDARD COVERED TOP RISER"
3740 GOTO 3760
3750 LPRINT TAB(25); "STANDARD BAFFLE INLET RISER"
3760 LPRINT TAB(25); "LENGTH/WIDTH RATIO OF ";
3770 LPRINT USING "#.##"; 1 / Y
3780 IF F1$ = "B" OR F1$ = "b" THEN 3810
3790 LPRINT TAB(31); "FREE-STANDING"
3800 GOTO 3820
3810 LPRINT TAB(33); "EMBEDDED"
3820 IF F2$ = "B" OR F2$ = "b" THEN 3850
3830 LPRINT TAB(28); "SEGMENT 2 IS HOLLOW"
3840 GOTO 3860
3850 LPRINT TAB(28); "SEGMENT 2 IS SOLID"
3860 IF F3$ = "N" OR F3$ = "n" THEN 3890
3870 LPRINT TAB(17); "COMPUTING SOIL-STRUCTURE INTERACTION
FACTOR"
3880 GOTO 3900
3890 LPRINT TAB(16); "USING 1 FOR SOIL-STRUCTURE INTERACTION
FACTOR"
3900 LPRINT
3910 LPRINT
3920 LPRINT
3930 LPRINT TAB(9); "SOIL PROFILE TYPE -----------";
3940 LPRINT USING "##.##"; SPT%
3950 LPRINT TAB(9); "SEISMIC ZONE -----------------";
3960 LPRINT USING "##.##"; SZ%
3970 LPRINT TAB(9); "HAZARD CLASS ----------------- ";
3980 LPRINT ; HC$
3990 LPRINT TAB(9); "CONDUIT DIAMETER IN FEET -----";
4000 LPRINT USING "##.##"; Y * D
4010 LPRINT TAB(9); "NO. OF RISER SEGMENTS --------";
4020 LPRINT USING "##.##"; NOSEG%
4030 LPRINT TAB(9); "NO. OF SEGMENTS SUBMERGED ----";
4040 LPRINT USING "##.##"; NOSUB%
4050 LPRINT
4060 LPRINT
4070 LPRINT
4080 LPRINT
4090 '
4100 LPRINT "", "SEGMENT", "SEGMENT", "  WALL"
```

```
4110 LPRINT "", "", "HEIGHT", "THICKNESS"
4120 LPRINT "", "", " (FT)", "  (FT)  "
4130 LPRINT
4140 FOR L% = 0 TO NOSEG% - 1
4150 LPRINT USING "             ####          ##.###"; L% +
1; HSEGI(L%);
4160 LPRINT USING "       ##.###"; TI(L%)
4170 NEXT
4180 '
4190 LPRINT CHR$(12);
4200 LPRINT TAB(9); PI$
4210 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 2"
4220 LPRINT
4230 LPRINT
4240 LPRINT
4250 LPRINT
4260 LPRINT USING "                    BASE WIDTH (FT) ----
---- ##.###"; L1
4270 LPRINT USING "                    BASE LENGTH (FT) ---
---- ##.###"; B1
4280 IF F2$ = "A" OR F2$ = "a" THEN GOTO 4310
4290 LPRINT USING "                    SEGMENT 2 WIDTH (FT)
--- ##.###"; L2
4300 LPRINT USING "                    SEGMENT 2 LENGTH
(FT) -- ##.###"; B2
4310 LPRINT
4320 LPRINT
4330 LPRINT
4340 LPRINT
4350 IF F0$ = "A" OR F0$ = "a" THEN GOTO 4460
4360 LPRINT " ", "NO. WALLS", "T1", "T2", "T3"
4370 LPRINT " ", "         ", "(FT)", "(FT)", "(FT)"
4380 LPRINT
4390 LPRINT USING "             ####          ##.###";
NOWALLS%; T1;
4400 LPRINT USING "       ##.###       ##.###"; T2; T3
4410 '
4420 LPRINT
4430 LPRINT
4440 LPRINT
4450 LPRINT
4460 LPRINT TAB(10); USING "CONCRETE MODULUS OF ELASTICITY
(KSF) --- ######"; E
4470 LPRINT TAB(10); USING "SLIDING COEFF. OF FRICTION -----
--------  #.##"; CF
4480 IF TS$ = "B" OR TS$ = "b" THEN 4510
4490 LPRINT TAB(10); "MAX WALL THICKNESS FOR T&S STEEL (IN)
-- 16"
4500 GOTO 4520
4510 LPRINT TAB(10); "MAX WALL THICKNESS FOR T&S STEEL (IN)
-- 32"
4520 LPRINT TAB(10); USING "DEPTH OF EMBEDMENT (FT) --------
-------- ##.###"; HE
4530 LPRINT
4540 LPRINT TAB(10); USING "ACTIVE LATERAL EARTH PRESSURE
RATIO ----- #.##"; KA
```

```
4550 LPRINT TAB(10); USING "PASSIVE LATERAL EARTH PRESSURE
RATIO ---- #.##"; KP
4560 LPRINT TAB(10); USING "AT REST LATERAL EARTH PRESSURE
RATIO ---- #.##"; KO
4570 LPRINT TAB(10); "MOIST UNIT WEIGHT OF FILL (LBS/CU
FT)";
4580 LPRINT USING " - ###.##"; UNITWT
4590 LPRINT TAB(10); USING "TOTAL HEIGHT OF RISER (FT) -----
-------- ##.###"; HT
4600 LPRINT TAB(10); USING "TOTAL EFFECTIVE HEIGHT OF RISER
(FT) --- ##.###"; HS
4610 LPRINT
4620 LPRINT TAB(10); USING "EFFECTIVE DEPTH OF EMBEDMENT
(FT) ------ ##.###"; HR
4630 LPRINT TAB(10); USING "EFFECTIVE HEIGHT OF WEIR (FT) --
-------- ##.###"; HW
4640 LPRINT TAB(10); USING "EFFECTIVE SUBMERGED HEIGHT (FT)
-------- ##.###"; HH
4650 LPRINT TAB(10); USING "EFFECTIVE WEIGHT OF TOTAL RISER
(KIPS)  ###.##"; WE
4660 LPRINT TAB(10); USING "EFFECTIVE WEIGHT OF FILL (KIPS)
------- ###.##"; WF
4670 '
4680 LPRINT
4690 LPRINT
4700 LPRINT
4710 LPRINT
4720 LPRINT " ", "SEGMENT", "   Hi", "   Hx"
4730 LPRINT " ", "        ", "  (FT)", "  (FT)"
4740 LPRINT
4750 FOR L% = 0 TO NOSEG% - 1
4760 LPRINT USING "             ####          ###.##"; L% +
1; HI(L%);
4770 LPRINT USING "       ###.##"; HX(L%)
4780 NEXT
4790 '
4800 LPRINT CHR$(12);
4810 LPRINT TAB(9); PI$
4820 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 3"
4830 LPRINT
4840 LPRINT
4850 LPRINT
4860 LPRINT
4870 LPRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
4880 LPRINT
4890 LPRINT TAB(10); "FUNDAMENTAL PERIOD OF VIBRATION
(SECS)";
4900 LPRINT USING " ------ ###.##"; T(0)
4910 LPRINT TAB(10); "BASE SHEAR (KIPS)";
4920 LPRINT USING " --------------------------- ###.##";
V0(0)
4930 LPRINT TAB(10); "SOIL-STRUCTURE INTERACTION FACTOR";
4940 LPRINT USING " -----------   #.##"; I(0)
4950 LPRINT TAB(10); "HORIZ. PRESSURE DIAGRAM WEIGHTED WIDTH
(FT)";
4960 LPRINT USING " -  ##.##"; LE(0)
4970 LPRINT TAB(10); "MAXIMUM LATERAL EARTH PRESSURE (KSF)";
```

```
4980 LPRINT USING " --------   ##.##"; PMAX(0)
4990 LPRINT
5000 LPRINT TAB(10); "MAXIMUM BEARING PRESSURE (KSF)";
5010 LPRINT USING " -------------- ###.##"; P(0)
5020 LPRINT TAB(10); "MINIMUM POSITIVE BEARING PRESSURE
(KSF)";
5030 LPRINT USING " ----- ###.##"; PMIN(0)
5040 LPRINT TAB(10); "BEARING PRESSURE DIAGRAM SLOPE
(FT/FT)";
5050 LPRINT USING " ------ ###.##"; SLOPE(0)
5060 LPRINT TAB(10); "SAFETY FACTOR - OVERTURNING";
5070 LPRINT USING " -----------------  ##.###"; SFO(0)
5080 LPRINT TAB(10); "SAFETY FACTOR - SLIDING";
5090 LPRINT USING " ---------------------   ##.###"; SFS(0)
5100 '
5110 LPRINT
5120 LPRINT
5130 LPRINT
5140 LPRINT
5150 LPRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
5160 LPRINT
5170 LPRINT "", "SEGMENT", "  Vx", "  Mx"
5180 LPRINT "", "       ", " KIPS", "FT-KIPS"
5190 LPRINT
5200 FOR L% = 0 TO NOSEG%
5210 LPRINT USING "              ##            ###.##"; L% +
1; VX(0, L%);
5220 LPRINT USING "        ####.#"; MX(0, L%)
5230 NEXT
5240 '
5250 LPRINT CHR$(12);
5260 LPRINT TAB(9); PI$
5270 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 4"
5280 LPRINT
5290 LPRINT
5300 LPRINT
5310 LPRINT
5320 LPRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
5330 LPRINT
5340 LPRINT TAB(10); "FUNDAMENTAL PERIOD OF VIBRATION
(SECS)";
5350 LPRINT USING " ------ ###.##"; T(1)
5360 LPRINT TAB(10); "BASE SHEAR (KIPS)";
5370 LPRINT USING " ---------------------------- ###.##";
V0(1)
5380 LPRINT TAB(10); "SOIL-STRUCTURE INTERACTION FACTOR";
5390 LPRINT USING " -----------    #.##"; I(1)
5400 LPRINT TAB(10); "HORIZ. PRESSURE DIAGRAM WEIGHTED WIDTH
(FT)";
5410 LPRINT USING " -  ##.##"; LE(1)
5420 LPRINT TAB(10); "MAXIMUM LATERAL EARTH PRESSURE (KSF)";
5430 LPRINT USING " --------   ##.##"; PMAX(1)
5440 LPRINT
5450 LPRINT TAB(10); "MAXIMUM BEARING PRESSURE (KSF)";
5460 LPRINT USING " -------------- ###.##"; P(1)
```

```
5470 LPRINT TAB(10); "MINIMUM POSITIVE BEARING PRESSURE
(KSF)";
5480 LPRINT USING " ----- ###.##"; PMIN(1)
5490 LPRINT TAB(10); "BEARING PRESSURE DIAGRAM SLOPE
(FT/FT)";
5500 LPRINT USING " ------ ###.##"; SLOPE(1)
5510 LPRINT TAB(10); "SAFETY FACTOR - OVERTURNING";
5520 LPRINT USING " ----------------  ##.###"; SFO(1)
5530 LPRINT TAB(10); "SAFETY FACTOR - SLIDING";
5540 LPRINT USING " ---------------------  ##.###"; SFS(1)
5550 '
5560 LPRINT
5570 LPRINT
5580 LPRINT
5590 LPRINT
5600 LPRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
5610 LPRINT
5620 LPRINT "", "SEGMENT", "  Vx", "  Mx"
5630 LPRINT "", "        ", " KIPS", "FT-KIPS"
5640 LPRINT
5650 FOR L% = 0 TO NOSEG%
5660 LPRINT USING "             ##           ###.##"; L% +
1; VX(1, L%);
5670 LPRINT USING "        ####.#"; MX(1, L%)
5680 NEXT
5690 '
5700 LPRINT CHR$(12);
5710 LPRINT TAB(9); PI$
5720 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 5"
5730 LPRINT
5740 LPRINT
5750 LPRINT
5760 LPRINT
5770 LPRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
5780 LPRINT
5790 LPRINT "", "        VERTICAL BENDING"
5800 LPRINT
5810 I% = 1
5820 IF F2$ = "B" OR F2$ = "b" THEN I% = 2       'SEG 2 SOLID
5830 IF F1$ = "B" OR F1$ = "b" THEN I% = XX%     'EMBEDDED
RISER, I=1
5840 FOR L% = I% TO NOSEG% - 5
5850 LPRINT TAB(10); "CONCRETE COMPRESSIVE STRESS (PSI),";
5860 LPRINT USING " SEG. ## -----####"; L% + 1; FC(0, L%) /
.144
5870                                           'CONVERT KSF to PSI
5880 LPRINT TAB(10); FC$(0, L%)
5890 LPRINT
5900 NEXT
5910 '
5920 LPRINT CHR$(12);
5930 LPRINT TAB(9); PI$
5940 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 6"
5950 LPRINT
5960 LPRINT
5970 LPRINT
5980 LPRINT
```

```
5990 FOR L% = I% TO NOSEG% - 5
6000 LPRINT TAB(10); "STEEL TENSILE STRESS (KSI),";
6010 LPRINT USING " SEG. ## ------------#### "; L% + 1;
FS(0, L%) / 144
6020                                        'CONVERT ksf to ksi
6030 LPRINT TAB(10); FS$(0, L%)
6040 LPRINT TAB(10); K$(0, L%)
6050 LPRINT TAB(10); "AREA STEEL REQUIRED (SQ IN),";
6060 LPRINT USING " SEG. ## -----------  ##.##   ________";
L% + 1; ASV(0, L%) * 144
6070                                'CONVERT sq. ft. to sq. in.
6080 LPRINT
6090 NEXT
6100  '
6110 LPRINT CHR$(12);
6120 LPRINT TAB(9); PI$
6130 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 7"
6140 LPRINT
6150 LPRINT
6160 LPRINT
6170 LPRINT
6180 LPRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
6190 LPRINT
6200 LPRINT "", "        VERTICAL BENDING"
6210 LPRINT
6220 FOR L% = I% TO NOSEG% - 5
6230 LPRINT TAB(10); "CONCRETE COMPRESSIVE STRESS (PSI),";
6240 LPRINT USING " SEG. ## -----####"; L% + 1; FC(1, L%) /
.144
6250                                        'CONVERT KSF to PSI
6260 LPRINT TAB(10); FC$(1, L%)
6270 LPRINT
6280 NEXT
6290 '
6300 LPRINT CHR$(12);
6310 LPRINT TAB(9); PI$
6320 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 8"
6330 LPRINT
6340 LPRINT
6350 LPRINT
6360 LPRINT
6370 FOR L% = I% TO NOSEG% - 5
6380 LPRINT TAB(10); "STEEL TENSILE STRESS (KSI),";
6390 LPRINT USING " SEG. ## ------------####"; L% + 1; FS(1,
L%) / 144
6400                                       'CONVERT ksf to ksi
6410 LPRINT TAB(10); FS$(1, L%)
6420 LPRINT TAB(10); K$(1, L%)
6430 LPRINT TAB(10); "AREA STEEL REQUIRED (SQ IN),";
6440 LPRINT USING " SEG. ## -----------  ##.##   ________";
L% + 1; ASV(1, L%) * 144
6450                                'CONVERT sq. ft. to sq. in.
6460 LPRINT
6470 NEXT
6480 '
6490 LPRINT CHR$(12);
```

```
6500 LPRINT TAB(9); PI$
6510 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE 9"
6520 LPRINT
6530 LPRINT
6540 LPRINT
6550 LPRINT
6560 LPRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
6570 LPRINT
6580 LPRINT "", "       HORIZONTAL BENDING"
6590 LPRINT
6600 I% = 1
6610 K% = 1
6620 IF F2$ = "A" OR F2$ = "a" GOTO 6660     'SEG 2 HOLLOW
6630 I% = 2
6640 IF XX% = 2 AND F5$ = "1" THEN I% = 3
6650 '
6660 M% = 10
6670 FOR L% = I% TO NOSEG% - 5
6680 LPRINT
6690 LPRINT TAB(10); USING "SEGMENT  ##"; L% + 1
6700 LPRINT
6710 LPRINT TAB(7); AS1$(0, L%)
6720 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
6730 LPRINT USING "       POINT 1 ---##.#    ________"; S1(0,
L%)
6740 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
6750 LPRINT USING "  POINT 1 ---##.##   ________"; AS1(0, L%)
6760 LPRINT
6770 LPRINT TAB(7); AS3$(0, L%)
6780 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
6790 LPRINT USING "      POINT 2 ----##.#    ________"; S2(0,
L%)
6800 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
6810 LPRINT USING " POINT 3 ----##.##   ________"; AS3(0, L%)
6820 LPRINT
6830 LPRINT TAB(7); AS4$(0, L%)
6840 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
6850 LPRINT USING "      POINT 4 ----##.#    ________"; S4(0,
L%)
6860 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
6870 LPRINT USING " POINT 4 ----##.##   ________"; AS4(0, L%)
6880 LPRINT
6890 LPRINT TAB(7); AS6$(0, L%)
6900 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
6910 LPRINT USING "       POINT 5 ---##.#    ________"; S5(0,
L%)
6920 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
6930 LPRINT USING "  POINT 6 ---##.##   ________"; AS6(0, L%)
6940 LPRINT
6950 LPRINT TAB(7); VH$(0, L%)
6960 LPRINT TAB(10); "HORIZONTAL BENDING SHEAR (KSI)";
6970 LPRINT USING " -------------.###"; VH(0, L%)
6980 K% = -K%
6990 IF K% > 0 THEN LPRINT CHR$(12): LPRINT TAB(9); PI$:
LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE "; M%
7000 IF K% > 0 THEN M% = M% + 1
7010 '
```

```
7020 LPRINT
7030 LPRINT
7040 LPRINT
7050 LPRINT
7060 NEXT
7070 '
7080 IF K% > 0 GOTO 7170
7090 LPRINT CHR$(12);
7100 LPRINT TAB(9); PI$
7110 LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE "; M%
7120 M% = M% + 1
7130 LPRINT
7140 LPRINT
7150 LPRINT
7160 LPRINT
7170 LPRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
7180 LPRINT
7190 LPRINT "", "       HORIZONTAL BENDING"
7200 LPRINT
7210 K% = 1
7220 FOR L% = I% TO NOSEG% - 5
7230 LPRINT
7240 LPRINT TAB(10); USING "SEGMENT  ##"; L% + 1
7250 LPRINT
7260 LPRINT TAB(7); AS1$(1, L%)
7270 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
7280 LPRINT USING "       POINT 1 ---##.#    ________"; S1(1,
L%)
7290 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
7300 LPRINT USING "  POINT 1 ---##.##    ________"; AS1(1, L%)
7310 LPRINT
7320 LPRINT TAB(7); AS3$(1, L%)
7330 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
7340 LPRINT USING "      POINT 2 ----##.#    ________"; S2(1,
L%)
7350 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
7360 LPRINT USING " POINT 3 ----##.##    ________"; AS3(1, L%)
7370 LPRINT
7380 LPRINT TAB(7); AS4$(1, L%)
7390 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
7400 LPRINT USING "      POINT 4 ----##.#    ________"; S4(1,
L%)
7410 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
7420 LPRINT USING " POINT 4 ----##.##    ________"; AS4(1, L%)
7430 LPRINT
7440 LPRINT TAB(7); AS6$(1, L%)
7450 LPRINT TAB(10); "STEEL SPACING REQUIRED (IN.),";
7460 LPRINT USING "       POINT 5 ---##.#    ________"; S5(1,
L%)
7470 LPRINT TAB(10); "STEEL AREA REQUIRED (SQ. IN./FT.),";
7480 LPRINT USING "  POINT 6 ---##.##    ________"; AS6(1, L%)
7490 LPRINT
7500 LPRINT TAB(7); VH$(1, L%)
7510 LPRINT TAB(10); "HORIZONTAL BENDING SHEAR (KSI)";
7520 LPRINT USING " --------------.###"; VH(1, L%)
7530 K% = -K%
```

```
7540 IF K% > 0 THEN LPRINT CHR$(12): LPRINT TAB(9); PI$:
LPRINT TAB(9); DATE$, TIME$; TAB(65); "PAGE "; M%
7550 IF K% > 0 THEN M% = M% + 1
7560 '
7570 LPRINT
7580 LPRINT
7590 LPRINT
7600 LPRINT
7610 NEXT
7620 LPRINT
7630 LPRINT
7640 LPRINT
7650 LPRINT
7660 LPRINT "", "GROUND MOTION PARALLEL TO ENDWALLS"
7670 LPRINT
7680 LPRINT "", "       HORIZONTAL BENDING"
7690 LPRINT
7700 LPRINT
7710 LPRINT TAB(7); VP$(0)
7720 LPRINT
7730 LPRINT TAB(10); "FOR THE LOWEST EFFECTIVE WALL SECTION,
"
7740 LPRINT TAB(10); "THE SHEAR IN THE HORIZONTAL PLANE IS
(KSI)";
7750 LPRINT USING " -------------.###"; VP(0)
7760 LPRINT
7770 '
7780 LPRINT
7790 LPRINT
7800 LPRINT
7810 LPRINT
7820 LPRINT "", "GROUND MOTION PARALLEL TO SIDEWALLS"
7830 LPRINT
7840 LPRINT "", "       HORIZONTAL BENDING"
7850 LPRINT
7860 LPRINT
7870 LPRINT TAB(7); VP$(1)
7880 LPRINT
7890 LPRINT TAB(10); "FOR THE LOWEST EFFECTIVE WALL SECTION,
"
7900 LPRINT TAB(10); "THE SHEAR IN THE HORIZONTAL PLANE IS
(KSI)";
7910 LPRINT USING " -------------.###"; VP(1)
7920 LPRINT
7921 LPRINT CHR$(12);
7930 SHELL " "
7940 CHAIN "sarisers"
12260 '
12270 '********** ERROR CODE HANDLER SUBROUTINE ************
12280 '                   orig. adaptation by Mark Boysen
1/91
12295 '
12300 Handlerr:
12310 '
12320 SELECT CASE ERR
       CASE 24, 25                'Device Timeout (24) and
Device fault (25)'
```

```
            PRINT "Device timeout or device fault, such as
printer not on line!"
            PRINT "Turn Printer on and/or press ONLINE button,
then;"
            PRINT "        press any key to continue;"
            Pause$ = INPUT$(1)
            RESUME
          CASE 27                       'Printer out of paper'
            PRINT "Printer is out of paper. Insert paper, then
"
            PRINT "        press any key to continue."
            Pause$ = INPUT$(1)
            RESUME
          CASE ELSE
            PRINT "Unanticipated error in error handling
routine!!! Stop"
            PRINT "ERR ="; ERR
            ON ERROR GOTO 0
        END SELECT
```

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